Promat

Promat Handbook

Fire Protection of Load-bearing Steel Structures

Claddings, reactive and non-reactive coatings, membranes: all technologies - one partner

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Information

1. Fire protection of load-bearing steel structures - claddings, reactive and non-reactive coatings, membranes

Promat is a leading manufacturer of fire resistant materials that offers all four methods of passive fire protection of steel structures. The complete solution range of fire protection of steel structures can be delivered by one supplier. We tested a variety of structures. With our support during the design and application you can choose the optimal solution for your project. Safe and economical.

We ensure high fire resistance during the time. Considering the working life foreseen in Eurocodes, our products with high durability reduce maintenance costs throughout the designed life of a building. Promat is a large company with strong traditions and long history. We can offer long-term fire safety in your buildings.

Cladding with PROMATECT® boards
The excellent stability of the cementitious/calcium silicate PROMATECT® boards allows the application of self-supporting boxed protection without fixing to the steel structure.

PROMATECT® boards can be also stapled from the front side, which speeds up the installation of the cladding. Under the lining is not necessary to mount any supporting under-structure.

PROMATECT® boards allow fabrication of thin single-layer claddings. Lining thickness is determined by the required fire resistance, section factor A_p/V and the design (critical) temperature.

Promat offers several types of fire protective boards, suitable for different uses.

- PROMATECT®-H is designed for the most demanding applications for steel and concrete protection. It characterized by high mechanical stability, shock resistance tensile caliber, water and frost resistance and fire resistance. It is suitable for semi-exposed uses (type Y, Z_1 and Z_2 according to EAD 350142-00-1106). Details are provided in construction sheet 1.01.
- PROMATECT®-200 is our economic alternative. Excellent fire resistance properties are commonplace. It is suitable for indoor use only (type Z_2 according to EAD 350142-00-1106). Details are provided in construction sheet 1.02.
- PROMATECT®-XS is a non-combustible gypsum board reinforced with fiber glass. PROMATECT®-XS boards can be used both in residential and non-residential constructions (e.g. public utility buildings) as fire protection of steel structures (beams, columns). It is suitable for semi-exposed uses (type Y and Z_2 according to EAD 350142-00-1106). Details are provided in construction sheet 1.03.

Non-reactive fire protection coatings PROMASPRAY®
PROMASPRAY® renderings are suitable for fire protection of structural steel and concrete structures. In addition to the fire resistance they have the advantage of absorbing noise.

Promat has in its product portfolio a rich selection of non-reactive coatings. Here are just some of the PROMASPRAY® rendering types.

- PROMASPRAY®-P300 is a fiber free fire protective rendering, based on plaster and vermiculite, with low bulk density, suitable for fire protection of steel and concrete structures, but it is also used for timber constructions. It is suitable for internal and semi-exposed use (type Y and Z_2 according to EAD 350140-00-1106). Detailed information can be found in construction sheet 1.06.
- PROMASPRAY®-C450 is a fire protective rendering based on cement and vermiculite with medium bulk density, suitable for fire protection of steel and concrete. It is suitable for indoor and for outdoor use with partial exposure to weathering (type Y, Z_1 and Z_2 according to EAD 350140-00-1106). For detailed information contact our sales representative.
- PROMASPRAY®-FMII is a fire protective rendering with high bulk density based on cement, vermiculite and mineral fibres. It is intended for special applications such as the construction of tunnels and for use in petrochemical industry. It can withstand the fire load in accordance with the hydrocarbon curve and the tunnel temperature curves. It is also suitable for outdoor environments. For more detailed information contact our sales representative.

Reactive fire protection coatings PROMAPAINT®
An alternative to the PROMATECT® claddings and PROMASPRAY® renderings solutions may be required, where the steel structure should stay visible. The PROMAPAINT® reactive systems are water-based fire protective coatings; in case of fire they create an insulating foam barrier on the surface of constructions.

- PROMAPAINT®-SC3 is designed for high levels of fire resistance (up to R 150) and tested for open and hollow steel sections. It is suitable for indoor and also for outdoor applications (type X, Y, Z_1 and Z_2 according to EAD 350402-00-1106). Detailed information can be found in construction sheet 1.04.
- PROMAPAINT®-SC4 is optimized for fire resistance of R 30 and R 60 tested for open and hollow steel sections. It is suitable for indoor and for outdoor application (type X, Y, Z_1 and Z_2 according to ETAG 018-2 used as EAD). Detailed information can be found in construction sheet 1.05.

Fire protective membrane composed of PROMATECT® boards
A smooth suspended ceiling can protect the steel structure against fire. Fire resistances R(EI) 30 to R(EI) 90 are valid for the whole structure. For detailed information, see the relevant construction sheet.

Combination of fire protective materials
We can use different systems of passive fire protection of steel structures (e. g. boards for columns, paint for truss) in one building - they can be used together, but must be properly designed. According to good practice, manufacturers of different systems should be contacted for relevant use when a system of one manufacturer is being used together with a system from another manufacturer.

The strength of Promat lies in a broad range of materials and systems, so you only need one producer for a wide selection of systems. We can help you make the right choice by selecting the best solution for your project.

WARNING: This brochure does not contain all Promat products and constructions for the protection of structural steel. For other solutions, please contact our sales representatives.

2. Choosing the appropriate fire protective system

2.1 General

Steel is a non-combustible material. Based on the EC decision steel is classified as a non-combustible material without the need of further demonstration. Loaded steel structures when heated to approx. 500 °C lose a significant proportion of its load-bearing capacity.

The temperature exceeding 500 °C is achieved in the development of a fire in a matter of minutes. During the standard fire resistance tests the temperature reaches approx. 550 °C in 5 minutes.

To maintain the load-bearing capacity in case of fire, the steel structure must be protected with fire protection measures.

Promat offers various ways to achieve fire resistance of R 15 to R 360.

2.2 Requirements

Basic requirements for construction

Buildings must meet the basic requirements (in further text - BR) for construction work. Safety in case of fire is BR2, while the steel structure also applies to the BR1 Mechanical resistance and stability.

The construction work must be designed and built in such a way that it should not collapse for a certain time period in the event of a fire.

Classification

Fire protective systems of steel structures are classified according to EN 13501-2. The classification is based on the prescribed standardized fire tests.

Fire tests

Fire resistance of load-bearing steel structures protected by reactive or non-reactive coating, cladding or a membrane is demonstrated by testing in accordance with the EN 13381 series. This standard has several parts. The horizontal membranes are tested according to part 1, the non-reactive coatings and the boards for steel protection to part 4, while for the reactive paints part 8 shall be used.

Design of steel structures

Steel structures are designed according to Eurocode 1993, Part 1-2. The results of the static calculations have to be used for the design with fire protection measures. One of the most important data is the critical temperature of each element of the steel structure.

Construction products suitable for fire protection

According to the EC Regulation 305/2011 (often referred as "CPR" **C**onstruction **P**roduct **R**egulation) construction work must satisfy the basic requirements for construction work for an economically reasonable working life. Therefore the functionality of the fire protective materials must also be considered in the context of time. Special construction products for fire protection do not have any harmonized European standards. Their assessment follows ETAG 018 or the relevant EAD. According to this guideline the suitability of construction products for different uses has to be determined. ETAG 018 has four parts. Suitability of use is defined differently for the three groups of construction products. The 3 new EADs define the same conditions.

ETAG 018-2 in article 2.2.2 or EAD 350402-00-1106 in article 1.2.3. defines conditions for reactive paints:

- **Type X**: for use in all conditions (internal, semi-exposed and exposed)
- **Type Y**: for use in internal and semi-exposed conditions. Semi exposed includes temperatures below zero, but no exposure to rain and limited exposure to UV (but UV is not assessed).
- **Type Z_1**: for use in internal conditions with humidity equal to or higher than 85% RH, excluding temperatures below 0 °C
- **Type Z_2**: for use in internal conditions with humidity lower than 85% RH, excluding temperatures below 0 °C

ETAG 018-3 or EAD 350140-00-1106 defines the conditions for renderings:

- **Type X**: for use in all conditions (internal, semi-exposed and exposed),
- **Type Y**: for use in internal and semi-exposed conditions. Semi-exposed includes temperatures below 0 °C, but no exposure to rain and limited exposure to UV (but the effect of UV exposure is not assessed),
- **Type Z_1**: for use in internal conditions with humidity equal to or higher than 85 % RH, excluding temperatures below 0 °C,
- **Type Z_2**: for use in internal conditions excluding temperatures below 0 °C, with humidity lower than 85 % RH.

NOTE (for both product groups listed above): Products that meet the requirements for type X, meet the requirements for all other types. Products that meet the requirements for type Y also meet the requirements for types Z_1 and Z_2. Products that meet the requirements for type Z_1 also meet the requirements for type Z_2.

ETAG 018-4 or EAD 350142-00-1106 defines the conditions for boards:

- **Type X**: for all uses (internal, semi-exposed and exposed)
- **Type Y**: for internal and semi-exposed use
- **Type Z_1**: for internal use, in high humidity environments.
- **Type Z_2**: for internal use only.

NOTE: Products that meet requirements for type X meet the requirements for all other types. Products that meet requirements for types Y and Z_1 also meet the requirements for type Z_2. However, products that meet the requirements for type Y do not necessarily meet the requirements for type Z_1.

Life span and durability

Designed life span for buildings is provided in table 2.1 of Eurocode 1990. For building structures and other common structures a 50 years life span is foreseen. Working life span of products is a different matter, as it depends upon its durability and normal maintenance. The durability of fire protective materials has to be assessed according to ETAG 018 or the related EAD under defined environmental conditions (X, Y, Z_1, Z_2) and is defined as products' ability to preserve fire performance after ageing therefore it is not the same as "product life". Paint is categorized as repairable or easily replaceable product, for which tests require max. 10 years working life span and 25 years for sprays and boards.

ETA - European Technical Assessment
Test results according to ETAG 018 or the related EAD are used for the assessment of the construction product. European technical assessment carried out by one TAB (Technical Assessment Body) only, should be a member of EOTA (European Organisation for Technical Assessment). A European Technical Assessment (ETA) issued by a TAB is valid across the European economic area. A construction product assessed by an ETA must be CE marked.

DoP – Declaration of Performance
The manufacturer shall draw for the product a declaration of performance (DoP) described in the CPR. The declaration of performance is the final document for the construction product. It allows free movement of this product on the European market. The declaration of performance shall be provided in the language required by the member state in which the product is made available (CPR Art. 7).

Fire resistance of the structure depends on the test assembly (design). The fire resistance of the construction product could be different in each proved systems. The fire resistance of the elements of the structure is demonstrated by the tests of accredited testing laboratories. The results are shown in the classification protocols or the assessments and not in the declaration of performance which is valid for the construction product only.

Intended use
The manufacturer has to declare intended use or uses of the construction product in the declaration of performance in accordance with ETAG 018 or the relevant EAD.

Use categories related to climatic conditions are defined for outdoor and indoor use (see previous pages for X, Y, Z_1, Z_2).

Use categories related to the element intended to be protected have been divided into 10 product families. Two are defined for the fire protection of steel structures:
- **Type 1**: Fire protective products as a horizontal membrane protection,
- **Type 4:** Fire protective products to protect load-bearing steel elements.

2.3 Fire resistance of load-bearing steel constructions

Fire resistance of the structure is indicated by the symbol R and REI for compartment structures. This is often achieved by protecting with fire protective systems. The fire protective system shall be tested according to the EN 13381 series by an accredited laboratory. The results of standardized tests should be used to develop a classification report or an assessment according to EN 13501-2. Dimensioning tables are part of the classification, which list the necessary thickness of the fire protective material.

Contractor of the fire construction must apply the appropriate thickness of the correct fire protective material according to the dimensioning tables. To determine the proper thickness of the material the following input data is required:
- determine the material and configuration of the fire protection measures (boxed or profiled configuration)
- fire resistance rate (e.g. R 90),
- information about requested thermal stresses on the time / temperature curve (e.g. ISO 834),
- design temperature (e.g. 500 °C),
- details of all members of steel structures - section type, size, cross-sectional area, open/hollow, exposure to fire.

The input data is the source for calculating section factor A_p/V for each member and determine the thickness of the fire protection.

Fire protection configurations
A. Boxed configuration is typical for fire protective claddings. It provides reliable fire protection of load-bearing structures and a good deal of construction details. The thickness of the used material is easy to control on the front of the boxes. The surface can be aesthetically adjusted. Required tests according to EN 13381-4.

B. Profiled configuration follows the section. Various materials can be used:
- Non-reactive coating systems (renderings) - suitable even for very complicatedly shaped structures. The system can contain an anchor coating, reinforcing grid and protective coating. Are tested according to EN 13381-4.
- Reactive coatings are particularly useful to preserve the appearance and shape of the steel structure. The reactive coating is applied after anti-corrosion treatment. The system can also include a finishing coating. Various anti-corrosion and finish coatings may affect the use category X, Y, Z_1 and Z_2. Reactive coatings should be tested according to EN 13381-8.
- Profiled cladding with boards - used in exceptional cases, particularly for large sections and must be fire tested in this specific configuration.

C. Horizontal membrane is a kind of suspended ceiling. It creates a smooth level surface, protecting the supporting structure from excessive heat. Membranes are tested according to EN 13381-1.

Fire resistance rate
The fire protection rate of structure must be specified in the project.

WARNING: Applicator who applies the fire protective material must have the basic information of the required characteristics for each case: fire resistance rate and design temperature.

Thermal stress
In the fire resistance test the structure exposed to thermal stress by fire of the chosen scenario. The common structures are tested according to the standard temperature/time curve (often called as ISO 834 curve). Unless stated otherwise, all information in this handbook is valid for the standard curve ISO 834.

More fire scenarios exist for other uses. The tests for the petrochemical industry are carried out according to the hydrocarbon curve (HC) or the modified hydrocarbon curve (MHC). There are several other types of curves for the protection of tunnel structures. For these requirements contact the local Promat office.

Design temperature and critical temperature
The load-bearing properties of the structural steel are temperature dependent. Reaching the critical temperature of the support element threatens its capacity. Design temperature can never be higher than the calculated critical temperature of the steel member. The results of static calculations according to Eurocodes should be used for determining the design temperature.

Lower design temperature is more demanding and requires higher thickness of protective material. Dimensioning tables may include a number of design temperatures ranging from 350 °C to 750 °C, according to the EC requirements.

Common design temperature is country specific. Please contact your local Promat office for further information.

Steel sections
The geometric shape of the steel section has a great influence on his behaviour under fire conditions. Sections are divided into two groups:
- Open sections - no cavities, such as sections I, H, L, T, U, C
- Hollow sections - RHS - Rectangular Hollow Sections, SHS - Square Hollow Sections and CHS - Circular Hollow Sections

Different rules apply for open and hollow sections depending on the type of fire protection measures.
- Boxed cladding - material thickness in the dimensioning table applies equally for open and hollow sections.
- Non-reactive coatings - material thickness in the dimensioning table is valid for open sections. For hollow sections, thickness is calculated according to the rules set out in EN 13381-4. Details are presented in the individual construction sheets.
- Reactive coatings - thickness shall be demonstrated separately for open sections and according to the results of a second test with hollow sections. Two separate dimensioning tables should be given from the producer if tested on hollow sections as well.

Steel bars, rods and flat sections are recommended to protect as hollow sections, paying attention to the mass factor, thus conservatively on the side of safety.

Exposure to fire
Elements of steel structures are often exposed to fire from three or four sides. For example, if a steel beam is protected from the top by a concrete ceiling, it is exposed to the fire from three sides. Some features are only partially exposed to fire, from 1 or 2 sides (assuming that the fire resistance of the ceiling meets at least the required rating). The greater the surface exposed to fire, the faster the member overheats. This physical dependence is taken into account when calculating the section factor A_p/V.

2.4 Calculation of section factor A_p/V
The section factor is defined as the surface area of the member per unit length A_p divided by the volume per unit length V. It is measured in units of m^{-1}.

Area exposed to fire A_p is a multiple of the inner perimeter of the fire protection measures U and unit length L. The perimeter is calculated depending on the configuration of the fire protective system. In the case of a boxed configuration the perimeter U is calculated as the sum of the side lengths of the perfect rectangle described around the steel section. In the case of the profiled configuration perimeter U is equal to the sprayed surface of the section per unit length L.

The volume V of the section is a multiple of the cross section area A_{cs} and the unit length L.

For the section of the unit length L the following formula applies:

$$\frac{A_p}{V} = \frac{U \times L}{A_{cs} \times 10^{-6} \times L} = \frac{U}{A_{cs} \times 10^{-6}}$$

A_p [m^2], V [m^3], A_p/V [m^{-1}], U [m], L [m], A_{cs} [mm^2]

The section factor A_p/V is used in older literature as U/A or U/A_{cs}. It is a different expression of the same quantity.

When calculating the area exposed to fire A_p the number of the exposed sides of the section should be taken into account. Calculation is based on the perimeter U depending on the configuration (boxed or profiled configuration).

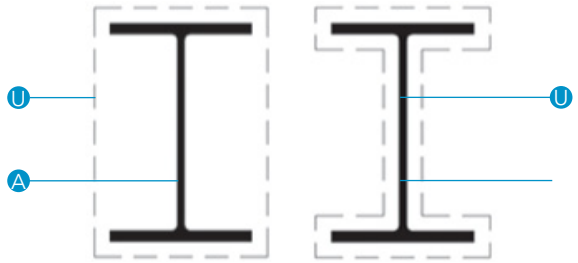
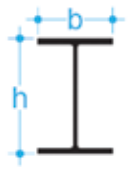
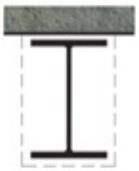
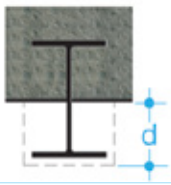
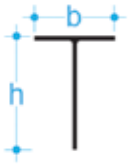
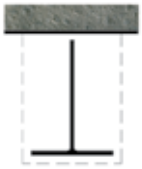
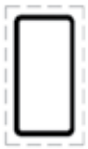
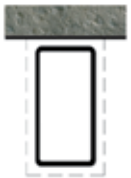
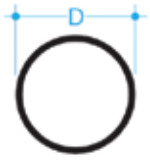


Table 1

Various boxed protection configurations with values of perimeter U for use in the calculation of section factor A_p/V (U/A_{cs})

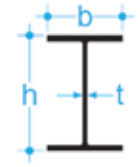
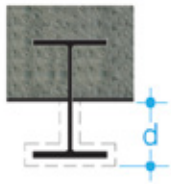
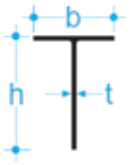
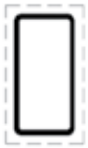
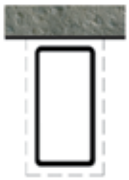
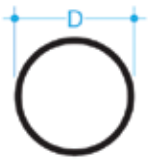
Steel section		Boxed protection				
		Four sides	Three sides	Three sides (partially exposed)	Two sides	One side (partially exposed)
I and H section						
		2b + 2h	b + 2h	b + 2d	b + h	b
T section						
		2b + 2h	b + 2h	b + 2h		
L section						
		2b + 2h	b + 2h	b + 2h		
U section						
		2b + 2h	2b + h	b + 2h		
Square or rectangular hollow sections						
		2b + 2h	b + 2h			
Circular hollow sections						
		πD				

Section factor

NOTE: The air space created in boxing a circular section improves the insulation and the value of A_p/V. Therefore, A_p higher than profiled protection would be anomalous. Hence, the calculated A_p per section length is taken as the outer circumference of the circular section (πD) and not 4D.

Table 2

Various profiled protection configurations with values of perimeter U for use in the calculation of section factor A_p/V (U/A_{cs})

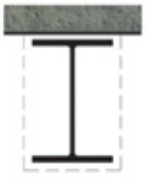
Steel section		Profiled protection				
		Four sides	Three sides	Three sides (partially exposed)	Two sides	One side (partially exposed)
I and H section		 2b + 2h + 2(b - t) = 4b + 2h - 2t	 b + 2h + 2(b - t) = 3b + 2h - 2t	 b + 2d + (b - t) = 2b + 2d - t	 b + h + 2(b - t)/2 = 2b + h - t	 b
T section		 2b + 2h	 b + 2h	 b + 2h + (b - t) = 2b + 2h - t		
L section		 2b + 2h	 b + 2h	 b + 2h + (b - t) = 2b + 2h - t		
U section		 2b + 2h + 2(b -t) = 4b + 2h - 2t	 2b + h + 2(b - t) = 4b + h - 2t	 b + 2h + 2(b - t) = 3b + 2h - 2t		
Square or rectangular hollow sections		 2b + 2h	 b + 2h			
Circular hollow sections		 πD				

- For standard rolled sections the section area A_{cs} can be found in the steel tables, but assuming rectangled web and flanges and knowing the thickness of the section it is relatively easy to calculate as well.
- Rolled sections have rounded edges and sloping flanges. This affects the result of the calculation of the section factor, in particular for the profiled configuration. These differences are sometimes neglected. For the accuracy of the result the use of table values is recommended.

In general, for the same perimeter U a slim section has higher section factor A_p/V and massive sections have lower section factor A_p/V. In case of fire the slim section achieves the critical temperature in shorter time than a massive section and therefore requires greater thickness of protective material.

When comparing sections protected in two ways of the protective configurations (boxed and profiled) and exposed to fire in two ways (three- and four-sided), significant differences could be found in the calculated results of the section factors. For example, the section HEA 200 results a range from 108 m^{-1} to 212 m^{-1}, as shown in the following table 3.

Table 3 - Section factor comparison on one steel section

					Section factor A_p/V [m^{-1}]			
					Profiled configuration		Boxed configuration	
								
					$(U - b) / A_{cs}$	U / A_{cs}	$(b + 2h) / A_{cs}$	$(2b + 2h) / A_{cs}$
HEA	h	b	U	A_{cs}	3 sides	4 sides	3 sides	4 sides
	m	m	$m^2.m^{-1}$	mm^2	m^{-1}	m^{-1}	m^{-1}	m^{-1}
160	0,152	0,160	0,906	3880	192	234	120	161
180	0,171	0,180	1,020	4530	185	225	115	155
200	0,190	0,200	1,140	5380	175	212	108	145

2.5 Protective thickness

The required thickness of the fire protective material can be found in the dimensioning tables that are part of our construction sheets. Any extrapolation and interpolation beyond the tables is strictly forbidden for the applicators.

Cladding

The thickness of the cladding can be found in the tables according to the selected board type. Increasing the thickness of the cladding is allowed from the fire safety point of view. It is necessary to take into account the possibility of mounting corner joints of thin boards (under 15 mm). If the dimensioning of the thickness of the table sets of two numbers (15 + 15 for example), it is expected to mount two layers. The thinner board should always be mounted on the thicker board. The sealant joint is required only if specified in the relevant construction sheet. If the construction sheet does not specify a sealant, it is possible but not obligatory to use Promat ® Filler PRO.

Non-reactive coating systems

The required thickness of the system can be found in the tables according to the selected type. Increasing the thickness of the rendering is allowed, but should not exceed the maximum tested thickness.

Reactive coatings

The dimensioning tables give the required dry film thickness (DFT) of the reactive coating without primer and protective coating.

Horizontal membrane

The type and thickness of the fire protective board is listed in the related construction sheet. It depends on the parameters of the steel member above the membrane and the requested fire resistance. Part of the design is the air cavity; the minimum height of the cavity must be followed.

2.6 Providing fire protection of steel structures at the construction site

The required fire resistance is achieved only after proper and professional application of the construction product. Applicator is responsible for the proper installation of the fire protective product and the applied material thickness, therefore responsible for the actually achieved fire resistance. Applicator must comply with the technological procedure and conditions of the installation of the construction products of the manufacturer. The applicator is not allowed to install a construction product which is not suitable for that case.

Contractor of the fire structure must be a trained professional or company. For details on installation guidelines, please contact your local Promat office.

2.7 Examples

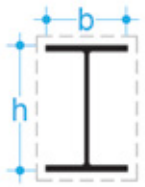
Example 1

Input: Column HEA 200, exposure to fire from 4 sides according to ISO 834 curve, critical temperature 515 °C, requested fire rating R 90, boxed cladding fire protection with boards for exterior use (category type Y).

Task: Recommend the type and thickness of the board

Solution:
Board 1: PROMATECT®-XS (assessed for semi-exposed use type Y according to EAD 350142-00-1106)
Board 2: PROMATECT®-H (assessed for semi-exposed use type Y according to ETAG 018-4 or EAD 350142-00-1106)

Calculation of board thickness:
Section HEA 200
h = 190 mm
b = 200 mm
A_{cs} = 5383 mm²



$A_p/V = (2b + 2h) / A_{cs} = (2 \times 0{,}19 + (2 \times 0{,}2) / (5383 \times 10^{-6}) = 145\ m^{-1}$

Design temperature must be lower than the critical temperature. Recommended design temperature is 500 °C.
500 °C < 515 °C (meets the demand)

In the dimensioning table of PROMATECT®-H and PROMATECT®-XS boards search for columns at the design temperature of 500 °C, fire resistance R 90 and the next higher value than 145 -> read the required thickness of the material.
145 < 150 (meets the demand).

Recommendation: PROMATECT®-XS 25 mm or PROMATECT®-H 15 + 15 mm (for columns).

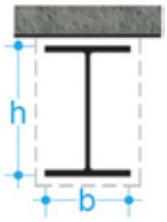
Example 2

Input: Beam HEA 200 below concrete ceiling, exposure to fire from 3 sides according to ISO 834 curve, critical temperature 515 °C, requested fire rating R 90, interior use.

Task: Compare different types of fire protective products, configurations and design material thicknesses.

Solution:
Section HEA 200
h = 190 mm
b = 200 mm
$U_{profiled}$ = 1,14 m
A_{cs} = 5383 mm²

1. Boxed cladding
$A_p/V = (b + 2h) / A_{cs} = (0{,}20 + 2 \times 0{,}19) / (5383 \times 10^{-6}) = 108\ m^{-1}$
Design temperature 500 °C (lower than 515 °C)
Design section factor A_p/V =110 m^{-1} (higher than 108 m^{-1})
Recommended product: PROMATECT®-XS / 25 mm or PROMATECT®-200 / 25 mm (for beams)



2. Profiled cladding with boards
$A_p/V = (U - b) / A_{cs} = (1{,}14 - 0{,}2) / (5383 \times 10^{-6}) = 175\ m^{-1}$ (profiled configuration)
Design temperature 500 °C (lower than 515 °C)
Design section factor A_p/V = 180 m^{-1} (higher than 175 m^{-1})
Recommended product: PROMATECT®-200 / 30 mm (*)
** Informational value only. If this configuration is needed, please contact your local Promat office.*

3. Non-reactive coating
A_p/V = 175 m^{-1} (profiled configuration)
Design temperature 500 °C (lower than 515 °C)
Design section factor A_p/V = 180 m^{-1} (higher than 175 m^{-1})
Recommended product: PROMASPRAY®-P300 / 28 mm

4. Reactive paint
A_p/V = 175 m^{-1} (profiled configuration)
Design temperature 500 °C (lower than 515 °C)
Design section factor A_p/V = 175 m^{-1}
Recommended product 1: PROMAPAINT®-SC3 / 2,889 mm
Recommended product 2: PROMAPAINT®-SC4 / 1,684 mm

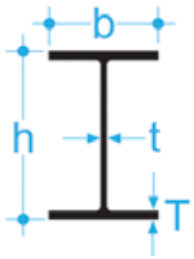
5. Horizontal membrane
According to related Promat construction sheet.
Check the requirements for R 90 (meets the requirements)
Recommended product: PROMATECT®-H / 25 mm

3. Acronyms

A_{cs}	Cross section area of the member	[mm^2]
A_p	Area exposed to fire	[m^2]
A_p/V	Section factor	[m^{-1}]
V	Section volume	[m^3]
U	Perimeter of fire protection measure	[m]
b	Width of the section	[m]
h	Height (depth) of the section	[m]
D	Outer diameter of the circular section	[m]
t	Web thickness	[m]

4. Section factors of steel sections - tables

Table 1 - Section factors of steel sections IPN (INP)



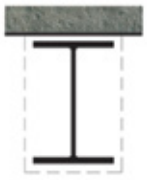
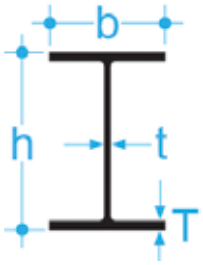
Symbol	Section dimensions		Thickness		Nominal weight	Cross section	Nominal surface	Section factor A_p/V [m^{-1}]			
								Profiled configuration		Boxed configuration	
											
								3 sides	4 sides	3 sides	4 sides
	Height (h)	Width (b)	Web (t)	Flange (T)							
	mm	mm	mm	mm	kg/m	cm^2	m^2/m	m^{-1}	m^{-1}	m^{-1}	m^{-1}
IPN 80	80	42	3,9	5,9	5,94	7,57	0,304	347	402	267	323
IPN 100	100	50	4,5	6,8	8,34	10,6	0,370	302	350	236	284
IPN 120	120	58	5,1	7,7	11,1	14,2	0,439	269	310	210	251
IPN 140	140	66	5,7	8,6	14,3	18,2	0,502	240	276	191	227
IPN 160	160	74	6,3	9,5	17,9	22,8	0,575	219	251	173	206
IPN 180	180	82	6,9	10,4	21,9	27,9	0,640	200	230	159	188
IPN 200	200	90	7,5	11,3	26,2	33,4	0,709	186	213	147	174
IPN 220	220	98	8,1	12,2	31,1	39,5	0,775	172	197	137	162
IPN 240	240	106	8,7	13,1	36,2	46,1	0,844	161	184	128	151
IPN 260	260	113	9,4	14,1	41,9	53,3	0,906	149	170	119	140
IPN 280	280	119	10,1	15,2	47,9	61,0	0,966	139	159	111	131
IPN 300	300	125	10,8	16,2	54,2	69,0	1,030	132	150	106	124
IPN 320	320	131	11,5	17,3	61,0	77,7	1,090	124	141	99	116
IPN 340	340	137	12,2	18,3	68,0	86,7	1,150	117	133	95	111
IPN 360	360	143	13,0	19,5	76,1	97,0	1,210	110	125	89	104
IPN 380	380	149	13,7	20,5	84,0	107,0	1,270	105	119	85	99
IPN 400	400	155	14,4	21,6	92,4	118	1,330	100	113	81	95
IPN 450	450	170	16,2	24,3	115	147	1,480	90	101	73	85
IPN 500	500	185	18,0	27,0	141	179	1,630	81	92	67	77
IPN 550	550	200	19,0	30,0	166	212	1,800	76	85	62	71
IPN 600	600	215	21,6	32,4	199	254	1,920	68	76	56	65

Table 2 - Section factors of steel sections IPE



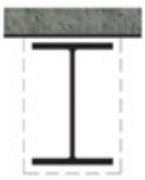
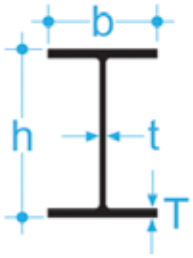
Symbol	Section dimensions		Thickness		Nominal weight	Cross section	Nominal surface	Section factor A_p/V [m^{-1}]			
								Profiled configuration		Boxed configuration	
											
								3 sides	4 sides	3 sides	4 sides
	Height (h)	Width (b)	Web (t)	Flange (T)							
	mm	mm	mm	mm	kg/m	cm^2	m^2/m	m^{-1}	m^{-1}	m^{-1}	m^{-1}
IPE 80	80	46	3,8	5,2	6,0	7,64	0,328	370	430	270	330
IPE 100	100	55	4,1	5,7	8,1	10,3	0,400	335	389	248	301
IPE 120	120	64	4,4	6,3	10,4	13,2	0,475	312	360	231	279
IPE 140	140	73	4,7	6,9	12,9	16,4	0,551	292	336	216	260
IPE 160	160	82	5,0	7,4	15,8	20,1	0,623	270	310	200	241
IPE 180	180	91	5,3	8,0	18,8	23,9	0,698	254	293	189	227
IPE 200	200	100	5,6	8,5	22,4	28,5	0,768	235	270	176	211
IPE 220	220	110	5,9	9,2	26,2	33,4	0,848	221	254	165	198
IPE 240	240	120	6,2	9,8	30,7	39,1	0,922	206	236	154	185
IPE 270	270	135	6,6	10,2	36,1	45,9	1,041	198	227	148	177
IPE 300	300	150	7,1	10,7	42,2	53,8	1,160	188	216	140	168
IPE 330	330	160	7,5	11,5	49,1	62,6	1,254	175	201	131	157
IPE 360	360	170	8,0	12,7	57,1	72,7	1,353	163	187	123	146
IPE 400	400	180	8,6	13,5	66,3	84,5	1,467	153	174	116	138
IPE 450	450	190	9,4	14,6	77,6	98,8	1,605	144	163	111	130
IPE 500	500	200	10,2	16,0	90,7	116	1,744	134	151	104	121
IPE 550	550	210	11,1	17,2	106	134	1,877	125	141	98	114
IPE 600	600	220	12,0	19,0	122	156	2,015	116	130	92	106

Table 3 - Section factors of steel sections HEA



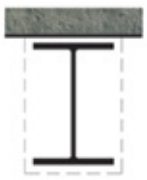
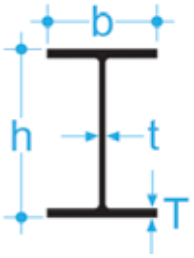
Symbol	Section dimensions		Thickness		Nominal weight	Cross section	Nominal surface	Section factor A_p/V [m^{-1}]			
								Profiled configuration		Boxed configuration	
											
								3 sides	4 sides	3 sides	4 sides
	Height (h)	Width (b)	Web (t)	Flange (T)							
	mm	mm	mm	mm	kg/m	cm^2	m^2/m	m^{-1}	m^{-1}	m^{-1}	m^{-1}
HEA 100	96	100	5,0	8,0	16,7	21,2	0,561	218	265	138	185
HEA 120	114	120	5,0	8,0	19,9	25,3	0,677	221	268	138	185
HEA 140	133	140	5,5	8,5	24,7	31,4	0,794	209	253	130	174
HEA 160	152	160	6,0	9,0	30,4	38,8	0,906	193	234	120	161
HEA 180	171	180	6,0	9,5	35,5	45,3	1,024	186	226	116	155
HEA 200	190	200	6,5	10,0	42,3	53,8	1,136	175	212	108	145
HEA 220	210	220	7,0	11,0	50,5	64,3	1,255	162	196	100	134
HEA 240	230	240	7,5	12,0	60,3	76,8	1,369	148	179	92	123
HEA 260	250	260	7,5	12,5	68,2	86,8	1,484	141	171	88	118
HEA 280	270	280	8,0	13,0	76,4	97,3	1,603	136	165	85	114
HEA 300	290	300	8,5	14,0	88,3	113	1,717	126	153	78	105
HEA 320	310	300	9,0	15,5	97,6	124	1,756	118	142	75	99
HEA 340	330	300	9,5	16,5	105	133	1,795	113	135	73	95
HEA 360	350	300	10,0	17,5	112	143	1,834	107	128	70	91
HEA 400	390	300	11,0	19,0	125	159	1,912	102	121	68	87
HEA 450	440	300	11,5	21,0	140	178	2,011	97	113	67	84
HEA 500	490	300	12,0	23,0	155	198	2,110	92	107	65	80
HEA 550	540	300	12,5	24,0	166	212	2,209	91	105	66	80
HEA 600	590	300	13,0	25,0	178	226	2,308	89	103	66	79
HEA 650	640	300	13,5	26,0	190	242	2,407	88	100	66	78
HEA 700	690	300	14,5	27,0	204	260	2,505	85	97	65	77
HEA 800	790	300	15,0	28,0	224	286	2,698	84	95	66	77
HEA 900	890	300	16,0	30,0	252	321	2,896	81	91	65	75
HEA 1000	990	300	16,5	31,0	272	347	3,095	81	90	66	75

Table 4 - Section factors of steel sections HEB



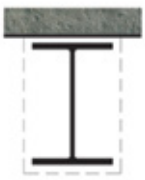
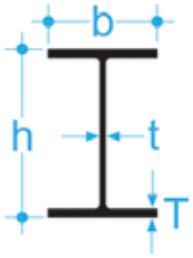
Symbol	Section dimensions		Thickness		Nominal weight	Cross section	Nominal surface	Section factor A_p/V [m^{-1}]			
								Profiled configuration		Boxed configuration	
											
								3 sides	4 sides	3 sides	4 sides
	Height (h)	Width (b)	Web (t)	Flange (T)							
	mm	mm	mm	mm	kg/m	cm^2	m^2/m	m^{-1}	m^{-1}	m^{-1}	m^{-1}
HEB 100	100	100	6,0	10,0	20,4	26	0,567	180	219	116	154
HEB 120	120	120	6,5	11,0	26,7	34	0,686	167	202	106	142
HEB 140	140	140	7,0	12,0	33,7	43	0,805	155	188	98	131
HEB 160	160	160	8,0	13,0	42,6	54,3	0,918	140	170	89	118
HEB 180	180	180	8,5	14,0	51,2	65,3	1,037	132	160	83	111
HEB 200	200	200	9,0	15,0	61,3	78,1	1,151	122	148	77	103
HEB 220	220	220	9,5	16,0	71,5	91	1,270	116	140	73	97
HEB 240	240	240	10,0	17,0	83,2	106	1,384	108	131	68	91
HEB 260	260	260	10,0	17,5	93,0	118	1,499	106	128	67	89
HEB 280	280	280	10,5	18,0	103	131	1,618	103	124	65	86
HEB 300	300	300	11,0	19,0	117	149	1,732	96	117	61	81
HEB 320	320	300	11,5	20,5	127	161	1,771	92	110	59	78
HEB 340	340	300	12,0	21,5	134	171	1,810	89	106	58	75
HEB 360	360	300	12,5	22,5	142	181	1,849	86	103	57	73
HEB 400	400	300	13,5	24,0	155	198	1,927	83	98	56	71
HEB 450	450	300	14,0	26,0	171	218	2,026	80	94	56	69
HEB 500	500	300	14,5	28,0	187	239	2,125	77	89	55	67
HEB 550	550	300	15,0	29,0	199	254	2,224	76	88	56	67
HEB 600	600	300	15,5	30,0	212	270	2,323	75	86	56	67
HEB 650	650	300	16,0	31,0	225	286	2,422	75	85	56	67
HEB 700	700	300	17,0	32,0	241	306	2,520	73	83	56	66
HEB 800	800	300	17,5	33,0	262	334	2,713	73	82	57	66
HEB 900	900	300	18,5	35,0	291	371	2,911	71	79	57	65
HEB 1000	1000	300	10,0	36,0	314	400	3,110	71	78	58	65

Table 5 - Section factors of steel sections HEM



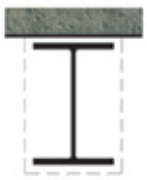
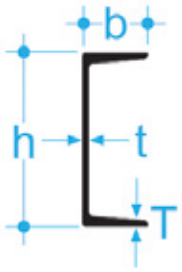
Symbol	Section dimensions		Thickness		Nominal weight	Cross section	Nominal surface	Section factor A_p/V [m^{-1}]			
								Profiled configuration		Boxed configuration	
											
								3 sides	4 sides	3 sides	4 sides
	Height (h)	Width (b)	Web (t)	Flange (T)							
	mm	mm	mm	mm	kg/m	cm^2	m^2/m	m^{-1}	m^{-1}	m^{-1}	m^{-1}
HEM 100	120	106	12,0	20,0	41,8	53,2	0,619	97	117	66	85
HEM 120	140	126	12,5	21,0	52,1	66,4	0,738	93	112	62	81
HEM 140	160	146	13,0	22,0	63,2	80,6	0,857	89	107	58	76
HEM 160	180	166	14,0	23,0	76,2	97,1	0,970	83	100	55	72
HEM 180	200	186	14,5	24,0	88,9	113	1,089	80	97	52	69
HEM 200	220	206	15,0	25,0	103	131	1,203	76	92	50	66
HEM 220	240	226	15,5	26,0	117	149	1,322	74	89	48	63
HEM 240	270	248	18,0	32,0	157	200	1,460	61	73	40	52
HEM 260	290	268	18,0	32,5	172	220	1,575	60	72	39	51
HEM 280	310	288	18,5	33,0	189	240	1,694	59	71	38	50
HEM 300	340	310	21,0	39,0	238	303	1,832	51	61	33	43
HEM 320	359	309	21,0	40,0	245	312	1,866	51	60	33	43
HEM 340	377	309	21,0	40,0	248	316	1,902	51	61	34	44
HEM 360	395	308	21,0	40,0	250	319	1,934	51	61	35	45
HEM 400	432	307	21,0	40,0	256	326	2,004	52	62	36	46
HEM 450	478	307	21,0	40,0	263	335	2,096	54	63	38	47
HEM 500	524	306	21,0	40,0	270	344	2,184	55	64	40	49
HEM 550	572	306	21,0	40,0	278	354	2,280	56	65	41	50
HEM 600	620	305	21,0	40,0	285	364	2,372	57	66	43	51
HEM 650	668	305	21,0	40,0	293	374	2,468	58	67	44	53
HEM 700	716	304	21,0	40,0	301	383	2,560	59	67	46	54
HEM 800	814	303	21,0	40,0	317	404	2,746	61	69	48	56
HEM 900	910	302	21,0	40,0	333	424	2,934	62	70	51	58
HEM 1000	1008	302	21,0	40,0	349	444	3,130	64	71	53	60

Table 6 - Section factors of steel sections UPE



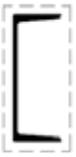
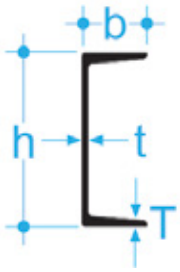
Symbol	Section dimensions		Thickness		Nominal weight	Cross section	Nominal surface	Section factor A_p/V [m^{-1}]			
								Profiled configuration		Boxed configuration	
											
								3 sides	4 sides	3 sides	4 sides
	Height (h)	Width (b)	Web (t)	Flange (T)							
	mm	mm	mm	mm	kg/m	cm^2	m^2/m	m^{-1}	m^{-1}	m^{-1}	m^{-1}
UPE 80	80	50	4	7	7,9	10,1	0,343	291	341	209	258
UPE 100	100	55	5	8	9,8	12,5	0,402	278	322	204	248
UPE 120	120	60	5	8	12,1	15,4	0,460	259	298	195	233
UPE 140	140	65	5	9	14,5	18,4	0,520	247	282	187	223
UPE 160	160	70	6	10	17,0	21,7	0,579	235	267	180	212
UPE 180	180	75	6	11	19,7	25,1	0,639	225	254	173	203
UPE 200	200	80	6	11	22,8	29,0	0,697	213	240	165	193
UPE 220	220	85	7	12	26,6	33,9	0,756	198	223	155	180
UPE 240	240	90	7	13	30,2	38,5	0,813	188	211	148	171
UPE 270	270	95	8	14	35,2	44,8	0,892	178	199	142	163
UPE 300	300	100	10	15	44,4	56,6	0,968	153	171	124	141
UPE 330	330	105	11	16	53,2	67,8	1,043	138	153	113	128
UPE 360	360	110	12	17	61,2	77,9	1,121	130	144	107	121
UPE 400	400	115	14	18	72,2	91,9	1,218	120	133	100	112

Table 7 - Section factors of steel sections UPN (UNP)



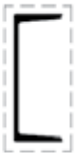
Symbol	Section dimensions		Thickness		Nominal weight	Cross section	Nominal surface	Section factor A_p/V [m^{-1}]			
								Profiled configuration		Boxed configuration	
											
								3 sides	4 sides	3 sides	4 sides
	Height (h)	Width (b)	Web (t)	Flange (T)							
	mm	mm	mm	mm	kg/m	cm^2	m^2/m	m^{-1}	m^{-1}	m^{-1}	m^{-1}
UPN 50	50	38	5	7	5,6	7,1	0,232	278	331	194	247
UPN 65	65	42	6	8	7,1	9,0	0,273	264	311	190	237
UPN 80	80	45	6	8	8,6	11,0	0,312	250	291	186	227
UPN 100	100	50	6	9	10,6	13,5	0,372	239	276	185	222
UPN 120	120	55	7	9	13,4	17,0	0,434	223	255	174	206
UPN 140	140	60	7	10	16,0	20,4	0,489	210	240	167	196
UPN 160	160	65	8	11	18,8	24,0	0,546	200	228	160	188
UPN 180	180	70	8	11	22,0	28,0	0,611	193	218	154	179
UPN 200	200	75	9	12	25,3	32,2	0,661	182	205	148	171
UPN 220	220	80	9	13	29,4	37,4	0,718	171	192	139	160
UPN 240	240	85	10	13	33,2	42,3	0,775	163	183	134	154
UPN 260	260	90	10	14	37,9	48,3	0,834	154	173	126	145
UPN 280	280	95	10	15	41,8	53,3	0,890	149	167	123	141
UPN 300	300	100	10	16	46,2	58,8	0,950	145	162	119	136
UPN 320	320	100	14	17,5	59,5	75,8	0,982	116	130	98	111
UPN 350	350	100	14	16	60,6	77,3	1,050	123	135	103	116
UPN 380	380	102	13,5	16	63,1	80,4	1,110	125	138	107	120
UPN 400	400	110	14	18	71,8	91,5	1,180	117	129	99	111

Table 8 - Equal angles

				Section factor A_p/V [m^{-1}]			
				Profiled configuration		Boxed configuration	
							
				3 sides	4 sides	3 sides	4 sides
Width of the section (b)	**Wall thickness (t)**	**Nominal weight**	**Cross section**				
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}	m^{-1}	m^{-1}
90 x 90	7	9,6	12,2	215	285	220	295
	8	10,9	13,9	190	250	195	260
	10	13,4	17,1	150	205	160	210
	12	15,9	20,3	130	175	135	175
100 x 100	8	12,2	15,5	185	250	195	260
	10	15,0	19,2	150	205	155	210
	12	17,8	22,7	130	170	130	175
	15	21,9	27,9	105	140	110	145
120 x 120	8	14,7	18,7	185	250	190	255
	10	18,2	23,2	150	200	155	205
	12	21,6	27,5	125	170	130	175
	15	26,6	33,9	105	140	105	140
150 x 150	10	23,0	29,3	150	200	155	205
	12	27,3	34,8	125	170	130	170
	15	33,8	43,0	100	135	105	140
	18	40,1	51,0	85	115	90	120
200 x 200	16	48,5	61,8	95	125	95	130
	18	54,2	69,1	85	115	85	115
	20	59,9	76,3	75	105	80	105
	24	71,1	90,6	65	85	65	90

Table 9 - Unequal angles

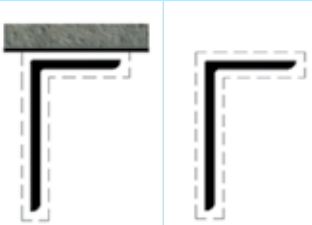
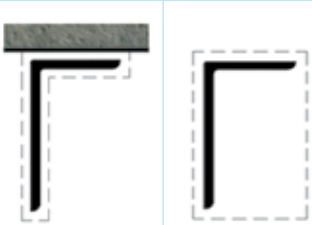
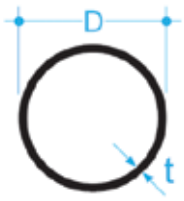
				Section factor A_p/V [m^{-1}]			
				Profiled configuration		Boxed configuration	
							
				3 sides	4 sides	3 sides	4 sides
Outer dimensions (h x b)	**Wall thickness (t)**	**Nominal weight**	**Cross section**				
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}	m^{-1}	m^{-1}
100 x 65	7	8,8	11,2	230	290	235	295
	8	9,9	12,7	200	255	210	260
	10	12,3	15,6	165	205	170	210
100 x 75	8	10,6	13,5	200	255	205	260
	10	13,0	16,6	160	205	165	210
	12	15,4	19,7	135	175	140	180
125 x 75	8	12,2	15,5	205	250	210	260
	10	15,0	19,1	165	205	170	210
	12	17,8	22,7	140	170	145	175
150 x 75	10	17,0	21,7	170	205	175	210
	12	20,2	25,7	140	170	145	175
	15	24,8	31,7	115	140	120	140
150 x 90	10	18,2	23,2	165	205	170	205
	12	21,6	27,5	140	170	140	175
	15	26,6	33,9	110	140	115	140
200 x 100	10	23,0	29,2	165	200	170	205
	12	27,3	34,8	140	170	145	170
	15	33,7	43,0	115	135	115	140
200 x 150	12	32,0	40,8	130	170	135	170
	15	39,6	50,5	105	135	110	140
	18	47,1	60,0	90	115	90	115

Table 10 - Circular hollow sections (CHS), according to EN 10210-2:2006 and EN 10219-2:2006



				Section factor A_p/V [m^{-1}]	
				Profiled configuration	Boxed configuration
					
Outer diameter of the circular hollow section (D)	Wall thickness (t)	Nominal weight	Cross section		NOTE: The air space created in boxing a circular section improves the insulation and the value of A_p/V. Therefore, A_p higher than profiled protection would be anomalous. Hence, the calculated A_p per section length is taken as the outer circumference of the circular section (πD) and not 4D.
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}
21,3	2,0	0,95	1,21	554	705
	2,3	1,08	1,37	489	622
	2,5	1,16	1,48	453	576
	2,6	1,20	1,53	438	557
	3,0	1,35	1,72	390	496
	3,2	1,43	1,82	368	469
26,9	2,0	1,23	1,56	542	690
	2,3	1,40	1,78	475	605
	2,5	1,50	1,92	441	561
	2,6	1,56	1,98	427	544
	3,0	1,77	2,25	376	479
	3,2	1,87	2,38	356	453
33,7	2,0	1,56	1,99	533	678
	2,5	1,92	2,45	433	551
	2,6	1,99	2,54	417	531
	3,0	2,27	2,89	367	467
	3,2	2,41	3,07	345	440
	4,0	2,93	3,73	284	362
42,4	2,0	1,99	2,54	525	668
	2,5	2,46	3,13	426	542
	2,6	2,55	3,25	410	522
	3,0	2,91	3,71	360	458
	3,2	3,09	3,94	339	431
	4,0	3,79	4,83	276	352
48,3	2,0	2,28	2,91	522	664
	2,5	2,82	3,60	422	537
	2,6	2,93	3,73	407	518
	3,0	3,35	4,27	356	453
	3,2	3,56	4,53	335	427
	4,0	4,37	5,57	273	347
	5,0	5,34	6,80	224	285

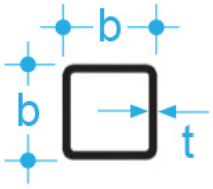
Outer diameter of the circular hollow section (D)	Wall thickness (t)	Nominal weight	Cross section	Profiled configuration	Boxed configuration
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}
60,3	2,0	2,88	3,66	518	660
	2,5	3,56	4,54	418	532
	2,6	3,70	4,71	403	513
	3,0	4,24	5,40	351	447
	3,2	4,51	5,74	331	421
	4,0	5,55	7,07	268	342
	5,0	6,82	8,69	218	278
76,1	2,0	3,65	4,66	514	654
	2,5	4,54	5,78	414	527
	2,6	4,71	6,00	399	508
	3,0	5,41	6,89	347	442
	3,2	5,75	7,33	327	416
	4,0	7,11	9,06	264	336
	5,0	8,77	11,2	214	272
	6,0	10,4	13,2	182	231
88,9	2,0	4,29	5,46	512	652
	2,5	5,33	6,79	412	524
	3,0	6,36	8,10	345	440
	3,2	6,76	8,62	324	413
	4,0	8,38	10,7	262	333
	5,0	10,3	13,2	212	270
	6,0	12,3	15,6	180	228
	6,3	12,8	16,3	172	219
101,6	2,0	4,91	6,26	510	650
	2,5	6,11	7,78	411	523
	3,0	7,29	9,29	344	438
	3,2	7,77	9,89	323	411
	4,0	9,63	12,3	260	331
	5,0	11,9	15,2	210	268
	6,0	14,1	18,0	178	226
	6,3	14,8	18,9	169	216
	8,0	18,5	23,5	136	173
	10,0	22,6	28,8	111	142
114,3	2,5	6,89	8,8	409	520
	3,0	8,23	10,5	342	436
	3,2	8,77	11,2	321	409
	4,0	10,9	13,9	259	329
	5,0	13,5	17,2	209	266
	6,0	16,0	20,4	177	225

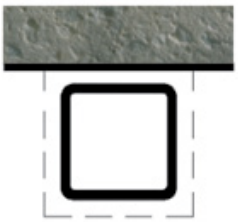
Outer diameter of the circular hollow section (D)	Wall thickness (t)	Nominal weight	Cross section	Profiled configuration	Boxed configuration
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}
114,3	6,3	16,8	21,4	168	214
	8,0	21,0	26,7	135	172
	10,0	25,7	32,8	110	140
139,7	3,0	10,1	12,9	341	434
	4,0	13,4	17,1	257	327
	5,0	16,6	21,2	208	264
	6,0	19,8	25,2	175	222
	6,3	20,7	26,4	167	212
	8,0	26,0	33,1	133	169
	10,0	32,0	40,7	108	138
	12,0	37,8	48,1	92	117
	12,5	39,2	50,0	88	112
168,3	3,0	12,2	15,6	339	432
	4,0	16,2	20,6	257	327
	4,5	18,2	23,2	228	291
	5,0	20,1	25,7	206	262
	6,0	24,0	30,6	173	220
	6,3	25,2	32,1	165	210
	8,0	31,6	40,3	132	168
	10,0	39,0	49,7	107	136
	12,0	46,3	58,9	90	115
	12,5	48,0	61,2	87	110
177,8	5,0	21,3	27,1	207	263
	6,0	25,4	32,4	173	220
	6,3	26,6	33,9	165	210
	8,0	33,5	42,7	131	167
	10,0	41,4	52,7	106	135
	12,0	49,1	62,5	90	114
	12,5	51,0	64,9	87	110
193,7	5,0	23,3	29,6	206	262
	6,0	27,8	35,4	172	219
	6,3	29,1	37,1	165	209
	8,0	36,6	46,7	131	166
	10,0	45,3	57,7	106	135
	11,0	49,6	63,1	97	123
	12,5	55,9	71,2	86	109
	16,0	70,1	89,3	69	87
219,1	5,0	26,4	33,6	205	261
	6,0	31,5	40,2	172	219

Outer diameter of the circular hollow section (D)	Wall thickness (t)	Nominal weight	Cross section	Profiled configuration	Boxed configuration
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}
219,1	6,3	33,1	42,1	164	209
	8,0	41,6	53,1	130	166
	10,0	51,6	65,7	105	134
	12,0	61,3	78,1	89	113
	12,5	63,7	81,1	85	109
	16,0	80,1	102	68	86
	20,0	98,2	125	56	71
244,5	5,0	29,5	37,6	205	261
	6,0	35,3	45,0	171	218
	6,3	37,0	47,1	164	208
	8,0	46,7	59,4	130	165
	10,0	57,8	73,7	104	133
	12,0	68,8	87,7	88	112
	12,5	71,5	91,1	85	108
	16,0	90,2	115	67	86
	20,0	111	141	55	70
	25,0	135	172	45	57
273,0	5,0	33,0	42,1	204	260
	6,0	39,5	50,3	171	218
	6,3	41,4	52,8	163	207
	8,0	52,3	66,6	129	164
	10,0	64,9	82,6	104	133
	12,0	77,2	98,4	88	111
	12,5	80,3	102	85	108
	16,0	101	129	67	85
	20,0	125	159	54	69
	25,0	153	195	44	56
323,9	5,0	39,3	50,1	204	259
	6,0	47,0	59,9	170	217
	6,3	49,3	62,9	162	206
	8,0	62,3	79,4	129	164
	10,0	77,4	98,6	104	132
	12,0	92,3	118	87	110
	12,5	96,0	122	84	107
	16,0	121	155	66	84
	20,0	150	191	54	68
	25,0	184	235	44	56
355,6	6,0	51,7	65,9	170	216
	6,3	54,3	69,1	162	206

Outer diameter of the circular hollow section (D)	Wall thickness (t)	Nominal weight	Cross section	Profiled configuration	Boxed configuration
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}
355,6	8,0	68,6	87,4	128	163
	10,0	85,2	109	103	131
	12,0	102	130	86	110
	12,5	106	135	83	106
	16,0	134	171	66	84
	20,0	166	211	53	68
	25,0	204	260	43	55
406,4	6,0	59,2	75,5	170	216
	6,3	62,2	79,2	162	206
	8,0	78,6	100	128	163
	10,0	97,8	125	103	131
	12,0	117	149	86	110
	12,5	121	155	83	105
	16,0	154	196	66	83
	20,0	191	243	53	67
	25,0	235	300	43	55
	30,0	278	355	36	46
	40,0	361	460	28	36
457,0	6,0	66,7	85,0	169	216
	6,3	70,0	89,2	161	205
	8,0	88,6	113	128	162
	10,0	110	140	103	131
	12,0	132	168	86	109
	12,5	137	175	83	105
	16,0	174	222	65	83
	20,0	216	275	53	67
	25,0	266	339	43	54
	30,0	316	402	36	46
	40,0	411	524	28	35
508,0	6,0	74,3	94,6	169	215
	6,3	77,9	99,3	161	205
	8,0	98,6	126	127	162
	10,0	123	156	103	131
	12,0	147	187	86	109
	12,5	153	195	82	105
	16,0	194	247	65	83
	20,0	241	307	52	67
	25,0	298	379	43	54
	30,0	354	451	36	46
	40,0	462	588	28	35
	50,0	565	719	23	29

Table 11 - Square hollow sections (SHS), according to EN 10210-2:2006 and EN 10219-2:2006





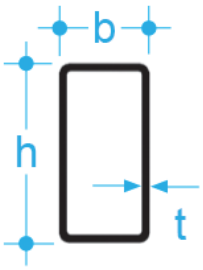
				Section factor A_p/V [m^{-1}]	
				3 sides	4 sides
Width of the section (b)	Wall thickness (t)	Nominal weight	Cross section		
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}
40 x 40	2,5	2,89	3,68	327	435
	3,0	3,41	4,34	277	369
	4,0	4,39	5,59	215	287
	5,0	5,28	6,73	179	238
50 x 50	2,5	3,68	4,68	321	428
	3,0	4,35	5,54	271	362
	4,0	5,64	7,19	209	279
	5,0	6,85	8,73	172	230
	6,0	7,99	10,2	148	197
	6,3	8,31	10,6	142	189
60 x 60	2,5	4,46	5,68	317	423
	3,0	5,29	6,74	268	357
	4,0	6,9	8,79	205	274
	5,0	8,42	10,7	169	225
	6,0	9,87	12,6	143	191
	6,3	10,3	13,1	138	184
	8,0	12,5	16,0	113	150
70 x 70	3,0	6,24	7,94	265	353
	4,0	8,15	10,4	202	270
	5,0	9,99	12,7	166	221
	6,0	11,8	15,0	140	187
	6,3	12,3	15,6	135	180
	8,0	15,0	19,2	110	146
80 x 80	3,0	7,18	9,14	263	351
	4,0	9,41	12,0	200	267
	5,0	11,6	14,7	164	218
	6,0	13,6	17,4	138	184
	6,3	14,2	18,1	133	177
	8,0	17,5	22,4	108	143

Width of the section (b)	Wall thickness (t)	Nominal weight	Cross section	3 sides	4 sides
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}
90 x 90	4,0	10,7	13,6	199	265
	5,0	13,1	16,7	162	216
	6,0	15,5	19,8	137	182
	6,3	16,2	20,7	131	174
	8,0	20,1	25,6	106	141
100 x 100	4,0	11,9	15,2	198	264
	5,0	14,7	18,7	161	214
	6,0	17,4	22,2	136	181
	6,3	18,2	23,2	130	173
	8,0	22,6	28,8	105	139
	10,0	27,0	34,9	86	115
120 x 120	5,0	17,8	22,7	159	212
	6,0	21,2	27,0	134	178
	6,3	22,2	28,2	128	171
	8,0	27,6	35,2	103	137
	10,0	33,7	42,9	84	112
	12,0	39,5	50,3	72	96
	12,5	40,9	52,1	70	93
140 x 140	5,0	21,0	26,7	158	210
	6,0	24,9	31,8	133	177
	6,3	26,1	33,3	127	169
	8,0	32,6	41,6	101	135
	10,0	40,0	50,9	83	111
	12,0	47,0	59,9	71	94
	12,5	48,7	62,1	68	91
150 x 150	5,0	22,6	28,7	157	210
	6,0	26,8	34,2	132	176
	6,3	28,1	35,8	126	168
	8,0	35,1	44,8	101	134
	10,0	43,1	54,9	82	110
	12,0	50,8	64,7	70	93
	12,5	52,7	67,1	68	90
	16,0	65,2	83,0	55	73
160 x 160	5,0	24,1	30,7	157	209
	6,0	28,7	36,6	132	175
	6,3	30,1	38,3	126	168
	8,0	37,6	48,0	100	134
	10,0	46,3	58,9	82	109
	12,0	54,6	69,5	70	93
	12,5	56,6	72,1	67	89
	16,0	70,2	89,4	54	72

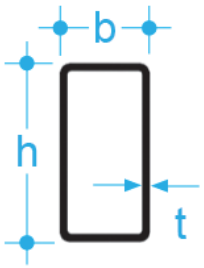
Width of the section (b)	Wall thickness (t)	Nominal weight	Cross section	3 sides	4 sides
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}
180 x 180	5,0	27,3	34,7	156	208
	6,0	32,5	41,4	131	174
	6,3	34,0	43,3	125	167
	8,0	42,7	54,4	100	133
	10,0	52,5	66,9	81	108
	12,0	62,1	79,1	69	92
	12,5	64,4	82,1	66	88
	16,0	80,2	102,2	53	71
200 x 200	5,0	30,4	38,7	156	207
	6,0	36,2	46,2	130	174
	6,3	38,0	48,4	124	166
	8,0	47,7	60,8	99	132
	10,0	58,8	74,9	81	107
	12,0	69,6	88,7	68	91
	12,5	72,3	92,1	66	87
	16,0	90,3	115	53	70
220 x 220	6,0	40,0	51,0	130	173
	6,3	41,9	53,4	124	165
	8,0	52,7	67,2	99	131
	10,0	65,1	82,9	80	107
	12,0	77,2	98,3	68	90
	12,5	80,1	102	65	87
	16,0	100	128	52	69
250 x 250	6,0	45,7	58,2	129	172
	6,3	47,9	61,0	123	164
	8,0	60,3	76,8	98	131
	10,0	74,5	94,9	80	106
	12,0	88,5	113	67	89
	12,5	91,9	117	65	86
	16,0	115	147	52	69
260 x 260	6,0	47,6	60,6	129	172
	6,3	49,9	63,5	123	164
	8,0	62,8	80,0	98	130
	10,0	77,7	98,9	79	106
	12,0	92,2	117	67	89
	12,5	95,8	122	64	86
	16,0	120	153	51	68

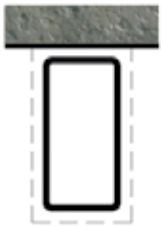
Width of the section (b)	Wall thickness (t)	Nominal weight	Cross section	3 sides	4 sides
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}
300 x 300	6,0	55,1	70,2	129	171
	6,3	57,8	73,6	123	164
	8,0	72,8	92,8	97	130
	10,0	90,	115	79	105
	12,0	107	137	66	88
	12,5	112	142	64	85
	16,0	141	179	51	68
350 x 350	8,0	85,4	109	97	129
	10,0	106	135	78	104
	12,0	126	161	66	87
	12,5	131	167	63	84
	16,0	166	211	50	67
400 x 400	10,0	122	155	78	104
	12,0	145	185	65	87
	12,5	151	192	63	84
	16,0	191	243	50	66
	20,0	235	300	40	54

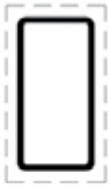
Table 12 - Rectangular hollow sections (RHS), according to EN 10210-2:2006 and EN 10219-2:2006



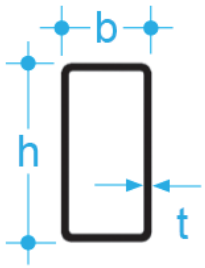
				Section factor A_p/V [m^{-1}]		
				3 sides		4 sides
Outer dimensions (h x b)	Wall thickness (t)	Nominal weight	Cross section			
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}	m^{-1}
50 x 25	2,5	2,69	3,43	292	365	438
	3	3,17	4,04	248	310	372
50 x 30	2,5	2,89	3,68	299	354	435
	3,0	3,41	4,34	254	300	369
	4,0	4,39	5,59	197	233	287
	5,0	5,28	6,73	164	194	238
60 x 40	2,5	3,68	4,68	300	342	428
	3,0	4,35	5,54	253	289	362
	4,0	5,64	7,19	195	223	279
	5,0	6,85	8,73	161	184	230
	6,0	7,99	10,2	138	157	197
	6,3	8,31	10,6	133	151	189
80 x 40	3,0	5,29	6,74	238	297	357
	4,0	6,9	8,79	183	228	274
	5,0	8,42	10,7	150	187	225
	6,0	9,87	12,6	127	159	191
	6,3	10,3	13,1	123	153	184
	8,0	12,5	16	100	125	150
90 x 50	3,0	6,24	7,94	240	290	353
	4,0	8,15	10,4	183	222	270
	5,0	9,99	12,7	150	182	221
	6,0	11,8	15	127	154	187
	6,3	12,3	15,6	122	148	180
	8,0	15	19,2	99	120	146
100 x 50	3,0	6,71	8,54	235	293	352
	4,0	8,78	11,2	179	224	268
	5,0	10,8	13,7	146	183	219
	6,0	12,7	16,2	124	155	186
	6,3	13,3	16,9	119	148	178
	8,0	16,3	20,8	97	121	145

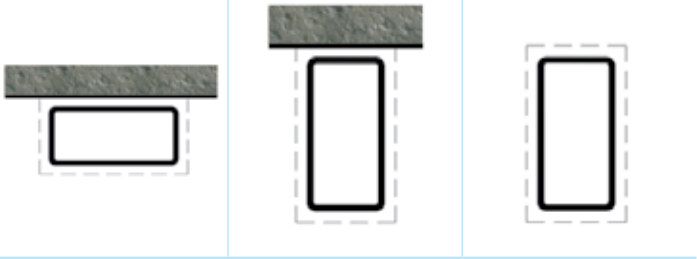




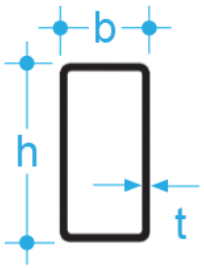


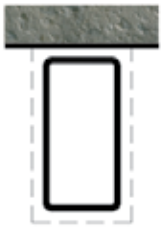
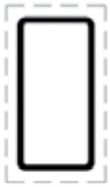
				Section factor A_p/V [m^{-1}]		
				3 sides		4 sides
Outer dimensions (h x b)	**Wall thickness (t)**	**Nominal weight**	**Cross section**			
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}	m^{-1}
100 x 60	3,0	7,18	9,14	241	285	351
	4,0	9,41	12	184	217	267
	5,0	11,6	14,7	150	177	218
	6,0	13,6	17,4	127	150	184
	6,3	14,2	18,1	122	144	177
	8,0	17,5	22,4	99	117	143
120 x 60	4,0	10,7	13,6	177	221	265
	5,0	13,1	16,7	144	180	216
	6,0	15,5	19,8	122	152	182
	6,3	16,2	20,7	116	145	174
	8,0	20,1	25,6	94	118	141
	10,0	24,3	30,9	78	98	117
120 x 80	4,0	11,9	15,2	185	211	264
	5,0	14,7	18,7	150	172	214
	6,0	17,4	22,2	127	145	181
	6,3	18,2	23,2	121	138	173
	8,0	22,6	28,8	98	112	139
	10,0	27,4	34,9	81	92	115
140 x 80	4,0	13,2	16,8	179	215	262
	5,0	16,3	20,7	145	174	213
	6,0	19,3	24,6	122	147	179
	6,3	20,2	25,7	117	141	172
	8,0	25,1	32	94	113	138
	10,0	30,6	38,9	78	93	114
150 x 100	4,0	15,1	19,2	183	209	261
	5,0	18,6	23,7	148	169	211
	6,0	22,1	28,2	125	142	178
	6,3	23,1	29,5	119	136	170
	8,0	28,9	36,8	96	109	136
	10,0	35,3	44,9	78	90	112
	12,0	41,4	52,7	67	76	95

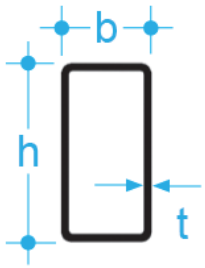


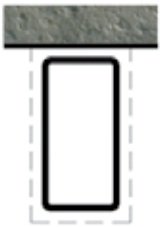
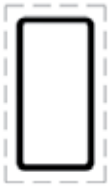


				Section factor A_p/V [m^{-1}]		
				3 sides		4 sides
Outer dimensions (h x b)	Wall thickness (t)	Nominal weight	Cross section			
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}	m^{-1}
150 x 100	12,5	42,8	54,6	65	74	92
160 x 80	4,0	14,4	18,4	174	218	261
	5,0	17,8	22,7	141	177	212
	6,0	21,2	27	119	149	178
	6,3	22,2	28,2	114	142	171
	8,0	27,6	35,2	91	114	137
	10,0	33,7	42,9	75	94	112
	12,0	39,5	50,3	64	80	96
	12,5	40,9	52,1	62	77	93
180 x 100	4,0	16,9	21,6	176	213	260
	5,0	21	26,7	143	173	210
	6,0	24,9	31,8	120	145	177
	6,3	26,1	33,3	115	139	169
	8,0	32,6	41,6	92	111	135
	10,0	40	50,9	75	91	111
	12,0	47	59,9	64	77	94
	12,5	48,7	62,1	62	75	91
200 x 100	4,0	18,2	23,2	173	216	259
	5,0	22,6	28,7	140	175	210
	6,0	26,8	34,2	117	147	176
	6,3	28,1	35,8	112	140	168
	8,0	35,1	44,8	90	112	134
	10,0	43,1	54,9	73	92	110
	12,0	50,8	64,7	62	78	93
	12,5	52,7	67,1	60	75	90
	16,0	65,2	83	49	61	73
200 x 120	6,0	28,7	36,6	121	143	175
	6,3	30,1	38,3	115	136	168
	8,0	37,6	48	92	109	134
	8,0	37,6	48	92	109	109
	10,0	46,3	58,9	75	89	93



				Section factor A_p/V [m^{-1}]		
						
				3 sides		4 sides
Outer dimensions (h x b)	**Wall thickness (t)**	**Nominal weight**	**Cross section**			
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}	m^{-1}
200 x 120	12,0	54,6	69,5	64	75	89
	12,5	56,6	72,1	62	73	84
250 x 150	6,0	36,2	46,2	120	141	174
	6,3	38	48,4	114	135	166
	8,0	47,7	60,8	91	107	132
	10,0	58,8	74,9	74	87	107
	12,0	69,6	88,7	63	74	91
	12,5	72,3	92,1	60	71	87
	16,0	90,3	115	48	57	70
260 x 180	6,0	40	51	122	138	173
	6,3	41,9	53,4	117	132	165
	8,0	52,7	67,2	93	105	131
	10,0	65,1	82,9	75	85	107
	12,0	77,2	98,3	64	72	90
	12,5	80,1	102	61	69	87
	16,0	100	128	49	55	69
300 x 200	6,0	45,7	58,2	121	138	172
	6,3	47,9	61	115	132	164
	8,0	60,3	76,8	92	105	131
	10,0	74,5	94,9	74	85	106
	12,0	88,5	113	62	71	89
	12,5	91,9	117	60	69	86
	16,0	115	147	48	55	69
350 x 250	6,0	55,1	70,2	107	129	157
	6,3	57,8	73,6	102	123	150
	8,0	72,8	92,8	81	97	119
	10,0	90,2	115	66	79	96
	12,0	107	137	55	66	81
	12,5	112	142	53	64	78
	16,0	141	179	42	51	62

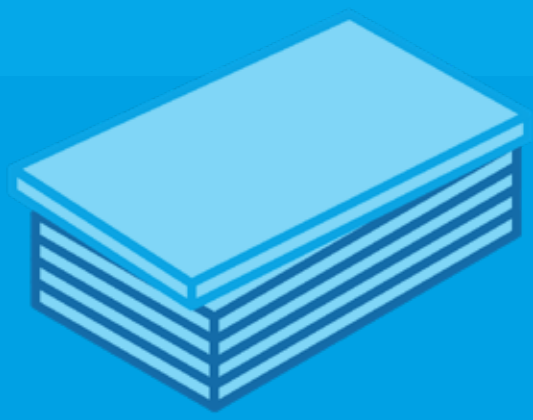


				Section factor A_p/V [m^{-1}]		
						
				3 sides		4 sides
Outer dimensions (h x b)	**Wall thickness (t)**	**Nominal weight**	**Cross section**			
mm	mm	kg/m	cm^2	m^{-1}	m^{-1}	m^{-1}
400 x 200	8,0	72,8	92,8	87	108	130
	10,0	90,2	115	70	87	105
	12,0	107	137	59	73	88
	12,5	112	142	57	71	85
	16,0	141	179	45	56	68
450 x 250	8,0	85,4	109	88	106	129
	10,0	106	135	71	86	104
	12,0	126	161	60	72	87
	12,5	131	167	57	69	84
	16,0	166	211	46	55	67
500 x 300	10,0	122	155	71	84	104
	12,0	145	185	60	71	87
	12,5	151	192	58	68	84
	16,0	191	243	46	54	66
	20,0	235	300	37	44	54

5. Regulations and standards

- REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC
- EN 13501-1 Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
- EN 13501-2 Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance and/or smoke control tests, excluding ventilation services
- EN 13381-1 Test methods for determining the contribution to the fire resistance of structural members - Part 1: Horizontal protective membranes
- EN 13381-4 Test methods for determining the contribution to the fire resistance of structural members - Part 4: Applied passive protection to steel members
- EN 13381-8 Test methods for determining the contribution to the fire resistance of structural members - Part 8: Applied reactive protection to steel members
- EN 1990 Eurocode: Basis of structural design
- EN 1991-1-2 Eurocode 1: Actions on structures - Part 1-2: General actions - Actions on structures exposed to fire
- EN 1993-1-1 Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings
- EN 1993-1-2 Eurocode 3: Design of steel structures - Part 1-2: General rules - Structural fire design
- ETAG 018-1 GUIDELINE FOR EUROPEAN TECHNICAL APPROVAL OF FIRE PROTECTIVE PRODUCTS Part 1: General
- ETAG 018-2 GUIDELINE FOR EUROPEAN TECHNICAL APPROVAL OF FIRE PROTECTIVE PRODUCTS Part 2: Reactive Coatings
- ETAG 018-3 GUIDELINE FOR EUROPEAN TECHNICAL APPROVAL OF FIRE PROTECTIVE PRODUCTS Part 3: Renderings and kits based on renderings intended to fire resisting applications
- ETAG 018-4 GUIDELINE FOR EUROPEAN TECHNICAL APPROVAL OF FIRE PROTECTIVE PRODUCTS Part 4: Fire Protective Board, Slab and Mat Products and Kits
- EAD 350402-00-1106 Reactive coatings for fire protection of steel elements
- EAD 350140-00-1106 Renderings and rendering kits intended for fire resistant applications
- EAD 350142-00-1106 Fire protective board, slab and mat products and kits

Promat Products



Products

Promat Products

Promat Fire Stopping has been providing approved fire stopping products for application in all building areas all across the world for the past 50 years.

The following pages give an overview of the products, which are used for building Promat fire stopping constructions as well as product data, features, area of application and processing information.

The products include:

- Fire stopping boards for all areas of high rise and housebuilding technology
- Fire stopping glass
- Intumescent building materials
- Fire stopping collars
- Intumescent paints
- Fire stopping mortar and fillers
- Associated products (silicone, waterproofing, glues, etc.)

The development of new products and systems is made possible by carrying out research and subsequent fire tests in our own facilities.

For Promat, safety and quality are two aspects, which belong together. In addition to offical quality control effectuated by the means of independent testing of our materials' fire stopping properties, the quality of our products is also strictly monitored during the prduction process.

By continually developing the range of products on offer, Promat focusses not only on fire stopping properties but also on

- ecological,
- economical,
- design and application

aspects.

The required ETAs and Classification Reports for the listed products and their use in fire stopping constructions/systems are available and should be complied with.

PROMATECT®-H
Fire protective construction board

Product description
Silicate based fire protective construction board with cement binder, resistant to moisture, of stable dimensions, large format and self-supporting. It is produced with quality assurance according to the standard ISO 9001.

Fields of application
Execution of construction elements for construction and technical fire protection according to EN standard in all the fields of building construction and industrial construction, e.g. in steel structures, fire resistant partitions, fire dampers, wall structures, facade elements. PROMATECT®-H has the following intended uses (according to EAD 350142-00-1106): internal use (type Z_2), internal use in high humidity conditions (type Z_1) and external semi-exposed use (type Y).

Technical data	
Nominal dry density (average)	approx. 870 kg/m³
Moisture content	approx. 5 – 10 % (air dried)
Alkalinity (pH-value)	approx. 12
Thermal conductivity λ	approx. 0,175 W/(m.K)
Coefficient of resistance to water vapor diffusion μ	approx. 20,0

Properties	
Construction material class	A1, EN 13501-1
Surface properties	one side smooth, one side mildly coarse
Storage	store in a dry location
Disposal	remains can be disposed off on waste tips for class I construction waste (EWC code 17 01 07)

Static values			
	Bending strength σ_{break}	Tensile strength Z_{break}	Compressive strength ⊥
(deflection f ≤ l/250, safety factor n ≥ 3)	7,6 N/mm² (in the longitudinal direction of the board)	4,8 N/mm² (in the longitudinal direction of the board)	9,3 N/mm² (perpendicularly to the board surface)

Pullout resistances					
	Pullout resistances of screws (Z_{break})				
Type of screws	Screw for fast construction 3,9 x 55 (G 233/355) Knipping	Screw for fast construction 4,2 x 45 (Hi-Lo-thread) Knipping	Screw for fast construction ABC-Spax 4,5 x 40	Screw for fast construction ABC-Spax 4,5 x 50	Screwing nut (type B 3815) RAMPA
Layout	in the board surface	in the board surface	in the board surface	in the board surface	in the board surface
Depth of screwing screws	15 mm	15 mm	15 mm	15 mm	15 mm
Pullout resistance Z_{break}	624 N	550 N	584 N	581 N	350 N

Formats and weights								
	Board thickness and weight							
Standard formats	2500 mm x 1250 mm	6 mm	8 mm	10 mm	12 mm	15 mm	20 mm	25 mm
	3000 mm x 1250 mm*	-	-					
Dimensional tolerance	thickness	±0,5 mm				±1,0 mm		±1,5 mm
	length and width	±3,0 mm						
Board weight [kg/m²]	in dry state	approx. 5,3	approx. 7,0	approx. 8,7	approx. 10,5	approx. 13,1	approx. 17,4	approx. 21,8
	+20 °C, 65 % rel. hum.	approx. 5,6	approx. 7,4	approx. 9,2	approx. 11,1	approx. 13,9	approx. 18,5	approx. 23,1

** on request*

PROMATECT®-200
Fire protective construction board

Product description
Silicate based fire protective construction board with PROMAXON® binder, resistant to moisture, of stable dimensions, large format and self-supporting. It is produced with quality assurance according to the standard ISO 9001.

Fields of application
Execution of construction elements for construction and technical fire protection according to EN standard in all the fields of building construction and industrial construction, e.g. fire protection of structural steel members, in fire resistant partitions, electrical cable enclosures, wall structures and facade elements. PROMATECT®-200 has the following intended uses (according to EAD 350142-00-1106): internal use (type Z_2).

Technical data	
Nominal dry density (average)	approx. 835 kg/m³
Moisture content	approx. 1 – 2 % (air dried)
Alkalinity (pH-value)	approx. 9
Thermal conductivity λ	approx. 0,189 W/(m.K)
Coefficient of resistance to water vapor diffusion μ	approx. 4,0

Properties	
Construction material class	A1, EN 13501-1
Surface properties	one side smooth, one side mildly coarse
Storage	store in a dry location
Disposal	Remains can be disposed off on waste tips for class I construction waste (EWC code 17 01 07)

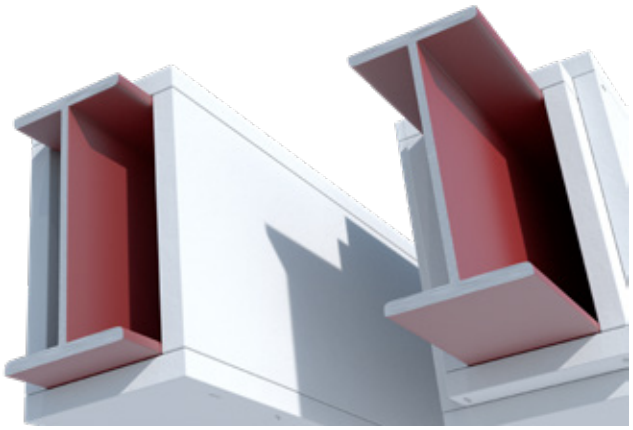
Static values			
	Bending strength σ_{break}	**Tensile strength Z_{break}**	**Compressive strength ⊥**
(deflection f ≤ l/250, safety factor n ≥ 3)	3,0 N/mm² (in the longitudinal direction of the board)	1,2 N/mm² (in the longitudinal direction of the board)	4,7 N/mm² (perpendicularly to the board surface)

Pullout resistances					
	Pullout resistances of screws (Z_{break})				
Type of screws	Screw for fast construction 3,9 x 55 (G 233/355) Knipping	Screw for fast construction 4,2 x 45 (Hi-Lo-thread) Knipping	Screw for fast construction ABC-Spax 4,5 x 40	Screw for fast construction ABC-Spax 4,5 x 50	Screwing nut (type B 3815) RAMPA
Layout	in the board surface	in the board surface	in the board surface	in the board surface	in the board surface
Depth of screwing screws	15 mm	15 mm	15 mm	15 mm	15 mm
Pullout resistance Z_{break}	n/a *	n/a *	n/a *	n/a *	n/a *

** data not available*

Formats and weights							
	Board thickness and weight						
Standard formats	2500 mm x 1200 mm	12 mm	15 mm	18 mm	20 mm	25 mm	30 mm
Dimensional tolerance	thickness	±0,5 mm					
	length and width	+0/-3 mm					
Board weight [kg/m²]	in dry state	approx. 10,7	approx. 11,7	approx. 14,0	approx. 15,6	approx. 19,5	approx. 23,4
	+20 °C, 65 % rel. hum.	approx. 11,6	approx. 12,6	approx. 15,1	approx. 16,8	approx. 21,1	approx. 25,1

PROMATECT®-XS
Fire protective construction board



Technical data	
Nominal dry density (50% RH, 23 °C)	915 kg/m³ ± 8%
Thermal conductivity λ (20 °C)	approx. 0,275 W/(m.K)
Compressive strength	≥ 6 N/mm²
Construction material class	A1, EN 13501-1
Storage	store in a dry location

Product description
PROMATECT®-XS is an innovative high performing fire protective board, specifically designed for fire protection of structural steel elements such as columns and beams in either opened or hollow sections, when high fire protection performance is required. Thanks to its properties it guarantees protection of structures from R 30 up to R 180. The board is also characterised by very good mechanical properties such as impact resistance, stiffness as well as bending strength and compressive strength.
PROMATECT®-XS has got a square edge; does not contain dangerous compounds - it is environmentally friendly and recyclable.

Fields of application
PROMATECT®-XS board can be used both in residential and non-residential constructions (e.g. public utility buildings) as fire protection of steel structures (beams, columns). It is suitable for semi-exposed uses (type Y and Z_2 according to EAD 350142-00-1106).

Transport and assembly of boards
The transport and assembly of boards should be in accordance with the general manufacturer's recommendations. In the case of the board cutting with a high-rotation cutter, a protective mask must be worn. Connection of boards is carried out by means of generally commercially available fasteners, such as staples, nails or screws. For processing of boards the same standard tools as for woodworking are used.

Packaging
- 12,5 mm: 40 pcs./pallet
- 15 mm: 32 pcs./pallet
- 20 mm: 24 pcs./pallet
- 25 mm: 24 pcs./pallet

Subject to change.

Formats and weights					
	Board thickness and weight				
Standard formats	2500 mm x 1200 mm* *at thickness 25 mm: 2000 mm x 1200 mm	12,5 mm	15 mm	20 mm	25 mm
Dimensional tolerance	thickness	-0,6/+0,2 mm	±0,5 mm		
	length and width	-5/+0 mm			
Board weight [kg/m²]	in dry state	approx. 11,4	approx. 13,7	approx. 18,3	approx. 22,9

PROMAPAINT®-SC3
Reactive fire protective coating

Technical data and properties	
Colour	white
Consistency	liquid
Density	1350 kg/m³ ± 200 kg/m³
Solid content	71% ± 3 %
Expansion ratio	~ 1 : 15
Viscosity	~30 Pas at 20 °C
Consumption	~1,85 kg/m² [1 mm DFT*]
Curing time between layers (for the same product)	~1000 µm after 8 hours (20 °C, 50 % RH)
Working temperature	+10 °C up to +35 °C
Storage temperature	+5 °C up to +45 °C
VOC-content	≤ 10 g/l
Dilution	water - max. 5 %
Use category (according to EAD 350402-00-1106)	without topcoat: type Z_2 with suitable protective topcoat: type X, Y and Z_1

** Dry film thickness*

Product description
PROMAPAINT®-SC3 is a water borne intumescent paint for fire protection of steel, concrete and hollow brick structures.

Fields of application
- inside of buildings
- in open halls
- protective coating intended for all conditions (internal, semi-exposed and exposed): according to EAD 350402-00-1106

System advantages / customer benefits
- aesthetic surface (thin and seamless result)
- easy to apply
- can be repainted
- both open and hollow steel sections
- suitable for galvanized steel structures
- improving fire resistance of load-bearing brick and reinforced concrete members
- fire resistance up to R(EI) 180

Test certificate / approval
PROMAPAINT®-SC3 is approved by ETA and is tested for steel structures and concrete components according to European standards. The coated steel or concrete components achieve fire resistance classes from R(EI) 15 to R(EI) 180.

Processing
PROMAPAINT®-SC3 may only be applied by trained professionals. Not for use in components that are constantly in highly humid areas or are exposed to aggressive gases. Surface must be free from grease, oil, rust, dirt or any other contaminant that may inhibit the bonding of PROMAPAINT®-SC3 to the primer. Stir well before use. Apply PROMAPAINT®-SC3 with a roller, brush or airless spray. Maximum dry film thickness (DFT) of one applied layer should be approximately 700 µm, which is approximately 1.020 µm of wet film thickness (WFT). When using a roller or brush, the maximum DFT of one applied layer should be approximately 350 µm (approx. 510 µm WFT). The processing temperature must be between +10 °C and +35 °C.

Labelling
The product labeling complies with the current legal regulations.

Packaging
- 25 kg sheet metal containers
- 24 pcs./pallet (600 kg)

Subject to change.

Storage requirements
Store in a cool, dry place. Shelf-life at least 18 months in original sealed containers.

Safety instructions
PROMAPAINT®-SC3 is a technical paint, no mixing with conventional paints is allowed. Individual layers should be applied with care. Check compliance with the required layer thickness. Only tested and approved primers and topcoats should be used. Product details available on request at Promat.

PROMAPAINT®-SC4

Reactive fire protective coating

Technical data and properties	
Colour	white
Consistency	liquid
Density	1.300 kg/m³ ± 50 kg/m³
Solid content	68 % ± 2%
Expansion ratio	high expansion
Viscosity	~30 Pas at 20 °C
Consumption	~1,95 kg/m² [1 mm DFT*]
Curing time between layers (for the same product)	~1000 µm after 8 hours (20 °C, 50 % RH)
Working temperature	+10 °C up to +35 °C
Storage temperature	+5 °C up to +40 °C
VOC-content	< 2,2 g/l
Dilution	water - max. 5 %
Use category (according to ETAG 018-2 used as EAD)	without topcoat: t ype Z_2 with suitable protective topcoat: type X, Y and Z_1

** Dry film thickness*

Product description

PROMAPAINT®-SC4 is a single component intumescent paint in water emulsion consisting of synthetic resin especially formulated for fire protection of load-bearing steel and concrete/trapezoidal profiled steel sheet composite slab structures.

Fields of application

- inside of buildings
- in open halls
- protective coating intended for all conditions (internal, semi-exposed and exposed): according to ETAG 018-2 used as EAD

System advantages / customer benefits

- aesthetic surface (thin and seamless result)
- easy to apply
- can be repainted
- both open and hollow steel sections
- suitable for galvanized steel structures
- fire resistance up to R(EI) 120

Test certificate / approval

PROMAPAINT®-SC4 is approved by ETA and is tested for steel structures according to European standards. The coated steel components achieve fire resistance classes from R 15 to R 90.

Processing

PROMAPAINT®-SC4 may only be applied by trained professionals. Not for use in components that are constantly in highly humid areas or are exposed to aggressive gases. Surface must be free from grease, oil, rust, dirt or any other contaminant that may inhibit the bonding of PROMAPAINT®-SC4 to the primer. Stir well before use. Apply PROMAPAINT®-SC4 with a roller, brush or airless spray. Maximum dry film thickness (DFT) of one applied layer should be approximately 750 µm, which is approximately 1.100 µm of wet film thickness (WFT). When using a roller or brush, the maximum DFT of one applied layer should be approximately 350 µm (approx. 515 µm WFT). The processing temperature must be between +10 °C and +35 °C.

Packaging

- 25 kg sheet metal containers
- 24 pcs./pallet (600 kg)

Subject to change.

Storage requirements

Store in a cool, dry place. Shelf-life at least 18 months in original sealed containers.

Safety instructions

PROMAPAINT®-SC4 is a technical paint, no mixing with conventional paints is allowed. Individual layers should be applied with care. Check compliance with the required layer thickness. Only tested and approved primers and topcoats should be used. Product details available on request at Promat.

PROMASPRAY®-P300
Non-reactive fire protective rendering

Technical data	
Density ρ	310 kg/m³ ± 15 % with batch mix method 450 kg/m³ ± 15 % with continuous method
Alkalinity (pH-value)	approx. 8 - 8,5
Thermal conductivity λ	0,078 W/(m.K) at 24 °C
Properties	
Construction material class	A1, EN 13501-1
Consumption	~0,35 kg/(mm.m²)
Minimum rendering thickness	8 mm
Rendering thickness range	8 – 76 mm
Thickness of one layer	approx. 15 – 20 mm
Cure	By hydraulic set
Initial set	10 to 15 hours at 20 °C and 50 % RH without accelerator
Primer	BONDSEAL® (approx. 150 g/m²)

Product description
PROMASPRAY®-P300 is a spray or trowel applied, single package factory controlled premix, based on vermiculite and gypsum, for internal use. PROMASPRAY®-P300 is a lightweight rendering that provides very efficient fire resistance from 15 to 360 minutes, depending on the thickness.

Fields of application
The product is suitable for semi-exposed and internal use (EAD 350140-00-1106, type Y and Z_2) for fire protection of:
- concrete structural elements
- structural steel
- timber floors
- load-bearing flat concrete profiled sheet composite elements

System advantages / customer benefits
- lightweight and durable rendering suitable for fire resistance of up to 360 minutes
- economic and quick application
- improves acoustic and thermal insulation
- fire protection of steel ribbed slabs

Test certificate / approval
PROMASPRAY®-P300 is assessed by European Technical Assessment (ETA). Load-bearing steel, load-bearing concrete elements, load-bearing timber floors and load-bearing flat concrete profiled sheet composite elements are tested in accordance with applicable European standards (EN). Depending on the applied layer thickness and area of application, fire resistance R(EI) 15 to R(EI) 360 can be achieved.

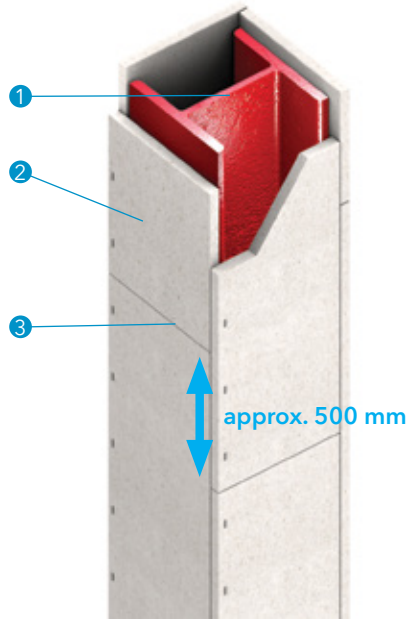
Packaging
- 20 kg plastic bags
- 24 bags/pallet

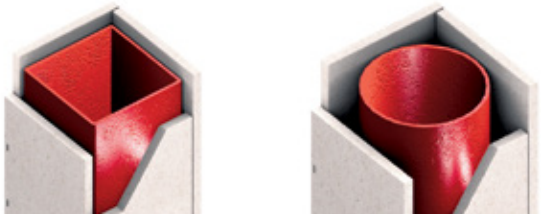
Subject to change.

Storage requirements
- Store in cool and dry conditions
- Protect from moisture
- Shelf life of original sealed containers at least 12 months
- Once opened, containers should be finished swiftly

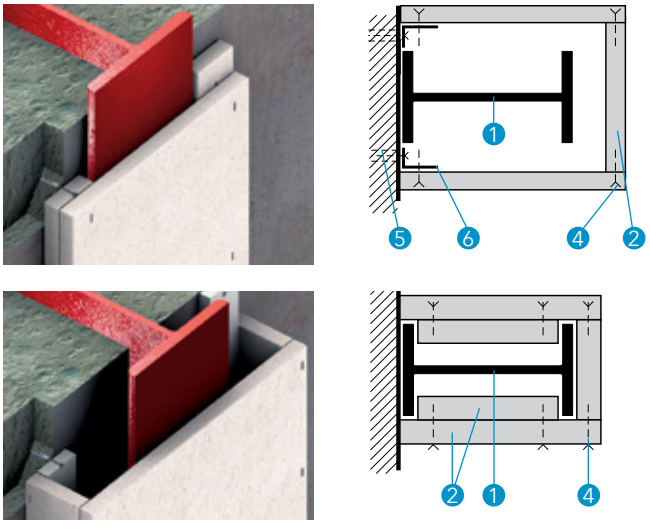
Safety instructions
- Keep out of reach of children.
- Avoid contact with food or beverages.
- Please refer to the safety data sheet for additional advice.

Systems for fire protection of load-bearing steel structures





Detail A - Installation examples



Detail B - Three-sided cladding

Technical data

1. Load-bearing steel column or steel beam
2. PROMATECT®-H, board thickness according to fire resistance, A_p/V ratio value and design (critical) steel temperature according to Eurocode
3. Board joints, approx. 500 mm apart on every side of the column
4. Steel staples or screws (see the table)
5. Fixing, distance approx. 500 mm
6. Steel angle 20/40 x 0,7
7. Soldiers, made from 1 or 2 pieces of PROMATECT®-H, b ≥ 100 mm, d = 20 mm
8. Additional perpendicular stiffening of PROMATECT®-H strip (d ≥ 20 mm) for profiles with height ≥ 560 mm

Certificate: 2014-Efectis-R0363c[Rev.2]

Fire resistance

R 30 to R 360 according to EN 13501-2, depending on the A_p/V value and the design steel temperature according to Eurocode.

Advantages:

- Low thickness of cladding
- Cladding with moisture resistant PROMATECT®-H boards
- Application possibilities up to $A_p/V \leq 360\ m^{-1}$
- Tables with performance above R 120 are available upon request

General instructions (columns)

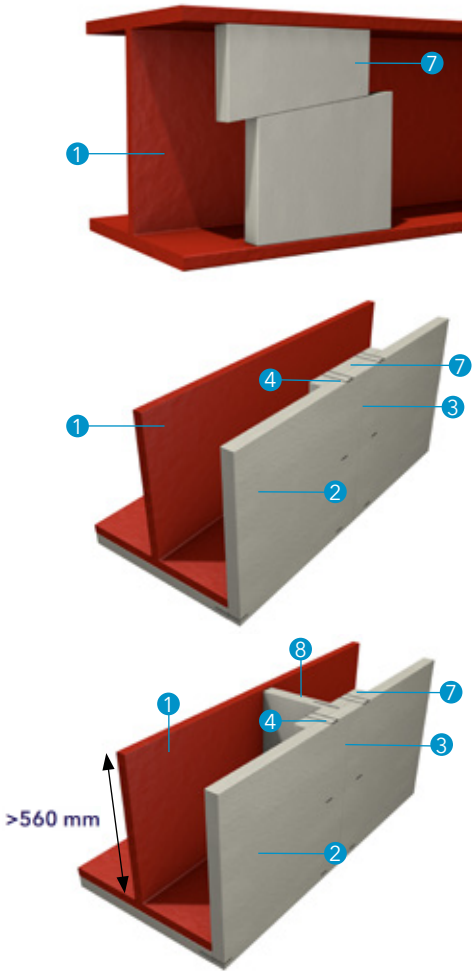
The required thickness of the fire protective cladding depends on the required fire resistance, the design temperature of the steel structure (the maximum allowed /critical/ temperature of the steel member) and the A_p/V ratio. Please refer to the tables on the following pages for the details to determine the required thickness of PROMATECT®-H cladding. The joints of boards are arranged with the offset of 500 mm to each other. Bonding or filling of joints and edges of PROMATECT®-H boards is not required from a structural fire protection point of view.

Detail A

The drawings show the box-shaped cladding of different steel sections. The high stability of PROMATECT®-H boards allows clamping on the front side. A sub-construction or fixing into steel is not required.

Detail B

The drawings show the standard details for three-sided cladding of steel columns.
The required data for A_p/V value calculation and determination of the required thickness of cladding are given on the former pages.



Details C, D and E – Installation examples

General instructions (beams)

Cladding of steel beams is generally done from three sides. The required thickness of the fire protective cladding depends on the required fire resistance, the design temperature of the steel structure (the maximum allowed /critical/ temperature of the steel member) and the A_p/V ratio. Please refer to the tables on the following pages for the details to determine the required thickness of PROMATECT®-H cladding (2). At uneven bottom sides of solid floors the joints between PROMATECT®-H cladding and the solid floor should be filled with Promat ® Filler PRO.

Details C, D and E

PROMATECT®-H soldiers (7) shall be adjusted in such a way that their outer surfaces protrude about 5 mm over the steel flange. The cladding (2) shall be fastened to the soldiers. At beams heights ≥ 560 mm one stabilising perpendicular bridge (8) shall be mounted on each soldier and fitted together with the soldier tightly between the flanges of the steel section.
In case that a very low required cladding thickness is calculated (e.g. PROMATECT®-H in 6 or 8 mm), the corresponding thickness of flange cladding (d2) shall be selected so that the correct clamping or screw connection should be possible. In this way an economical joint cladding with predominantly thin PROMATECT®-H fire protection boards can be done.

The drawings show the standard detail for three-sided cladding of steel beams.
Information related to the A_p/V value calculation and determination of the required thickness of cladding are given on the former pages.

Table 1 – Fastening means

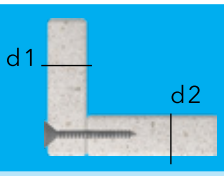
Way of fixing		Edge of fixing d1 < d2, d2 > 12 mm
Fastening means	**ABC - SPAX - screw**	**Steel staple**
Board thickness d1	**Nominal 200 mm centres**	**Nominal 100 mm centres**
10 mm	-	28/10,7/1,2
12 mm	-	28/10,7/1,2
15 mm	4,0 x 40	38/10,7/1,2
20 mm	4,5 x 50	50/11,2/1,53

Table 2 - Cladding thicknesses R 30 for open and hollow section beams and columns

R 30	Cladding thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
0	12	12	12	12	12	12	12	12	12
46	12	12	12	12	12	12	12	12	12
50	12	12	12	12	12	12	12	12	12
60	12	12	12	12	12	12	12	12	12
70	12	12	12	12	12	12	12	12	12
80	12	12	12	12	12	12	12	12	12
90	12	12	12	12	12	12	12	12	12
100	12	12	12	12	12	12	12	12	12
110	12	12	12	12	12	12	12	12	12
120	12	12	12	12	12	12	12	12	12
130	12	12	12	12	12	12	12	12	12
140	12	12	12	12	12	12	12	12	12
150	15	12	12	12	12	12	12	12	12
160	15	12	12	12	12	12	12	12	12
170	15	12	12	12	12	12	12	12	12
180	15	15	12	12	12	12	12	12	12
190	15	15	12	12	12	12	12	12	12
200	15	15	12	12	12	12	12	12	12
210	20	15	15	12	12	12	12	12	12
220	20	15	15	12	12	12	12	12	12
230	20	15	15	12	12	12	12	12	12
240	20	15	15	12	12	12	12	12	12
250	20	15	15	12	12	12	12	12	12
260	20	20	15	12	12	12	12	12	12
270	20	20	15	15	12	12	12	12	12
280	20	20	15	15	12	12	12	12	12
290	20	20	15	15	12	12	12	12	12
300	20	20	15	15	12	12	12	12	12
310	20	20	15	15	12	12	12	12	12
320	20	20	15	15	12	12	12	12	12
330	20	20	15	15	12	12	12	12	12
340	20	20	15	15	12	12	12	12	12
350	20	20	15	15	12	12	12	12	12
360	20	20	20	15	15	12	12	12	12

Table 3 - Cladding thicknesses R 60 for open and hollow section beams and columns

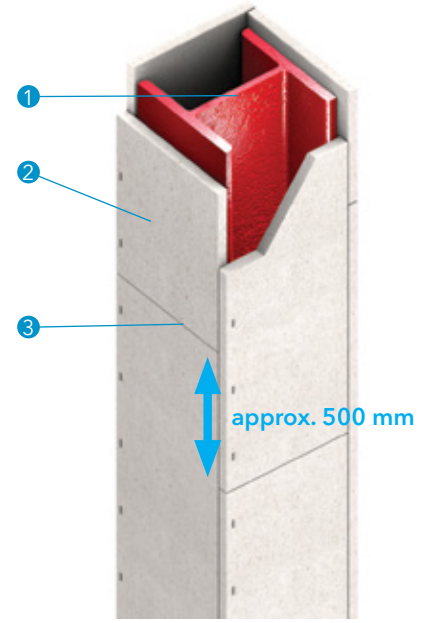
R 60	Cladding thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
0	12	12	12	12	12	12	12	12	12
46	12	12	12	12	12	12	12	12	12
50	12	12	12	12	12	12	12	12	12
60	15	12	12	12	12	12	12	12	12
70	20	15	12	12	12	12	12	12	12
80	20	15	15	12	12	12	12	12	12
90	20	20	15	12	12	12	12	12	12
100	25	20	20	15	12	12	12	12	12
110	25	20	20	15	15	12	12	12	12
120	25	20	20	20	15	12	12	12	12
130	25	25	20	20	15	15	12	12	12
140	25	25	20	20	15	15	12	12	12
150	25	25	25	20	20	15	15	12	12
160	25	25	25	20	20	15	15	12	12
170	15 + 15	25	25	20	20	20	15	12	12
180	15 + 15	25	25	20	20	20	15	15	12
190	15 + 15	25	25	25	20	20	15	15	12
200	15 + 15	25	25	25	20	20	20	15	12
210	15 + 15	15 + 12	25	25	20	20	20	15	12
220	15 + 15	15 + 12	25	25	20	20	20	15	15
230	15 + 15	15 + 15	25	25	25	20	20	20	15
240	15 + 15	15 + 15	25	25	25	20	20	20	15
250	20 + 12	15 + 15	25	25	25	20	20	20	15
260	20 + 12	15 + 15	15 + 12	25	25	20	20	20	15
270	20 + 12	15 + 15	15 + 12	25	25	20	20	20	20
280	20 + 12	15 + 15	15 + 12	25	25	25	20	20	20
290	20 + 12	15 + 15	15 + 12	25	25	25	20	20	20
300	20 + 12	15 + 15	15 + 12	25	25	25	20	20	20
310	20 + 12	15 + 15	15 + 12	25	25	25	20	20	20
320	20 + 12	15 + 15	15 + 12	25	25	25	20	20	20
330	20 + 12	15 + 15	15 + 15	15 + 12	25	25	20	20	20
340	20 + 12	15 + 15	15 + 15	15 + 12	25	25	25	20	20
350	20 + 12	15 + 15	15 + 15	15 + 12	25	25	25	20	20
360	20 + 12	15 + 15	15 + 15	15 + 12	25	25	25	20	20

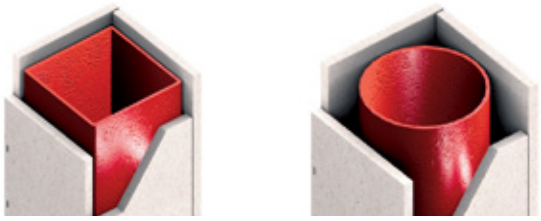
Table 4 - Cladding thicknesses R 90 for open and hollow section beams and columns

R 90	Cladding thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
0	20	15	15	12	12	12	12	12	12
46	20	15	15	12	12	12	12	12	12
50	20	20	15	12	12	12	12	12	12
60	25	20	20	15	12	12	12	12	12
70	25	25	20	20	12	12	12	12	12
80	15 + 15	25	25	20	15	15	12	12	12
90	15 + 15	15 + 12	25	20	20	15	12	12	12
100	20 + 12	15 + 15	25	25	20	20	15	12	12
110	20 + 15	15 + 15	15 + 12	25	20	20	15	12	12
120	20 + 15	20 + 12	15 + 15	25	25	20	20	15	12
130	20 + 15	20 + 12	15 + 15	15 + 12	25	25	20	15	12
140	25 + 12	20 + 15	15 + 15	15 + 15	25	25	20	20	15
150	25 + 12	20 + 15	20 + 12	15 + 15	25	25	20	20	20
160	20 + 20	20 + 15	20 + 12	15 + 15	25	25	25	20	20
170	20 + 20	20 + 15	20 + 12	15 + 15	15 + 12	25	25	20	20
180	20 + 20	20 + 15	20 + 12	15 + 15	15 + 12	15 + 12	25	20	20
190	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	15 + 12	25	25	20
200	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	15 + 12	25	25	20
210	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	15 + 12	25	25	20
220	20 + 20	25 + 12	20 + 12	20 + 12	15 + 15	15 + 15	15 + 12	25	25
230	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	15 + 15	15 + 12	25	25
240	20 + 20	20 + 20	20 + 15	20 + 15	15 + 15	15 + 15	15 + 12	25	25
250	25 + 20	20 + 20	20 + 15	20 + 15	20 + 12	15 + 15	15 + 12	15 + 12	25
260	25 + 20	20 + 20	20 + 15	20 + 15	20 + 12	15 + 15	15 + 12	15 + 12	25
270	25 + 20	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	15 + 12	15 + 12	25
280	25 + 20	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	15 + 15	15 + 12	25
290	25 + 20	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	15 + 15	15 + 12	25
300	25 + 20	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	15 + 15	15 + 12	25
310	25 + 20	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	15 + 15	15 + 12	15 + 12
320	25 + 20	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	15 + 15	15 + 12	15 + 12
330	25 + 20	20 + 20	25 + 12	20 + 15	20 + 15	20 + 12	15 + 15	15 + 12	15 + 12
340	25 + 20	20 + 20	25 + 12	20 + 15	20 + 15	20 + 12	15 + 15	15 + 12	15 + 12
350	25 + 20	20 + 20	25 + 12	20 + 15	20 + 15	20 + 12	15 + 15	15 + 12	15 + 12
360	25 + 20	20 + 20	25 + 12	20 + 15	20 + 15	20 + 12	15 + 15	15 + 12	15 + 12

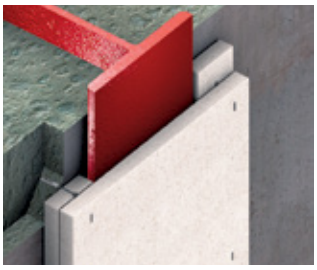
Table 5 - Cladding thicknesses R 120 for open and hollow section beams and columns

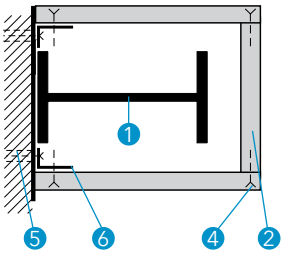
R 120	Cladding thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
0	15 + 12	25	20	15	15	12	12	12	12
46	15 + 12	25	20	15	15	12	12	12	12
50	15 + 12	25	20	20	15	12	12	12	12
60	20 + 12	15 + 12	25	20	20	15	15	12	12
70	15 + 20	15 + 15	15 + 12	25	20	20	15	15	12
80	12 + 25	20 + 15	15 + 15	15 + 12	25	20	20	15	12
90	20 + 20	20 + 15	20 + 12	15 + 15	25	25	20	20	15
100	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	25	25	20	15
110	25 + 20	20 + 20	20 + 15	20 + 12	15 + 15	15 + 12	25	20	20
120	25 + 20	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	25	25	20
130	25 + 20	25 + 20	20 + 20	20 + 15	20 + 12	15 + 15	15 + 12	25	20
140	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	15 + 15	15 + 15	25	25
150	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	25	25
160	25 + 25	25 + 20	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	15 + 15	25
170	25 + 25	25 + 20	25 + 20	20 + 20	20 + 15	20 + 15	20 + 12	15 + 15	25
180	25 + 25	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	25
190	25 + 25	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	15 + 15
200	25 + 25	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15	15 + 15
210	25 + 25	25 + 25	25 + 20	20 + 20	25 + 12	20 + 15	20 + 15	20 + 12	15 + 15
220	25 + 25	25 + 25	25 + 20	20 + 20	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15
230	25 + 25	25 + 25	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15
240	25 + 25	25 + 25	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	20 + 12	15 + 15
250	25 + 25	25 + 25	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	20 + 15	20 + 12
260	25 + 25	25 + 25	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	20 + 15	20 + 12
270	25 + 25	25 + 25	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	20 + 15	20 + 12
280	25 + 25	25 + 25	25 + 20	25 + 20	20 + 20	20 + 20	25 + 12	20 + 15	20 + 12
290	25 + 25	25 + 25	25 + 20	25 + 20	20 + 20	20 + 20	25 + 12	20 + 15	20 + 12
300	25 + 25	25 + 25	25 + 25	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	20 + 12
310	25 + 25	25 + 25	25 + 25	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	20 + 15
320	25 + 25	25 + 25	25 + 25	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	20 + 15
330	25 + 25	25 + 25	25 + 25	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	20 + 15
340	25 + 25	25 + 25	25 + 25	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	20 + 15
350	25 + 25	25 + 25	25 + 25	25 + 20	25 + 20	20 + 20	25 + 12	20 + 15	20 + 15
360	25 + 25	25 + 25	25 + 25	25 + 20	25 + 20	20 + 20	20 + 20	20 + 20	20 + 15

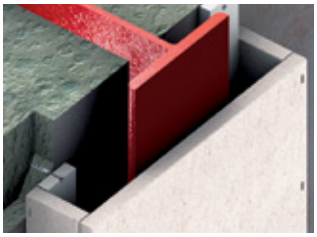


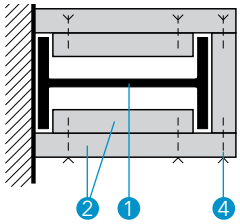


Detail A - Installation examples









Detail B - Three-sided cladding

Technical data

1. Load-bearing steel column or steel beam
2. PROMATECT®-200, board thickness according to fire resistance, A_p/V ratio value and design (critical) steel temperature, according to Eurocode
3. Board joints, approx. 500 mm apart on every side of the column
4. Steel staples or screws (see the table)
5. Plastic dowels with screw, distance approx. 500 mm
6. Steel angle 20/40 x 0,7
7. Soldiers, made from 1 or 2 pieces of PROMATECT®-H, b ≥ 100 mm, d = 20 mm
8. Additional perpendicular stiffening of PROMATECT®-H strip (d ≥ 20 mm) for profiles with height ≥ 560 mm

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Fire resistance

R 30 to R 300 according to EN 13501-2, depending on the A_p/V value and the design steel temperature according to Eurocode.

Advantages:

- Low thickness of cladding
- Application possibilities up to $A_p/V \leq 350\ m^{-1}$
- Tables with performance above R 120 are available upon request

General instructions (columns)

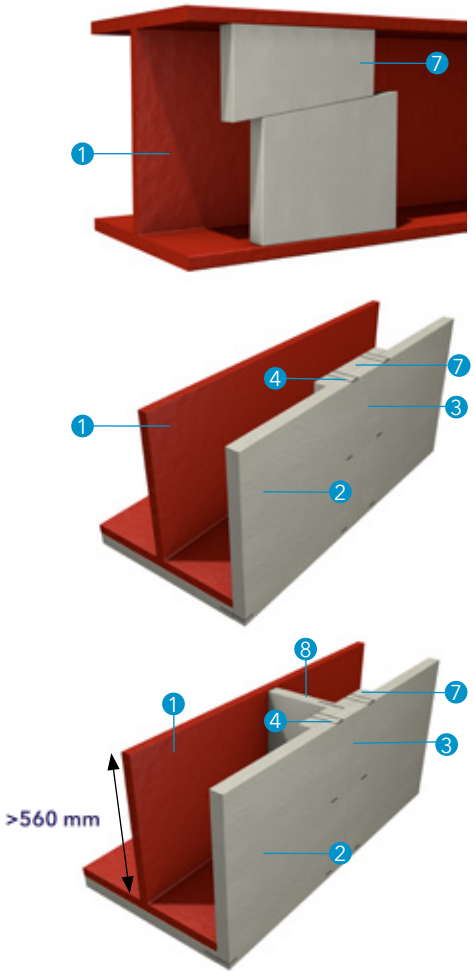
The required thickness of the fire protective cladding depends on the required fire resistance, the design temperature of the steel structure (the maximum allowed /critical/ temperature of the steel member) and the A_p/V ratio. Please refer to the tables on the following pages for the details to determine the required thickness of PROMATECT®-200 cladding (2). The joints of boards are arranged with the offset of 500 mm to each other. Bonding or filling of joints and edges of PROMATECT®-200 boards is not required from a structural fire protection point of view.

Detail A

The drawings show the box-shaped cladding of different steel sections. The high stability of PROMATECT®-200 boards (2) allows clamping on the front side and/or screw connection (4). A sub-construction or fixing into steel is not required.

Detail B

The drawings show the standard details for three-sided cladding of steel columns.
The required data for A_p/V value calculation and determination of the required thickness of cladding are given on the former pages.



Details C, D and E – Installation examples

General instructions (beams)

Cladding of steel beams is generally done from three sides. The required thickness of the fire protective cladding depends on the required fire resistance, the design temperature of the steel structure (the maximum allowed /critical/ temperature of the steel member) and the A_p/V ratio. Please refer to the tables on the following pages for the details to determine the required thickness of PROMATECT®-200 cladding (2). At uneven bottom sides of solid floors the joints between PROMATECT®-200 cladding and the solid floor should be filled with Promat ® Filler PRO.

Details C, D and E

PROMATECT®-H soldiers (7) shall be adjusted in such a way that their outer surfaces protrude about 5 mm over the support flange. The cladding (2) shall be fastened to the soldiers. At beams heights ≥ 560 mm one stabilising perpendicular bridge (8) shall be mounted on each soldier and fitted together with the soldier tightly between the flanges of the steel section.

The drawings show the standard detail for three-sided cladding of steel beams.
The required data for A_p/V value calculation and determination of the required thickness of cladding are given on the former pages.

Table 1 – Fastening means

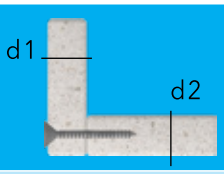
Way of fixing		Edge of fixing d1 < d2, d2 > 12 mm
Fastening means	ABC - SPAX - screw	Steel staple
Board thickness d1	Nominal 200 mm centres	Nominal 100 mm centres
12 mm	-	28/10,7/1,2
15 mm	4,0 x 40	38/10,7/1,2
18 mm	4,0 x 40	44/11,2/1,53
20 mm	4,5 x 50	50/11,2/1,53
25 mm	5,0 x 60	63/11,2/1,53

Table 2 - Cladding thicknesses R 30 for columns and beams in four-sided design

R 30	Cladding thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
0	15	15	15	15	15	15	15	15	15
46	15	15	15	15	15	15	15	15	15
50	15	15	15	15	15	15	15	15	15
60	15	15	15	15	15	15	15	15	15
70	15	15	15	15	15	15	15	15	15
80	15	15	15	15	15	15	15	15	15
90	15	15	15	15	15	15	15	15	15
100	15	15	15	15	15	15	15	15	15
110	15	15	15	15	15	15	15	15	15
120	15	15	15	15	15	15	15	15	15
130	15	15	15	15	15	15	15	15	15
140	15	15	15	15	15	15	15	15	15
150	15	15	15	15	15	15	15	15	15
160	15	15	15	15	15	15	15	15	15
170	15	15	15	15	15	15	15	15	15
180	15	15	15	15	15	15	15	15	15
190	15	15	15	15	15	15	15	15	15
200	15	15	15	15	15	15	15	15	15
210	15	15	15	15	15	15	15	15	15
220	15	15	15	15	15	15	15	15	15
230	15	15	15	15	15	15	15	15	15
240	15	15	15	15	15	15	15	15	15
250	15	15	15	15	15	15	15	15	15
260	15	15	15	15	15	15	15	15	15
270	15	15	15	15	15	15	15	15	15
280	15	15	15	15	15	15	15	15	15
290	15	15	15	15	15	15	15	15	15
300	15	15	15	15	15	15	15	15	15
310	15	15	15	15	15	15	15	15	15
320	15	15	15	15	15	15	15	15	15
330	15	15	15	15	15	15	15	15	15
340	15	15	15	15	15	15	15	15	15
350	15	15	15	15	15	15	15	15	15
360	15	15	15	15	15	15	15	15	15

Table 3 - Cladding thicknesses R 30 for beams in three-sided design

R 30	Cladding thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
0	15	15	15	15	15	15	15	15	15
46	15	15	15	15	15	15	15	15	15
50	15	15	15	15	15	15	15	15	15
60	15	15	15	15	15	15	15	15	15
70	15	15	15	15	15	15	15	15	15
80	15	15	15	15	15	15	15	15	15
90	15	15	15	15	15	15	15	15	15
100	15	15	15	15	15	15	15	15	15
110	15	15	15	15	15	15	15	15	15
120	15	15	15	15	15	15	15	15	15
130	15	15	15	15	15	15	15	15	15
140	15	15	15	15	15	15	15	15	15
150	15	15	15	15	15	15	15	15	15
160	15	15	15	15	15	15	15	15	15
170	15	15	15	15	15	15	15	15	15
180	15	15	15	15	15	15	15	15	15
190	15	15	15	15	15	15	15	15	15
200	15	15	15	15	15	15	15	15	15
210	15	15	15	15	15	15	15	15	15
220	15	15	15	15	15	15	15	15	15
230	18	15	15	15	15	15	15	15	15
240	18	15	15	15	15	15	15	15	15
250	18	15	15	15	15	15	15	15	15
260	18	15	15	15	15	15	15	15	15
270	18	15	15	15	15	15	15	15	15
280	18	15	15	15	15	15	15	15	15
290	18	15	15	15	15	15	15	15	15
300	18	15	15	15	15	15	15	15	15
310	18	15	15	15	15	15	15	15	15
320	18	15	15	15	15	15	15	15	15
330	18	15	15	15	15	15	15	15	15
340	18	15	15	15	15	15	15	15	15
350	18	15	15	15	15	15	15	15	15
360	18	15	15	15	15	15	15	15	15

Table 4 - Cladding thicknesses R 60 for columns and beams in four-sided design

R 60	Cladding thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
0	15	15	15	15	15	15	15	15	15
46	15	15	15	15	15	15	15	15	15
50	15	15	15	15	15	15	15	15	15
60	15	15	15	15	15	15	15	15	15
70	15	15	15	15	15	15	15	15	15
80	15	15	15	15	15	15	15	15	15
90	18	15	15	15	15	15	15	15	15
100	18	18	15	15	15	15	15	15	15
110	18	18	18	15	15	15	15	15	15
120	20	18	18	15	15	15	15	15	15
130	20	20	18	18	18	15	15	15	15
140	25	20	18	18	18	18	15	15	15
150	25	20	20	18	18	18	15	15	15
160	25	25	20	18	18	18	18	15	15
170	25	25	20	18	18	18	18	15	15
180	25	25	20	20	18	18	18	18	15
190	25	25	25	20	18	18	18	18	15
200	30	25	25	20	18	18	18	18	15
210	30	25	25	20	20	18	18	18	18
220	30	25	25	25	20	18	18	18	18
230	15 + 15	30	25	25	20	18	18	18	18
240	15 + 15	30	25	25	20	20	18	18	18
250	15 + 15	30	25	25	20	20	18	18	18
260	15 + 15	30	25	25	25	20	18	18	18
270	15 + 15	30	25	25	25	20	18	18	18
280	15 + 15	15 + 15	30	25	25	20	20	18	18
290	15 + 15	15 + 15	30	25	25	20	20	18	18
300	15 + 15	15 + 15	30	25	25	25	20	18	18
310	15 + 15	15 + 15	30	25	25	25	20	18	18
320	15 + 15	15 + 15	30	25	25	25	20	18	18
330	15 + 15	15 + 15	30	25	25	25	20	18	18
340	15 + 15	15 + 15	30	30	25	25	20	20	18
350	15 + 15	15 + 15	15 + 15	30	25	25	20	20	18
360	15 + 15	15 + 15	15 + 15	30	25	25	25	20	18

Table 5 - Cladding thicknesses R 60 for beams in three-sided design

R 60	Cladding thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
0	15	15	15	15	15	15	15	15	15
46	15	15	15	15	15	15	15	15	15
50	15	15	15	15	15	15	15	15	15
60	15	15	15	15	15	15	15	15	15
70	15	15	15	15	15	15	15	15	15
80	18	15	15	15	15	15	15	15	15
90	18	18	15	15	15	15	15	15	15
100	20	18	18	15	15	15	15	15	15
110	25	18	18	15	15	15	15	15	15
120	25	20	18	18	15	15	15	15	15
130	25	20	18	18	15	15	15	15	15
140	25	20	18	18	15	15	15	15	15
150	25	25	20	18	18	15	15	15	15
160	25	25	20	18	18	15	15	15	15
170	25	25	20	18	18	15	15	15	15
180	30	25	25	20	18	18	15	15	15
190	30	25	25	20	18	18	15	15	15
200	30	25	25	20	18	18	15	15	15
210	30	25	25	20	18	18	15	15	15
220	30	25	25	20	18	18	18	15	15
230	30	25	25	25	20	18	18	15	15
240	30	30	25	25	20	18	18	15	15
250	30	30	25	25	20	18	18	15	15
260	30	30	25	25	20	18	18	15	15
270	30	30	25	25	20	18	18	18	15
280	30	30	25	25	20	20	18	18	15
290	30	30	25	25	25	20	18	18	15
300	30	30	25	25	25	20	18	18	15
310	30	30	25	25	25	20	18	18	15
320	30	30	30	25	25	20	18	18	15
330	30	30	30	25	25	20	18	18	15
340	30	30	30	25	25	20	18	18	15
350	30	30	30	25	25	20	18	18	15
360	30	30	30	25	25	20	18	18	18

Table 6 - Cladding thicknesses R 90 for columns and beams in four-sided design

R 90	Cladding thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
0	18	15	15	15	15	15	15	15	15
46	18	15	15	15	15	15	15	15	15
50	18	15	15	15	15	15	15	15	15
60	20	18	15	15	15	15	15	15	15
70	20	20	18	18	15	15	15	15	15
80	25	20	20	18	18	18	18	18	15
90	25	25	20	20	18	18	18	18	18
100	25	25	25	20	20	18	18	18	18
110	30	25	25	25	20	20	18	18	18
120	15 + 15	25	25	25	20	20	20	18	18
130	20 + 12	30	25	25	25	20	20	20	18
140	20 + 12	15 + 15	25	25	25	25	20	20	18
150	20 + 12	15 + 15	30	25	25	25	20	20	20
160	15 + 18	20 + 12	15 + 15	25	25	25	25	20	20
170	15 + 18	20 + 12	15 + 15	30	25	25	25	25	20
180	20 + 15	20 + 12	15 + 15	15 + 15	25	25	25	25	20
190	20 + 15	20 + 12	15 + 15	15 + 15	30	25	25	25	25
200	20 + 15	20 + 12	15 + 15	15 + 15	15 + 15	25	25	25	25
210	20 + 15	15 + 18	20 + 12	15 + 15	15 + 15	30	25	25	25
220	20 + 15	15 + 18	20 + 12	15 + 15	15 + 15	30	25	25	25
230	20 + 15	15 + 18	20 + 12	15 + 15	15 + 15	15 + 15	30	25	25
240	18 + 18	20 + 15	20 + 12	15 + 15	15 + 15	15 + 15	30	25	25
250	18 + 18	20 + 15	20 + 12	15 + 15	15 + 15	15 + 15	15 + 15	25	25
260	18 + 18	20 + 15	20 + 12	15 + 15	15 + 15	15 + 15	15 + 15	30	25
270	18 + 18	20 + 15	20 + 12	15 + 15	15 + 15	15 + 15	15 + 15	30	25
280	20 + 18	20 + 15	15 + 18	20 + 12	15 + 15	15 + 15	15 + 15	30	25
290	20 + 18	20 + 15	15 + 18	20 + 12	15 + 15	15 + 15	15 + 15	30	25
300	20 + 18	20 + 15	15 + 18	20 + 12	15 + 15	15 + 15	15 + 15	15 + 15	25
310	20 + 18	20 + 15	15 + 18	20 + 12	15 + 15	15 + 15	15 + 15	15 + 15	25
320	20 + 18	20 + 15	15 + 18	20 + 12	15 + 15	15 + 15	15 + 15	15 + 15	30
330	20 + 18	18 + 18	20 + 15	20 + 12	15 + 15	15 + 15	15 + 15	15 + 15	30
340	20 + 18	18 + 18	20 + 15	20 + 12	15 + 15	15 + 15	15 + 15	15 + 15	30
350	20 + 18	18 + 18	20 + 15	20 + 12	15 + 15	15 + 15	15 + 15	15 + 15	30
360	20 + 18	18 + 18	20 + 15	20 + 12	15 + 15	15 + 15	15 + 15	15 + 15	30

Table 7 - Cladding thicknesses R 90 for beams in three-sided design

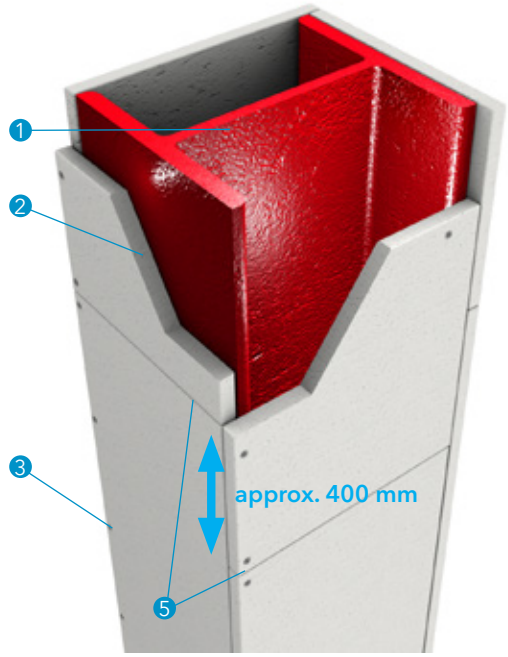
R 90	Cladding thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
0	18	15	15	15	15	15	15	15	15
46	18	15	15	15	15	15	15	15	15
50	18	18	15	15	15	15	15	15	15
60	25	18	18	15	15	15	15	15	15
70	25	20	18	18	15	15	15	15	15
80	25	25	20	18	18	15	15	15	15
90	30	25	25	20	18	18	15	15	15
100	30	25	25	20	20	18	18	15	15
110	30	30	25	25	20	18	18	18	15
120	30	30	25	25	20	20	18	18	15
130	15 + 15	30	25	25	25	20	18	18	18
140	20 + 12	30	30	25	25	20	20	18	18
150	20 + 12	30	30	25	25	25	20	18	18
160	20 + 12	15 + 15	30	30	25	25	20	20	18
170	15 + 18	15 + 15	30	30	25	25	25	20	18
180	15 + 18	20 + 12	30	30	25	25	25	20	18
190	20 + 15	20 + 12	15 + 15	30	25	25	25	20	20
200	20 + 15	20 + 12	15 + 15	30	30	25	25	25	20
210	20 + 15	20 + 12	15 + 15	30	30	25	25	25	20
220	20 + 15	15 + 18	15 + 15	30	30	25	25	25	20
230	20 + 15	15 + 18	15 + 15	30	30	30	25	25	25
240	18 + 18	15 + 18	15 + 15	15 + 15	30	30	25	25	25
250	18 + 18	20 + 15	20 + 12	15 + 15	30	30	25	25	25
260	18 + 18	20 + 15	20 + 12	15 + 15	30	30	25	25	25
270	20 + 18	20 + 15	20 + 12	15 + 15	30	30	25	25	25
280	20 + 18	20 + 15	20 + 12	15 + 15	30	30	30	25	25
290	20 + 18	20 + 15	20 + 12	15 + 15	15 + 15	30	30	25	25
300	20 + 18	20 + 15	20 + 12	15 + 15	15 + 15	30	30	25	25
310	20 + 18	20 + 15	20 + 12	15 + 15	15 + 15	30	30	25	25
320	20 + 18	20 + 15	15 + 18	15 + 15	15 + 15	30	30	25	25
330	20 + 18	18 + 18	15 + 18	15 + 15	15 + 15	30	30	30	25
340	20 + 18	18 + 18	15 + 18	15 + 15	15 + 15	30	30	30	25
350	20 + 18	18 + 18	15 + 18	15 + 15	15 + 15	15 + 15	30	30	25
360	20 + 18	18 + 18	15 + 18	15 + 15	15 + 15	15 + 15	30	30	25

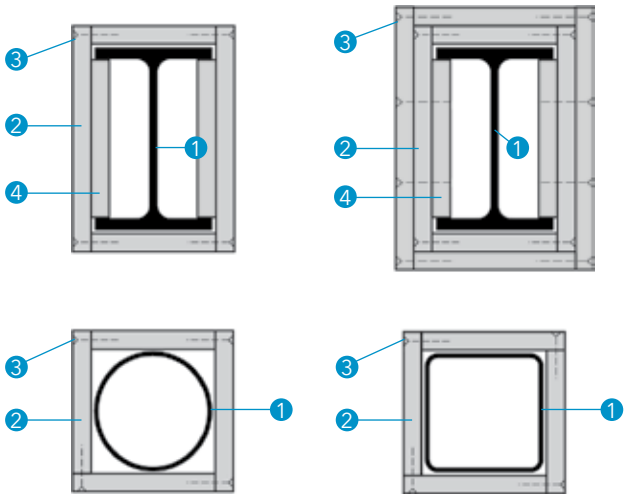
Table 8 - Cladding thicknesses R 120 for columns and beams in four-sided design

R 120	Cladding thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
0	20	20	18	15	15	15	15	15	15
46	20	20	18	15	15	15	15	15	15
50	20	20	18	18	15	15	15	15	15
60	25	25	20	20	18	18	18	18	18
70	25	25	25	20	20	20	18	18	18
80	15 + 15	25	25	25	25	20	20	20	18
90	20 + 12	30	25	25	25	25	20	20	20
100	20 + 15	20 + 12	30	25	25	25	25	20	20
110	18 + 18	15 + 18	15 + 15	30	25	25	25	25	20
120	20 + 18	20 + 15	20 + 12	15 + 15	25	25	25	25	25
130	20 + 18	18 + 18	20 + 15	20 + 12	30	25	25	25	25
140	20 + 18	18 + 18	20 + 15	20 + 12	15 + 15	30	25	25	25
150	20 + 20	20 + 18	20 + 15	15 + 18	20 + 12	15 + 15	30	25	25
160	20 + 20	20 + 18	18 + 18	20 + 15	20 + 12	15 + 15	30	25	25
170	20 + 20	20 + 20	20 + 18	20 + 15	20 + 12	15 + 15	15 + 15	30	25
180	20 + 25	20 + 20	20 + 18	20 + 15	15 + 18	20 + 12	15 + 15	15 + 15	25
190	20 + 25	20 + 20	20 + 18	18 + 18	15 + 18	20 + 12	15 + 15	15 + 15	30
200	20 + 25	20 + 20	20 + 18	18 + 18	20 + 15	20 + 12	15 + 15	15 + 15	30
210	20 + 25	20 + 20	20 + 20	20 + 18	20 + 15	20 + 12	15 + 15	15 + 15	30
220	20 + 25	20 + 25	20 + 20	20 + 18	20 + 15	15 + 18	15 + 15	15 + 15	15 + 15
230	20 + 25	20 + 25	20 + 20	20 + 18	20 + 15	15 + 18	20 + 12	15 + 15	15 + 15
240	20 + 25	20 + 25	20 + 20	20 + 18	18 + 18	15 + 18	20 + 12	15 + 15	15 + 15
250	20 + 25	20 + 25	20 + 20	20 + 18	18 + 18	20 + 15	20 + 12	15 + 15	15 + 15
260	20 + 25	20 + 25	20 + 20	20 + 18	18 + 18	20 + 15	20 + 12	15 + 15	15 + 15
270	20 + 25	20 + 25	20 + 20	20 + 20	20 + 18	20 + 15	20 + 12	15 + 15	15 + 15
280	20 + 25	20 + 25	20 + 25	20 + 20	20 + 18	20 + 15	15 + 18	15 + 15	15 + 15
290	20 + 25	20 + 25	20 + 25	20 + 20	20 + 18	20 + 15	15 + 18	20 + 12	15 + 15
300	20 + 25	20 + 25	20 + 25	20 + 20	20 + 18	20 + 15	15 + 18	20 + 12	15 + 15
310	20 + 25	20 + 25	20 + 25	20 + 20	20 + 18	20 + 15	15 + 18	20 + 12	15 + 15
320	20 + 25	20 + 25	20 + 25	20 + 20	20 + 18	20 + 15	15 + 18	20 + 12	15 + 15
330	20 + 25	20 + 25	20 + 25	20 + 20	20 + 18	18 + 18	20 + 15	20 + 12	15 + 15
340	20 + 25	20 + 25	20 + 25	20 + 20	20 + 18	18 + 18	20 + 15	20 + 12	15 + 15
350	20 + 25	20 + 25	20 + 25	20 + 20	20 + 18	18 + 18	20 + 15	20 + 12	15 + 15
360	25 + 25	20 + 25	20 + 25	20 + 20	20 + 18	18 + 18	20 + 15	20 + 12	15 + 15

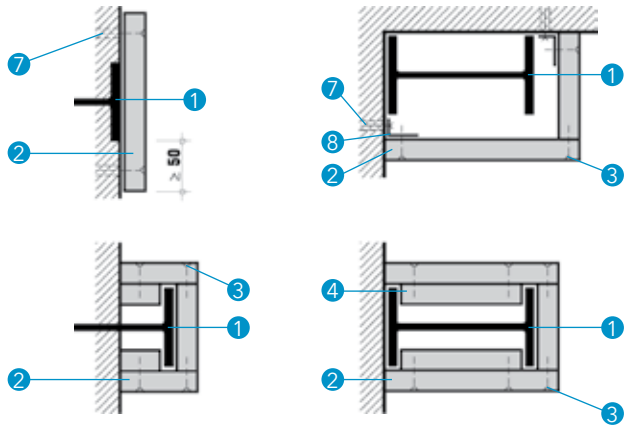
Table 9 - Cladding thicknesses R 120 for beams in three-sided design

R 120	Cladding thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
0	25	20	18	15	15	15	15	15	15
46	25	20	18	15	15	15	15	15	15
50	25	25	20	18	15	15	15	15	15
60	30	25	25	20	18	18	15	15	15
70	30	30	25	25	20	18	18	15	15
80	15 + 15	30	25	25	25	20	18	18	15
90	15 + 18	30	30	25	25	25	20	18	18
100	20 + 15	20 + 12	30	30	25	25	20	20	18
110	18 + 18	15 + 18	30	30	25	25	25	20	20
120	20 + 18	20 + 15	20 + 12	30	30	25	25	25	20
130	20 + 18	18 + 18	15 + 18	30	30	25	25	25	25
140	20 + 20	20 + 18	20 + 15	15 + 15	30	30	25	25	25
150	20 + 20	20 + 18	20 + 15	20 + 12	30	30	25	25	25
160	20 + 20	20 + 18	18 + 18	20 + 12	15 + 15	30	30	25	25
170	20 + 25	20 + 20	20 + 18	15 + 18	15 + 15	30	30	25	25
180	20 + 25	20 + 20	20 + 18	20 + 15	15 + 15	30	30	30	25
190	20 + 25	20 + 20	20 + 18	20 + 15	20 + 12	15 + 15	30	30	25
200	20 + 25	20 + 25	20 + 20	18 + 18	20 + 12	15 + 15	30	30	30
210	20 + 25	20 + 25	20 + 20	20 + 18	15 + 18	15 + 15	30	30	30
220	20 + 25	20 + 25	20 + 20	20 + 18	20 + 15	15 + 15	15 + 15	30	30
230	20 + 25	20 + 25	20 + 20	20 + 18	20 + 15	15 + 15	15 + 15	30	30
240	20 + 25	20 + 25	20 + 25	20 + 18	20 + 15	15 + 15	15 + 15	30	30
250	20 + 25	20 + 25	20 + 25	20 + 20	20 + 15	20 + 12	15 + 15	15 + 15	30
260	20 + 25	20 + 25	20 + 25	20 + 20	18 + 18	20 + 12	15 + 15	15 + 15	30
270	20 + 25	20 + 25	20 + 25	20 + 20	18 + 18	20 + 12	15 + 15	15 + 15	30
280	20 + 25	20 + 25	20 + 25	20 + 20	20 + 18	15 + 18	15 + 15	15 + 15	30
290	25 + 25	20 + 25	20 + 25	20 + 20	20 + 18	15 + 18	15 + 15	15 + 15	15 + 15
300	25 + 25	20 + 25	20 + 25	20 + 20	20 + 18	20 + 15	15 + 15	15 + 15	15 + 15
310	25 + 25	20 + 25	20 + 25	20 + 25	20 + 18	20 + 15	15 + 15	15 + 15	15 + 15
320	25 + 25	20 + 25	20 + 25	20 + 25	20 + 18	20 + 15	15 + 15	15 + 15	15 + 15
330	25 + 25	20 + 25	20 + 25	20 + 25	20 + 18	20 + 15	15 + 15	15 + 15	15 + 15
340	25 + 25	20 + 25	20 + 25	20 + 25	20 + 20	20 + 15	15 + 15	15 + 15	15 + 15
350	25 + 25	20 + 25	20 + 25	20 + 25	20 + 20	20 + 15	15 + 15	15 + 15	15 + 15
360	25 + 25	20 + 25	20 + 25	20 + 25	20 + 20	18 + 18	20 + 12	15 + 15	15 + 15





Details A/B/C/D - Installation examples



Technical data

1. Load-bearing steel column or steel beam
2. PROMATECT®-XS board thickness according to fire resistance, A_p/V ratio value and design (critical) steel temperature according to Eurocode
3. Connecting member (steel staples)
4. Soldiers, made from 1 or 2 pieces of PROMATECT®-XS, b ≥ 120 mm, d = 20 mm
5. Board joints, approx. 400 mm apart on every side of the steel section
6. Additional perpendicular stiffening of PROMATECT®-XS strip in the case of profiles with height ≥ 400 mm
7. Steel anchor for fastening in massive partitions
8. Steel angle

Certificate: ETA 18/0645, Applus laboratories 22/32303623, Applus laboratories 22/32305223, Applus laboratories 23/32302877, Applus laboratories 23/32302878

Fire resistance

R 30 to R 180 according to EN 13501-2, depending on the A_p/V value and the design steel temperature according to Eurocode. Tables with performance more than R 120 are available upon request.

Advantages

High efficiency in fire conditions - fire rating from R 30 up to R 180, design temperature from 300 °C - enables use, in principle, in any type of buildings with high requirements in the scope of fire safety. The highest A1 class of reaction to fire classifies the boards as a completely non-flammable product. Cladding of steel columns and beams does not require any additional substructure, which significantly increases the efficiency of the solution and reduces the assembly costs. High aesthetics of the ready-made protection eliminates the need for its finish. The low weight of the system (boards) influences the speed of the executed works and the work comfort. The innovative production process guarantees stability of technical parameters and repeatability of dimensions.

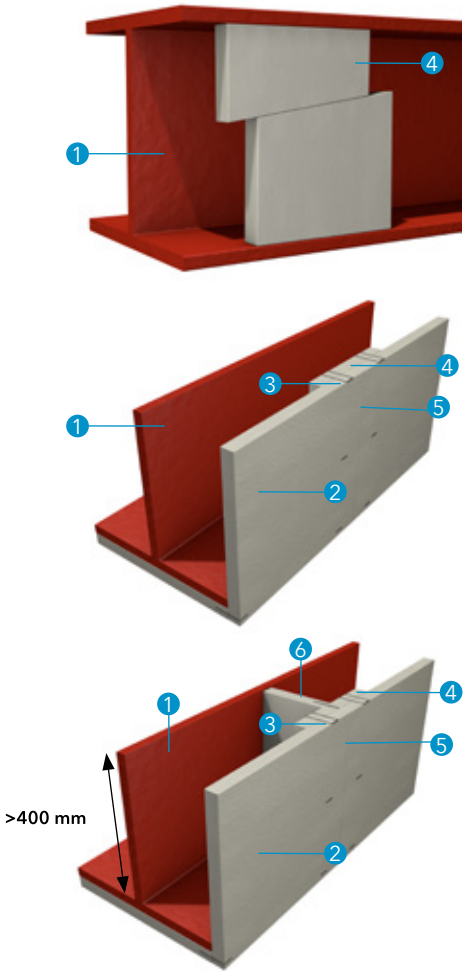
General instructions

The required thickness of the fire protective cladding depends on the required fire resistance, the design temperature of the steel structure (the maximum allowed /critical/ temperature of the steel member) and the A_p/V ratio. Please refer to the tables on the following pages for the details to determine the required thickness of PROMATECT®-XS cladding. The joints of boards are arranged with the offset of 400 mm to each other. Bonding or filling of joints and edges of PROMATECT®-XS boards is not required from a structural fire protection point of view.

Claddings of PROMATECT®-XS boards are made by the direct cladding method. The height of the web in the protected section must not exceed 600 mm.

Detail A/B/C/D

The drawings show the box-shaped cladding of different steel sections. The high stability of PROMATECT®-XS boards (2) allows clamping on the front side and/or screw connection (3). A sub-construction or fixing into steel is not required.



Details E, F and G

Cladding of beams with three-sided fire exposure.
PROMATECT®-XS soldiers (4) - spaced not more than 1200 mm - shall be adjusted in such a way that their outer surfaces protrude about 5 mm over the steel flange. The cladding (2) shall be fastened to the soldiers. At beams heights ≥ 400 mm one stabilising perpendicular bridge (6) shall be mounted on each soldier and fitted together with the soldier tightly between the flanges of the steel section. An alternative solution for mounting the perpendicular stabilizing bridge can be seen in the section below.

Details E, F and G - Installation examples

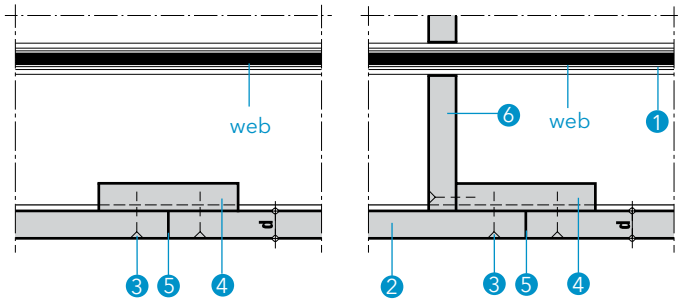


Table 1 - Fastening means

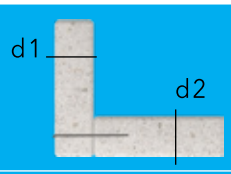
Board thickness	 corner connection, d1 ≤ d2	 double layer, d1 ≤ d2
	steel staples spacing = 100 mm	steel staples spacing = 100 mm
12,5 mm	30/5,85/1,27 x 1,05	30/5,85/1,27 x 1,05
15 mm	35/10,5/1,45 x 1,30	35/10,5/1,45 x 1,30
20 mm	40/10,5/1,45 x 1,30	40/10,5/1,45 x 1,30
25 mm	50/10,5/1,45 x 1,30	50/10,5/1,45 x 1,30

Table 2 - Cladding thicknesses R 30 for open and hollow section columns in four-sided fire exposure

R 30	Cladding thickness [mm]									
	Design temperature [°C]									
A_p/V [m^{-1}]	300	350	400	450	500	550	600	650	700	750
48	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
120	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
175	15	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
190	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
245	20	15	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5
305	20	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5
330	20	20	15	15	12,5	12,5	12,5	12,5	12,5	12,5
353	20	20	15	15	12,5	12,5	12,5	12,5	12,5	12,5

Table 3 - Cladding thicknesses R 45 for open and hollow section columns in four-sided fire exposure

R 45	Cladding thickness [mm]									
	Design temperature [°C]									
A_p/V [m^{-1}]	300	350	400	450	500	550	600	650	700	750
48	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
65	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
90	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
120	20	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5
150	20	20	15	15	12,5	12,5	12,5	12,5	12,5	12,5
165	20	20	20	15	12,5	12,5	12,5	12,5	12,5	12,5
170	25	20	20	15	12,5	12,5	12,5	12,5	12,5	12,5
185	25	20	20	15	15	12,5	12,5	12,5	12,5	12,5
215	25	20	20	20	15	12,5	12,5	12,5	12,5	12,5
225	25	20	20	20	15	15	12,5	12,5	12,5	12,5
265	25	25	20	20	15	15	12,5	12,5	12,5	12,5
270	25	25	20	20	15	15	15	12,5	12,5	12,5
285	25	25	20	20	20	15	15	12,5	12,5	12,5
325	25	25	20	20	20	15	15	15	12,5	12,5
353	25	25	20	20	20	15	15	15	12,5	12,5

Table 4 - Cladding thicknesses R 60 for open and hollow section columns in four-sided fire exposure

R 60	Cladding thickness [mm]									
	Design temperature [°C]									
A_p/V [m^{-1}]	300	350	400	450	500	550	600	650	700	750
48	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
55	20	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
60	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
75	20	20	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
80	20	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5
90	25	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5
95	25	20	15	15	12,5	12,5	12,5	12,5	12,5	12,5
100	25	20	20	15	12,5	12,5	12,5	12,5	12,5	12,5
115	25	20	20	15	15	12,5	12,5	12,5	12,5	12,5
125	25	25	20	20	15	12,5	12,5	12,5	12,5	12,5
140	25	25	20	20	15	15	12,5	12,5	12,5	12,5
150	25	25	20	20	15	15	12,5	12,5	12,5	12,5
155	12,5 + 12,5	25	20	20	20	15	12,5	12,5	12,5	12,5
160	12,5 + 12,5	25	20	20	20	15	15	12,5	12,5	12,5
170	12,5 + 12,5	25	25	20	20	15	15	12,5	12,5	12,5
185	12,5 + 12,5	25	25	20	20	20	15	12,5	12,5	12,5
190	12,5 + 12,5	25	25	20	20	20	15	15	12,5	12,5
215	12,5 + 12,5	25	25	20	20	20	15	15	15	12,5
225	12,5 + 12,5	25	25	20	20	20	20	15	15	12,5
235	12,5 + 12,5	25	25	25	20	20	20	15	15	12,5
250	12,5 + 12,5	12,5 + 12,5	25	25	20	20	20	15	15	15
265	15 + 12,5	12,5 + 12,5	25	25	20	20	20	15	15	15
275	15 + 12,5	12,5 + 12,5	25	25	20	20	20	20	15	15
330	15 + 12,5	12,5 + 12,5	25	25	25	20	20	20	15	15
335	15 + 12,5	12,5 + 12,5	25	25	25	20	20	20	20	15
353	15 + 12,5	12,5 + 12,5	25	25	25	20	20	20	20	15
358	15 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5

Table 5 - Cladding thicknesses R 90 for open and hollow section columns in four-sided fire exposure

R 90	Cladding thickness [mm]									
	Design temperature [°C]									
A_p/V [m^{-1}]	300	350	400	450	500	550	600	650	700	750
48	25	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5
55	25	20	20	12,5	12,5	12,5	12,5	12,5	12,5	12,5
60	25	20	20	15	12,5	12,5	12,5	12,5	12,5	12,5
65	25	25	20	15	12,5	12,5	12,5	12,5	12,5	12,5
70	12,5 + 12,5	25	20	20	15	12,5	12,5	12,5	12,5	12,5
75	15 + 12,5	25	20	20	15	12,5	12,5	12,5	12,5	12,5
80	15 + 12,5	25	25	20	20	15	12,5	12,5	12,5	12,5
85	15 + 12,5	25	25	20	20	15	12,5	12,5	12,5	12,5
90	15 + 12,5	12,5 + 12,5	25	20	20	15	15	12,5	12,5	12,5
95	15 + 12,5	12,5 + 12,5	25	25	20	20	15	12,5	12,5	12,5
100	15 + 15	15 + 12,5	25	25	20	20	15	12,5	12,5	12,5
105	15 + 15	15 + 12,5	25	25	20	20	15	15	12,5	12,5
110	15 + 15	15 + 12,5	25	25	20	20	20	15	12,5	12,5
115	15 + 15	15 + 12,5	12,5 + 12,5	25	20	20	20	15	15	12,5
120	15 + 15	15 + 12,5	12,5 + 12,5	25	25	20	20	15	15	12,5
125	15 + 15	15 + 12,5	12,5 + 12,5	25	25	20	20	20	15	12,5
130	20 + 12,5	15 + 12,5	12,5 + 12,5	25	25	20	20	20	15	15
135	20 + 12,5	15 + 15	15 + 12,5	25	25	20	20	20	15	15
145	20 + 12,5	15 + 15	15 + 12,5	25	25	25	20	20	20	15
165	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	20	20	20	20
175	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	25	20	20	20
185	20 + 12,5	20 + 12,5	15 + 15	15 + 12,5	25	25	25	20	20	20
190	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	25	20	20	20
215	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	25	20	20
260	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	25	25	20
265	20 + 15	20 + 12,5	15 + 15	15 + 12,5	15 + 12,5	12,5 + 12,5	25	25	25	20
270	20 + 15	20 + 12,5	15 + 15	15 + 15	15 + 12,5	12,5 + 12,5	25	25	25	20
275	20 + 15	20 + 12,5	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	25	20
285	20 + 15	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	25	20
300	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	25	20
325	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	25	25
353	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	25	25
358	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5

Table 6 - Cladding thicknesses R 120 for open and hollow section columns in four-sided fire exposure

R 120	Cladding thickness [mm]									
	Design temperature [°C]									
A_p/V [m^{-1}]	300	350	400	450	500	550	600	650	700	750
48	15 + 12,5	25	20	20	15	12,5	12,5	12,5	12,5	12,5
50	15 + 12,5	25	25	20	15	12,5	12,5	12,5	12,5	12,5
55	15 + 15	15 + 12,5	25	20	20	15	12,5	12,5	12,5	12,5
60	15 + 15	15 + 12,5	25	25	20	15	12,5	12,5	12,5	12,5
65	20 + 12,5	15 + 15	25	25	20	20	15	12,5	12,5	12,5
70	20 + 12,5	15 + 15	15 + 12,5	25	20	20	15	15	12,5	12,5
75	20 + 12,5	15 + 15	15 + 12,5	25	25	20	20	15	12,5	12,5
80	20 + 15	20 + 12,5	15 + 15	25	25	20	20	15	15	12,5
85	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	20	20	15	12,5
90	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	20	20	15	15
95	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	20	20	20	15
100	25 + 12,5	20 + 15	20 + 12,5	15 + 15	12,5 + 12,5	25	25	20	20	15
105	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	20	20	20
115	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	25	20	20
120	25 + 12,5	25 + 12,5	20 + 15	15 + 15	15 + 12,5	12,5 + 12,5	25	25	20	20
125	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	12,5 + 12,5	25	25	20	20
130	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	20	20
135	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	25	20
140	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	25	20
155	20 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 12,5	12,5 + 12,5	25	25	25
160	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	25
175	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	25
200	25 + 20	20 + 20	25 + 12,5	25 + 12,5	20 + 15	20 + 12,5	15 + 12,5	12,5 + 12,5	25	25
205	25 + 20	20 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25
210	25 + 20	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25
215	25 + 20	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25
270	25 + 20	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25
275	25 + 20	25 + 20	20 + 20	25 + 12,5	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5
285	25 + 20	25 + 20	20 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5
295	25 + 20	25 + 20	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5
320	25 + 20	25 + 20	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5
358	-	25 + 20	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5

NOTE! The indicated double-layer insulation systems can be modified based on the following principles:

- a one-layer system can be replaced by a double-layer system (e.g. "12,7 + 12,7" can be used instead of "25")
- a double-layer system can be replaced by a three-layer system (e.g. „15 + 15 + 15" can be used instead of „25 + 20")
- the total thickness of the modified insulation system must be equal or greater than the thickness given in the table (e.g. „25 + 15" can be used instead of „2 x 20")
- a double-layer system cannot be replaced by a single-layer system of equal or greater cladding thickness

For fire resistance above R 120, please contact your local Promat office.

Table 7 - Cladding thicknesses R 30 for open and hollow section beams in three-sided fire exposure

R 30	Cladding thickness [mm]									
	Design temperature [°C]									
A_p/V [m^{-1}]	300	350	400	450	500	550	600	650	700	750
52	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
135	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
205	15	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
215	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
295	20	15	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5
353	20	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5

Table 8 - Cladding thicknesses R 45 for open and hollow section beams in three-sided fire exposure

R 45	Cladding thickness [mm]									
	Design temperature [°C]									
A_p/V [m^{-1}]	300	350	400	450	500	550	600	650	700	750
52	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
70	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
95	20	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
100	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
130	20	20	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
135	20	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5
170	20	20	15	15	12,5	12,5	12,5	12,5	12,5	12,5
175	25	20	15	15	12,5	12,5	12,5	12,5	12,5	12,5
180	25	20	20	15	12,5	12,5	12,5	12,5	12,5	12,5
215	25	20	20	15	15	12,5	12,5	12,5	12,5	12,5
240	25	20	20	20	15	12,5	12,5	12,5	12,5	12,5
270	25	25	20	20	15	15	12,5	12,5	12,5	12,5
320	25	25	20	20	20	15	12,5	12,5	12,5	12,5
335	25	25	20	20	20	15	15	12,5	12,5	12,5
353	25	25	20	20	20	15	15	12,5	12,5	12,5

Table 9 - Cladding thicknesses R 60 for open and hollow section beams in three-sided fire exposure

R 60	Cladding thickness [mm]									
	Design temperature [°C]									
A_p/V [m^{-1}]	300	350	400	450	500	550	600	650	700	750
52	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
60	20	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
65	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
80	20	20	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
85	20	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5
95	25	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5
105	25	20	20	12,5	12,5	12,5	12,5	12,5	12,5	12,5
110	25	20	20	15	12,5	12,5	12,5	12,5	12,5	12,5
130	25	25	20	15	15	12,5	12,5	12,5	12,5	12,5
135	25	25	20	20	15	12,5	12,5	12,5	12,5	12,5
150	25	25	20	20	15	12,5	12,5	12,5	12,5	12,5
160	12,5 + 12,5	25	20	20	15	15	12,5	12,5	12,5	12,5
165	12,5 + 12,5	25	20	20	20	15	12,5	12,5	12,5	12,5
170	12,5 + 12,5	25	25	20	20	15	12,5	12,5	12,5	12,5
190	12,5 + 12,5	25	25	20	20	15	15	12,5	12,5	12,5
205	15 + 12,5	25	25	20	20	20	15	12,5	12,5	12,5
220	15 + 12,5	25	25	20	20	20	15	15	12,5	12,5
225	15 + 12,5	25	25	20	20	20	15	15	12,5	12,5
235	15 + 12,5	12,5 + 12,5	25	25	20	20	15	15	12,5	12,5
250	15 + 12,5	12,5 + 12,5	25	25	20	20	20	15	12,5	12,5
260	15 + 12,5	12,5 + 12,5	25	25	20	20	20	15	15	12,5
305	15 + 12,5	12,5 + 12,5	25	25	20	20	20	15	15	15
310	15 + 12,5	12,5 + 12,5	25	25	20	20	20	20	15	15
320	15 + 12,5	12,5 + 12,5	25	25	25	20	20	20	15	15
353	15 + 12,5	12,5 + 12,5	25	25	25	20	20	20	15	15
355	15 + 12,5	15 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5
358	15 + 12,5	15 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5

Table 10 - Cladding thicknesses R 90 for open and hollow section beams in three-sided fire exposure

R 90	Cladding thickness [mm]									
	Design temperature [°C]									
A_p/V [m^{-1}]	300	350	400	450	500	550	600	650	700	750
52	25	20	15	12,5	12,5	12,5	12,5	12,5	12,5	12,5
60	25	20	20	12,5	12,5	12,5	12,5	12,5	12,5	12,5
65	25	25	20	15	12,5	12,5	12,5	12,5	12,5	12,5
70	15 + 12,5	25	20	20	12,5	12,5	12,5	12,5	12,5	12,5
75	15 + 12,5	25	20	20	15	12,5	12,5	12,5	12,5	12,5
80	15 + 12,5	25	25	20	15	12,5	12,5	12,5	12,5	12,5
85	15 + 12,5	12,5 + 12,5	25	20	20	12,5	12,5	12,5	12,5	12,5
90	15 + 15	12,5 + 12,5	25	20	20	15	12,5	12,5	12,5	12,5
95	15 + 15	15 + 12,5	25	25	20	15	12,5	12,5	12,5	12,5
100	15 + 15	15 + 12,5	25	25	20	20	15	12,5	12,5	12,5
105	15 + 15	15 + 12,5	25	25	20	20	15	12,5	12,5	12,5
115	15 + 15	15 + 12,5	12,5 + 12,5	25	25	20	20	15	12,5	12,5
120	20 + 12,5	15 + 15	15 + 12,5	25	25	20	20	15	12,5	12,5
130	20 + 12,5	15 + 15	15 + 12,5	25	25	20	20	15	15	12,5
135	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	20	20	20	15	12,5
140	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	20	20	15	12,5
150	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	20	20	15	15
155	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	20	20	20	15
160	20 + 12,5	15 + 15	15 + 12,5	15 + 12,5	25	25	20	20	20	15
165	20 + 12,5	15 + 15	15 + 15	15 + 12,5	25	25	20	20	20	15
170	20 + 12,5	20 + 12,5	15 + 15	15 + 12,5	25	25	25	20	20	15
175	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	20	20	20
205	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	25	20	20
215	20 + 15	20 + 12,5	15 + 15	15 + 12,5	15 + 12,5	25	25	25	20	20
220	20 + 15	20 + 12,5	15 + 15	15 + 12,5	15 + 12,5	25	25	25	20	20
230	20 + 15	20 + 12,5	15 + 15	15 + 15	15 + 12,5	12,5 + 12,5	25	25	20	20
245	20 + 15	20 + 12,5	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	25	20
270	20 + 15	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	25	20
290	20 + 15	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	25	20
295	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	12,5 + 12,5	25	25	20
300	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	15 + 12,5	12,5 + 12,5	25	25	25
340	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 15	15 + 12,5	12,5 + 12,5	25	25	25
353	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 15	15 + 12,5	12,5 + 12,5	25	25	25
358	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 15	15 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5	12,5 + 12,5

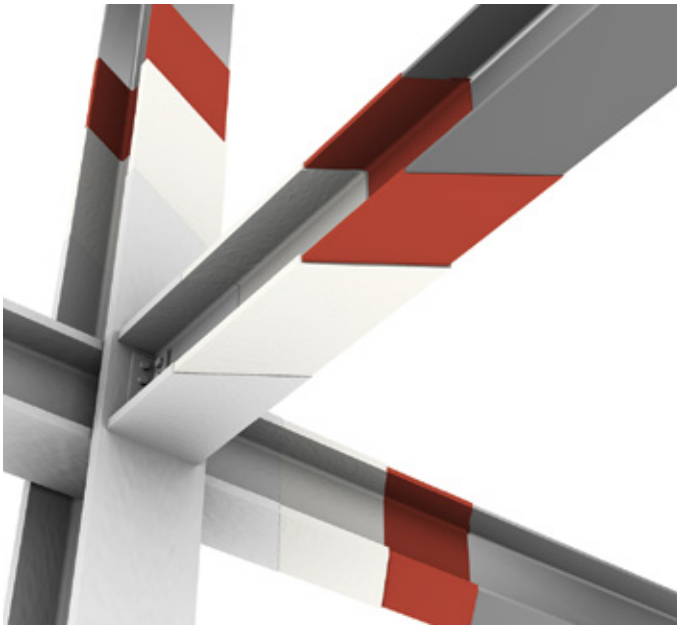
Table 11 - Cladding thicknesses R 120 for open and hollow section beams in three-sided fire exposure

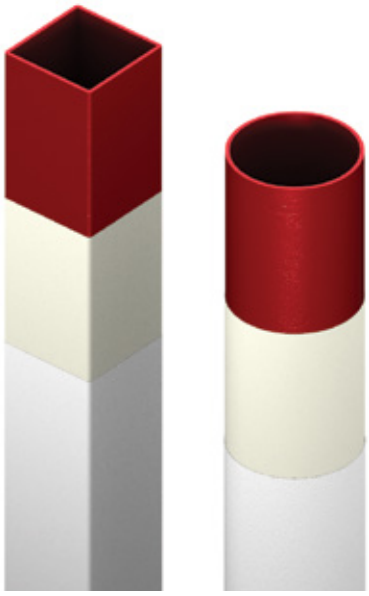
R 120	Cladding thickness [mm]									
	Design temperature [°C]									
A_p/V [m^{-1}]	300	350	400	450	500	550	600	650	700	750
49	15 + 12,5	15 + 10	25	20	15	12,5	12,5	12,5	12,5	12,5
50	15 + 15	15 + 10	25	20	15	12,5	12,5	12,5	12,5	12,5
52	15 + 15	15 + 10	25	20	15	12,5	12,5	12,5	12,5	12,5
55	15 + 15	15 + 12,5	25	20	15	12,5	12,5	12,5	12,5	12,5
60	20 + 12,5	15 + 12,5	25	25	20	15	12,5	12,5	12,5	12,5
65	20 + 12,5	15 + 15	15 + 12,5	25	20	20	12,5	12,5	12,5	12,5
70	20 + 12,5	15 + 15	15 + 12,5	25	25	20	15	12,5	12,5	12,5
75	20 + 15	20 + 12,5	15 + 12,5	12,5 + 12,5	25	20	20	12,5	12,5	12,5
80	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	20	20	15	12,5	12,5
85	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	20	20	12,5	12,5
90	25 + 12,5	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	20	20	15	12,5
95	25 + 12,5	20 + 15	20 + 12,5	15 + 15	12,5 + 12,5	25	25	20	15	12,5
100	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	20	20	15
105	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	20	20	15
110	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	20	20
115	20 + 20	25 + 12,5	20 + 15	15 + 15	15 + 12,5	12,5 + 12,5	25	25	20	20
120	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	20	20
125	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	20	20
130	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25	20
145	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 15	15 + 12,5	25	25	25
150	20 + 20	25 + 12,5	20 + 15	20 + 15	20 + 12,5	15 + 15	15 + 12,5	25	25	25
155	20 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25
160	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25	25
175	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	15 + 12,5	25	25
180	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	15 + 12,5	25	25
185	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 15	15 + 12,5	12,5 + 12,5	25
190	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25
195	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25
205	25 + 20	20 + 20	25 + 12,5	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25
215	25 + 20	20 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5	25
220	25 + 20	20 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	15 + 12,5	12,5 + 12,5
225	25 + 20	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	15 + 12,5	12,5 + 12,5
235	25 + 20	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 15	15 + 12,5	12,5 + 12,5
250	25 + 20	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5
270	25 + 20	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 15	20 + 12,5	15 + 15	15 + 12,5	12,5 + 12,5
280	25 + 20	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 15	20 + 12,5	15 + 15	15 + 12,5	15 + 12,5
290	25 + 20	25 + 20	20 + 20	25 + 12,5	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 12,5	15 + 12,5
305	25 + 20	25 + 20	20 + 20	25 + 12,5	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 15	15 + 12,5
320	25 + 20	25 + 20	20 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	15 + 15	15 + 15	15 + 12,5
340	25 + 20	25 + 20	20 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	20 + 12,5	15 + 15	15 + 12,5
355	25 + 20	25 + 20	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	20 + 12,5	15 + 15	15 + 12,5
358	25 + 20	25 + 20	25 + 20	20 + 20	25 + 12,5	20 + 15	20 + 12,5	20 + 12,5	15 + 15	15 + 12,5

NOTE! The indicated double-layer insulation systems can be modified based on the following principles:

- a one-layer system can be replaced by a double-layer system (e.g. "12,7 + 12,7" can be used instead of "25")
- a double-layer system can be replaced by a three-layer system (e.g. „15 + 15 + 15" can be used instead of „25 + 20")
- the total thickness of the modified insulation system must be equal or greater than the thickness given in the table (e.g. „25 + 15" can be used instead of „2 x 20")
- a double-layer system cannot be replaced by a single-layer system of equal or greater cladding thickness

For fire resistance above R 120, please contact your local Promat office.





Technical data

1. Load-bearing steel structure
2. Generic compatible primer
3. PROMAPAINT®-SC3, coating thickness according to A_p/V ratio value, fire resistance and design (critical) temperature
4. Suitable topcoat

Certificate: ETA-20/1258,-Warringtonfire 327033 Issue 3, Warringtonfire 344794 Issue 2 and Warringtonfire 436946

Fire resistance

R 30 to R 150 according to EN 13501-2, depending on the A_p/V value and the design steel temperature according to Eurocode.

Advantages:

- Tested and approved for open H-, I-, U-, L-, C- and T-sections for fire protection up to R 150
- Fire protection of CHS and RHS up to R 120
- Tested on galvanized steel
- Low layer thicknesses
- Durable, lightweight coating
- Topcoat not necessary for indoor applications with low humidity (Z_2)
- Fully exposed (X) with suitable topcoat
- Optical structure of the steel member remains visible
- Solvent free

Fields of application

PROMAPAINT®-SC3 is a coating for structural fire protection of open and hollow sections. Classified are the steel members with A_p/V value from 66 up to 346 m^{-1}, with three- and four-sided exposure to fire and with design steel temperature from 350 up to 750 °C.

Application temperature

PROMAPAINT®-SC3 should be applied when the temperature of the substrate and the ambient air temperature is at least 10 °C or more. This temperature should be maintained 24 hours before application. The maximal temperature of substrate and ambient air temperature should not exceed 35 °C.

Substrate preparation

The substrate should be clean, dry and free of any dust, loose scaling, loose rust, oil and other release agents that prevent good adhesion.
PROMAPAINT®-SC3 may be applied on steel surfaces without primer pre-treatment as well as on primed steel surfaces. Useable on galvanized surfaces with suitable primer, such as Promat® TY-ROX.

Compatible primers

See the ETA for details.

Tested topcoats:
See the ETA for details.

Instructions regarding the coating thicknesses
The required thickness of the fire protective reactive coating depends on the required fire resistance, the design temperature of the steel structure (the maximum allowed /critical/ temperature of the steel member) and the A_p/V ratio. The necessary dry film thicknesses (without the primer and the topcoat of any thickness) are listed in the tables (for fire resistance of more than R 120, please contact the Promat Technical department).

For further details, please refer to the PROMAPAINT®-SC3 Application guidelines.

Table 1 - Layer thicknesses R 30 for open section beams

R 30	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
66	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
70	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
75	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
80	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
85	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
90	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
95	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
100	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
105	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
110	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
115	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
120	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
125	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
130	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
135	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
140	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
145	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
150	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
155	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
160	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
165	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
170	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
175	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
180	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
185	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
190	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
195	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
200	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
205	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
210	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
215	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
220	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
225	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
230	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
235	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
240	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
245	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
250	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
255	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
260	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
265	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
270	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
275	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
280	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
285	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
290	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
295	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
300	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
305	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
310	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
315	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
320	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
325	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
330	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
335	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
340	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
342	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845

Table 2 - Layer thicknesses R 45 for open section beams

R 45	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
66	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
70	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
75	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
80	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
85	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
90	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
95	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
100	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
105	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
110	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
115	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
120	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
125	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
130	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
135	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
140	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
145	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
150	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
155	1,865	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
160	1,888	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
165	1,910	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
170	1,932	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
175	1,953	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
180	1,973	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
185	1,992	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
190	2,011	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
195	2,030	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
200	2,048	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
205	2,065	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
210	2,082	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
215	2,098	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
220	2,114	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
225	2,130	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
230	2,145	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
235	2,160	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
240	2,174	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
245	2,188	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
250	2,201	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
255	2,215	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
260	2,227	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
265	2,240	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
270	2,252	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
275	2,264	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
280	2,276	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
285	2,287	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
290	2,299	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
295	2,309	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
300	2,320	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
305	2,331	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
310	2,341	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
315	2,351	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
320	2,360	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
325	2,370	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
330	2,379	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
335	2,388	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
340	2,397	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
342	2,400	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845

Table 3 - Layer thicknesses R 60 for open section beams

R 60	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
66	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
70	1,902	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
75	1,975	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
80	2,044	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
85	2,111	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
90	2,174	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
95	2,235	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
100	2,293	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
105	2,349	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
110	2,402	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
115	2,454	1,871	1,845	1,845	1,845	1,845	1,845	1,845	1,845
120	2,503	1,913	1,845	1,845	1,845	1,845	1,845	1,845	1,845
125	2,551	1,953	1,845	1,845	1,845	1,845	1,845	1,845	1,845
130	2,597	1,992	1,845	1,845	1,845	1,845	1,845	1,845	1,845
135	2,641	2,029	1,845	1,845	1,845	1,845	1,845	1,845	1,845
140	2,684	2,066	1,845	1,845	1,845	1,845	1,845	1,845	1,845
145	2,725	2,101	1,845	1,845	1,845	1,845	1,845	1,845	1,845
150	2,765	2,135	1,845	1,845	1,845	1,845	1,845	1,845	1,845
155	2,804	2,168	1,845	1,845	1,845	1,845	1,845	1,845	1,845
160	2,841	2,199	1,845	1,845	1,845	1,845	1,845	1,845	1,845
165	2,877	2,230	1,845	1,845	1,845	1,845	1,845	1,845	1,845
170	2,911	2,260	1,845	1,845	1,845	1,845	1,845	1,845	1,845
175	2,945	2,289	1,845	1,845	1,845	1,845	1,845	1,845	1,845
180	2,978	2,318	1,845	1,845	1,845	1,845	1,845	1,845	1,845
185	3,009	2,345	1,845	1,845	1,845	1,845	1,845	1,845	1,845
190	3,040	2,372	1,845	1,845	1,845	1,845	1,845	1,845	1,845
195	3,070	2,397	1,845	1,845	1,845	1,845	1,845	1,845	1,845
200	3,099	2,423	1,845	1,845	1,845	1,845	1,845	1,845	1,845
205	3,127	2,447	1,845	1,845	1,845	1,845	1,845	1,845	1,845
210	3,154	2,471	1,845	1,845	1,845	1,845	1,845	1,845	1,845
215	3,181	2,494	1,845	1,845	1,845	1,845	1,845	1,845	1,845
220	3,206	2,517	1,845	1,845	1,845	1,845	1,845	1,845	1,845
225	3,231	2,539	1,845	1,845	1,845	1,845	1,845	1,845	1,845
230	3,256	2,560	1,845	1,845	1,845	1,845	1,845	1,845	1,845
235	3,280	2,581	1,845	1,845	1,845	1,845	1,845	1,845	1,845
240	3,303	2,601	1,845	1,845	1,845	1,845	1,845	1,845	1,845
245	3,325	2,621	1,845	1,845	1,845	1,845	1,845	1,845	1,845
250	3,347	2,641	1,851	1,845	1,845	1,845	1,845	1,845	1,845
255	3,369	2,660	1,866	1,845	1,845	1,845	1,845	1,845	1,845
260	3,389	2,678	1,881	1,845	1,845	1,845	1,845	1,845	1,845
265	3,410	2,696	1,895	1,845	1,845	1,845	1,845	1,845	1,845
270	3,430	2,714	1,909	1,845	1,845	1,845	1,845	1,845	1,845
275	3,449	2,731	1,922	1,845	1,845	1,845	1,845	1,845	1,845
280	3,468	2,748	1,936	1,845	1,845	1,845	1,845	1,845	1,845
285	3,486	2,764	1,949	1,845	1,845	1,845	1,845	1,845	1,845
290	3,504	2,780	1,962	1,845	1,845	1,845	1,845	1,845	1,845
295	3,522	2,796	1,974	1,845	1,845	1,845	1,845	1,845	1,845
300	3,539	2,811	1,987	1,845	1,845	1,845	1,845	1,845	1,845
305	3,556	2,826	1,999	1,845	1,845	1,845	1,845	1,845	1,845
310	3,573	2,841	2,010	1,845	1,845	1,845	1,845	1,845	1,845
315	3,589	2,856	2,022	1,845	1,845	1,845	1,845	1,845	1,845
320	3,604	2,870	2,033	1,845	1,845	1,845	1,845	1,845	1,845
325	3,620	2,884	2,044	1,845	1,845	1,845	1,845	1,845	1,845
330	3,635	2,897	2,055	1,845	1,845	1,845	1,845	1,845	1,845
335	3,650	2,910	2,066	1,845	1,845	1,845	1,845	1,845	1,845
340	3,664	2,923	2,076	1,845	1,845	1,845	1,845	1,845	1,845
342	3,669	2,928	2,080	1,845	1,845	1,845	1,845	1,845	1,845

Table 4 - Layer thicknesses R 90 for open section beams

R 90	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
66	2,983	2,473	1,949	1,845	1,845	1,845	1,845	1,845	1,845
70	3,091	2,570	2,032	1,845	1,845	1,845	1,845	1,845	1,845
75	3,219	2,685	2,131	1,845	1,845	1,845	1,845	1,845	1,845
80	3,341	2,796	2,227	1,845	1,845	1,845	1,845	1,845	1,845
85	3,458	2,902	2,319	1,845	1,845	1,845	1,845	1,845	1,845
90	3,570	3,004	2,408	1,890	1,845	1,845	1,845	1,845	1,845
95	3,677	3,102	2,493	1,964	1,845	1,845	1,845	1,845	1,845
100	3,780	3,197	2,576	2,036	1,845	1,845	1,845	1,845	1,845
105	3,878	3,288	2,656	2,105	1,845	1,845	1,845	1,845	1,845
110	3,973	3,375	2,733	2,173	1,845	1,845	1,845	1,845	1,845
115	4,064	3,459	2,808	2,238	1,845	1,845	1,845	1,845	1,845
120	4,151	3,541	2,880	2,301	1,845	1,845	1,845	1,845	1,845
125	4,235	3,619	2,949	2,363	1,845	1,845	1,845	1,845	1,845
130	4,316	3,695	3,017	2,422	1,856	1,845	1,845	1,845	1,845
135	4,394	3,768	3,082	2,480	1,905	1,845	1,845	1,845	1,845
140	4,470	3,839	3,146	2,536	1,953	1,845	1,845	1,845	1,845
145	4,542	3,907	3,207	2,591	2,000	1,845	1,845	1,845	1,845
150	4,612	3,973	3,267	2,644	2,046	1,845	1,845	1,845	1,845
155	4,680	4,038	3,325	2,696	2,091	1,845	1,845	1,845	1,845
160	4,746	4,100	3,381	2,746	2,134	1,845	1,845	1,845	1,845
165	4,809	4,160	3,436	2,795	2,177	1,845	1,845	1,845	1,845
170	4,871	4,218	3,489	2,843	2,218	1,845	1,845	1,845	1,845
175	4,930	4,275	3,541	2,889	2,259	1,845	1,845	1,845	1,845
180	4,988	4,330	3,591	2,935	2,298	1,845	1,845	1,845	1,845
185	5,043	4,384	3,640	2,979	2,337	1,845	1,845	1,845	1,845
190	5,097	4,436	3,687	3,022	2,375	1,845	1,845	1,845	1,845
195	5,150	4,486	3,734	3,064	2,411	1,845	1,845	1,845	1,845
200	5,201	4,535	3,779	3,105	2,447	1,846	1,845	1,845	1,845
205	5,250	4,583	3,823	3,145	2,483	1,877	1,845	1,845	1,845
210	5,299	4,629	3,866	3,184	2,517	1,906	1,845	1,845	1,845
215	5,345	4,675	3,907	3,222	2,551	1,935	1,845	1,845	1,845
220	5,391	4,719	3,948	3,260	2,584	1,964	1,845	1,845	1,845
225	5,435	4,762	3,988	3,296	2,616	1,992	1,845	1,845	1,845
230	5,478	4,803	4,027	3,332	2,648	2,019	1,845	1,845	1,845
235	5,520	4,844	4,065	3,367	2,679	2,046	1,845	1,845	1,845
240	5,561	4,884	4,101	3,401	2,709	2,072	1,845	1,845	1,845
245	5,600	4,923	4,138	3,434	2,739	2,098	1,845	1,845	1,845
250	5,639	4,961	4,173	3,466	2,768	2,123	1,845	1,845	1,845
255	5,677	4,997	4,207	3,498	2,796	2,148	1,845	1,845	1,845
260	5,713	5,033	4,241	3,530	2,824	2,172	1,845	1,845	1,845
265	5,749	5,069	4,274	3,560	2,852	2,196	1,845	1,845	1,845
270	5,784	5,103	4,306	3,590	2,879	2,220	1,845	1,845	1,845
275	5,818	5,137	4,338	3,619	2,905	2,243	1,845	1,845	1,845
280	5,852	5,169	4,369	3,648	2,931	2,266	1,845	1,845	1,845
285	5,884	5,202	4,399	3,676	2,956	2,288	1,845	1,845	1,845
290	5,916	5,233	4,428	3,704	2,981	2,310	1,845	1,845	1,845
295	5,947	5,264	4,457	3,731	3,006	2,331	1,845	1,845	1,845
300	5,978	5,294	4,486	3,757	3,030	2,352	1,845	1,845	1,845
305	6,007	5,323	4,514	3,783	3,053	2,373	1,845	1,845	1,845
310	6,036	5,352	4,541	3,809	3,076	2,394	1,845	1,845	1,845
315	6,065	5,380	4,567	3,834	3,099	2,414	1,845	1,845	1,845
320	6,093	5,408	4,594	3,859	3,121	2,434	1,845	1,845	1,845
325	6,120	5,435	4,619	3,883	3,143	2,453	1,845	1,845	1,845
330	6,146	5,461	4,644	3,906	3,165	2,472	1,845	1,845	1,845
335	6,172	5,487	4,669	3,930	3,186	2,491	1,845	1,845	1,845
340	6,198	5,512	4,693	3,952	3,207	2,510	1,845	1,845	1,845
342	6,207	5,521	4,702	3,960	3,214	2,516	1,845	1,845	1,845

Table 5 - Layer thicknesses R 120 for open section beams

R 120	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
66	4,126	3,580	3,010	2,532	2,095	1,845	1,845	1,845	1,845
70	4,280	3,724	3,140	2,650	2,201	1,845	1,845	1,845	1,845
75	4,463	3,896	3,296	2,792	2,329	1,934	1,845	1,845	1,845
80	4,639	4,061	3,446	2,929	2,453	2,046	1,845	1,845	1,845
85	4,806	4,219	3,590	3,061	2,574	2,156	1,845	1,845	1,845
90	4,966	4,371	3,730	3,189	2,691	2,262	1,845	1,845	1,845
95	5,120	4,517	3,864	3,313	2,804	2,366	1,870	1,845	1,845
100	5,267	4,657	3,993	3,433	2,914	2,467	1,958	1,845	1,845
105	5,408	4,792	4,118	3,550	3,021	2,566	2,045	1,845	1,845
110	5,544	4,922	4,239	3,662	3,125	2,662	2,129	1,845	1,845
115	5,674	5,047	4,356	3,771	3,226	2,756	2,211	1,845	1,845
120	5,799	5,168	4,469	3,877	3,324	2,847	2,292	1,845	1,845
125	5,919	5,285	4,578	3,980	3,420	2,936	2,371	1,845	1,845
130	6,035	5,398	4,684	4,080	3,513	3,023	2,448	1,845	1,845
135	6,147	5,506	4,787	4,177	3,604	3,108	2,524	1,903	1,845
140	6,255	5,612	4,886	4,271	3,692	3,191	2,598	1,965	1,845
145	6,359	5,714	4,982	4,363	3,778	3,272	2,670	2,027	1,845
150	-	5,812	5,076	4,452	3,862	3,351	2,741	2,087	1,845
155	-	5,908	5,167	4,538	3,944	3,428	2,811	2,146	1,845
160	-	6,000	5,255	4,623	4,023	3,504	2,879	2,204	1,845
165	-	6,090	5,340	4,705	4,101	3,578	2,946	2,261	1,845
170	-	6,177	5,424	4,785	4,177	3,650	3,011	2,317	1,845
175	-	6,261	5,504	4,862	4,251	3,721	3,075	2,373	1,845
180	-	6,343	5,583	4,938	4,324	3,790	3,138	2,427	1,845
185	-	-	5,660	5,012	4,394	3,858	3,200	2,480	1,845
190	-	-	5,734	5,084	4,463	3,924	3,260	2,532	1,845
195	-	-	5,807	5,155	4,531	3,989	3,320	2,584	1,880
200	-	-	5,877	5,223	4,597	4,053	3,378	2,634	1,922
205	-	-	5,946	5,290	4,662	4,115	3,435	2,684	1,963
210	-	-	6,013	5,356	4,725	4,176	3,491	2,733	2,004
215	-	-	6,079	5,420	4,786	4,236	3,546	2,781	2,044
220	-	-	6,143	5,482	4,847	4,295	3,600	2,828	2,084
225	-	-	6,205	5,543	4,906	4,352	3,653	2,875	2,123
230	-	-	6,266	5,603	4,964	4,408	3,706	2,921	2,162
235	-	-	6,325	5,661	5,021	4,464	3,757	2,966	2,200
240	-	-	-	5,718	5,076	4,518	3,807	3,010	2,237
245	-	-	-	5,774	5,131	4,571	3,857	3,054	2,274
250	-	-	-	5,828	5,184	4,623	3,905	3,097	2,311
255	-	-	-	5,882	5,236	4,675	3,953	3,139	2,347
260	-	-	-	5,934	5,287	4,725	4,000	3,181	2,382
265	-	-	-	5,985	5,338	4,775	4,047	3,222	2,417
270	-	-	-	6,035	5,387	4,823	4,092	3,263	2,452
275	-	-	-	6,084	5,435	4,871	4,137	3,302	2,486
280	-	-	-	6,132	5,483	4,918	4,181	3,342	2,520
285	-	-	-	6,180	5,529	4,964	4,224	3,380	2,553
290	-	-	-	6,226	5,575	5,009	4,267	3,418	2,586
295	-	-	-	6,271	5,620	5,053	4,309	3,456	2,618
300	-	-	-	6,315	5,663	5,097	4,350	3,493	2,650
305	-	-	-	6,359	5,707	5,140	4,391	3,530	2,681
310	-	-	-	-	5,749	5,182	4,431	3,566	2,713
315	-	-	-	-	5,791	5,223	4,470	3,601	2,743
320	-	-	-	-	5,832	5,264	4,509	3,636	2,774
325	-	-	-	-	5,872	5,304	4,547	3,671	2,804
330	-	-	-	-	5,911	5,344	4,585	3,705	2,833
335	-	-	-	-	5,950	5,383	4,622	3,738	2,862
340	-	-	-	-	5,988	5,421	4,658	3,771	2,891
342	-	-	-	-	6,001	5,434	4,671	3,783	2,901

Table 6 - Layer thicknesses R 30 for open section columns

R 30	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
71	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
75	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
80	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
85	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
90	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
95	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
100	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
105	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
110	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
115	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
120	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
125	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
130	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
135	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
140	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
145	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
150	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
155	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
160	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
165	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
170	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
175	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
180	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
185	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
190	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
195	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
200	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
205	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
210	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
215	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
220	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
225	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
230	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
235	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
240	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
245	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
250	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
255	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
260	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
265	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
270	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
275	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
280	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
285	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
290	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
295	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
300	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
305	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
310	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
315	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
320	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
325	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
330	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
335	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
340	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
345	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
346	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951

Table 7 - Layer thicknesses R 45 for open section columns

R 45	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
71	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
75	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
80	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
85	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
90	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
95	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
100	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
105	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
110	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
115	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
120	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
125	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
130	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
135	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
140	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
145	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
150	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
155	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
160	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
165	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
170	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
175	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
180	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
185	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
190	1,974	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
195	2,009	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
200	2,044	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
205	2,076	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
210	2,108	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
215	2,138	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
220	2,167	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
225	2,196	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
230	2,223	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
235	2,249	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
240	2,274	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
245	2,299	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
250	2,323	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
255	2,346	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
260	2,368	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
265	2,389	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
270	2,410	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
275	2,430	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
280	2,450	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
285	2,469	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
290	2,488	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
295	2,505	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
300	2,523	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
305	2,540	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
310	2,556	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
315	2,572	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
320	2,588	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
325	2,603	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
330	2,618	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
335	2,632	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
340	2,646	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
345	2,660	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
346	2,664	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951

Table 8 - Layer thicknesses R 60 for open section columns

R 60	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
71	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
75	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
80	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
85	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
90	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
95	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
100	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
105	1,990	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
110	2,088	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
115	2,180	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
120	2,266	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
125	2,348	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
130	2,426	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
135	2,499	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
140	2,569	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
145	2,635	1,951	1,951	1,951	1,951	1,951	1,951	1,951	1,951
150	2,698	1,955	1,951	1,951	1,951	1,951	1,951	1,951	1,951
155	2,757	2,014	1,951	1,951	1,951	1,951	1,951	1,951	1,951
160	2,814	2,070	1,951	1,951	1,951	1,951	1,951	1,951	1,951
165	2,869	2,124	1,951	1,951	1,951	1,951	1,951	1,951	1,951
170	2,921	2,175	1,951	1,951	1,951	1,951	1,951	1,951	1,951
175	2,970	2,224	1,951	1,951	1,951	1,951	1,951	1,951	1,951
180	3,018	2,271	1,951	1,951	1,951	1,951	1,951	1,951	1,951
185	3,063	2,317	1,951	1,951	1,951	1,951	1,951	1,951	1,951
190	3,107	2,360	1,951	1,951	1,951	1,951	1,951	1,951	1,951
195	3,149	2,402	1,951	1,951	1,951	1,951	1,951	1,951	1,951
200	3,189	2,443	1,951	1,951	1,951	1,951	1,951	1,951	1,951
205	3,228	2,482	1,951	1,951	1,951	1,951	1,951	1,951	1,951
210	3,265	2,519	1,951	1,951	1,951	1,951	1,951	1,951	1,951
215	3,301	2,555	1,951	1,951	1,951	1,951	1,951	1,951	1,951
220	3,335	2,590	1,951	1,951	1,951	1,951	1,951	1,951	1,951
225	3,369	2,624	1,951	1,951	1,951	1,951	1,951	1,951	1,951
230	3,401	2,657	1,958	1,951	1,951	1,951	1,951	1,951	1,951
235	3,432	2,688	1,989	1,951	1,951	1,951	1,951	1,951	1,951
240	3,462	2,719	2,019	1,951	1,951	1,951	1,951	1,951	1,951
245	3,491	2,748	2,049	1,951	1,951	1,951	1,951	1,951	1,951
250	3,519	2,777	2,077	1,951	1,951	1,951	1,951	1,951	1,951
255	3,546	2,804	2,104	1,951	1,951	1,951	1,951	1,951	1,951
260	3,572	2,831	2,131	1,951	1,951	1,951	1,951	1,951	1,951
265	3,597	2,857	2,157	1,951	1,951	1,951	1,951	1,951	1,951
270	3,622	2,883	2,182	1,951	1,951	1,951	1,951	1,951	1,951
275	3,646	2,907	2,206	1,951	1,951	1,951	1,951	1,951	1,951
280	3,669	2,931	2,230	1,951	1,951	1,951	1,951	1,951	1,951
285	3,691	2,954	2,253	1,951	1,951	1,951	1,951	1,951	1,951
290	3,713	2,976	2,276	1,951	1,951	1,951	1,951	1,951	1,951
295	3,734	2,998	2,298	1,951	1,951	1,951	1,951	1,951	1,951
300	3,755	3,020	2,319	1,951	1,951	1,951	1,951	1,951	1,951
305	3,775	3,040	2,340	1,951	1,951	1,951	1,951	1,951	1,951
310	3,794	3,060	2,360	1,951	1,951	1,951	1,951	1,951	1,951
315	3,813	3,080	2,380	1,951	1,951	1,951	1,951	1,951	1,951
320	3,832	3,099	2,399	1,951	1,951	1,951	1,951	1,951	1,951
325	3,850	3,118	2,418	1,951	1,951	1,951	1,951	1,951	1,951
330	3,867	3,136	2,436	1,951	1,951	1,951	1,951	1,951	1,951
335	3,884	3,154	2,454	1,951	1,951	1,951	1,951	1,951	1,951
340	3,901	3,171	2,471	1,951	1,951	1,951	1,951	1,951	1,951
345	3,917	3,188	2,488	1,951	1,951	1,951	1,951	1,951	1,951
346	3,921	3,192	2,493	1,951	1,951	1,951	1,951	1,951	1,951

Table 9 - Layer thicknesses R 90 for open section columns

R 90	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
71	2,757	2,003	1,951	1,951	1,951	1,951	1,951	1,951	1,951
75	2,938	2,174	1,951	1,951	1,951	1,951	1,951	1,951	1,951
80	3,131	2,358	1,951	1,951	1,951	1,951	1,951	1,951	1,951
85	3,310	2,529	1,951	1,951	1,951	1,951	1,951	1,951	1,951
90	3,477	2,690	2,016	1,951	1,951	1,951	1,951	1,951	1,951
95	3,633	2,841	2,160	1,951	1,951	1,951	1,951	1,951	1,951
100	3,778	2,983	2,295	1,951	1,951	1,951	1,951	1,951	1,951
105	3,914	3,116	2,424	1,951	1,951	1,951	1,951	1,951	1,951
110	4,042	3,242	2,545	1,951	1,951	1,951	1,951	1,951	1,951
115	4,162	3,361	2,661	1,998	1,951	1,951	1,951	1,951	1,951
120	4,275	3,474	2,771	2,103	1,951	1,951	1,951	1,951	1,951
125	4,382	3,581	2,875	2,202	1,951	1,951	1,951	1,951	1,951
130	4,484	3,682	2,975	2,297	1,951	1,951	1,951	1,951	1,951
135	4,579	3,779	3,070	2,389	1,951	1,951	1,951	1,951	1,951
140	4,670	3,870	3,160	2,476	1,951	1,951	1,951	1,951	1,951
145	4,756	3,958	3,247	2,560	1,951	1,951	1,951	1,951	1,951
150	4,838	4,041	3,330	2,640	1,996	1,951	1,951	1,951	1,951
155	4,916	4,121	3,410	2,718	2,070	1,951	1,951	1,951	1,951
160	4,991	4,197	3,486	2,792	2,141	1,951	1,951	1,951	1,951
165	5,062	4,270	3,559	2,863	2,209	1,951	1,951	1,951	1,951
170	5,130	4,340	3,629	2,932	2,275	1,951	1,951	1,951	1,951
175	5,194	4,407	3,697	2,998	2,339	1,951	1,951	1,951	1,951
180	5,257	4,471	3,762	3,062	2,400	1,951	1,951	1,951	1,951
185	5,316	4,533	3,824	3,124	2,460	1,951	1,951	1,951	1,951
190	5,373	4,592	3,884	3,183	2,517	1,951	1,951	1,951	1,951
195	5,428	4,649	3,942	3,241	2,573	1,951	1,951	1,951	1,951
200	5,480	4,704	3,998	3,296	2,627	1,983	1,951	1,951	1,951
205	5,531	4,757	4,052	3,350	2,679	2,033	1,951	1,951	1,951
210	5,579	4,808	4,104	3,402	2,730	2,081	1,951	1,951	1,951
215	5,626	4,857	4,155	3,452	2,779	2,128	1,951	1,951	1,951
220	5,671	4,904	4,204	3,501	2,827	2,174	1,951	1,951	1,951
225	5,715	4,950	4,251	3,548	2,873	2,218	1,951	1,951	1,951
230	5,757	4,994	4,296	3,594	2,918	2,261	1,951	1,951	1,951
235	5,797	5,037	4,341	3,639	2,962	2,303	1,951	1,951	1,951
240	5,836	5,078	4,383	3,682	3,004	2,344	1,951	1,951	1,951
245	5,874	5,118	4,425	3,724	3,046	2,384	1,951	1,951	1,951
250	5,911	5,157	4,465	3,764	3,086	2,423	1,951	1,951	1,951
255	5,946	5,195	4,504	3,804	3,125	2,461	1,951	1,951	1,951
260	5,980	5,231	4,542	3,842	3,163	2,498	1,951	1,951	1,951
265	6,013	5,267	4,579	3,880	3,200	2,534	1,951	1,951	1,951
270	6,045	5,301	4,615	3,916	3,236	2,569	1,951	1,951	1,951
275	6,077	5,334	4,650	3,951	3,271	2,603	1,951	1,951	1,951
280	6,107	5,367	4,684	3,986	3,306	2,636	1,951	1,951	1,951
285	6,136	5,398	4,716	4,019	3,339	2,669	1,955	1,951	1,951
290	6,165	5,429	4,748	4,052	3,372	2,701	1,985	1,951	1,951
295	6,192	5,458	4,780	4,084	3,403	2,732	2,014	1,951	1,951
300	6,219	5,487	4,810	4,115	3,435	2,762	2,043	1,951	1,951
305	6,245	5,515	4,840	4,145	3,465	2,792	2,071	1,951	1,951
310	6,271	5,543	4,868	4,175	3,494	2,821	2,098	1,951	1,951
315	6,295	5,570	4,897	4,203	3,523	2,849	2,125	1,951	1,951
320	6,319	5,595	4,924	4,232	3,552	2,877	2,152	1,951	1,951
325	6,343	5,621	4,951	4,259	3,579	2,904	2,177	1,951	1,951
330	6,366	5,645	4,977	4,286	3,606	2,931	2,203	1,951	1,951
335	6,388	5,670	5,002	4,312	3,633	2,957	2,227	1,951	1,951
340	6,410	5,693	5,027	4,338	3,658	2,982	2,252	1,951	1,951
345	6,431	5,716	5,051	4,363	3,684	3,007	2,275	1,951	1,951
346	6,436	5,722	5,058	4,370	3,691	3,014	2,282	1,951	1,951

Table 10 - Layer thicknesses R 120 for open section columns

R 120	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
71	4,411	3,552	2,839	2,196	1,951	1,951	1,951	1,951	1,951
75	4,634	3,767	3,045	2,388	1,951	1,951	1,951	1,951	1,951
80	4,872	4,000	3,268	2,599	2,007	1,951	1,951	1,951	1,951
85	5,093	4,216	3,477	2,797	2,193	1,951	1,951	1,951	1,951
90	5,299	4,420	3,675	2,985	2,371	1,951	1,951	1,951	1,951
95	5,491	4,610	3,861	3,164	2,539	1,973	1,951	1,951	1,951
100	5,670	4,789	4,037	3,333	2,700	2,124	1,951	1,951	1,951
105	5,838	4,958	4,204	3,494	2,854	2,269	1,951	1,951	1,951
110	5,996	5,117	4,362	3,648	3,001	2,408	1,951	1,951	1,951
115	6,145	5,268	4,512	3,794	3,141	2,542	1,951	1,951	1,951
120	6,285	5,410	4,654	3,933	3,276	2,670	2,062	1,951	1,951
125	6,417	5,545	4,790	4,067	3,405	2,793	2,177	1,951	1,951
130	6,541	5,674	4,919	4,194	3,529	2,912	2,288	1,951	1,951
135	6,660	5,795	5,042	4,316	3,648	3,026	2,396	1,951	1,951
140	6,772	5,911	5,160	4,433	3,762	3,136	2,499	1,951	1,951
145	-	6,022	5,273	4,545	3,872	3,242	2,600	1,951	1,951
150	-	6,127	5,380	4,653	3,978	3,345	2,697	2,016	1,951
155	-	6,228	5,483	4,756	4,080	3,444	2,791	2,102	1,951
160	-	6,324	5,582	4,855	4,178	3,539	2,882	2,186	1,951
165	-	6,416	5,677	4,951	4,273	3,632	2,970	2,268	1,951
170	-	6,505	5,768	5,043	4,364	3,721	3,056	2,348	1,951
175	-	6,589	5,856	5,132	4,452	3,808	3,139	2,425	1,951
180	-	6,670	5,940	5,217	4,538	3,892	3,219	2,500	1,951
185	-	6,748	6,021	5,300	4,620	3,973	3,298	2,573	1,951
190	-	6,823	6,100	5,379	4,700	4,052	3,374	2,644	1,951
195	-	-	6,175	5,456	4,777	4,128	3,447	2,713	2,014
200	-	-	6,247	5,530	4,852	4,203	3,519	2,780	2,076
205	-	-	6,318	5,602	4,924	4,274	3,589	2,846	2,136
210	-	-	6,385	5,672	4,995	4,344	3,657	2,910	2,195
215	-	-	6,451	5,739	5,063	4,412	3,723	2,972	2,253
220	-	-	6,514	5,804	5,129	4,478	3,787	3,033	2,310
225	-	-	6,575	5,867	5,193	4,542	3,850	3,093	2,365
230	-	-	6,634	5,929	5,255	4,605	3,911	3,150	2,419
235	-	-	6,692	5,988	5,316	4,666	3,970	3,207	2,471
240	-	-	6,747	6,046	5,375	4,725	4,028	3,262	2,523
245	-	-	6,801	6,102	5,432	4,782	4,085	3,316	2,573
250	-	-	6,854	6,156	5,488	4,838	4,140	3,369	2,622
255	-	-	-	6,209	5,542	4,893	4,194	3,420	2,670
260	-	-	-	6,260	5,595	4,946	4,247	3,470	2,717
265	-	-	-	6,310	5,646	4,998	4,298	3,520	2,764
270	-	-	-	6,359	5,696	5,049	4,348	3,568	2,809
275	-	-	-	6,406	5,745	5,098	4,397	3,615	2,853
280	-	-	-	6,452	5,792	5,147	4,445	3,661	2,897
285	-	-	-	6,497	5,838	5,194	4,492	3,706	2,939
290	-	-	-	6,541	5,884	5,240	4,537	3,750	2,981
295	-	-	-	6,584	5,928	5,285	4,582	3,793	3,021
300	-	-	-	6,625	5,971	5,328	4,626	3,835	3,062
305	-	-	-	6,666	6,013	5,371	4,669	3,877	3,101
310	-	-	-	6,705	6,054	5,413	4,710	3,917	3,139
315	-	-	-	6,744	6,094	5,454	4,751	3,957	3,177
320	-	-	-	6,781	6,133	5,495	4,792	3,996	3,214
325	-	-	-	6,818	6,171	5,534	4,831	4,034	3,250
330	-	-	-	6,854	6,209	5,572	4,869	4,071	3,286
335	-	-	-	-	6,245	5,610	4,907	4,108	3,321
340	-	-	-	-	6,281	5,647	4,944	4,144	3,356
345	-	-	-	-	6,316	5,683	4,980	4,179	3,389
346	-	-	-	-	6,326	5,693	4,990	4,189	3,399

Table 11 - Layer thicknesses R 30 for rectangular hollow section beams in three-sided fire exposure

R 30	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
50	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
55	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
60	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
65	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
70	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
75	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
80	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
85	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
90	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
95	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
100	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
105	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
110	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
115	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
120	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
125	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
130	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
135	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
140	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
145	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
150	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
155	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
160	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
165	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
170	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
175	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
180	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
185	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
190	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
195	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
200	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
205	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
210	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
215	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
220	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
225	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
230	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
235	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
240	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
245	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
250	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
255	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
260	1,846	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
265	1,868	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
270	1,890	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
275	1,910	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833

Table 12 - Layer thickness R 45 for rectangular hollow section beams in three-sided fire exposure

R 45	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
50	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
55	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
60	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
65	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
70	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
75	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
80	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
85	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
90	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
95	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
100	1,849	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
105	1,944	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
110	2,036	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
115	2,124	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
120	2,208	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
125	2,289	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
130	2,367	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
135	2,442	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
140	2,514	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
145	2,584	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
150	2,651	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
155	2,716	1,843	1,833	1,833	1,833	1,833	1,833	1,833	1,833
160	2,779	1,896	1,833	1,833	1,833	1,833	1,833	1,833	1,833
165	2,840	1,948	1,833	1,833	1,833	1,833	1,833	1,833	1,833
170	2,898	1,998	1,833	1,833	1,833	1,833	1,833	1,833	1,833
175	2,955	2,047	1,833	1,833	1,833	1,833	1,833	1,833	1,833
180	3,010	2,094	1,833	1,833	1,833	1,833	1,833	1,833	1,833
185	3,063	2,140	1,833	1,833	1,833	1,833	1,833	1,833	1,833
190	3,114	2,185	1,833	1,833	1,833	1,833	1,833	1,833	1,833
195	3,164	2,228	1,833	1,833	1,833	1,833	1,833	1,833	1,833
200	3,213	2,271	1,833	1,833	1,833	1,833	1,833	1,833	1,833
205	3,260	2,312	1,833	1,833	1,833	1,833	1,833	1,833	1,833
210	3,305	2,352	1,833	1,833	1,833	1,833	1,833	1,833	1,833
215	3,350	2,391	1,833	1,833	1,833	1,833	1,833	1,833	1,833
220	3,393	2,429	1,833	1,833	1,833	1,833	1,833	1,833	1,833
225	3,435	2,466	1,833	1,833	1,833	1,833	1,833	1,833	1,833
230	3,475	2,502	1,833	1,833	1,833	1,833	1,833	1,833	1,833
235	3,515	2,538	1,833	1,833	1,833	1,833	1,833	1,833	1,833
240	3,554	2,572	1,833	1,833	1,833	1,833	1,833	1,833	1,833
245	3,591	2,606	1,833	1,833	1,833	1,833	1,833	1,833	1,833
250	3,628	2,638	1,833	1,833	1,833	1,833	1,833	1,833	1,833
255	3,663	2,670	1,833	1,833	1,833	1,833	1,833	1,833	1,833
260	3,698	2,702	1,833	1,833	1,833	1,833	1,833	1,833	1,833
265	3,732	2,732	1,833	1,833	1,833	1,833	1,833	1,833	1,833
270	3,765	2,762	1,833	1,833	1,833	1,833	1,833	1,833	1,833
275	3,797	2,791	1,833	1,833	1,833	1,833	1,833	1,833	1,833

Table 13 - Layer thicknesses R 60 for rectangular hollow section beams in three-sided fire exposure

R 60	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
50	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
55	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
60	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
65	1,965	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
70	2,143	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
75	2,312	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
80	2,474	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833
85	2,628	1,882	1,833	1,833	1,833	1,833	1,833	1,833	1,833
90	2,775	2,007	1,833	1,833	1,833	1,833	1,833	1,833	1,833
95	2,916	2,127	1,833	1,833	1,833	1,833	1,833	1,833	1,833
100	3,050	2,242	1,833	1,833	1,833	1,833	1,833	1,833	1,833
105	3,179	2,354	1,833	1,833	1,833	1,833	1,833	1,833	1,833
110	3,303	2,461	1,833	1,833	1,833	1,833	1,833	1,833	1,833
115	3,421	2,565	1,833	1,833	1,833	1,833	1,833	1,833	1,833
120	3,535	2,665	1,895	1,833	1,833	1,833	1,833	1,833	1,833
125	3,645	2,762	1,977	1,833	1,833	1,833	1,833	1,833	1,833
130	3,750	2,855	2,056	1,833	1,833	1,833	1,833	1,833	1,833
135	3,852	2,946	2,133	1,833	1,833	1,833	1,833	1,833	1,833
140	3,950	3,033	2,208	1,833	1,833	1,833	1,833	1,833	1,833
145	4,044	3,118	2,280	1,833	1,833	1,833	1,833	1,833	1,833
150	4,135	3,200	2,351	1,833	1,833	1,833	1,833	1,833	1,833
155	4,223	3,279	2,420	1,833	1,833	1,833	1,833	1,833	1,833
160	4,307	3,357	2,487	1,833	1,833	1,833	1,833	1,833	1,833
165	4,389	3,431	2,552	1,833	1,833	1,833	1,833	1,833	1,833
170	4,469	3,504	2,616	1,833	1,833	1,833	1,833	1,833	1,833
175	4,545	3,575	2,678	1,846	1,833	1,833	1,833	1,833	1,833
180	4,619	3,643	2,738	1,896	1,833	1,833	1,833	1,833	1,833
185	4,691	3,710	2,797	1,945	1,833	1,833	1,833	1,833	1,833
190	4,761	3,775	2,854	1,993	1,833	1,833	1,833	1,833	1,833
195	4,828	3,838	2,910	2,040	1,833	1,833	1,833	1,833	1,833
200	4,894	3,899	2,965	2,085	1,833	1,833	1,833	1,833	1,833
205	4,957	3,959	3,018	2,130	1,833	1,833	1,833	1,833	1,833
210	5,019	4,017	3,070	2,174	1,833	1,833	1,833	1,833	1,833
215	5,079	4,073	3,121	2,217	1,833	1,833	1,833	1,833	1,833
220	5,137	4,128	3,170	2,259	1,833	1,833	1,833	1,833	1,833
225	5,194	4,182	3,219	2,301	1,833	1,833	1,833	1,833	1,833
230	5,249	4,235	3,266	2,341	1,833	1,833	1,833	1,833	1,833
235	5,302	4,286	3,313	2,381	1,833	1,833	1,833	1,833	1,833
240	5,355	4,335	3,358	2,420	1,833	1,833	1,833	1,833	1,833
245	5,405	4,384	3,402	2,458	1,833	1,833	1,833	1,833	1,833
250	5,455	4,432	3,446	2,495	1,833	1,833	1,833	1,833	1,833
255	5,503	4,478	3,488	2,532	1,833	1,833	1,833	1,833	1,833
260	5,550	4,523	3,530	2,568	1,833	1,833	1,833	1,833	1,833
265	5,595	4,568	3,571	2,603	1,833	1,833	1,833	1,833	1,833
270	5,640	4,611	3,610	2,637	1,833	1,833	1,833	1,833	1,833
275	5,684	4,653	3,649	2,671	1,833	1,833	1,833	1,833	1,833

Table 14 - Layer thicknesses R 90 for rectangular hollow section beams in three-sided fire exposure

R 90	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
50	2,902	2,219	1,833	1,833	1,833	1,833	1,833	1,833	1,833
55	3,218	2,489	1,894	1,833	1,833	1,833	1,833	1,833	1,833
60	3,518	2,748	2,114	1,833	1,833	1,833	1,833	1,833	1,833
65	3,803	2,995	2,327	1,833	1,833	1,833	1,833	1,833	1,833
70	4,073	3,233	2,531	1,937	1,833	1,833	1,833	1,833	1,833
75	4,331	3,460	2,729	2,106	1,833	1,833	1,833	1,833	1,833
80	4,576	3,679	2,920	2,270	1,833	1,833	1,833	1,833	1,833
85	4,810	3,889	3,105	2,429	1,841	1,833	1,833	1,833	1,833
90	5,034	4,091	3,284	2,584	1,973	1,833	1,833	1,833	1,833
95	5,248	4,285	3,456	2,735	2,101	1,833	1,833	1,833	1,833
100	5,453	4,473	3,624	2,881	2,226	1,833	1,833	1,833	1,833
105	5,649	4,653	3,786	3,024	2,349	1,833	1,833	1,833	1,833
110	5,837	4,827	3,943	3,162	2,468	1,847	1,833	1,833	1,833
115	6,017	4,995	4,095	3,297	2,585	1,945	1,833	1,833	1,833
120	-	5,157	4,243	3,429	2,699	2,042	1,833	1,833	1,833
125	-	5,314	4,386	3,557	2,811	2,136	1,833	1,833	1,833
130	-	5,465	4,526	3,682	2,920	2,229	1,833	1,833	1,833
135	-	5,611	4,661	3,804	3,027	2,320	1,833	1,833	1,833
140	-	5,753	4,792	3,923	3,132	2,410	1,833	1,833	1,833
145	-	5,890	4,920	4,039	3,234	2,497	1,833	1,833	1,833
150	-	6,023	5,044	4,152	3,334	2,584	1,891	1,833	1,833
155	-	6,152	5,165	4,262	3,433	2,668	1,961	1,833	1,833
160	-	-	5,283	4,370	3,529	2,751	2,031	1,833	1,833
165	-	-	5,397	4,475	3,623	2,833	2,099	1,833	1,833
170	-	-	5,509	4,578	3,715	2,913	2,166	1,833	1,833
175	-	-	5,618	4,679	3,806	2,992	2,232	1,833	1,833
180	-	-	5,724	4,777	3,895	3,070	2,297	1,833	1,833
185	-	-	5,827	4,873	3,982	3,146	2,362	1,833	1,833
190	-	-	5,928	4,967	4,067	3,221	2,425	1,833	1,833
195	-	-	6,026	5,059	4,151	3,295	2,487	1,833	1,833
200	-	-	6,122	5,149	4,233	3,367	2,549	1,833	1,833
205	-	-	-	5,238	4,313	3,439	2,609	1,833	1,833
210	-	-	-	5,324	4,392	3,509	2,669	1,871	1,833
215	-	-	-	5,408	4,470	3,578	2,728	1,918	1,833
220	-	-	-	5,491	4,546	3,646	2,786	1,965	1,833
225	-	-	-	5,572	4,621	3,713	2,844	2,012	1,833
230	-	-	-	5,651	4,695	3,778	2,900	2,058	1,833
235	-	-	-	5,729	4,767	3,843	2,956	2,103	1,833
240	-	-	-	5,806	4,838	3,907	3,011	2,148	1,833
245	-	-	-	5,880	4,907	3,970	3,065	2,193	1,833
250	-	-	-	5,954	4,976	4,031	3,119	2,237	1,833
255	-	-	-	6,026	5,043	4,092	3,172	2,280	1,833
260	-	-	-	6,096	5,109	4,152	3,224	2,323	1,833
265	-	-	-	6,166	5,174	4,211	3,275	2,365	1,833
270	-	-	-	-	5,238	4,269	3,326	2,407	1,833
275	-	-	-	-	5,301	4,327	3,376	2,449	1,833

Table 15 - Layer thicknesses R 120 rectangular hollow section beams in three-sided fire exposure

R 120	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
50	4,432	3,587	2,903	2,338	1,864	1,833	1,833	1,833	1,833
55	4,856	3,960	3,230	2,623	2,110	1,833	1,833	1,833	1,833
60	5,258	4,318	3,545	2,898	2,349	1,877	1,833	1,833	1,833
65	5,640	4,661	3,849	3,166	2,582	2,078	1,833	1,833	1,833
70	6,003	4,989	4,142	3,425	2,810	2,276	1,833	1,833	1,833
75	-	5,304	4,425	3,677	3,031	2,469	1,975	1,833	1,833
80	-	5,606	4,698	3,921	3,247	2,658	2,139	1,833	1,833
85	-	5,896	4,963	4,158	3,458	2,844	2,299	1,833	1,833
90	-	-	5,218	4,389	3,664	3,025	2,457	1,950	1,833
95	-	-	5,466	4,614	3,866	3,203	2,613	2,083	1,833
100	-	-	5,705	4,832	4,062	3,378	2,766	2,215	1,833
105	-	-	5,937	5,044	4,254	3,549	2,916	2,345	1,833
110	-	-	6,162	5,251	4,441	3,716	3,064	2,473	1,936
115	-	-	-	5,452	4,625	3,881	3,209	2,600	2,044
120	-	-	-	5,648	4,804	4,042	3,352	2,724	2,150
125	-	-	-	5,840	4,979	4,201	3,493	2,847	2,256
130	-	-	-	6,026	5,150	4,356	3,632	2,969	2,360
135	-	-	-	-	5,318	4,508	3,768	3,089	2,463
140	-	-	-	-	5,482	4,658	3,902	3,207	2,565
145	-	-	-	-	5,643	4,805	4,034	3,324	2,666
150	-	-	-	-	5,800	4,949	4,165	3,439	2,766
155	-	-	-	-	5,954	5,091	4,293	3,553	2,864
160	-	-	-	-	6,105	5,230	4,419	3,665	2,962
165	-	-	-	-	-	5,367	4,543	3,776	3,059
170	-	-	-	-	-	5,501	4,666	3,885	3,154
175	-	-	-	-	-	5,633	4,786	3,993	3,249
180	-	-	-	-	-	5,763	4,905	4,100	3,343
185	-	-	-	-	-	5,890	5,022	4,205	3,435
190	-	-	-	-	-	6,016	5,138	4,309	3,527
195	-	-	-	-	-	6,139	5,251	4,412	3,618
200	-	-	-	-	-	-	5,363	4,514	3,708
205	-	-	-	-	-	-	5,474	4,614	3,797
210	-	-	-	-	-	-	5,583	4,713	3,885
215	-	-	-	-	-	-	5,690	4,811	3,972
220	-	-	-	-	-	-	5,796	4,908	4,059
225	-	-	-	-	-	-	5,901	5,004	4,144
230	-	-	-	-	-	-	6,004	5,098	4,229
235	-	-	-	-	-	-	6,105	5,192	4,313
240	-	-	-	-	-	-	-	5,284	4,396
245	-	-	-	-	-	-	-	5,375	4,478
250	-	-	-	-	-	-	-	5,465	4,559
255	-	-	-	-	-	-	-	5,555	4,640
260	-	-	-	-	-	-	-	5,643	4,720
265	-	-	-	-	-	-	-	5,730	4,799
270	-	-	-	-	-	-	-	5,816	4,877
275	-	-	-	-	-	-	-	5,902	4,955

Table 16 - Layer thicknesses R 30 for hollow section columns in four-sided fire exposure

R 30	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
50	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
55	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
60	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
65	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
70	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
75	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
80	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
85	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
90	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
95	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
100	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
105	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
110	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
115	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
120	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
125	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
130	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
135	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
140	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
145	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
150	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
155	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
160	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
165	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
170	2,010	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
175	2,063	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
180	2,114	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
185	2,163	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
190	2,210	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
195	2,255	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
200	2,299	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
205	2,340	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
210	2,381	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
215	2,419	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
220	2,456	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
225	2,492	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
230	2,527	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
235	2,560	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
240	2,593	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
245	2,624	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
250	2,654	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
255	2,683	1,999	1,989	1,989	1,989	1,989	1,989	1,989	1,989
260	2,711	2,028	1,989	1,989	1,989	1,989	1,989	1,989	1,989
265	2,739	2,057	1,989	1,989	1,989	1,989	1,989	1,989	1,989
270	2,765	2,084	1,989	1,989	1,989	1,989	1,989	1,989	1,989
275	2,791	2,111	1,989	1,989	1,989	1,989	1,989	1,989	1,989
280	2,816	2,137	1,989	1,989	1,989	1,989	1,989	1,989	1,989
285	2,840	2,163	1,989	1,989	1,989	1,989	1,989	1,989	1,989
290	2,864	2,188	1,989	1,989	1,989	1,989	1,989	1,989	1,989
295	2,887	2,212	1,989	1,989	1,989	1,989	1,989	1,989	1,989
300	2,909	2,236	1,989	1,989	1,989	1,989	1,989	1,989	1,989
305	2,930	2,259	1,989	1,989	1,989	1,989	1,989	1,989	1,989
310	2,951	2,281	1,989	1,989	1,989	1,989	1,989	1,989	1,989
315	2,972	2,303	1,989	1,989	1,989	1,989	1,989	1,989	1,989
320	2,992	2,324	1,989	1,989	1,989	1,989	1,989	1,989	1,989
325	3,011	2,345	1,989	1,989	1,989	1,989	1,989	1,989	1,989
330	3,030	2,365	1,989	1,989	1,989	1,989	1,989	1,989	1,989
335	3,048	2,385	1,989	1,989	1,989	1,989	1,989	1,989	1,989

Table 17 - Layer thicknesses R 45 for hollow section columns in four-sided fire exposure

R 45	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
50	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
55	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
60	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
65	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
70	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
75	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
80	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
85	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
90	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
95	2,014	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
100	2,157	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
105	2,290	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
110	2,415	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
115	2,533	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
120	2,644	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
125	2,749	2,018	1,989	1,989	1,989	1,989	1,989	1,989	1,989
130	2,848	2,113	1,989	1,989	1,989	1,989	1,989	1,989	1,989
135	2,942	2,203	1,989	1,989	1,989	1,989	1,989	1,989	1,989
140	3,031	2,290	1,989	1,989	1,989	1,989	1,989	1,989	1,989
145	3,116	2,373	1,989	1,989	1,989	1,989	1,989	1,989	1,989
150	3,196	2,452	1,989	1,989	1,989	1,989	1,989	1,989	1,989
155	3,273	2,528	1,989	1,989	1,989	1,989	1,989	1,989	1,989
160	3,346	2,602	2,052	1,989	1,989	1,989	1,989	1,989	1,989
165	3,416	2,672	2,120	1,989	1,989	1,989	1,989	1,989	1,989
170	3,482	2,740	2,186	1,989	1,989	1,989	1,989	1,989	1,989
175	3,546	2,805	2,250	1,989	1,989	1,989	1,989	1,989	1,989
180	3,607	2,868	2,313	1,989	1,989	1,989	1,989	1,989	1,989
185	3,665	2,929	2,373	1,989	1,989	1,989	1,989	1,989	1,989
190	3,721	2,988	2,431	1,989	1,989	1,989	1,989	1,989	1,989
195	3,775	3,044	2,488	1,989	1,989	1,989	1,989	1,989	1,989
200	3,827	3,099	2,543	1,989	1,989	1,989	1,989	1,989	1,989
205	3,876	3,151	2,597	1,989	1,989	1,989	1,989	1,989	1,989
210	3,924	3,203	2,649	2,031	1,989	1,989	1,989	1,989	1,989
215	3,970	3,252	2,700	2,080	1,989	1,989	1,989	1,989	1,989
220	4,014	3,300	2,749	2,127	1,989	1,989	1,989	1,989	1,989
225	4,057	3,346	2,797	2,173	1,989	1,989	1,989	1,989	1,989
230	4,098	3,391	2,844	2,218	1,989	1,989	1,989	1,989	1,989
235	4,138	3,435	2,889	2,262	1,989	1,989	1,989	1,989	1,989
240	4,177	3,477	2,933	2,305	1,989	1,989	1,989	1,989	1,989
245	4,214	3,518	2,976	2,348	1,989	1,989	1,989	1,989	1,989
250	4,250	3,558	3,019	2,389	1,989	1,989	1,989	1,989	1,989
255	4,285	3,596	3,060	2,429	1,989	1,989	1,989	1,989	1,989
260	4,318	3,634	3,100	2,469	1,989	1,989	1,989	1,989	1,989
265	4,351	3,670	3,139	2,508	1,989	1,989	1,989	1,989	1,989
270	4,382	3,706	3,177	2,546	1,989	1,989	1,989	1,989	1,989
275	4,413	3,741	3,214	2,583	1,989	1,989	1,989	1,989	1,989
280	4,443	3,774	3,250	2,619	1,989	1,989	1,989	1,989	1,989
285	4,472	3,807	3,286	2,655	2,016	1,989	1,989	1,989	1,989
290	4,500	3,839	3,320	2,690	2,049	1,989	1,989	1,989	1,989
295	4,527	3,870	3,354	2,725	2,082	1,989	1,989	1,989	1,989
300	4,553	3,900	3,387	2,758	2,114	1,989	1,989	1,989	1,989
305	4,579	3,930	3,420	2,791	2,146	1,989	1,989	1,989	1,989
310	4,604	3,959	3,452	2,824	2,177	1,989	1,989	1,989	1,989
315	4,628	3,987	3,483	2,856	2,208	1,989	1,989	1,989	1,989
320	4,652	4,014	3,513	2,887	2,238	1,989	1,989	1,989	1,989
325	4,675	4,041	3,543	2,917	2,268	1,989	1,989	1,989	1,989
330	4,698	4,067	3,572	2,948	2,297	1,989	1,989	1,989	1,989
335	4,719	4,093	3,600	2,977	2,326	1,989	1,989	1,989	1,989

Table 18 - Layer thicknesses R 60 for hollow section columns in four-sided fire exposure

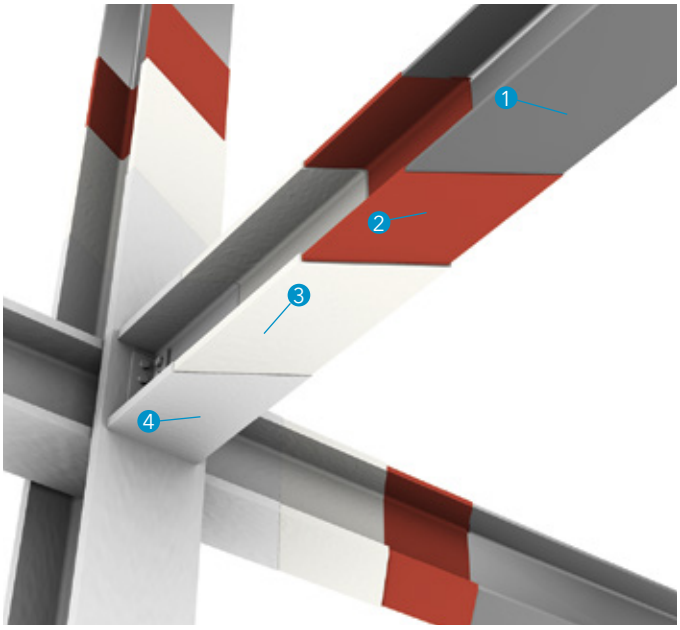
R 60	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
50	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
55	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
60	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
65	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
70	2,226	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
75	2,463	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
80	2,682	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
85	2,885	2,110	1,989	1,989	1,989	1,989	1,989	1,989	1,989
90	3,075	2,281	1,989	1,989	1,989	1,989	1,989	1,989	1,989
95	3,251	2,444	1,989	1,989	1,989	1,989	1,989	1,989	1,989
100	3,417	2,598	2,064	1,989	1,989	1,989	1,989	1,989	1,989
105	3,571	2,745	2,200	1,989	1,989	1,989	1,989	1,989	1,989
110	3,717	2,884	2,330	1,989	1,989	1,989	1,989	1,989	1,989
115	3,853	3,017	2,456	1,989	1,989	1,989	1,989	1,989	1,989
120	3,982	3,144	2,576	2,007	1,989	1,989	1,989	1,989	1,989
125	4,104	3,265	2,693	2,113	1,989	1,989	1,989	1,989	1,989
130	4,219	3,380	2,805	2,216	1,989	1,989	1,989	1,989	1,989
135	4,328	3,491	2,913	2,316	1,989	1,989	1,989	1,989	1,989
140	4,431	3,596	3,017	2,414	1,989	1,989	1,989	1,989	1,989
145	4,530	3,698	3,118	2,508	1,989	1,989	1,989	1,989	1,989
150	4,623	3,795	3,216	2,600	2,048	1,989	1,989	1,989	1,989
155	4,712	3,888	3,310	2,690	2,130	1,989	1,989	1,989	1,989
160	4,797	3,978	3,401	2,777	2,210	1,989	1,989	1,989	1,989
165	4,878	4,064	3,489	2,862	2,289	1,989	1,989	1,989	1,989
170	4,955	4,147	3,574	2,945	2,366	1,989	1,989	1,989	1,989
175	5,029	4,227	3,657	3,026	2,442	1,989	1,989	1,989	1,989
180	5,099	4,304	3,737	3,104	2,516	1,989	1,989	1,989	1,989
185	5,167	4,378	3,815	3,181	2,588	2,034	1,989	1,989	1,989
190	5,232	4,449	3,891	3,256	2,659	2,099	1,989	1,989	1,989
195	5,295	4,518	3,964	3,329	2,729	2,163	1,989	1,989	1,989
200	5,355	4,585	4,035	3,400	2,798	2,226	1,989	1,989	1,989
205	5,412	4,650	4,105	3,470	2,865	2,288	1,989	1,989	1,989
210	5,468	4,712	4,172	3,537	2,931	2,350	1,989	1,989	1,989
215	5,521	4,773	4,237	3,604	2,995	2,410	1,989	1,989	1,989
220	5,573	4,831	4,301	3,669	3,059	2,470	1,989	1,989	1,989
225	5,622	4,888	4,363	3,732	3,121	2,528	1,989	1,989	1,989
230	5,670	4,943	4,423	3,794	3,182	2,586	1,989	1,989	1,989
235	5,716	4,996	4,482	3,855	3,242	2,643	1,989	1,989	1,989
240	5,761	5,047	4,539	3,914	3,301	2,699	1,989	1,989	1,989
245	5,804	5,098	4,595	3,972	3,359	2,755	2,021	1,989	1,989
250	5,846	5,146	4,649	4,029	3,416	2,810	2,070	1,989	1,989
255	5,886	5,194	4,702	4,084	3,472	2,863	2,117	1,989	1,989
260	5,925	5,239	4,753	4,139	3,526	2,917	2,164	1,989	1,989
265	5,963	5,284	4,804	4,192	3,580	2,969	2,211	1,989	1,989
270	6,000	5,328	4,853	4,244	3,634	3,021	2,257	1,989	1,989
275	6,035	5,370	4,901	4,295	3,686	3,072	2,303	1,989	1,989
280	6,070	5,411	4,948	4,345	3,737	3,122	2,349	1,989	1,989
285	6,103	5,451	4,994	4,395	3,787	3,172	2,394	1,989	1,989
290	6,136	5,490	5,039	4,443	3,837	3,221	2,438	1,989	1,989
295	6,167	5,528	5,082	4,490	3,886	3,270	2,482	1,989	1,989
300	6,198	5,565	5,125	4,536	3,934	3,317	2,526	1,989	1,989
305	6,228	5,601	5,167	4,582	3,981	3,365	2,569	1,989	1,989
310	6,257	5,637	5,208	4,626	4,028	3,411	2,612	1,989	1,989
315	6,285	5,671	5,248	4,670	4,073	3,457	2,654	1,989	1,989
320	6,312	5,704	5,287	4,713	4,118	3,503	2,696	1,989	1,989
325	6,339	5,737	5,326	4,755	4,163	3,547	2,738	1,989	1,989
330	6,365	5,769	5,363	4,796	4,206	3,592	2,779	1,989	1,989
335	6,391	5,800	5,400	4,837	4,249	3,635	2,820	1,989	1,989

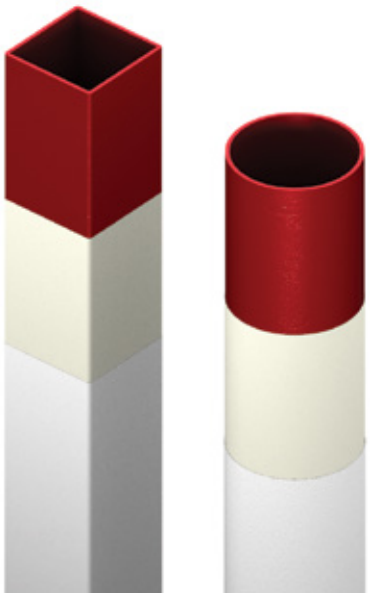
Table 19 - Layer thicknesses R 90 for hollow section columns in four-sided fire exposure

R 90	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
50	2,916	2,089	1,989	1,989	1,989	1,989	1,989	1,989	1,989
55	3,343	2,448	1,989	1,989	1,989	1,989	1,989	1,989	1,989
60	3,732	2,784	2,243	1,989	1,989	1,989	1,989	1,989	1,989
65	4,088	3,098	2,522	2,003	1,989	1,989	1,989	1,989	1,989
70	4,416	3,394	2,788	2,236	1,989	1,989	1,989	1,989	1,989
75	4,719	3,672	3,043	2,461	1,996	1,989	1,989	1,989	1,989
80	4,999	3,934	3,286	2,678	2,188	1,989	1,989	1,989	1,989
85	5,258	4,182	3,518	2,889	2,376	1,989	1,989	1,989	1,989
90	5,500	4,416	3,741	3,092	2,559	2,112	1,989	1,989	1,989
95	5,725	4,638	3,955	3,289	2,737	2,272	1,989	1,989	1,989
100	5,936	4,848	4,160	3,480	2,911	2,429	1,989	1,989	1,989
105	6,134	5,048	4,356	3,665	3,082	2,584	2,050	1,989	1,989
110	6,319	5,239	4,546	3,844	3,248	2,735	2,182	1,989	1,989
115	6,494	5,420	4,728	4,018	3,410	2,884	2,313	1,989	1,989
120	-	5,592	4,903	4,187	3,569	3,031	2,442	1,989	1,989
125	-	5,757	5,071	4,350	3,724	3,175	2,569	1,989	1,989
130	-	5,915	5,234	4,510	3,876	3,317	2,696	1,989	1,989
135	-	6,065	5,391	4,664	4,024	3,456	2,820	2,078	1,989
140	-	6,209	5,542	4,814	4,169	3,593	2,944	2,181	1,989
145	-	6,348	5,689	4,961	4,311	3,728	3,066	2,282	1,989
150	-	6,480	5,830	5,103	4,450	3,861	3,186	2,383	1,989
155	-	-	5,967	5,241	4,586	3,992	3,305	2,484	1,989
160	-	-	6,099	5,376	4,719	4,120	3,423	2,583	2,004
165	-	-	6,227	5,507	4,850	4,247	3,540	2,682	2,089
170	-	-	6,351	5,635	4,977	4,371	3,655	2,781	2,174
175	-	-	6,471	5,759	5,102	4,494	3,769	2,878	2,259
180	-	-	-	5,881	5,225	4,615	3,882	2,975	2,344
185	-	-	-	5,999	5,345	4,733	3,993	3,071	2,428
190	-	-	-	6,115	5,463	4,851	4,103	3,167	2,512
195	-	-	-	6,228	5,579	4,966	4,213	3,262	2,596
200	-	-	-	6,338	5,692	5,080	4,320	3,356	2,680
205	-	-	-	6,445	5,803	5,191	4,427	3,450	2,763
210	-	-	-	-	5,912	5,302	4,533	3,543	2,846
215	-	-	-	-	6,019	5,411	4,638	3,636	2,929
220	-	-	-	-	6,124	5,518	4,741	3,728	3,011
225	-	-	-	-	6,227	5,623	4,843	3,819	3,094
230	-	-	-	-	6,328	5,727	4,945	3,910	3,176
235	-	-	-	-	6,428	5,830	5,045	4,000	3,258
240	-	-	-	-	6,525	5,931	5,144	4,089	3,340
245	-	-	-	-	-	6,031	5,243	4,178	3,421
250	-	-	-	-	-	6,129	5,340	4,267	3,502
255	-	-	-	-	-	6,226	5,436	4,354	3,583
260	-	-	-	-	-	6,322	5,531	4,442	3,664
265	-	-	-	-	-	6,417	5,626	4,528	3,745
270	-	-	-	-	-	6,510	5,719	4,614	3,825
275	-	-	-	-	-	-	5,812	4,700	3,905
280	-	-	-	-	-	-	5,903	4,785	3,985
285	-	-	-	-	-	-	5,994	4,869	4,065
290	-	-	-	-	-	-	6,084	4,953	4,144
295	-	-	-	-	-	-	6,173	5,037	4,223
300	-	-	-	-	-	-	6,261	5,120	4,302
305	-	-	-	-	-	-	6,348	5,202	4,381
310	-	-	-	-	-	-	6,434	5,284	4,460
315	-	-	-	-	-	-	6,520	5,365	4,538
320	-	-	-	-	-	-	-	5,446	4,616
325	-	-	-	-	-	-	-	5,527	4,694
330	-	-	-	-	-	-	-	5,606	4,772
335	-	-	-	-	-	-	-	5,686	4,849

Table 20 - Layer thicknesses R 120 for hollow section columns in four-sided fire exposure

R 120	Dry film thickness [mm]								
	Design temperature [°C]								
A_p/V [m^{-1}]	350	400	450	500	550	600	650	700	750
50	4,781	3,603	2,956	2,397	1,989	1,989	1,989	1,989	1,989
55	5,300	4,057	3,359	2,748	2,279	1,989	1,989	1,989	1,989
60	5,774	4,483	3,743	3,086	2,577	2,172	1,989	1,989	1,989
65	6,208	4,881	4,109	3,413	2,867	2,429	1,989	1,989	1,989
70	-	5,256	4,458	3,728	3,150	2,682	2,198	1,989	1,989
75	-	5,608	4,791	4,032	3,426	2,930	2,415	1,989	1,989
80	-	5,940	5,109	4,326	3,694	3,174	2,629	2,026	1,989
85	-	6,254	5,414	4,611	3,956	3,413	2,840	2,202	1,989
90	-	-	5,706	4,886	4,212	3,648	3,049	2,378	1,989
95	-	-	5,986	5,152	4,461	3,879	3,255	2,552	2,096
100	-	-	6,255	5,410	4,704	4,105	3,459	2,725	2,247
105	-	-	6,513	5,660	4,942	4,328	3,660	2,896	2,398
110	-	-	-	5,903	5,174	4,547	3,859	3,067	2,548
115	-	-	-	6,138	5,401	4,763	4,056	3,236	2,698
120	-	-	-	6,366	5,622	4,974	4,250	3,404	2,847
125	-	-	-	-	5,839	5,183	4,442	3,571	2,996
130	-	-	-	-	6,051	5,387	4,632	3,737	3,145
135	-	-	-	-	6,258	5,589	4,820	3,901	3,293
140	-	-	-	-	6,460	5,787	5,005	4,064	3,440
145	-	-	-	-	-	5,981	5,188	4,227	3,587
150	-	-	-	-	-	6,173	5,370	4,388	3,734
155	-	-	-	-	-	6,362	5,549	4,548	3,881
160	-	-	-	-	-	6,547	5,726	4,707	4,026
165	-	-	-	-	-	-	5,902	4,864	4,172
170	-	-	-	-	-	-	6,075	5,021	4,317
175	-	-	-	-	-	-	6,247	5,177	4,462
180	-	-	-	-	-	-	6,416	5,331	4,606
185	-	-	-	-	-	-	-	5,485	4,750
190	-	-	-	-	-	-	-	5,638	4,893
195	-	-	-	-	-	-	-	5,789	5,036
200	-	-	-	-	-	-	-	5,940	5,178
205	-	-	-	-	-	-	-	6,089	5,321
210	-	-	-	-	-	-	-	6,238	5,462
215	-	-	-	-	-	-	-	6,385	5,604
220	-	-	-	-	-	-	-	6,532	5,745
225	-	-	-	-	-	-	-	-	5,885
230	-	-	-	-	-	-	-	-	6,025
235	-	-	-	-	-	-	-	-	6,165
240	-	-	-	-	-	-	-	-	6,304
245	-	-	-	-	-	-	-	-	6,443
250	-	-	-	-	-	-	-	-	-
255	-	-	-	-	-	-	-	-	-
260	-	-	-	-	-	-	-	-	-
265	-	-	-	-	-	-	-	-	-
270	-	-	-	-	-	-	-	-	-
275	-	-	-	-	-	-	-	-	-
280	-	-	-	-	-	-	-	-	-
285	-	-	-	-	-	-	-	-	-
290	-	-	-	-	-	-	-	-	-
295	-	-	-	-	-	-	-	-	-
300	-	-	-	-	-	-	-	-	-
305	-	-	-	-	-	-	-	-	-
310	-	-	-	-	-	-	-	-	-
315	-	-	-	-	-	-	-	-	-
320	-	-	-	-	-	-	-	-	-
325	-	-	-	-	-	-	-	-	-
330	-	-	-	-	-	-	-	-	-
335	-	-	-	-	-	-	-	-	-





Technical data

1. Load-bearing steel structure
2. Generic compatible primer
3. PROMAPAINT®-SC4, coating thickness according to A_p/V ratio value, fire resistance and design (critical) temperature
4. Suitable topcoat

Certificate: ETA-13/0198, Warringtonfire 436953

Fire resistance

R 15 to R 90 according to EN 13501-2, depending on the A_p/V value and the design steel temperature according to Eurocode.

Advantages:

- Tested and approved for open H-, I-, U-, L- and T-sections for fire protection up to R 90 and for hollow sections up to R 90
- Tested on galvanized steel
- Low layer thicknesses
- Durable, lightweight coating
- Topcoat not necessary for indoor applications with low humidity (Z_2)
- Fully exposed (X) with suitable topcoat
- Optical structure of the steel member remains visible
- Solvent free

Fields of application

PROMAPAINT®-SC4 is a coating for structural fire protection of open and hollow sections. Classified are the steel components with A_p/V value from 46 up to 345 m^{-1}, with three- and four-sided exposure to fire and with design steel temperature from 350 up to 750 °C.

Application temperature

PROMAPAINT®-SC4 should be applied when the temperature of the substrate and the ambient air temperature is at least 10 °C or more. This temperature should be maintained 24 hours before application. The maximal temperature of substrate and ambient air temperature should not exceed 35 °C.

Substrate preparation

The substrate should be clean, dry and free of any dust, loose scaling, loose rust, oil and other release agents that prevent good adhesion. PROMAPAINT®-SC4 may be applied on steel surfaces without primer pre-treatment as well as on primed steel surfaces. On galvanized surfaces may be used where the zinc layer has a thickness of up to 200 µm.

Generic compatible primers

- Acrylic
- Short/medium oil alkyd
- Two component epoxy
- Zinc silicate (inorganic zinc)
- Zinc rich epoxy (containing about 80% by mass of metallic zinc powder)
- Zinc rich epoxy (containing about 96% by mass of metallic zinc powder)
- Polybutadien (Promat® TY-ROX)

For any other primers, please contact your Promat technical office.

Tested topcoats:

- Type Z_2 environment: topcoat only required to provide a desired color
- Type Y environment (including type Z_1 and Z_2):
  - CARBOTHANE 134 PU
  - PURMAL S30 MIX
  - CHEMUKRYL
  - BARPIDOL S/AIRE

Instructions regarding the coating thicknesses

The required thickness of the fire protective reactive coating depends on the required fire resistance, the design temperature of the steel structure (the maximum allowed /critical/ temperature of the steel member) and the A_p/V ratio. The required dry layer thicknesses (excluding the primer and topcoat of any thickness) are listed in the tables.

For further details, please refer to the PROMAPAINT®-SC4 Application guidelines.

Table 1 - Layer thicknesses R 15 for open section beams in three-sided fire exposure

R 15	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
70	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
75	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
80	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
85	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
90	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
95	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
100	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
105	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
110	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
115	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
120	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
125	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
130	0,191	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
135	0,204	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
140	0,216	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
145	0,228	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
150	0,238	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
155	0,248	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
160	0,257	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
165	0,266	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
170	0,274	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
175	0,282	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
180	0,289	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
185	0,296	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
190	0,303	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
195	0,309	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
200	0,315	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
205	0,321	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
210	0,326	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
215	0,331	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
220	0,336	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
225	0,341	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
230	0,345	0,193	0,188	0,188	0,188	0,188	0,188	0,188	0,188
235	0,350	0,197	0,188	0,188	0,188	0,188	0,188	0,188	0,188
240	0,354	0, 202	0,188	0,188	0,188	0,188	0,188	0,188	0,188
245	0,358	0, 206	0,188	0,188	0,188	0,188	0,188	0,188	0,188
250	0,362	0,210	0,188	0,188	0,188	0,188	0,188	0,188	0,188
255	0,365	0,214	0,188	0,188	0,188	0,188	0,188	0,188	0,188
260	0,369	0,218	0,188	0,188	0,188	0,188	0,188	0,188	0,188
265	0,372	0,222	0,188	0,188	0,188	0,188	0,188	0,188	0,188
270	0,376	0,225	0,188	0,188	0,188	0,188	0,188	0,188	0,188
275	0,379	0,229	0,188	0,188	0,188	0,188	0,188	0,188	0,188
280	0,382	0,232	0,188	0,188	0,188	0,188	0,188	0,188	0,188
285	0,385	0,235	0,188	0,188	0,188	0,188	0,188	0,188	0,188
290	0,388	0,238	0,188	0,188	0,188	0,188	0,188	0,188	0,188
295	0,391	0,241	0,188	0,188	0,188	0,188	0,188	0,188	0,188
300	0,393	0,244	0,188	0,188	0,188	0,188	0,188	0,188	0,188

Table 2 - Layer thicknesses R 30 for open section beams in three-sided fire exposure

R 30	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
70	0,392	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
75	0,435	0,188	0,188	0,188	0,188	0,188	0,188	0,188	0,188
80	0,473	0,227	0,188	0,188	0,188	0,188	0,188	0,188	0,188
85	0,507	0,263	0,188	0,188	0,188	0,188	0,188	0,188	0,188
90	0,537	0,296	0,188	0,188	0,188	0,188	0,188	0,188	0,188
95	0,564	0,325	0,188	0,188	0,188	0,188	0,188	0,188	0,188
100	0,589	0,351	0,188	0,188	0,188	0,188	0,188	0,188	0,188
105	0,611	0,375	0,188	0,188	0,188	0,188	0,188	0,188	0,188
110	0,631	0,397	0,206	0,188	0,188	0,188	0,188	0,188	0,188
115	0,650	0,417	0,227	0,188	0,188	0,188	0,188	0,188	0,188
120	0,667	0,435	0,247	0,188	0,188	0,188	0,188	0,188	0,188
125	0,683	0,452	0,265	0,188	0,188	0,188	0,188	0,188	0,188
130	0,698	0,468	0,281	0,188	0,188	0,188	0,188	0,188	0,188
135	0,711	0,482	0,296	0,188	0,188	0,188	0,188	0,188	0,188
140	0,724	0,495	0,311	0,188	0,188	0,188	0,188	0,188	0,188
145	0,736	0,508	0,324	0,199	0,188	0,188	0,188	0,188	0,188
150	0,747	0,519	0,336	0,212	0,188	0,188	0,188	0,188	0,188
155	0,757	0,530	0,348	0,224	0,188	0,188	0,188	0,188	0,188
160	0,767	0,541	0,358	0,236	0,188	0,188	0,188	0,188	0,188
165	0,776	0,550	0,368	0,246	0,188	0,188	0,188	0,188	0,188
170	0,785	0,559	0,378	0,256	0,188	0,188	0,188	0,188	0,188
175	0,793	0,568	0,387	0,266	0,188	0,188	0,188	0,188	0,188
180	0,801	0,576	0,395	0,275	0,188	0,188	0,188	0,188	0,188
185	0,808	0,584	0,403	0,283	0,188	0,188	0,188	0,188	0,188
190	0,815	0,591	0,411	0,291	0,188	0,188	0,188	0,188	0,188
195	0,822	0,598	0,418	0,299	0,189	0,188	0,188	0,188	0,188
200	0,828	0,604	0,425	0,306	0,196	0,188	0,188	0,188	0,188
205	0,834	0,610	0,432	0,313	0,203	0,188	0,188	0,188	0,188
210	0,840	0,616	0,438	0,319	0,210	0,188	0,188	0,188	0,188
215	0,845	0,622	0,444	0,325	0,216	0,188	0,188	0,188	0,188
220	0,851	0,627	0,449	0,331	0,223	0,188	0,188	0,188	0,188
225	0,856	0,633	0,455	0,337	0,228	0,188	0,188	0,188	0,188
230	0,860	0,637	0,460	0,342	0,234	0,188	0,188	0,188	0,188
235	0,865	0,642	0,465	0,347	0,239	0,188	0,188	0,188	0,188
240	0,869	0,647	0,470	0,352	0,245	0,188	0,188	0,188	0,188
245	0,874	0,651	0,474	0,357	0,249	0,188	0,188	0,188	0,188
250	0,878	0,655	0,479	0,362	0,254	0,188	0,188	0,188	0,188
255	0,881	0,659	0,483	0,366	0,259	0,188	0,188	0,188	0,188
260	0,885	0,663	0,487	0,370	0,263	0,188	0,188	0,188	0,188
265	0,889	0,667	0,491	0,374	0,267	0,188	0,188	0,188	0,188
270	0,892	0,670	0,494	0,378	0,271	0,188	0,188	0,188	0,188
275	0,896	0,674	0,498	0,382	0,275	0,188	0,188	0,188	0,188
280	0,899	0,677	0,501	0,385	0,279	0,191	0,188	0,188	0,188
285	0,902	0,680	0,505	0,389	0,282	0,195	0,188	0,188	0,188
290	0,905	0,684	0,508	0,392	0,286	0,199	0,188	0,188	0,188
295	0,908	0,687	0,511	0,395	0,289	0,202	0,188	0,188	0,188
300	0,911	0,689	0,514	0,399	0,293	0,206	0,188	0,188	0,188

Table 3 - Layer thicknesses R 45 for open section beams in three-sided fire exposure

R 45	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
70	0,882	0,575	0,316	0,188	0,188	0,188	0,188	0,188	0,188
75	0,928	0,623	0,367	0,192	0,188	0,188	0,188	0,188	0,188
80	0,967	0,665	0,412	0,239	0,188	0,188	0,188	0,188	0,188
85	1,003	0,702	0,452	0,281	0,188	0,188	0,188	0,188	0,188
90	1,035	0,735	0,487	0,319	0,188	0,188	0,188	0,188	0,188
95	1,063	0,765	0,518	0,352	0,194	0,188	0,188	0,188	0,188
100	1,089	0,792	0,546	0,381	0,226	0,188	0,188	0,188	0,188
105	1,113	0,816	0,572	0,408	0,254	0,188	0,188	0,188	0,188
110	1,134	0,838	0,595	0,433	0,279	0,188	0,188	0,188	0,188
115	1,154	0,858	0,616	0,455	0,303	0,188	0,188	0,188	0,188
120	1,172	0,877	0,635	0,475	0,324	0,198	0,188	0,188	0,188
125	1,188	0,894	0,653	0,494	0,343	0,218	0,188	0,188	0,188
130	1,204	0,910	0,669	0,511	0,361	0,237	0,188	0,188	0,188
135	1,218	0,924	0,685	0,527	0,378	0,254	0,188	0,188	0,188
140	1,232	0,938	0,699	0,541	0,393	0,270	0,188	0,188	0,188
145	1,244	0,951	0,712	0,555	0,407	0,285	0,188	0,188	0,188
150	1,256	0,962	0,724	0,568	0,421	0,299	0,196	0,188	0,188
155	1,267	0,973	0,736	0,580	0,433	0,312	0,209	0,188	0,188
160	1,277	0,984	0,746	0,591	0,445	0,324	0,222	0,188	0,188
165	1,287	0,994	0,756	0,601	0,456	0,335	0,233	0,188	0,188
170	1,296	1,003	0,766	0,611	0,466	0,346	0,244	0,188	0,188
175	1,305	1,012	0,775	0,620	0,475	0,355	0,255	0,188	0,188
180	1,313	1,020	0,783	0,629	0,484	0,365	0,264	0,188	0,188
185	1,320	1,027	0,791	0,637	0,493	0,374	0,274	0,188	0,188
190	1,328	1,035	0,799	0,645	0,501	0,382	0,282	0,189	0,188
195	1,335	1,042	0,806	0,653	0,509	0,390	0,290	0,198	0,188
200	1,341	1,048	0,813	0,660	0,516	0,398	0,298	0,206	0,188
205	1,348	1,055	0,819	0,666	0,523	0,405	0,306	0,213	0,188
210	1,354	1,061	0,825	0,673	0,530	0,412	0,313	0,221	0,188
215	1,359	1,067	0,831	0,679	0,536	0,418	0,319	0,228	0,188
220	1,365	1,072	0,837	0,685	0,542	0,424	0,326	0,234	0,188
225	1,370	1,077	0,842	0,690	0,548	0,430	0,332	0,240	0,188
230	-	1,082	0,847	0,695	0,553	0,436	0,338	0,246	0,188
235	-	1,087	0,852	0,701	0,558	0,441	0,343	0,252	0,188
240	-	1,092	0,857	0,705	0,563	0,447	0,349	0,258	0,188
245	-	1,096	0,862	0,710	0,568	0,451	0,354	0,263	0,188
250	-	1,100	0,866	0,715	0,573	0,456	0,359	0,268	0,190
255	-	1,104	0,870	0,719	0,577	0,461	0,363	0,273	0,195
260	-	1,108	0,874	0,723	0,582	0,465	0,368	0,277	0,200
265	-	1,112	0,878	0,727	0,586	0,469	0,372	0,282	0,204
270	-	1,116	0,882	0,731	0,590	0,473	0,376	0,286	0,209
275	-	1,119	0,885	0,734	0,593	0,477	0,380	0,290	0,213
280	-	1,123	0,889	0,738	0,597	0,481	0,384	0,294	0,217
285	-	1,126	0,892	0,741	0,600	0,485	0,388	0,298	0,221
290	-	1,129	0,895	0,745	0,604	0,488	0,392	0,302	0,225
295	-	1,132	0,898	0,748	0,607	0,492	0,395	0,305	0,229
300	-	1,135	0,901	0,751	0,610	0,495	0,398	0,309	0,232

Table 4 - Layer thicknesses R 60 for open section beams in three-sided fire exposure

R 60	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
70	1,373	1,012	0,706	0,500	0,299	0,188	0,188	0,188	0,188
75	1,420	1,061	0,757	0,554	0,356	0,190	0,188	0,188	0,188
80	1,462	1,104	0,802	0,601	0,406	0,242	0,188	0,188	0,188
85	1,499	1,141	0,841	0,642	0,449	0,287	0,188	0,188	0,188
90	1,532	1,175	0,876	0,678	0,488	0,328	0,191	0,188	0,188
95	1,562	1,205	0,907	0,711	0,522	0,363	0,229	0,188	0,188
100	1,590	1,232	0,935	0,740	0,553	0,395	0,262	0,188	0,188
105	1,614	1,257	0,961	0,766	0,580	0,424	0,292	0,188	0,188
110	1,637	1,279	0,984	0,790	0,605	0,450	0,319	0,195	0,188
115	1,657	1,300	1,005	0,812	0,628	0,474	0,343	0,221	0,188
120	1,676	1,318	1,024	0,832	0,648	0,495	0,366	0,244	0,188
125	1,694	1,336	1,042	0,850	0,667	0,515	0,386	0,265	0,188
130	1,710	1,352	1,058	0,867	0,685	0,533	0,405	0,285	0,188
135	1,725	1,367	1,073	0,883	0,701	0,550	0,423	0,303	0,200
140	1,739	1,380	1,087	0,897	0,716	0,566	0,439	0,320	0,217
145	1,752	1,393	1,100	0,911	0,730	0,580	0,454	0,335	0,233
150	1,765	1,405	1,112	0,923	0,743	0,593	0,467	0,349	0,248
155	1,776	1,417	1,124	0,935	0,755	0,606	0,480	0,363	0,261
160	1,787	1,427	1,134	0,946	0,766	0,618	0,493	0,375	0,274
165	1,797	1,437	1,144	0,956	0,777	0,629	0,504	0,387	0,286
170	1,807	1,446	1,154	0,966	0,787	0,639	0,515	0,398	0,298
175	1,816	1,455	1,163	0,975	0,796	0,649	0,525	0,408	0,308
180	1,824	1,464	1,171	0,984	0,805	0,658	0,534	0,418	0,318
185	1,833	1,471	1,179	0,992	0,814	0,667	0,543	0,427	0,328
190	1,840	1,479	1,187	0,999	0,822	0,675	0,551	0,436	0,337
195	1,848	1,486	1,194	1,007	0,829	0,682	0,559	0,444	0,345
200	1,855	1,493	1,200	1,014	0,836	0,690	0,567	0,452	0,353
205	1,861	1,499	1,207	1,020	0,843	0,697	0,574	0,459	0,361
210	1,867	1,505	1,213	1,026	0,849	0,703	0,581	0,466	0,368
215	1,873	1,511	1,219	1,032	0,856	0,710	0,587	0,473	0,375
220	1,879	1,517	1,224	1,038	0,861	0,716	0,594	0,479	0,381
225	-	1,522	1,230	1,044	0,867	0,721	0,600	0,485	0,388
230	-	-	-	1,049	0,872	0,727	0,605	0,491	0,394
235	-	-	-	1,054	0,877	0,732	0,611	0,497	0,399
240	-	-	-	1,059	0,882	0,737	0,616	0,502	0,405
245	-	-	-	1,063	0,887	0,742	0,621	0,507	0,410
250	-	-	-	1,067	0,892	0,747	0,625	0,512	0,415
255	-	-	-	1,072	0,896	0,751	0,630	0,517	0,420
260	-	-	-	1,076	0,900	0,755	0,634	0,521	0,424
265	-	-	-	1,080	0,904	0,760	0,639	0,526	0,429
270	-	-	-	1,083	0,908	0,763	0,643	0,530	0,433
275	-	-	-	1,087	0,912	0,767	0,647	0,534	0,437
280	-	-	-	1,090	0,915	0,771	0,650	0,538	0,441
285	-	-	-	1,094	0,919	0,774	0,654	0,541	0,445
290	-	-	-	1,097	0,922	0,778	0,657	0,545	0,449
295	-	-	-	1,100	0,925	0,781	0,661	0,549	0,452
300	-	-	-	1,103	0,928	0,784	0,664	0,552	0,456

Table 5 - Layer thicknesses R 90 for open section beams in three-sided fire exposure

R 90	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
70	-	-	1,487	1,225	0,966	0,745	0,556	0,375	0,216
75	-	-	1,537	1,277	1,020	0,802	0,615	0,437	0,281
80	-	-	1,581	1,323	1,067	0,851	0,667	0,491	0,337
85	-	-	1,620	1,363	1,108	0,894	0,712	0,538	0,386
90	-	-	1,655	1,398	1,145	0,932	0,751	0,579	0,429
95	-	-	1,685	1,429	1,177	0,966	0,786	0,615	0,467
100	-	-	1,713	1,457	1,206	0,996	0,818	0,648	0,500
105	-	-	1,738	1,483	1,233	1,023	0,846	0,677	0,531
110	-	-	1,761	1,506	1,256	1,048	0,871	0,703	0,558
115	-	-	1,782	1,527	1,278	1,070	0,894	0,727	0,583
120	-	-	1,801	1,546	1,298	1,091	0,915	0,749	0,605
125	-	-	1,818	1,564	1,316	1,109	0,935	0,769	0,626
130	-	-	1,835	1,580	1,332	1,126	0,952	0,787	0,645
135	-	-	1,850	1,595	1,348	1,142	0,969	0,804	0,662
140	-	-	1,863	1,609	1,362	1,157	0,984	0,820	0,678
145	-	-	1,876	1,622	1,375	1,170	0,998	0,834	0,693
150	-	-	-	1,634	1,388	1,183	1,011	0,848	0,707
155	-	-	-	1,646	1,399	1,195	1,023	0,860	0,720
160	-	-	-	1,656	1,410	1,206	1,034	0,872	0,732
165	-	-	-	1,666	1,420	1,216	1,045	0,883	0,744
170	-	-	-	1,675	1,430	1,226	1,055	0,893	0,754
175	-	-	-	1,684	1,438	1,235	1,064	0,903	0,764
180	-	-	-	1,692	1,447	1,244	1,073	0,912	0,774
185	-	-	-	1,700	1,455	1,252	1,082	0,921	0,783
190	-	-	-	1,708	1,462	1,260	1,090	0,929	0,791
195	-	-	-	1,715	1,470	1,267	1,097	0,937	0,799
200	-	-	-	1,721	1,476	1,274	1,104	0,944	0,806
205	-	-	-	1,728	1,483	1,281	1,111	0,951	0,813
210	-	-	-	1,734	1,489	1,287	1,117	0,958	0,820
215	-	-	-	1,740	1,495	1,293	1,123	0,964	0,827
220	-	-	-	1,745	1,500	1,298	1,129	0,970	0,833
225	-	-	-	1,750	1,506	1,304	1,135	0,976	0,839
230	-	-	-	-	-	-	-	0,981	0,844
235	-	-	-	-	-	-	-	0,986	0,850
240	-	-	-	-	-	-	-	0,991	0,855
245	-	-	-	-	-	-	-	0,996	0,860
250	-	-	-	-	-	-	-	1,001	0,864
255	-	-	-	-	-	-	-	1,005	0,869
260	-	-	-	-	-	-	-	1,009	0,873
265	-	-	-	-	-	-	-	1,013	0,878
270	-	-	-	-	-	-	-	1,017	0,882
275	-	-	-	-	-	-	-	1,021	0,885
280	-	-	-	-	-	-	-	1,025	0,889
285	-	-	-	-	-	-	-	1,028	0,893
290	-	-	-	-	-	-	-	1,031	0,896
295	-	-	-	-	-	-	-	1,035	0,899
300	-	-	-	-	-	-	-	1,038	0,903

Table 6 -Layer thicknesses R 15 for open section columns and open section beams in four-sided fire exposure

R 15	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
70	0,160	0,160	0,160	0,160	0,160	160	0,160	0,160	0,160
75	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
80	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
85	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
90	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
95	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
100	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
105	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
110	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
115	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
120	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
125	0,170	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
130	0,184	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
135	0,197	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
140	0,209	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
145	0,221	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
150	0,231	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
155	0,242	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
160	0,251	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
165	0,260	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
170	0,268	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
175	0,276	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
180	0,283	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
185	0,290	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
190	0,297	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
195	0,304	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
200	0,310	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
205	0,315	0,164	0,160	0,160	0,160	0,160	0,160	0,160	0,160
210	0,321	0,170	0,160	0,160	0,160	0,160	0,160	0,160	0,160
215	0,326	0,176	0,160	0,160	0,160	0,160	0,160	0,160	0,160
220	0,331	0,181	0,160	0,160	0,160	0,160	0,160	0,160	0,160
225	0,336	0,186	0,160	0,160	0,160	0,160	0,160	0,160	0,160
230	0,340	0,191	0,160	0,160	0,160	0,160	0,160	0,160	0,160
235	0,345	0,196	0,160	0,160	0,160	0,160	0,160	0,160	0,160
240	0,349	0,200	0,160	0,160	0,160	0,160	0,160	0,160	0,160
245	0,353	0,205	0,160	0,160	0,160	0,160	0,160	0,160	0,160
250	0,357	0,209	0,160	0,160	0,160	0,160	0,160	0,160	0,160
255	0,361	0,213	0,160	0,160	0,160	0,160	0,160	0,160	0,160
260	0,364	0,217	0,160	0,160	0,160	0,160	0,160	0,160	0,160
265	0,368	0,220	0,160	0,160	0,160	0,160	0,160	0,160	0,160
270	0,371	0,224	0,160	0,160	0,160	0,160	0,160	0,160	0,160
275	0,374	0,227	0,160	0,160	0,160	0,160	0,160	0,160	0,160
280	0,377	0,231	0,160	0,160	0,160	0,160	0,160	0,160	0,160
285	0,380	0,234	0,160	0,160	0,160	0,160	0,160	0,160	0,160
290	0,383	0,237	0,160	0,160	0,160	0,160	0,160	0,160	0,160
295	0,386	0,240	0,160	0,160	0,160	0,160	0,160	0,160	0,160
300	0,389	0,243	0,160	0,160	0,160	0,160	0,160	0,160	0,160

Table 7 - Layer thicknesses R 30 for open section columns and open section beams in four-sided fire exposure

R 30	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
70	0,384	0,160	0,160	0,160	0,160	0,160	0,160	0,160	0,160
75	0,428	0,184	0,160	0,160	0,160	0,160	0,160	0,160	0,160
80	0,466	0,226	0,160	0,160	0,160	0,160	0,160	0,160	0,160
85	0,501	0,263	0,160	0,160	0,160	0,160	0,160	0,160	0,160
90	0,531	0,296	0,160	0,160	0,160	0,160	0,160	0,160	0,160
95	0,559	0,326	0,160	0,160	0,160	0,160	0,160	0,160	0,160
100	0,584	0,352	0,160	0,160	0,160	0,160	0,160	0,160	0,160
105	0,606	0,377	0,181	0,160	0,160	0,160	0,160	0,160	0,160
110	0,627	0,399	0,205	0,160	0,160	0,160	0,160	0,160	0,160
115	0,646	0,419	0,226	0,160	0,160	0,160	0,160	0,160	0,160
120	0,663	0,437	0,246	0,160	0,160	0,160	0,160	0,160	0,160
125	0,679	0,454	0,264	0,160	0,160	0,160	0,160	0,160	0,160
130	0,694	0,470	0,281	0,160	0,160	0,160	0,160	0,160	0,160
135	0,708	0,485	0,296	0,169	0,160	0,160	0,160	0,160	0,160
140	0,721	0,498	0,311	0,184	0,160	0,160	0,160	0,160	0,160
145	0,733	0,511	0,324	0,198	0,160	0,160	0,160	0,160	0,160
150	0,744	0,522	0,336	0,211	0,160	0,160	0,160	0,160	0,160
155	0,754	0,533	0,348	0,224	0,160	0,160	0,160	0,160	0,160
160	0,764	0,544	0,359	0,235	0,160	0,160	0,160	0,160	0,160
165	0,774	0,554	0,369	0,246	0,160	0,160	0,160	0,160	0,160
170	0,782	0,563	0,379	0,256	0,160	0,160	0,160	0,160	0,160
175	0,791	0,571	0,388	0,265	0,160	0,160	0,160	0,160	0,160
180	0,798	0,579	0,396	0,274	0,169	0,160	0,160	0,160	0,160
185	0,806	0,587	0,405	0,283	0,178	0,160	0,160	0,160	0,160
190	0,813	0,595	0,412	0,291	0,187	0,160	0,160	0,160	0,160
195	0,819	0,601	0,419	0,299	0,195	0,160	0,160	0,160	0,160
200	0,826	0,608	0,426	0,306	0,202	0,160	0,160	0,160	0,160
205	0,832	0,614	0,433	0,313	0,209	0,160	0,160	0,160	0,160
210	0,838	0,620	0,439	0,319	0,216	0,160	0,160	0,160	0,160
215	0,843	0,626	0,445	0,325	0,222	0,160	0,160	0,160	0,160
220	0,848	0,631	0,451	0,331	0,229	0,160	0,160	0,160	0,160
225	0,853	0,637	0,456	0,337	0,235	0,160	0,160	0,160	0,160
230	0,858	0,642	0,462	0,342	0,240	0,160	0,160	0,160	0,160
235	0,863	0,646	0,466	0,348	0,246	0,160	0,160	0,160	0,160
240	0,867	0,651	0,471	0,353	0,251	0,160	0,160	0,160	0,160
245	0,872	0,655	0,476	0,357	0,256	0,160	0,160	0,160	0,160
250	0,876	0,660	0,480	0,362	0,260	0,165	0,160	0,160	0,160
255	0,880	0,664	0,484	0,366	0,265	0,169	0,160	0,160	0,160
260	0,883	0,668	0,488	0,371	0,269	0,174	0,160	0,160	0,160
265	0,887	0,671	0,492	0,375	0,274	0,178	0,160	0,160	0,160
270	0,891	0,675	0,496	0,378	0,278	0,183	0,160	0,160	0,160
275	0,894	0,678	0,500	0,382	0,282	0,187	0,160	0,160	0,160
280	0,897	0,682	0,503	0,386	0,285	0,190	0,160	0,160	0,160
285	0,900	0,685	0,507	0,389	0,289	0,194	0,160	0,160	0,160
290	0,903	0,688	0,510	0,393	0,292	0,198	0,160	0,160	0,160
295	0,906	0,691	0,513	0,396	0,296	0,201	0,160	0,160	0,160
300	0,909	0,694	0,516	0,399	0,299	0,205	0,160	0,160	0,160

Table 8 - Layer thicknesses R 45 for open section columns and open section beams in four-sided fire exposure

R 45	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m-1)	350	400	450	500	550	600	650	700	750
70	0,879	0,581	0,317	0,160	0,160	0,160	0,160	0,160	0,160
75	0,925	0,629	0,369	0,191	0,160	0,160	0,160	0,160	0,160
80	0,965	0,672	0,414	0,239	0,160	0,160	0,160	0,160	0,160
85	1,001	0,709	0,454	0,281	0,160	0,160	0,160	0,160	0,160
90	1,033	0,743	0,489	0,319	0,169	0,160	0,160	0,160	0,160
95	1,062	0,773	0,521	0,352	0,204	0,160	0,160	0,160	0,160
100	1,088	0,800	0,550	0,383	0,236	0,160	0,160	0,160	0,160
105	1,112	0,824	0,575	0,410	0,264	0,160	0,160	0,160	0,160
110	1,134	0,846	0,599	0,434	0,290	0,160	0,160	0,160	0,160
115	1,153	0,867	0,620	0,457	0,313	0,175	0,160	0,160	0,160
120	1,172	0,885	0,640	0,477	0,335	0,197	0,160	0,160	0,160
125	1,188	0,903	0,657	0,496	0,354	0,218	0,160	0,160	0,160
130	1,204	0,919	0,674	0,513	0,372	0,236	0,160	0,160	0,160
135	1,218	0,933	0,689	0,529	0,389	0,254	0,160	0,160	0,160
140	1,232	0,947	0,704	0,544	0,404	0,270	0,165	0,160	0,160
145	1,244	0,960	0,717	0,558	0,419	0,285	0,181	0,160	0,160
150	1,256	0,972	0,729	0,570	0,432	0,299	0,195	0,160	0,160
155	1,267	0,983	0,741	0,582	0,445	0,312	0,209	0,160	0,160
160	1,278	0,993	0,751	0,594	0,456	0,324	0,221	0,160	0,160
165	1,287	1,003	0,762	0,604	0,467	0,335	0,233	0,160	0,160
170	1,296	1,012	0,771	0,614	0,477	0,346	0,244	0,160	0,160
175	1,305	1,021	0,780	0,623	0,487	0,356	0,254	0,160	0,160
180	1,313	1,029	0,789	0,632	0,496	0,365	0,264	0,170	0,160
185	1,321	1,037	0,797	0,641	0,505	0,374	0,273	0,180	0,160
190	1,328	1,045	0,804	0,648	0,513	0,383	0,282	0,189	0,160
195	1,335	1,052	0,812	0,656	0,521	0,391	0,290	0,197	0,160
200	1,342	1,058	0,818	0,663	0,528	0,398	0,298	0,205	0,160
205	1,348	1,065	0,825	0,670	0,535	0,406	0,306	0,213	0,160
210	1,355	1,071	0,831	0,676	0,542	0,412	0,313	0,220	0,160
215	1,360	1,077	0,837	0,682	0,548	0,419	0,319	0,227	0,160
220	1,366	1,082	0,843	0,688	0,554	0,425	0,326	0,234	0,160
225	1,371	1,087	0,848	0,694	0,560	0,431	0,332	0,240	0,161
230	-	1,092	0,853	0,699	0,565	0,437	0,338	0,246	0,167
235	-	1,097	0,858	0,704	0,571	0,442	0,343	0,252	0,173
240	-	1,102	0,863	0,709	0,576	0,447	0,349	0,257	0,179
245	-	1,106	0,868	0,714	0,580	0,452	0,354	0,263	0,184
250	-	1,111	0,872	0,718	0,585	0,457	0,359	0,268	0,190
255	-	1,115	0,876	0,722	0,590	0,462	0,364	0,273	0,195
260	-	1,119	0,880	0,727	0,594	0,466	0,368	0,277	0,199
265	-	1,122	0,884	0,731	0,598	0,470	0,372	0,282	0,204
270	-	1,126	0,888	0,734	0,602	0,474	0,377	0,286	0,208
275	-	1,130	0,891	0,738	0,606	0,478	0,381	0,290	0,213
280	-	1,133	0,895	0,742	0,609	0,482	0,385	0,294	0,217
285	-	1,136	0,898	0,745	0,613	0,486	0,388	0,298	0,221
290	-	1,139	0,901	0,748	0,616	0,489	0,392	0,302	0,225
295	-	-	0,904	0,752	0,620	0,493	0,395	0,305	0,228
300	-	-	0,907	0,755	0,623	0,496	0,399	0,309	0,232

Table 9 - Layer thicknesses R 60 for open section columns and open section beams in four-sided fire exposure

R 60	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
70	1,375	1,025	0,713	0,503	0,314	0,160	0,160	0,160	0,160
75	1,422	1,074	0,764	0,557	0,372	0,189	0,160	0,160	0,160
80	1,464	1,117	0,809	0,604	0,422	0,242	0,160	0,160	0,160
85	1,502	1,155	0,849	0,646	0,465	0,288	0,160	0,160	0,160
90	1,535	1,189	0,884	0,683	0,504	0,328	0,191	0,160	0,160
95	1,566	1,219	0,916	0,716	0,538	0,364	0,228	0,160	0,160
100	1,593	1,247	0,944	0,745	0,569	0,396	0,262	0,160	0,160
105	1,618	1,272	0,969	0,772	0,597	0,425	0,292	0,167	0,160
110	1,640	1,294	0,992	0,796	0,622	0,451	0,319	0,195	0,160
115	1,661	1,315	1,014	0,818	0,645	0,475	0,344	0,221	0,160
120	1,680	1,334	1,033	0,838	0,666	0,497	0,366	0,244	0,160
125	1,698	1,351	1,051	0,856	0,685	0,517	0,387	0,265	0,160
130	1,714	1,367	1,067	0,873	0,702	0,535	0,406	0,285	0,181
135	1,729	1,382	1,082	0,889	0,719	0,552	0,423	0,303	0,199
140	1,743	1,396	1,097	0,903	0,734	0,568	0,440	0,320	0,216
145	1,756	1,409	1,110	0,917	0,748	0,582	0,455	0,335	0,232
150	1,769	1,421	1,122	0,930	0,761	0,596	0,469	0,350	0,247
155	1,780	1,432	1,133	0,941	0,773	0,608	0,482	0,363	0,261
160	1,791	1,443	1,144	0,952	0,784	0,620	0,494	0,376	0,274
165	1,801	1,453	1,154	0,963	0,795	0,631	0,505	0,387	0,286
170	1,811	1,462	1,164	0,972	0,805	0,641	0,516	0,398	0,298
175	1,820	1,471	1,173	0,982	0,814	0,651	0,526	0,409	0,308
180	1,828	1,479	1,181	0,990	0,823	0,660	0,535	0,419	0,318
185	1,836	1,487	1,189	0,998	0,832	0,669	0,544	0,428	0,328
190	1,844	1,495	1,197	1,006	0,840	0,677	0,553	0,437	0,337
195	1,851	1,502	1,204	1,013	0,847	0,685	0,561	0,445	0,345
200	1,858	1,509	1,210	1,020	0,854	0,692	0,568	0,453	0,353
205	1,865	1,515	1,217	1,027	0,861	0,699	0,576	0,460	0,361
210	1,871	1,521	1,223	1,033	0,867	0,706	0,583	0,467	0,368
215	1,877	1,527	1,229	1,039	0,874	0,712	0,589	0,474	0,375
220	-	1,533	1,235	1,045	0,880	0,719	0,595	0,480	0,382
225	-	1,538	1,240	1,050	0,885	0,724	0,601	0,486	0,388
230	-	-	-	1,056	0,890	0,730	0,607	0,492	0,394
235	-	-	-	1,061	0,896	0,735	0,612	0,498	0,400
240	-	-	-	1,065	0,901	0,740	0,618	0,503	0,405
245	-	-	-	1,070	0,905	0,745	0,622	0,508	0,410
250	-	-	-	1,074	0,910	0,750	0,627	0,513	0,415
255	-	-	-	1,079	0,914	0,754	0,632	0,518	0,420
260	-	-	-	1,083	0,918	0,758	0,636	0,522	0,425
265	-	-	-	1,087	0,922	0,762	0,640	0,527	0,429
270	-	-	-	1,090	0,926	0,766	0,645	0,531	0,434
275	-	-	-	1,094	0,930	0,770	0,648	0,535	0,438
280	-	-	-	1,097	0,933	0,774	0,652	0,539	0,442
285	-	-	-	1,101	0,937	0,777	0,656	0,543	0,446
290	-	-	-	1,104	0,940	0,781	0,659	0,546	0,449
295	-	-	-	1,107	0,943	0,784	0,663	0,550	0,453
300	-	-	-	1,110	0,946	0,787	0,666	0,553	0,456

Table 10 - Layer thicknesses R 90 for open section columns and open section beams in four-sided fire exposure

R 90	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
70	-	-	1,505	1,238	0,995	0,750	0,558	0,375	0,216
75	-	-	1,555	1,290	1,049	0,807	0,618	0,438	0,281
80	-	-	1,600	1,335	1,097	0,857	0,670	0,492	0,338
85	-	-	1,639	1,375	1,138	0,900	0,715	0,539	0,387
90	-	-	1,673	1,411	1,175	0,938	0,755	0,581	0,430
95	-	-	1,704	1,442	1,207	0,972	0,790	0,617	0,468
100	-	-	1,732	1,471	1,236	1,002	0,821	0,650	0,502
105	-	-	1,757	1,496	1,263	1,029	0,850	0,679	0,532
110	-	-	1,780	1,519	1,286	1,054	0,875	0,706	0,559
115	-	-	1,801	1,540	1,308	1,076	0,898	0,730	0,584
120	-	-	1,820	1,560	1,328	1,097	0,920	0,752	0,607
125	-	-	1,837	1,577	1,346	1,116	0,939	0,772	0,628
130	-	-	1,854	1,594	1,363	1,133	0,957	0,790	0,647
135	-	-	1,869	1,609	1,378	1,149	0,973	0,807	0,664
140	-	-	-	1,623	1,392	1,163	0,988	0,823	0,680
145	-	-	-	1,636	1,405	1,177	1,002	0,837	0,695
150	-	-	-	1,648	1,418	1,190	1,015	0,851	0,709
155	-	-	-	1,659	1,429	1,202	1,028	0,863	0,722
160	-	-	-	1,670	1,440	1,213	1,039	0,875	0,734
165	-	-	-	1,680	1,450	1,223	1,050	0,886	0,746
170	-	-	-	1,689	1,460	1,233	1,060	0,897	0,756
175	-	-	-	1,698	1,469	1,242	1,069	0,906	0,766
180	-	-	-	1,706	1,477	1,251	1,078	0,915	0,776
185	-	-	-	1,714	1,485	1,259	1,086	0,924	0,785
190	-	-	-	1,721	1,493	1,266	1,094	0,932	0,793
195	-	-	-	1,728	1,500	1,274	1,102	0,940	0,801
200	-	-	-	1,735	1,506	1,281	1,109	0,947	0,809
205	-	-	-	1,741	1,513	1,287	1,116	0,954	0,816
210	-	-	-	1,747	1,519	1,294	1,122	0,961	0,823
215	-	-	-	1,753	1,525	1,300	1,128	0,967	0,829
220	-	-	-	1,759	1,530	1,305	1,134	0,973	0,835
225	-	-	-	1,764	1,536	1,311	1,140	0,979	0,841
230	-	-	-	-	-	-	-	0,984	0,847
235	-	-	-	-	-	-	-	0,990	0,852
240	-	-	-	-	-	-	-	0,995	0,857
245	-	-	-	-	-	-	-	0,999	0,862
250	-	-	-	-	-	-	-	1,004	0,867
255	-	-	-	-	-	-	-	1,008	0,871
260	-	-	-	-	-	-	-	1,013	0,876
265	-	-	-	-	-	-	-	1,017	0,880
270	-	-	-	-	-	-	-	1,021	0,884
275	-	-	-	-	-	-	-	1,024	0,888
280	-	-	-	-	-	-	-	1,028	0,892
285	-	-	-	-	-	-	-	1,032	0,895
290	-	-	-	-	-	-	-	1,035	0,899
295	-	-	-	-	-	-	-	1,038	0,902
300	-	-	-	-	-	-	-	1,041	0,905

Table 11 - Layer thicknesses R 15 for circular hollow section columns and beams

R 15	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
77	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
80	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
85	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
90	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
95	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
100	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
105	0,292	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
110	0,319	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
115	0,346	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
120	0,373	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
125	0,401	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
130	0,428	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
135	0,455	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
140	0,482	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
145	0,509	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
150	0,536	0,278	0,278	0,278	0,278	0,278	0,278	0,278	0,278
155	0,562	0,279	0,278	0,278	0,278	0,278	0,278	0,278	0,278
160	0,589	0,301	0,278	0,278	0,278	0,278	0,278	0,278	0,278
165	0,616	0,322	0,278	0,278	0,278	0,278	0,278	0,278	0,278
170	0,643	0,343	0,278	0,278	0,278	0,278	0,278	0,278	0,278
175	0,670	0,363	0,278	0,278	0,278	0,278	0,278	0,278	0,278
180	0,697	0,383	0,278	0,278	0,278	0,278	0,278	0,278	0,278
185	0,724	0,403	0,278	0,278	0,278	0,278	0,278	0,278	0,278
190	0,750	0,423	0,278	0,278	0,278	0,278	0,278	0,278	0,278
195	0,777	0,442	0,278	0,278	0,278	0,278	0,278	0,278	0,278
200	0,804	0,461	0,278	0,278	0,278	0,278	0,278	0,278	0,278
205	0,830	0,480	0,278	0,278	0,278	0,278	0,278	0,278	0,278
210	0,857	0,498	0,278	0,278	0,278	0,278	0,278	0,278	0,278
215	0,884	0,516	0,278	0,278	0,278	0,278	0,278	0,278	0,278
220	0,910	0,534	0,288	0,278	0,278	0,278	0,278	0,278	0,278
225	0,937	0,552	0,303	0,278	0,278	0,278	0,278	0,278	0,278
230	0,963	0,570	0,317	0,278	0,278	0,278	0,278	0,278	0,278

Table 12 - Layer thicknesses R 30 for circular hollow section columns and beams

R 30	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
77	0,829	0,569	0,322	0,278	0,278	0,278	0,278	0,278	0,278
80	0,865	0,601	0,353	0,278	0,278	0,278	0,278	0,278	0,278
85	0,936	0,665	0,415	0,278	0,278	0,278	0,278	0,278	0,278
90	1,007	0,728	0,474	0,278	0,278	0,278	0,278	0,278	0,278
95	1,078	0,790	0,531	0,297	0,278	0,278	0,278	0,278	0,278
100	1,149	0,851	0,587	0,351	0,278	0,278	0,278	0,278	0,278
105	1,220	0,911	0,641	0,403	0,278	0,278	0,278	0,278	0,278
110	-	0,969	0,693	0,453	0,278	0,278	0,278	0,278	0,278
115	-	1,027	0,744	0,500	0,289	0,278	0,278	0,278	0,278
120	-	1,084	0,793	0,546	0,334	0,278	0,278	0,278	0,278
125	-	1,140	0,841	0,590	0,377	0,278	0,278	0,278	0,278
130	-	1,195	0,888	0,632	0,417	0,278	0,278	0,278	0,278
135	-	1,250	0,933	0,673	0,456	0,278	0,278	0,278	0,278
140	-	-	0,977	0,712	0,493	0,309	0,278	0,278	0,278
145	-	-	1,020	0,750	0,529	0,344	0,278	0,278	0,278
150	-	-	1,062	0,787	0,563	0,377	0,278	0,278	0,278
155	-	-	1,103	0,822	0,596	0,409	0,278	0,278	0,278
160	-	-	1,142	0,856	0,627	0,439	0,282	0,278	0,278
165	-	-	1,181	0,889	0,657	0,468	0,311	0,278	0,278
170	-	-	1,219	0,921	0,686	0,496	0,338	0,278	0,278
175	-	-	1,255	0,952	0,714	0,522	0,364	0,278	0,278
180	-	-	-	0,982	0,741	0,547	0,389	0,278	0,278
185	-	-	-	1,011	0,766	0,571	0,412	0,280	0,278
190	-	-	-	1,039	0,791	0,595	0,435	0,303	0,278
195	-	-	-	1,066	0,815	0,617	0,457	0,324	0,278
200	-	-	-	1,092	0,838	0,638	0,477	0,345	0,278
205	-	-	-	1,118	0,860	0,659	0,497	0,364	0,278
210	-	-	-	1,143	0,882	0,679	0,516	0,383	0,278
215	-	-	-	1,167	0,903	0,698	0,534	0,401	0,290
220	-	-	-	1,190	0,923	0,716	0,552	0,418	0,307
225	-	-	-	1,213	0,943	0,734	0,569	0,434	0,323
230	-	-	-	1,235	0,961	0,751	0,585	0,450	0,339

Table 13 - Layer thicknesses R 45 for circular hollow section columns and beams

R 45	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
77	-	1,186	0,972	0,722	0,483	0,291	0,278	0,278	0,278
80	-	-	1,020	0,767	0,529	0,303	0,278	0,278	0,278
85	-	-	1,111	0,853	0,614	0,390	0,278	0,278	0,278
90	-	-	1,200	0,936	0,694	0,471	0,278	0,278	0,278
95	-	-	-	1,015	0,770	0,546	0,342	0,278	0,278
100	-	-	-	1,091	0,842	0,617	0,413	0,278	0,278
105	-	-	-	1,163	0,910	0,683	0,480	0,296	0,278
110	-	-	-	1,233	0,974	0,746	0,542	0,360	0,278
115	-	-	-	-	1,036	0,804	0,600	0,419	0,278
120	-	-	-	-	1,094	0,860	0,655	0,473	0,312
125	-	-	-	-	1,150	0,912	0,706	0,524	0,364
130	-	-	-	-	1,203	0,962	0,754	0,572	0,412
135	-	-	-	-	1,253	1,009	0,799	0,617	0,457
140	-	-	-	-	-	1,053	0,841	0,659	0,499
145	-	-	-	-	-	1,096	0,882	0,698	0,539
150	-	-	-	-	-	1,136	0,920	0,735	0,576
155	-	-	-	-	-	1,175	0,956	0,770	0,610
160	-	-	-	-	-	1,211	0,991	0,804	0,643
165	-	-	-	-	-	1,246	1,023	0,835	0,674
170	-	-	-	-	-	-	1,054	0,865	0,703
175	-	-	-	-	-	-	1,084	0,893	0,731
180	-	-	-	-	-	-	1,112	0,920	0,757
185	-	-	-	-	-	-	1,139	0,946	0,782
190	-	-	-	-	-	-	1,165	0,970	0,806
195	-	-	-	-	-	-	1,190	0,994	0,829
200	-	-	-	-	-	-	1,213	1,016	0,850
205	-	-	-	-	-	-	1,236	1,037	0,871
210	-	-	-	-	-	-	1,258	1,058	0,890
215	-	-	-	-	-	-	-	1,077	0,909
220	-	-	-	-	-	-	-	1,096	0,927
225	-	-	-	-	-	-	-	1,114	0,944
230	-	-	-	-	-	-	-	1,131	0,961

Table 14 - Layer thicknesses R 60 for circular hollow section columns and beams

R 60	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
77	-	-	-	-	1,101	0,860	0,629	0,410	0,278
80	-	-	-	-	1,157	0,914	0,685	0,467	0,278
85	-	-	-	-	1,262	1,017	0,787	0,572	0,370
90	-	-	-	-	-	1,112	0,881	0,667	0,469
95	-	-	-	-	-	1,200	0,968	0,755	0,558
100	-	-	-	-	-	-	1,049	0,835	0,640
105	-	-	-	-	-	-	1,124	0,909	0,714
110	-	-	-	-	-	-	1,194	0,978	0,783
115	-	-	-	-	-	-	1,259	1,041	0,846
120	-	-	-	-	-	-	-	1,100	0,904
125	-	-	-	-	-	-	-	1,156	0,959
130	-	-	-	-	-	-	-	1,207	1,009
135	-	-	-	-	-	-	-	1,255	1,056
140	-	-	-	-	-	-	-	-	1,100
145	-	-	-	-	-	-	-	-	1,141
150	-	-	-	-	-	-	-	-	1,180
155	-	-	-	-	-	-	-	-	1,217
160	-	-	-	-	-	-	-	-	1,251
165	-	-	-	-	-	-	-	-	-
170	-	-	-	-	-	-	-	-	-
175	-	-	-	-	-	-	-	-	-
180	-	-	-	-	-	-	-	-	-
185	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-
225	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-

Table 15 - Layer thicknesses R 15 for rectangular hollow section columns and beams in four-sided fire exposure

R 15	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
62	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
65	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
70	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
75	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
80	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
85	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
90	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
95	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
100	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
105	0,278	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
110	0,317	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
115	0,353	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
120	0,387	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
125	0,418	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
130	0,448	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
135	0,476	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
140	0,503	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
145	0,528	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
150	0,551	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
155	0,574	0,260	0,260	0,260	0,260	0,260	0,260	0,260	0,260
160	0,595	0,279	0,260	0,260	0,260	0,260	0,260	0,260	0,260
165	0,615	0,300	0,260	0,260	0,260	0,260	0,260	0,260	0,260
170	0,635	0,320	0,260	0,260	0,260	0,260	0,260	0,260	0,260
175	0,653	0,339	0,260	0,260	0,260	0,260	0,260	0,260	0,260
180	0,671	0,358	0,260	0,260	0,260	0,260	0,260	0,260	0,260
185	0,687	0,376	0,260	0,260	0,260	0,260	0,260	0,260	0,260
190	0,703	0,393	0,260	0,260	0,260	0,260	0,260	0,260	0,260
195	0,719	0,409	0,260	0,260	0,260	0,260	0,260	0,260	0,260
200	0,733	0,425	0,260	0,260	0,260	0,260	0,260	0,260	0,260
205	0,748	0,440	0,260	0,260	0,260	0,260	0,260	0,260	0,260
210	0,761	0,454	0,260	0,260	0,260	0,260	0,260	0,260	0,260
215	0,774	0,468	0,260	0,260	0,260	0,260	0,260	0,260	0,260
220	0,786	0,482	0,260	0,260	0,260	0,260	0,260	0,260	0,260
225	0,798	0,495	0,260	0,260	0,260	0,260	0,260	0,260	0,260
230	0,810	0,507	0,260	0,260	0,260	0,260	0,260	0,260	0,260
233	0,817	0,515	0,260	0,260	0,260	0,260	0,260	0,260	0,260

Table 16 - Layer thicknesses R 30 for rectangular hollow section columns and beams in four-sided fire exposure

R 30	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
62	0,715	0,346	0,260	0,260	0,260	0,260	0,260	0,260	0,260
65	0,780	0,407	0,260	0,260	0,260	0,260	0,260	0,260	0,260
70	0,879	0,501	0,260	0,260	0,260	0,260	0,260	0,260	0,260
75	0,970	0,588	0,271	0,260	0,260	0,260	0,260	0,260	0,260
80	1,052	0,668	0,346	0,260	0,260	0,260	0,260	0,260	0,260
85	1,128	0,743	0,417	0,260	0,260	0,260	0,260	0,260	0,260
90	1,198	0,814	0,483	0,260	0,260	0,260	0,260	0,260	0,260
95	-	0,879	0,546	0,260	0,260	0,260	0,260	0,260	0,260
100	-	0,941	0,606	0,309	0,260	0,260	0,260	0,260	0,260
105	-	0,999	0,662	0,362	0,260	0,260	0,260	0,260	0,260
110	-	1,053	0,716	0,412	0,260	0,260	0,260	0,260	0,260
115	-	1,105	0,767	0,461	0,260	0,260	0,260	0,260	0,260
120	-	1,153	0,816	0,508	0,260	0,260	0,260	0,260	0,260
125	-	1,199	0,862	0,552	0,265	0,260	0,260	0,260	0,260
130	-	1,243	0,907	0,595	0,305	0,260	0,260	0,260	0,260
135	-	-	0,949	0,636	0,344	0,260	0,260	0,260	0,260
140	-	-	0,990	0,676	0,381	0,260	0,260	0,260	0,260
145	-	-	1,028	0,714	0,417	0,260	0,260	0,260	0,260
150	-	-	1,066	0,751	0,452	0,260	0,260	0,260	0,260
155	-	-	1,101	0,787	0,486	0,260	0,260	0,260	0,260
160	-	-	1,135	0,821	0,519	0,260	0,260	0,260	0,260
165	-	-	1,168	0,854	0,551	0,260	0,260	0,260	0,260
170	-	-	1,200	0,886	0,582	0,286	0,260	0,260	0,260
175	-	-	1,230	0,917	0,612	0,314	0,260	0,260	0,260
180	-	-	-	0,947	0,641	0,342	0,260	0,260	0,260
185	-	-	-	0,976	0,670	0,368	0,260	0,260	0,260
190	-	-	-	1,004	0,697	0,394	0,260	0,260	0,260
195	-	-	-	1,031	0,724	0,420	0,260	0,260	0,260
200	-	-	-	1,058	0,750	0,444	0,260	0,260	0,260
205	-	-	-	1,083	0,776	0,468	0,260	0,260	0,260
210	-	-	-	1,108	0,800	0,492	0,260	0,260	0,260
215	-	-	-	1,132	0,825	0,515	0,260	0,260	0,260
220	-	-	-	1,155	0,848	0,538	0,260	0,260	0,260
225	-	-	-	1,178	0,871	0,560	0,260	0,260	0,260
230	-	-	-	1,200	0,893	0,582	0,265	0,260	0,260
233	-	-	-	1,213	0,906	0,594	0,277	0,260	0,260

Table 17 - Layer thicknesses R 45 for rectangular hollow section columns and beams in four-sided fire exposure

R 45	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
62	-	-	0,792	0,485	0,272	0,260	0,260	0,260	0,260
65	-	-	0,868	0,553	0,291	0,260	0,260	0,260	0,260
70	-	-	0,985	0,661	0,388	0,260	0,260	0,260	0,260
75	-	-	1,095	0,764	0,481	0,260	0,260	0,260	0,260
80	-	-	1,199	0,861	0,571	0,317	0,260	0,260	0,260
85	-	-	-	0,954	0,656	0,395	0,260	0,260	0,260
90	-	-	-	1,043	0,739	0,470	0,260	0,260	0,260
95	-	-	-	1,128	0,819	0,543	0,296	0,260	0,260
100	-	-	-	1,209	0,895	0,614	0,360	0,260	0,260
105	-	-	-	-	0,969	0,683	0,422	0,260	0,260
110	-	-	-	-	1,040	0,749	0,483	0,260	0,260
115	-	-	-	-	1,109	0,814	0,543	0,293	0,260
120	-	-	-	-	1,175	0,877	0,601	0,345	0,260
125	-	-	-	-	1,239	0,938	0,658	0,397	0,260
130	-	-	-	-	-	0,997	0,713	0,447	0,260
135	-	-	-	-	-	1,055	0,768	0,497	0,260
140	-	-	-	-	-	1,111	0,821	0,546	0,285
145	-	-	-	-	-	1,166	0,873	0,594	0,328
150	-	-	-	-	-	1,220	0,923	0,641	0,370
155	-	-	-	-	-	-	0,973	0,687	0,412
160	-	-	-	-	-	-	1,022	0,733	0,454
165	-	-	-	-	-	-	1,070	0,777	0,495
170	-	-	-	-	-	-	1,116	0,821	0,535
175	-	-	-	-	-	-	1,162	0,865	0,575
180	-	-	-	-	-	-	1,207	0,907	0,614
185	-	-	-	-	-	-	-	0,949	0,653
190	-	-	-	-	-	-	-	0,991	0,691
195	-	-	-	-	-	-	-	1,031	0,729
200	-	-	-	-	-	-	-	1,071	0,767
205	-	-	-	-	-	-	-	1,111	0,804
210	-	-	-	-	-	-	-	1,149	0,840
215	-	-	-	-	-	-	-	1,188	0,876
220	-	-	-	-	-	-	-	1,225	0,912
225	-	-	-	-	-	-	-	-	0,948
230	-	-	-	-	-	-	-	-	0,982
233	-	-	-	-	-	-	-	-	1,003

Table 18 - Layer thicknesses R 60 for rectangular hollow section columns and beams in four-sided fire exposure

R 60	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
62	-	-	-	1,156	0,844	0,581	0,356	0,260	0,260
65	-	-	-	1,245	0,926	0,655	0,423	0,260	0,260
70	-	-	-	-	1,058	0,776	0,531	0,318	0,260
75	-	-	-	-	1,184	0,892	0,637	0,413	0,260
80	-	-	-	-	-	1,005	0,740	0,506	0,298
85	-	-	-	-	-	1,114	0,841	0,598	0,380
90	-	-	-	-	-	1,220	0,939	0,688	0,461
95	-	-	-	-	-	-	1,035	0,776	0,541
100	-	-	-	-	-	-	1,128	0,862	0,620
105	-	-	-	-	-	-	1,219	0,947	0,698
110	-	-	-	-	-	-	-	1,030	0,774
115	-	-	-	-	-	-	-	1,112	0,850
120	-	-	-	-	-	-	-	1,193	0,925
125	-	-	-	-	-	-	-	-	0,999
130	-	-	-	-	-	-	-	-	1,071
135	-	-	-	-	-	-	-	-	1,143
140	-	-	-	-	-	-	-	-	1,214
145	-	-	-	-	-	-	-	-	-
150	-	-	-	-	-	-	-	-	-
155	-	-	-	-	-	-	-	-	-
160	-	-	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-	-	-
170	-	-	-	-	-	-	-	-	-
175	-	-	-	-	-	-	-	-	-
180	-	-	-	-	-	-	-	-	-
185	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-
225	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-
233	-	-	-	-	-	-	-	-	-

Table 19 - Layer thicknesses R 90 for rectangular hollow section columns and beams in four-sided fire exposure

R 90	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
62	-	-	-	-	-	-	-	1,139	0,907
65	-	-	-	-	-	-	-	1,240	1,000
70	-	-	-	-	-	-	-	-	1,152
75	-	-	-	-	-	-	-	-	-
80	-	-	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-	-	-
95	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-
105	-	-	-	-	-	-	-	-	-
110	-	-	-	-	-	-	-	-	-
115	-	-	-	-	-	-	-	-	-
120	-	-	-	-	-	-	-	-	-
125	-	-	-	-	-	-	-	-	-
130	-	-	-	-	-	-	-	-	-
135	-	-	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-	-	-
145	-	-	-	-	-	-	-	-	-
150	-	-	-	-	-	-	-	-	-
155	-	-	-	-	-	-	-	-	-
160	-	-	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-	-	-
170	-	-	-	-	-	-	-	-	-
175	-	-	-	-	-	-	-	-	-
180	-	-	-	-	-	-	-	-	-
185	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-
225	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-
233	-	-	-	-	-	-	-	-	-

Table 20 - Layer thicknesses R 15 for rectangular hollow section beams in three-sided fire exposure

R 15	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
46	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
50	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
55	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
60	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
65	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
70	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
75	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
80	0,319	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
85	0,349	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
90	0,378	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
95	0,405	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
100	0,432	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
105	0,457	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
110	0,482	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
115	0,506	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
120	0,529	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
125	0,551	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
130	0,573	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
135	0,594	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
140	0,614	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
145	0,634	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
150	0,653	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
155	0,672	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
160	0,690	0,312	0,312	0,312	0,312	0,312	0,312	0,312	0,312
165	0,707	0,322	0,312	0,312	0,312	0,312	0,312	0,312	0,312
170	0,724	0,334	0,312	0,312	0,312	0,312	0,312	0,312	0,312
175	0,741	0,347	0,312	0,312	0,312	0,312	0,312	0,312	0,312
180	0,757	0,359	0,312	0,312	0,312	0,312	0,312	0,312	0,312
185	0,772	0,370	0,312	0,312	0,312	0,312	0,312	0,312	0,312
190	0,788	0,382	0,312	0,312	0,312	0,312	0,312	0,312	0,312
195	0,802	0,393	0,312	0,312	0,312	0,312	0,312	0,312	0,312
200	0,817	0,404	0,312	0,312	0,312	0,312	0,312	0,312	0,312
205	0,831	0,415	0,312	0,312	0,312	0,312	0,312	0,312	0,312
210	0,845	0,425	0,312	0,312	0,312	0,312	0,312	0,312	0,312
216	0,858	0,435	0,312	0,312	0,312	0,312	0,312	0,312	0,312

WARNING: the data for rectangular hollow sections beams are related to a three-sided fire exposure. A four-sided fire exposure for such beams has to be calculated from the rectangular hollow sections columns tables, but limited to the maximum thickness for rectangular hollow section beams tables.

Table 21 - Layer thicknesses R 30 for rectangular hollow section beams in three-sided fire exposure

R 30	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
46	0,655	0,377	0,312	0,312	0,312	0,312	0,312	0,312	0,312
50	0,745	0,449	0,312	0,312	0,312	0,312	0,312	0,312	0,312
55	0,831	0,518	0,312	0,312	0,312	0,312	0,312	0,312	0,312
60	0,914	0,585	0,331	0,312	0,312	0,312	0,312	0,312	0,312
65	0,993	0,650	0,382	0,312	0,312	0,312	0,312	0,312	0,312
70	1,069	0,712	0,433	0,312	0,312	0,312	0,312	0,312	0,312
75	1,142	0,772	0,481	0,312	0,312	0,312	0,312	0,312	0,312
80	1,213	0,830	0,529	0,312	0,312	0,312	0,312	0,312	0,312
85	1,281	0,887	0,575	0,321	0,312	0,312	0,312	0,312	0,312
90	-	0,941	0,620	0,357	0,312	0,312	0,312	0,312	0,312
95	-	0,994	0,663	0,392	0,312	0,312	0,312	0,312	0,312
100	-	1,045	0,705	0,426	0,312	0,312	0,312	0,312	0,312
105	-	1,095	0,746	0,459	0,312	0,312	0,312	0,312	0,312
110	-	1,143	0,786	0,492	0,312	0,312	0,312	0,312	0,312
115	-	1,190	0,825	0,524	0,312	0,312	0,312	0,312	0,312
120	-	1,235	0,863	0,554	0,312	0,312	0,312	0,312	0,312
125	-	1,279	0,900	0,585	0,318	0,312	0,312	0,312	0,312
130	-	-	0,936	0,614	0,341	0,312	0,312	0,312	0,312
135	-	-	0,971	0,643	0,364	0,312	0,312	0,312	0,312
140	-	-	1,006	0,671	0,387	0,312	0,312	0,312	0,312
145	-	-	1,039	0,699	0,409	0,312	0,312	0,312	0,312
150	-	-	1,071	0,726	0,430	0,312	0,312	0,312	0,312
155	-	-	1,103	0,752	0,451	0,312	0,312	0,312	0,312
160	-	-	1,134	0,778	0,472	0,312	0,312	0,312	0,312
165	-	-	1,165	0,803	0,492	0,312	0,312	0,312	0,312
170	-	-	1,194	0,828	0,512	0,312	0,312	0,312	0,312
175	-	-	1,223	0,852	0,531	0,312	0,312	0,312	0,312
180	-	-	1,252	0,876	0,551	0,312	0,312	0,312	0,312
185	-	-	1,279	0,899	0,569	0,312	0,312	0,312	0,312
190	-	-	-	0,921	0,588	0,312	0,312	0,312	0,312
195	-	-	-	0,944	0,606	0,312	0,312	0,312	0,312
200	-	-	-	0,966	0,624	0,323	0,312	0,312	0,312
205	-	-	-	0,987	0,641	0,337	0,312	0,312	0,312
210	-	-	-	1,008	0,658	0,350	0,312	0,312	0,312
216	-	-	-	1,029	0,675	0,363	0,312	0,312	0,312

WARNING: the data for rectangular hollow sections beams are related to a three-sided fire exposure. A four-sided fire exposure for such beams has to be calculated from the rectangular hollow sections columns tables, but limited to the maximum thickness for rectangular hollow section beams tables.

Table 22 - Layer thicknesses R 45 for rectangular hollow section beams in three-sided fire exposure

R 45	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
46	1,235	0,878	0,607	0,393	0,312	0,312	0,312	0,312	0,312
50	-	0,996	0,705	0,475	0,312	0,312	0,312	0,312	0,312
55	-	1,109	0,800	0,555	0,355	0,312	0,312	0,312	0,312
60	-	1,218	0,892	0,632	0,420	0,312	0,312	0,312	0,312
65	-	-	0,981	0,708	0,484	0,312	0,312	0,312	0,312
70	-	-	1,068	0,781	0,546	0,349	0,312	0,312	0,312
75	-	-	1,152	0,853	0,606	0,400	0,312	0,312	0,312
80	-	-	1,234	0,922	0,665	0,449	0,312	0,312	0,312
85	-	-	-	0,990	0,723	0,498	0,312	0,312	0,312
90	-	-	-	1,057	0,779	0,546	0,346	0,312	0,312
95	-	-	-	1,121	0,835	0,592	0,385	0,312	0,312
100	-	-	-	1,184	0,889	0,638	0,423	0,312	0,312
105	-	-	-	1,245	0,941	0,683	0,461	0,312	0,312
110	-	-	-	-	0,993	0,727	0,498	0,312	0,312
115	-	-	-	-	1,043	0,770	0,534	0,328	0,312
120	-	-	-	-	1,093	0,812	0,570	0,358	0,312
125	-	-	-	-	1,141	0,853	0,605	0,387	0,312
130	-	-	-	-	1,188	0,894	0,639	0,415	0,312
135	-	-	-	-	1,235	0,934	0,673	0,444	0,312
140	-	-	-	-	1,280	0,973	0,706	0,471	0,312
145	-	-	-	-	-	1,011	0,738	0,498	0,312
150	-	-	-	-	-	1,049	0,770	0,525	0,312
155	-	-	-	-	-	1,086	0,802	0,552	0,329
160	-	-	-	-	-	1,122	0,833	0,578	0,350
165	-	-	-	-	-	1,158	0,863	0,603	0,371
170	-	-	-	-	-	1,193	0,893	0,628	0,392
175	-	-	-	-	-	1,227	0,923	0,653	0,412
180	-	-	-	-	-	1,261	0,952	0,677	0,432
185	-	-	-	-	-	-	0,980	0,702	0,452
190	-	-	-	-	-	-	1,008	0,725	0,472
195	-	-	-	-	-	-	1,036	0,749	0,491
200	-	-	-	-	-	-	1,063	0,772	0,510
205	-	-	-	-	-	-	1,090	0,794	0,529
210	-	-	-	-	-	-	1,116	0,817	0,547
216	-	-	-	-	-	-	1,142	0,839	0,565

WARNING: the data for rectangular hollow sections beams are related to a three-sided fire exposure. A four-sided fire exposure for such beams has to be calculated from the rectangular hollow sections columns tables, but limited to the maximum thickness for rectangular hollow section beams tables.

Table 23 - Layer thicknesses R 60 for rectangular hollow section beams in three-sided fire exposure

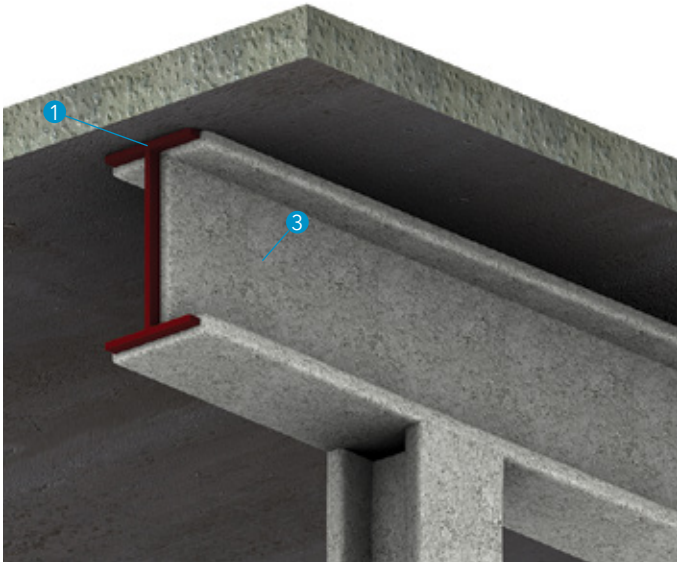
R 60	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
46	-	-	1,048	0,787	0,577	0,403	0,312	0,312	0,312
50	-	-	1,188	0,907	0,680	0,492	0,334	0,312	0,312
55	-	-	-	1,023	0,780	0,578	0,408	0,312	0,312
60	-	-	-	1,137	0,878	0,663	0,482	0,327	0,312
65	-	-	-	1,247	0,974	0,746	0,554	0,389	0,312
70	-	-	-	-	1,067	0,828	0,624	0,450	0,312
75	-	-	-	-	1,158	0,907	0,693	0,510	0,350
80	-	-	-	-	1,247	0,985	0,761	0,569	0,401
85	-	-	-	-	-	1,061	0,828	0,626	0,451
90	-	-	-	-	-	1,136	0,893	0,683	0,500
95	-	-	-	-	-	1,209	0,957	0,739	0,548
100	-	-	-	-	-	1,280	1,020	0,794	0,596
105	-	-	-	-	-	-	1,082	0,848	0,643
110	-	-	-	-	-	-	1,142	0,901	0,689
115	-	-	-	-	-	-	1,202	0,953	0,735
120	-	-	-	-	-	-	1,260	1,004	0,779
125	-	-	-	-	-	-	-	1,055	0,823
130	-	-	-	-	-	-	-	1,104	0,867
135	-	-	-	-	-	-	-	1,153	0,910
140	-	-	-	-	-	-	-	1,201	0,952
145	-	-	-	-	-	-	-	1,249	0,993
150	-	-	-	-	-	-	-	-	1,034
155	-	-	-	-	-	-	-	-	1,074
160	-	-	-	-	-	-	-	-	1,114
165	-	-	-	-	-	-	-	-	1,153
170	-	-	-	-	-	-	-	-	1,192
175	-	-	-	-	-	-	-	-	1,230
180	-	-	-	-	-	-	-	-	1,267
185	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-
216	-	-	-	-	-	-	-	-	-

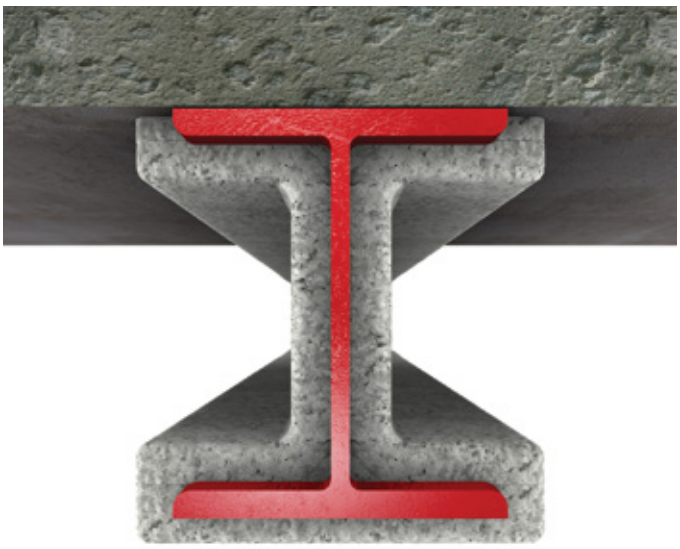
WARNING: the data for rectangular hollow sections beams are related to a three-sided fire exposure. A four-sided fire exposure for such beams has to be calculated from the rectangular hollow sections columns tables, but limited to the maximum thickness for rectangular hollow section beams tables.

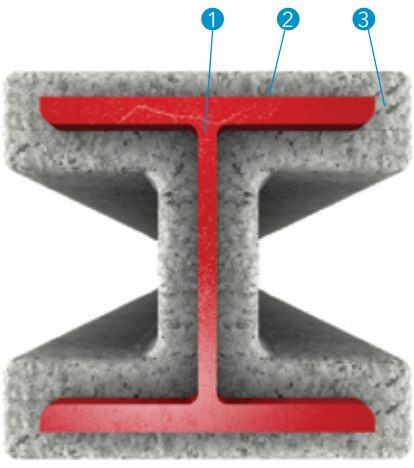
Table 24 - Layer thicknesses R 90 for rectangular hollow section beams in three-sided fire exposure

R 90	Dry film thickness [mm]								
	Design temperature [°C]								
Section Factor (m^{-1})	350	400	450	500	550	600	650	700	750
46	-	-	-	-	-	1,054	0,855	0,687	0,542
50	-	-	-	-	-	1,207	0,992	0,808	0,650
55	-	-	-	-	-	-	1,125	0,927	0,757
60	-	-	-	-	-	-	1,256	1,044	0,862
65	-	-	-	-	-	-	-	1,159	0,965
70	-	-	-	-	-	-	-	1,272	1,066
75	-	-	-	-	-	-	-	-	1,166
80	-	-	-	-	-	-	-	-	1,264
85	-	-	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-	-	-
95	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-
105	-	-	-	-	-	-	-	-	-
110	-	-	-	-	-	-	-	-	-
115	-	-	-	-	-	-	-	-	-
120	-	-	-	-	-	-	-	-	-
125	-	-	-	-	-	-	-	-	-
130	-	-	-	-	-	-	-	-	-
135	-	-	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-	-	-
145	-	-	-	-	-	-	-	-	-
150	-	-	-	-	-	-	-	-	-
155	-	-	-	-	-	-	-	-	-
160	-	-	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-	-	-
170	-	-	-	-	-	-	-	-	-
175	-	-	-	-	-	-	-	-	-
180	-	-	-	-	-	-	-	-	-
185	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-
216	-	-	-	-	-	-	-	-	-

WARNING: the data for rectangular hollow sections beams are related to a three-sided fire exposure. A four-sided fire exposure for such beams has to be calculated from the rectangular hollow sections columns tables, but limited to the maximum thickness for rectangular hollow section beams tables.







Technical data

1. Load-bearing steel structure
2. BONDSEAL® primer *
3. PROMASPRAY®-P300, coating thickness according to A_p/V ratio value, fire resistance and design (critical) temperature

Certificate: ETA 11/0043 and EFR-17-004159 Rev 1

** optional*

Fire resistance

R 30 to R 240 according to EN 13501-2, depending on the A_p/V value and the design steel temperature according to Eurocode.

Advantages:

- Durable, lightweight rendering that ensures fire protection up to R 240
- Cost effective and quick application
- semi-exposed and internal use
- Improves the acoustic and thermal insulation
- Tables for fire resistance R 45 and above R 120 are available upon request
- Thicknesses for design temperature 490 °C, 520 °C, 540 °C, 570 °C and 620 °C are available upon request

Fields of application

PROMASPRAY®-P300 is a rendering for structural fire protection of open and hollow section steel beams and columns. Classified are the steel components with A_p/V factor from 66 up to 495 m^{-1}, with three- and four-sided exposure to fire and with design steel temperature from 350 up to 750 °C.

The application is possible also on circular, rectangular or square hollow sections. For this purpose, however, the layer thickness (d_p) of the open profile with the same A_p/V value should be taken into consideration, according to EN 13381-4, Appendix A.3.

- At A_p/V values up to 250 m^{-1}:
  adjusted thickness = d_p x (1 + ((A_p/V) / 1000)
- At A_p/V values above 250 m^{-1}:
  adjusted thickness = 1,25 x d_p

Instructions regarding the coating thicknesses

The required thickness of the fire protective rendering depends on the required fire resistance, the design temperature of the steel structure (the maximum allowed /critical/ temperature of the steel member) and the A_p/V ratio. Please refer to the tables 2 to 9 for the details on the appropriate rendering thickness.

Application temperature

PROMASPRAY®-P300 should be applied when the temperature of the substrate and the ambient air temperature is at least 4 °C or more. This temperature should be maintained 24 hours before application. The maximal temperature of substrate and ambient air temperature should not exceed 50 °C. The temperature of the substrate should be at least 2 °C above the dew point temperature.

Application instructions

PROMASPRAY®-P300 shall be applied on the side to be protected. The application is carried out continuously in one or more working steps by using a spraying machine until the required coating thickness is reached. The measuring and

monitoring of coating thickness is performed by using special pins. The thickness of the initial coat of PROMASPRAY®-P300 is 9 to 17 mm. Subsequent coats, with thickness between 19 and 25 mm, can be applied until the final thickness is achieved. Allow the material to be set between coats. If the surface of the applied PROMASPRAY®-P300 is dry, pre-wet this surface with a water mist before applying the next coat. When spraying beams PROMASPRAY®-P300 is sprayed first on the top side of the lower flange. Thereafter the section can be sprayed in any order.

Substrate preparation

The substrate should be clean and dry, free of any dust, oil and other release agents that prevent good adhesion. All steel structures to be rendered with PROMASPRAY®-P300 should be pre-treated with BONDSEAL® which can be applied with a roller, brush or by spraying. The application quantity: approx.150 g/m². For exceptions, where the use of BONDSEAL® is not necessary, please contact your Promat technical office.

Table 1 - Corrosion protection of steel components

Type	Application thickness [µm]
Alkyd resin	40
Epoxy resin	45

In case of galvanized steel the zinc coating should not exceed 75 µm.

Suitable substrates:
- Blank steel
- Steel with corrosion protection (see Table 1)
- Steel, galvanized

Table 2 - Layer thicknesses R 30 for PROMASPRAY®-P300 for open section beams

R 30	Minimum rendering thickness [mm]								
A_p/V [m^{-1}]	Design temperature [°C]								
	350	400	450	500	550	600	650	700	750
≤ 66	11	11	11	11	11	11	11	11	11
70	11	11	11	11	11	11	11	11	11
80	11	11	11	11	11	11	11	11	11
90	11	11	11	11	11	11	11	11	11
100	11	11	11	11	11	11	11	11	11
110	12	11	11	11	11	11	11	11	11
120	12	11	11	11	11	11	11	11	11
130	13	11	11	11	11	11	11	11	11
140	14	11	11	11	11	11	11	11	11
150	14	12	11	11	11	11	11	11	11
160	15	12	11	11	11	11	11	11	11
170	15	13	11	11	11	11	11	11	11
180	16	13	11	11	11	11	11	11	11
190	16	14	12	11	11	11	11	11	11
200	17	14	12	11	11	11	11	11	11
210	17	15	13	11	11	11	11	11	11
220	17	15	13	11	11	11	11	11	11
230	17	15	13	12	11	11	11	11	11
240	18	16	14	12	11	11	11	11	11
250	18	16	14	12	11	11	11	11	11
260	18	16	14	13	11	11	11	11	11
270	18	16	14	13	11	11	11	11	11
280	19	16	15	13	12	11	11	11	11
290	19	17	15	13	12	11	11	11	11
300	19	17	15	13	12	11	11	11	11
310	19	17	15	14	12	11	11	11	11
320	19	17	15	14	12	11	11	11	11
330	19	17	16	14	13	11	11	11	11
340	20	18	16	14	13	12	11	11	11
350	20	18	16	14	13	12	11	11	11
360	20	18	16	15	13	12	11	11	11
370	20	18	16	15	13	12	11	11	11
380	20	18	16	15	13	12	11	11	11
390	20	18	16	15	14	12	11	11	11
400	20	18	17	15	14	12	11	11	11
410	20	18	17	15	14	13	11	11	11
420	20	19	17	15	14	13	12	11	11
430	20	19	17	15	14	13	12	11	11
440	21	19	17	16	14	13	12	11	11
450	21	19	17	16	14	13	12	11	11
460	21	19	17	16	14	13	12	11	11
470	21	19	17	16	15	13	12	11	11
480	21	19	17	16	15	13	12	11	11
490	21	19	18	16	15	14	12	11	11
495	21	19	18	16	15	14	12	11	11

Table 3 - Layer thicknesses R 60 for PROMASPRAY®-P300 for open section beams

R 60	Minimum rendering thickness [mm]								
A_p/V [m^{-1}]	Design temperature [°C]								
	350	400	450	500	550	600	650	700	750
≤ 66	15	11	11	11	11	11	11	11	11
70	16	12	11	11	11	11	11	11	11
80	18	14	11	11	11	11	11	11	11
90	19	16	13	11	11	11	11	11	11
100	21	17	14	12	11	11	11	11	11
110	22	18	15	13	11	11	11	11	11
120	23	19	17	14	12	11	11	11	11
130	24	20	18	15	13	11	11	11	11
140	25	21	18	16	14	12	11	11	11
150	25	22	19	17	15	13	11	11	11
160	26	23	20	18	15	14	12	11	11
170	27	23	21	18	16	14	13	11	11
180	27	24	21	19	17	15	13	12	11
190	28	24	22	19	17	15	14	12	11
200	28	25	22	20	18	16	14	13	12
210	28	25	23	20	18	17	15	13	12
220	29	26	23	21	19	17	15	14	13
230	29	26	24	21	19	17	16	14	13
240	30	27	24	22	20	18	16	15	13
250	30	27	24	22	20	18	17	15	14
260	30	27	25	22	20	19	17	16	14
270	30	28	25	23	21	19	17	16	15
280	31	28	25	23	21	19	18	16	15
290	31	28	26	23	21	20	18	16	15
300	31	28	26	24	22	20	18	17	15
310	31	29	26	24	22	20	19	17	16
320	31	29	26	24	22	20	19	17	16
330	32	29	26	24	22	21	19	18	16
340	32	29	27	25	23	21	19	18	16
350	32	29	27	25	23	21	19	18	17
360	32	29	27	25	23	21	20	18	17
370	32	30	27	25	23	21	20	18	17
380	32	30	27	25	23	22	20	19	17
390	33	30	28	25	24	22	20	19	18
400	33	30	28	26	24	22	20	19	18
410	33	30	28	26	24	22	21	19	18
420	33	30	28	26	24	22	21	19	18
430	33	30	28	26	24	22	21	20	18
440	33	31	28	26	24	23	21	20	18
450	33	31	28	26	24	23	21	20	19
460	33	31	29	26	25	23	21	20	19
470	34	31	29	27	25	23	22	20	19
480	34	31	29	27	25	23	22	20	19
490	34	31	29	27	25	23	22	20	19
495	34	31	29	27	25	23	22	20	19

Table 4 - Layer thicknesses R 90 for PROMASPRAY®-P300 for open section beams

R 90	Minimum rendering thickness [mm]								
A_p/V [m^{-1}]	Design temperature [°C]								
	350	400	450	500	550	600	650	700	750
≤ 66	24	19	15	12	11	11	11	11	11
70	25	20	16	13	11	11	11	11	11
80	27	22	19	16	13	11	11	11	11
90	29	24	21	18	15	13	11	11	11
100	31	26	22	19	17	14	12	11	11
110	32	28	24	21	18	16	14	12	11
120	33	29	25	22	20	17	15	13	12
130	34	30	27	23	21	18	16	14	13
140	35	31	28	25	22	20	17	16	14
150	36	32	29	26	23	21	18	17	15
160	37	33	29	26	24	21	19	17	16
170	38	34	30	27	25	22	20	18	17
180	38	34	31	28	25	23	21	19	17
190	39	35	32	29	26	24	22	20	18
200	40	36	32	29	27	24	22	20	19
210	40	36	33	30	27	25	23	21	19
220	41	37	33	30	28	26	23	22	20
230	41	37	34	31	28	26	24	22	20
240	41	38	34	31	29	27	24	23	21
250	42	38	35	32	29	27	25	23	21
260	42	38	35	32	30	27	25	24	22
270	42	39	36	33	30	28	26	24	22
280	43	39	36	33	31	28	26	24	23
290	43	39	36	33	31	29	27	25	23
300	43	40	37	34	31	29	27	25	23
310	44	40	37	34	32	29	27	25	24
320	44	40	37	34	32	30	28	26	24
330	44	40	37	35	32	30	28	26	24
340	44	41	38	35	32	30	28	26	25
350	44	41	38	35	33	30	28	27	25
360	45	41	38	35	33	31	29	27	25
370	45	41	38	36	33	31	29	27	25
380	45	42	38	36	33	31	29	27	26
390	45	42	39	36	34	31	29	28	26
400	45	42	39	36	34	32	30	28	26
410	45	42	39	36	34	32	30	28	26
420	46	42	39	37	34	32	30	28	26
430	46	42	39	37	34	32	30	28	27
440	46	43	40	37	34	32	30	29	27
450	46	43	40	37	35	32	31	29	27
460	46	43	40	37	35	33	31	29	27
470	46	43	40	37	35	33	31	29	27
480	46	43	40	37	35	33	31	29	28
490	46	43	40	38	35	33	31	29	28
495	46	43	40	38	35	33	31	29	28

Table 5 - Layer thicknesses R 120 for PROMASPRAY®-P300 for open section beams

R 120	Minimum rendering thickness [mm]								
A_p/V [m^{-1}]	Design temperature [°C]								
	350	400	450	500	550	600	650	700	750
≤ 66	32	27	22	19	16	13	11	11	11
70	33	28	24	20	17	14	12	11	11
80	36	31	26	23	19	17	14	12	11
90	39	33	29	25	22	19	17	14	13
100	41	35	31	27	24	21	19	16	14
110	42	37	33	29	26	23	20	18	16
120	44	39	34	30	27	24	22	20	18
130	45	40	36	32	29	26	23	21	19
140	46	41	37	33	30	27	25	22	20
150	47	42	38	34	31	28	26	23	21
160	48	43	39	35	32	29	27	24	22
170	49	44	40	36	33	30	28	25	23
180	50	45	41	37	34	31	29	26	24
190	50	46	42	38	35	32	29	27	25
200	51	46	42	39	36	33	30	28	26
210	52	47	43	39	36	33	31	29	27
220	52	48	44	40	37	34	32	29	27
230	53	48	44	41	38	35	32	30	28
240	53	49	45	41	38	35	33	31	28
250	54	49	45	42	39	36	33	31	29
260	54	50	46	42	39	36	34	32	29
270	54	50	46	43	40	37	34	32	30
280	55	50	47	43	40	37	35	32	30
290	55	51	47	43	40	38	35	33	31
300	55	51	47	44	41	38	36	33	31
310	56	51	48	44	41	38	36	34	32
320	56	52	48	45	42	39	36	34	32
330	56	52	48	45	42	39	37	34	32
340	57	52	49	45	42	39	37	35	33
350	57	53	49	45	42	40	37	35	33
360	57	53	49	46	43	40	38	35	33
370	57	53	49	46	43	40	38	36	34
380	57	53	50	46	43	41	38	36	34
390	58	53	50	46	44	41	38	36	34
400	58	54	50	47	44	41	39	36	34
410	58	54	50	47	44	41	39	37	35
420	58	54	50	47	44	42	39	37	35
430	58	54	51	47	44	42	39	37	35
440	58	54	51	48	45	42	40	37	35
450	59	55	51	48	45	42	40	38	36
460	59	55	51	48	45	42	40	38	36
470	59	55	51	48	45	43	40	38	36
480	59	55	51	48	45	43	40	38	36
490	59	55	52	48	46	43	40	38	36
495	59	55	52	48	46	43	41	38	36

Table 6 - Layer thicknesses R 30 for PROMASPRAY®-P300 for open section columns

R 30	Minimum rendering thickness [mm]								
A_p/V [m^{-1}]	Design temperature [°C]								
	350	400	450	500	550	600	650	700	750
≤ 66	10	10	10	10	10	10	10	10	10
70	10	10	10	10	10	10	10	10	10
80	10	10	10	10	10	10	10	10	10
90	10	10	10	10	10	10	10	10	10
100	11	10	10	10	10	10	10	10	10
110	12	10	10	10	10	10	10	10	10
120	12	10	10	10	10	10	10	10	10
130	13	11	10	10	10	10	10	10	10
140	14	11	10	10	10	10	10	10	10
150	14	12	10	10	10	10	10	10	10
160	15	12	10	10	10	10	10	10	10
170	15	13	11	10	10	10	10	10	10
180	16	13	11	10	10	10	10	10	10
190	16	14	12	10	10	10	10	10	10
200	17	14	12	11	10	10	10	10	10
210	17	15	13	11	10	10	10	10	10
220	17	15	13	11	10	10	10	10	10
230	17	15	13	12	10	10	10	10	10
240	18	16	14	12	10	10	10	10	10
250	18	16	14	12	11	10	10	10	10
260	18	16	14	13	11	10	10	10	10
270	18	16	14	13	11	10	10	10	10
280	19	16	15	13	12	10	10	10	10
290	19	17	15	13	12	11	10	10	10
300	19	17	15	13	12	11	10	10	10
310	19	17	15	14	12	11	10	10	10
320	19	17	15	14	12	11	10	10	10
330	19	17	16	14	13	11	10	10	10
340	20	18	16	14	13	12	10	10	10
350	20	18	16	14	13	12	11	10	10
360	20	18	16	15	13	12	11	10	10
370	20	18	16	15	13	12	11	10	10
380	20	18	16	15	13	12	11	10	10
390	20	18	16	15	14	12	11	10	10
400	20	18	17	15	14	12	11	10	10
410	20	18	17	15	14	13	11	10	10
420	20	19	17	15	14	13	12	11	10
430	20	19	17	15	14	13	12	11	10
440	21	19	17	16	14	13	12	11	10
450	21	19	17	16	14	13	12	11	10
460	21	19	17	16	14	13	12	11	10
470	21	19	17	16	15	13	12	11	10
480	21	19	17	16	15	13	12	11	10
490	21	19	18	16	15	14	12	11	10
495	21	19	18	16	15	14	12	11	11

Table 7 - Layer thicknesses R 60 for PROMASPRAY®-P300 for open section columns

R 60	Minimum rendering thickness [mm]								
A_p/V [m^{-1}]	Design temperature [°C]								
	350	400	450	500	550	600	650	700	750
≤ 66	15	11	10	10	10	10	10	10	10
70	16	12	10	10	10	10	10	10	10
80	18	14	11	10	10	10	10	10	10
90	19	16	13	10	10	10	10	10	10
100	21	17	14	12	10	10	10	10	10
110	22	18	15	13	11	10	10	10	10
120	23	19	17	14	12	10	10	10	10
130	24	20	18	15	13	11	10	10	10
140	25	21	18	16	14	12	10	10	10
150	25	22	19	17	15	13	11	10	10
160	26	23	20	18	15	14	12	10	10
170	27	23	21	18	16	14	13	11	10
180	27	24	21	19	17	15	13	12	10
190	28	24	22	19	17	15	14	12	11
200	28	25	22	20	18	16	14	13	12
210	28	25	23	20	18	17	15	13	12
220	29	26	23	21	19	17	15	14	13
230	29	26	24	21	19	17	16	14	13
240	30	27	24	22	20	18	16	15	13
250	30	27	24	22	20	18	17	15	14
260	30	27	25	22	20	19	17	16	14
270	30	28	25	23	21	19	17	16	15
280	31	28	25	23	21	19	18	16	15
290	31	28	26	23	21	20	18	16	15
300	31	28	26	24	22	20	18	17	15
310	31	29	26	24	22	20	19	17	16
320	31	29	26	24	22	20	19	17	16
330	32	29	26	24	22	21	19	18	16
340	32	29	27	25	23	21	19	18	16
350	32	29	27	25	23	21	19	18	17
360	32	29	27	25	23	21	20	18	17
370	32	30	27	25	23	21	20	18	17
380	32	30	27	25	23	22	20	19	17
390	33	30	28	25	24	22	20	19	18
400	33	30	28	26	24	22	20	19	18
410	33	30	28	26	24	22	21	19	18
420	33	30	28	26	24	22	21	19	18
430	33	30	28	26	24	22	21	20	18
440	33	31	28	26	24	23	21	20	18
450	33	31	28	26	24	23	21	20	19
460	33	31	29	26	25	23	21	20	19
470	34	31	29	27	25	23	22	20	19
480	34	31	29	27	25	23	22	20	19
490	34	31	29	27	25	23	22	20	19
495	34	31	29	27	25	23	22	20	19

Table 8 - Layer thicknesses R 90 for PROMASPRAY®-P300 for open section columns

R 90	Minimum rendering thickness [mm]								
A_p/V [m^{-1}]	Design temperature [°C]								
	350	400	450	500	550	600	650	700	750
≤ 66	24	19	15	12	10	10	10	10	10
70	25	20	16	13	11	10	10	10	10
80	27	22	19	16	13	11	10	10	10
90	29	24	21	18	15	13	11	10	10
100	31	26	22	19	17	14	12	10	10
110	32	28	24	21	18	16	14	12	10
120	33	29	25	22	20	17	15	13	12
130	34	30	27	23	21	18	16	14	13
140	35	31	28	25	22	20	17	16	14
150	36	32	29	26	23	21	18	17	15
160	37	33	29	26	24	21	19	17	16
170	38	34	30	27	25	22	20	18	17
180	38	34	31	28	25	23	21	19	17
190	39	35	32	29	26	24	22	20	18
200	40	36	32	29	27	24	22	20	19
210	40	36	33	30	27	25	23	21	19
220	41	37	33	30	28	26	23	22	20
230	41	37	34	31	28	26	24	22	20
240	41	38	34	31	29	27	24	23	21
250	42	38	35	32	29	27	25	23	21
260	42	38	35	32	30	27	25	24	22
270	42	39	36	33	30	28	26	24	22
280	43	39	36	33	31	28	26	24	23
290	43	39	36	33	31	29	27	25	23
300	43	40	37	34	31	29	27	25	23
310	44	40	37	34	32	29	27	25	24
320	44	40	37	34	32	30	28	26	24
330	44	40	37	35	32	30	28	26	24
340	44	41	38	35	32	30	28	26	25
350	44	41	38	35	33	30	28	27	25
360	45	41	38	35	33	31	29	27	25
370	45	41	38	36	33	31	29	27	25
380	45	42	38	36	33	31	29	27	26
390	45	42	39	36	34	31	29	28	26
400	45	42	39	36	34	32	30	28	26
410	45	42	39	36	34	32	30	28	26
420	46	42	39	37	34	32	30	28	26
430	46	42	39	37	34	32	30	28	27
440	46	43	40	37	34	32	30	29	27
450	46	43	40	37	35	32	31	29	27
460	46	43	40	37	35	33	31	29	27
470	46	43	40	37	35	33	31	29	27
480	46	43	40	37	35	33	31	29	28
490	46	43	40	38	35	33	31	29	28
495	46	43	40	38	35	33	31	29	28

Table 9 - Layer thicknesses R 120 for PROMASPRAY®-P300 for open section columns

R 120	Minimum rendering thickness [mm]								
A_p/V [m^{-1}]	Design temperature [°C]								
	350	400	450	500	550	600	650	700	750
≤ 66	32	27	22	19	16	13	11	10	10
70	33	28	24	20	17	14	12	10	10
80	36	31	26	23	19	17	14	12	10
90	39	33	29	25	22	19	17	14	13
100	41	35	31	27	24	21	19	16	14
110	42	37	33	29	26	23	20	18	16
120	44	39	34	30	27	24	22	20	18
130	45	40	36	32	29	26	23	21	19
140	46	41	37	33	30	27	25	22	20
150	47	42	38	34	31	28	26	23	21
160	48	43	39	35	32	29	27	24	22
170	49	44	40	36	33	30	28	25	23
180	50	45	41	37	34	31	29	26	24
190	50	46	42	38	35	32	29	27	25
200	51	46	42	39	36	33	30	28	26
210	52	47	43	39	36	33	31	29	27
220	52	48	44	40	37	34	32	29	27
230	53	48	44	41	38	35	32	30	28
240	53	49	45	41	38	35	33	31	28
250	54	49	45	42	39	36	33	31	29
260	54	50	46	42	39	36	34	32	29
270	54	50	46	43	40	37	34	32	30
280	55	50	47	43	40	37	35	32	30
290	55	51	47	43	40	38	35	33	31
300	55	51	47	44	41	38	36	33	31
310	56	51	48	44	41	38	36	34	32
320	56	52	48	45	42	39	36	34	32
330	56	52	48	45	42	39	37	34	32
340	57	52	49	45	42	39	37	35	33
350	57	53	49	45	42	40	37	35	33
360	57	53	49	46	43	40	38	35	33
370	57	53	49	46	43	40	38	36	34
380	57	53	50	46	43	41	38	36	34
390	58	53	50	46	44	41	38	36	34
400	58	54	50	47	44	41	39	36	34
410	58	54	50	47	44	41	39	37	35
420	58	54	50	47	44	42	39	37	35
430	58	54	51	47	44	42	39	37	35
440	58	54	51	48	45	42	40	37	35
450	59	55	51	48	45	42	40	38	36
460	59	55	51	48	45	42	40	38	36
470	59	55	51	48	45	43	40	38	36
480	59	55	51	48	45	43	40	38	36
490	59	55	52	48	46	43	40	38	36
495	59	55	52	48	46	43	41	38	36

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