KNAUF FRAMELESS ENCASEMENT SOLUTIONS FOR STRUCTURAL STEEL

FIRE PROTECTION

Build for the world we live in

CONTENTS

Introduction

PASSIVE FIRE PROTECTION

Whilst we hope it's never required, passive fire protection is a critical component for fire safety in buildings. Most importantly, it helps protect the lives of anyone using the building, but it can also reduce the financial impact of damage to buildings and contents if a fire does breakout.

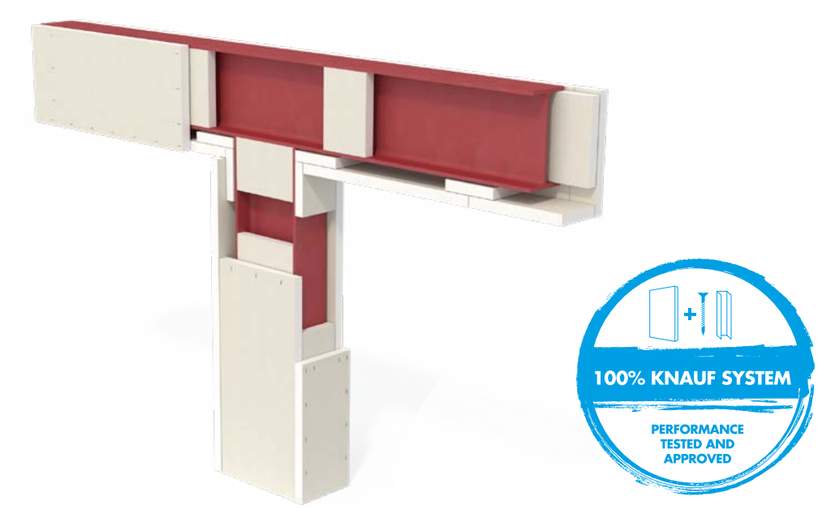
Protection of structural steel is of paramount importance, the whole buildings structural stability relies on the systems integrity being maintained, especially in the event of a fire.

Steel loses strength at temperatures over 550°C, so systems that protect the structural steels from the excessive heat associated with fire, are vital.

Glass Reinforced Gypsum (GRG) boards are widely used for structural fire protection in the UK and Ireland. They are used both when the protection system is in full view and where it is concealed. GRG boards give a clean "boxed" appearance, with the added advantage that the installation is a dry trade meaning it is less likely to have significant impacts on other build programme activities. Boards also offer the security of guaranteed thicknesses and performance due to the manufacturing process.

Knauf's Frameless Encasement system provides fire protection to structural columns and beams. It can be finished with a number of coatings and linings, including Knauf Airless Finish to match adjoining elements. The coatings do not affect the fire resistance classification of the system.

Knauf Frameless Encasement Solutions



Knauf Frameless Encasement Solutions using Knauf Fireboard, have been specifically developed to create encasements of column and beam structural steel work.

Frameless casings simply consist of Knauf Fireboard stapled to itself at abutting corners. For steelwork encased on all four sides, Knauf Fireboard is fixed at each corner directly through the material, independent of the structural steel. For partial encasements, involving wall or ceiling abutments, the encasement is fixed using lightweight Knauf Angle Sections at the abutment.

Key Features:

- Knauf's Frameless Encasement System maxmises the sellable floor space of the building
- Covered by Knauf's full system performance warranty
- Gives a range of fire protection performance from 30-240 minutes to a wide range of beam, column and joist sizes
- Reduced installation time as Knauf Fireboards can be stapled to one another without the need for other components
- Inspections for continuity are easier with the Knauf Frameless Encasement system compared to intumescent paint solutions, giving greater peace of mind both immediately after installation and during maintenance inspections
- Reduced waste and labour onsite as bespoke, cut to length Knauf Fireboard is available (subject to minimum order quantity)
- The boards have a high quality smooth surface finish, and can be taped, jointed and finished using Knauf Fireboard Spachtel (Joint Filler) and accessories

Frameless encasement systems have multiple benefits:

- Provide up to four hours' fire protection
- Speed and ease of installation
- The boards have a high quality smooth surface finish, and can be taped, jointed and finished using Knauf Fireboard Spachtel (Joint Filler) and Accessories

KNAUF FRAMELESS ENCASEMENT RANGE

Knauf Frameless Encasement Range consists of:

Knauf Fireboard

Knauf Fireboard-Spachtel (Joint Filler and Finish)

Knauf Glasfaser-Fugendeckstreifen (Joint Tape)

Knauf Hartmut (Fixing)

Staples (available from others)

COMPONENTS

Knauf Fireboard

Knauf Fireboard is a fleece-lined, glass reinforced gypsum (GRG) board, available in a range of thicknesses to suit all installation requirements.

Knauf Fireboard is also ideal for use as fillets in deflection head details.

A1 Reaction to Fire

Provides up to 4 hours fire protection for structural steel encasement.

Reaction to fire A1, according to EN 13501-1 of type GM-F according to EN 15283-1.

No need for additional coatings on the structural steel.

Available in 15, 20, 25 and 30mm

Various thicknesses provide different levels of fire protection.

No need to over engineer a design, simply use different board thickness combinations to achieve the required fire rating.

Ease of installation

No specialist labour or installation methods required.

No waiting for coatings or paint to dry in adverse weather conditions.

COMPONENTS

JOINT FILLER
Knauf Fireboard-Spachtel

Knauf Fireboard-Spachtel is a gypsum-based powder that is mixed with water to form a pliable joint filler.

Knauf recommend that Fireboards must be tightly butted. Joint filler is required for bedding joint tape.

On exposed encasements, Knauf Fireboard-Spachtel can also be used as a finish, providing a smooth surface for decoration if required.

Quality Assured
Manufactured in compliance with EN 13963.

Shelf Life
Can be stored for up to 6 months.

Workable Time
Apply Knauf Fireboard-Spachtel within 45 minutes of mixing.

Mixing
Sprinkle a maximum of 2.5kg into approx. 2 litres of cold water and mix to a lump-free creamy texture with a trowel or other similar hand tool.

JOINT TAPE
Knauf Glasfaser-Fugendeckstreifen

Knauf Glasfaser-Fugendeckstreifen is a fibre-glass tape used on all joints in Knauf Frameless Encasement installation.
To be embedded in Knauf Fireboard-Spachtel.

Handy Rolls
Available in 25m long rolls of 50mm wide.

FIXINGS
Knauf Hartmut

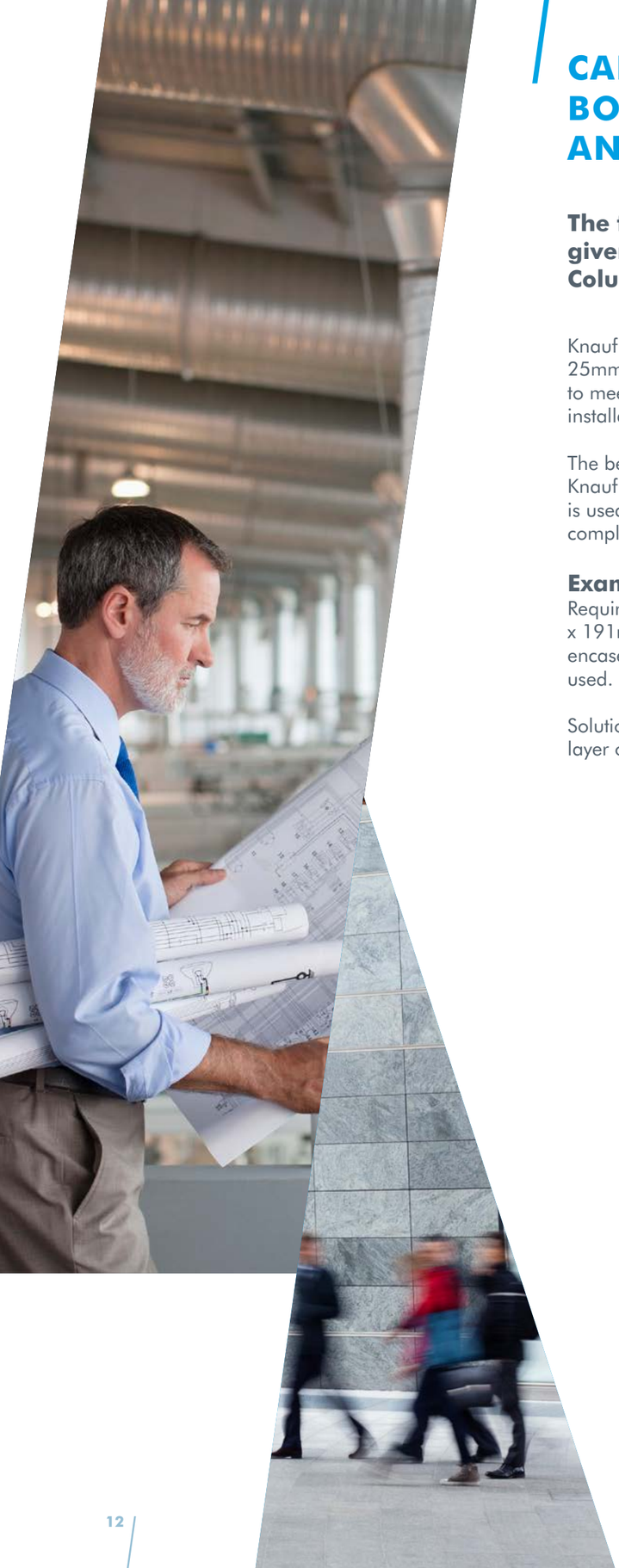
Knauf Hartmut is the ideal fixing through the Knauf partition stud to an abutting Knauf Frameless Encasement system.

Fixings included
The fixing includes a M5 x 60mm screw.

Staples

Knauf Fireboard is assembled around beams and columns using staples to fix board to board.

Staples used are to DIN 18182 or EN 14566 with steel wire diameter ≥1.34mm and are available from others.



CALCULATION FOR BOARD THICKNESS AND LAYERS

The following calculations are given as a guide to Steel Beam and Column Encasements.

Knauf Fireboard is available in 15mm, 20mm, 25mm and 30mm thicknesses that can be combined to meet the performance requirements of the installation.

The below example shows a typical calculation. Knauf recommends that the ASFP yellow book is used for A/V factors, or a structural engineer completes the necessary calculations.

Example

Requirement: One hour fire protection to 457mm x 191mm x 98kg/m steel beam with three-sided encasements. Refer to page 14 for details of formula used.

Solution: Section factor A/V = 90m^{-1}. Use single layer of 15mm Fireboard.

Board Thickness Combinations by Performance Requirement

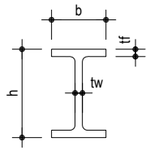
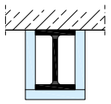
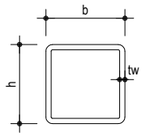
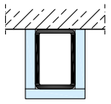
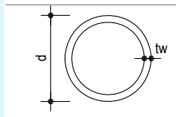
Section Factor (A/V)	Minutes 550°C					
	30	60	90	120	180	240
10	15mm	15mm	15mm	20mm	30mm	25+20mm
20						
30						
40						
50						
60						
70					25+20mm	
80			20mm	25mm		
90						
100				30mm		
110						
120			25mm			
130				20+20mm		
140						
150		20mm				
160						
170			30mm			
180						
190						
200						
210						
220						
230				20+15mm		
240						
250						
260						
270		25mm				
280						
290						
300						
310						
320						
330						
340				20+20mm		
350						
360						
370						
372.5						

Note
Structural and fire protection specialists to review and provide A/V sections factors in accordance with industry structural steel guidance's.

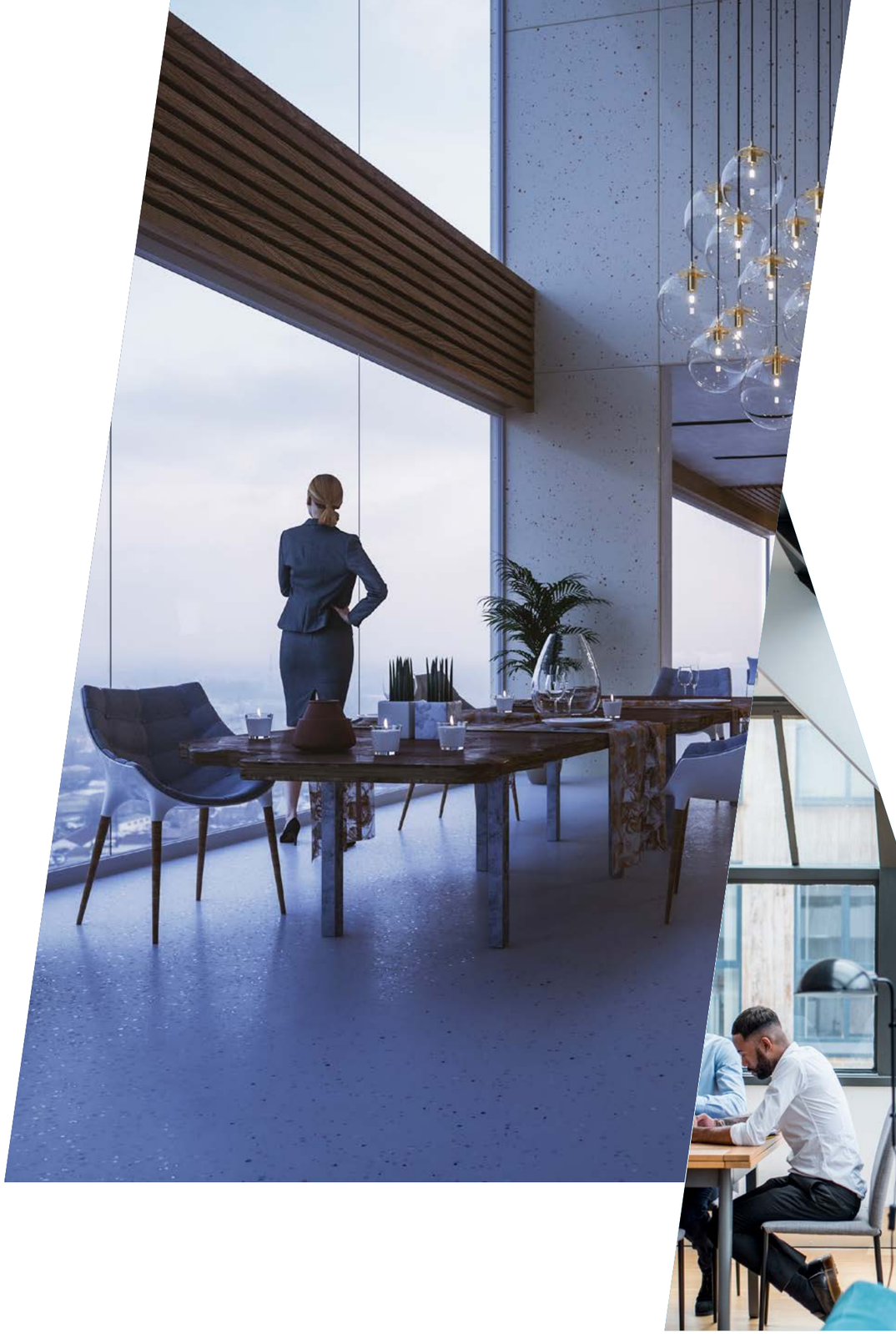
DETERMINATION OF PROFILE FACTOR A/V

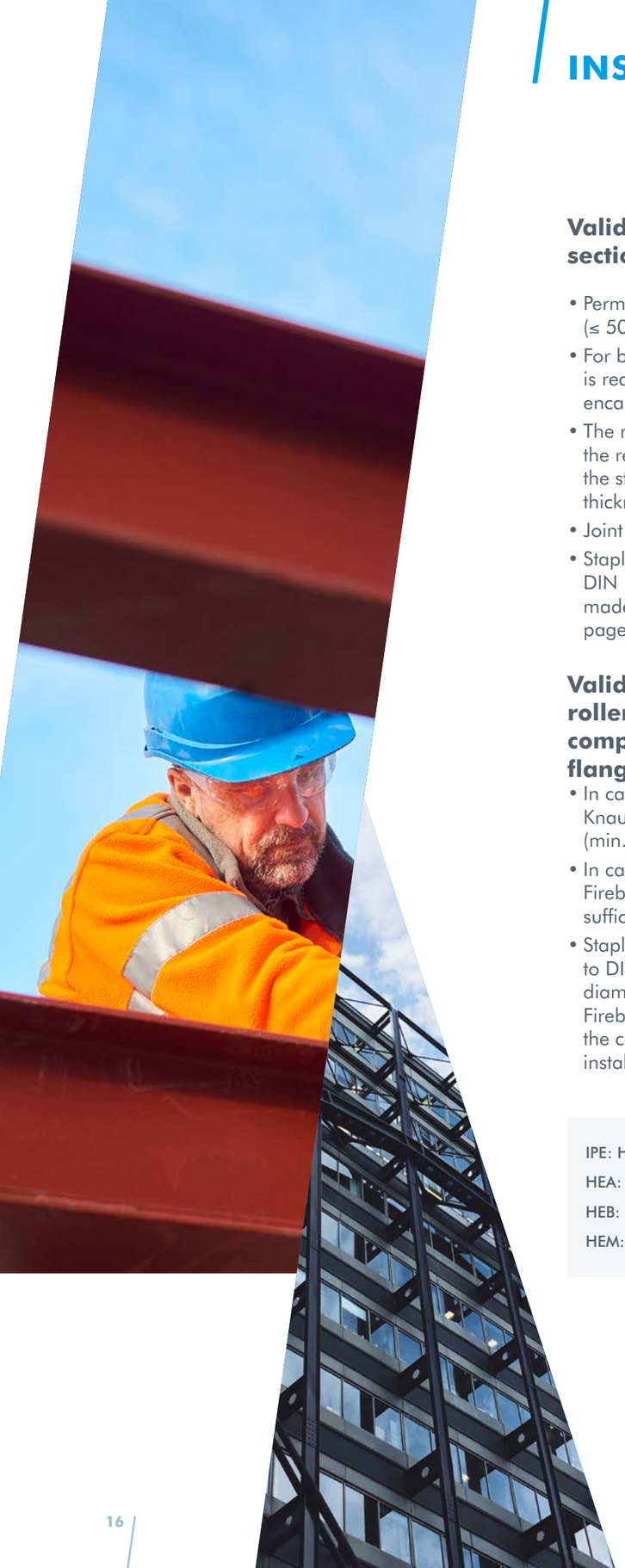
$$\text{Profile factor A/V } [m.^{-1}] = \frac{\text{Inner circumference A of the encasement [cm]}}{\text{Profile cross-section V [cm}^2\text{]}} \times 100$$

Examples for the determination of the inner circumference A of the encasement and the profile cross-section V.

Steel Profile		Profile cross-section V in cm²	Fire exposure	Inner circumference A of the encasement in cm	
I profile or H profile		tw - (h-2tf) +2 × (b × tf)	4-sided		2b + 2h
			3-sided		b + 2h
Square or rectangular hollow profile		2tw × b + 2tw × (h - 2tw)	4-sided		2b + 2h
			3-sided		b + 2h
Circular hollow profile		π × (d/2)² - π × [(d - 2tw)/2]²	4-sided		π × d

Specification of d, b, h, tw and tf in cm.
Please note: These calculations should be completed by a structural engineer.





INSTALLATION GUIDES

Valid for IPE, HEA, HEB, HEM sections up to 600mm.

- Permissible span width of boarding ≤ 600mm (≤ 500mm for Fireboard 15mm)
- For beam heights >600mm, a substructure is required. Please use the Knauf framed encasement system
- The required board thickness "t" depends on the required fire resistance and the A/V ratio of the steel beam section. See page 13 for board thickness requirements
- Joint backing required with single-layer board
- Staple all board layers with steel staples to DIN 18182 or EN 14566 with backing strips made of Knauf Fireboard. Please refer to page 19 for staple installation specification

Valid for open I, T, U and L-shaped roller profiles or for profiles of compound sections with parallel flange.

- In case of single-layer encasement, back with Knauf Fireboard strips of thickness "t" (min. 25mm), width 150mm on the board joint
- In case of 15mm board encasement thickness, Fireboard strips with "t" of min 20mm is sufficient
- Staple all board layers with steel staples acc. to DIN 18182 or EN 14566 with steel wire diameter 1.34mm with backing made of Knauf Fireboard strips as well as in the face side in the corners. Please refer to page 19 for staple installation specification.

IPE: Hot-rolled, medium flange I-sections

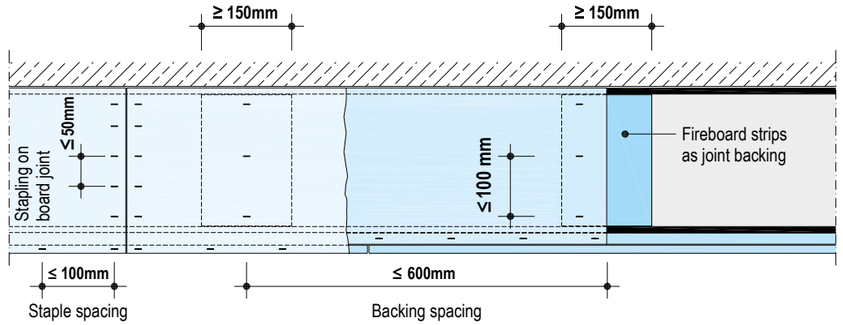
HEA: Hot-rolled, wide flange I-sections, light design

HEB: Hot-rolled, wide flange I-sections

HEM: Hot-rolled, wide flange I-sections, heavy design

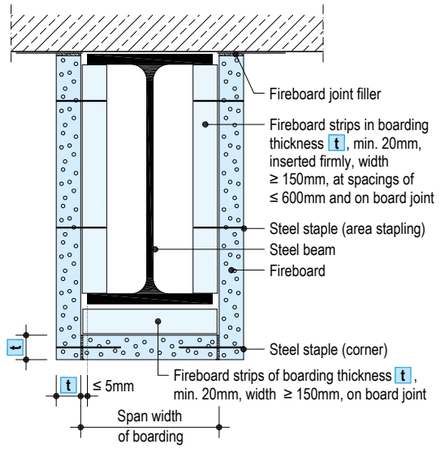
BEAM ENCASEMENTS

Joint Backing

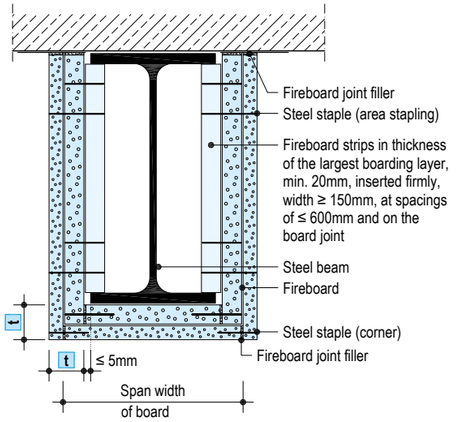


Shown
- **Beam ≤ 600mm**
- **Double-layer boarding**

Single Layer Frameless Encasement Cross Section



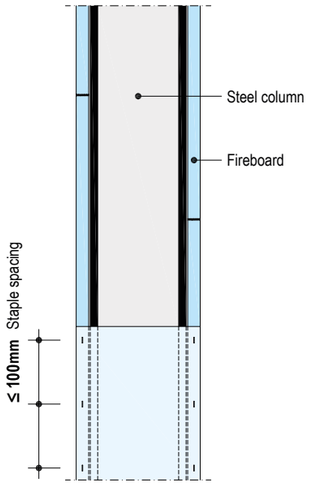
Double Layer Frameless Encasement Cross Section



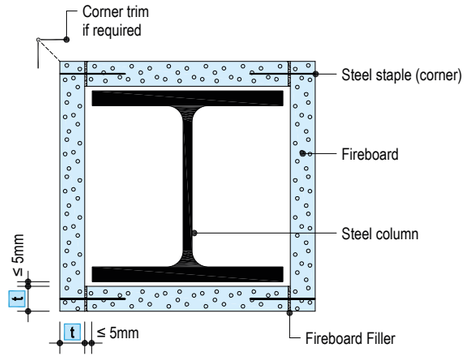
■ Stagger board joints of individual layers by ≥ 200mm

COLUMN ENCASEMENTS

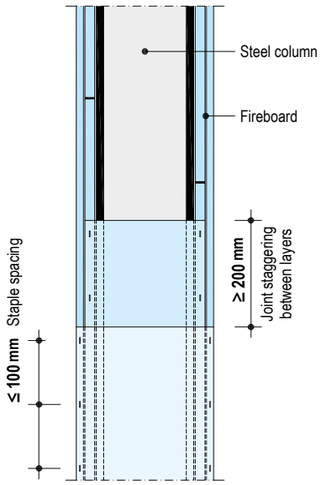
Single-layer boarding



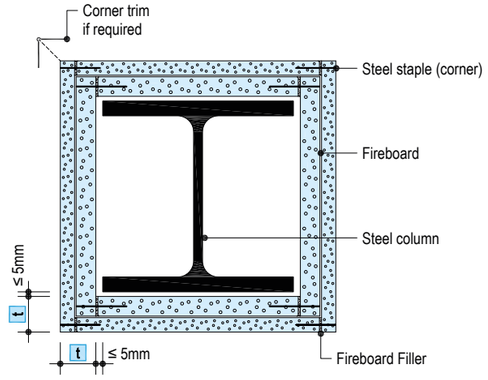
Horizontal cross section - single layer boarding



Double-layer boarding



Horizontal cross section - double layer boarding



STAPLING

Flush stapling of the board

Fireboard thickness mm	Fireboard strips mm	Staple lengths mm	Max staple spacings mm
15	20	35	100
20	25	40	100
25	25	50	100
30	30	60	100
20 + 15	25	40 + 55	100
2 × 20	25	40 + 60	100
25 + 20	25	50 + 70	100
2 × 25	25	50 + 75	100

Front side stapling of the board

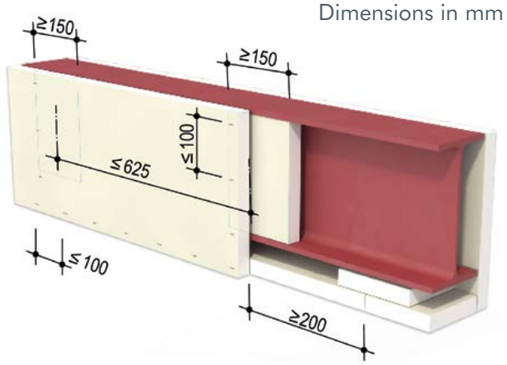
Fireboard thickness mm	Stapling lengths mm	Max. staple spacings mm
15	40	100
20	50	100
25	64	100
30	75	100
20 + 15	50 + 40	100
2 × 20	50 + 50	100
25 + 20	64 + 50	100
2 × 25	64 + 64	100

- The required board thickness “t” depends on the required fire resistance and the U/A rate of the steel column section.
- Staple all board layers with steel staples to DIN 18182 or EN 14566 with steel wire diameter ≥1.34mm
- Permissible cladding span width ≤600mm

FILLETS

Steel beam frameless encasement, stapled with Fireboard strips

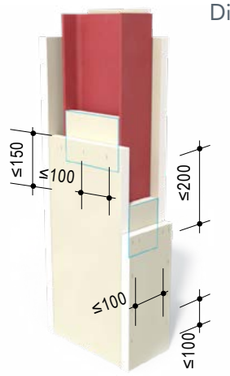
Dimensions in mm



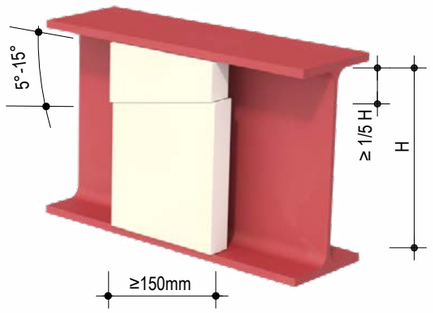
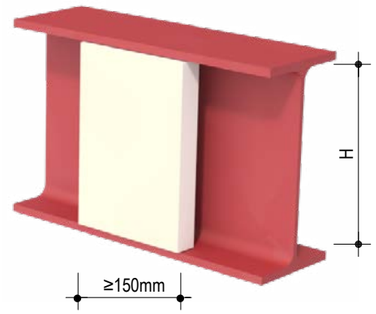
- Friction fit Fireboard strips between the steel beam flange, “t” minimum 25mm (with 15mm board thickness, strips at least 20mm thick are sufficient) and width ≥150mm on the board joint and as backing, with a spacing of maximum 600mm
- To make the insertion easier, the Fireboard strips can be cut with a sloped face and jammed in with the assistance of the sloped cut

Steel column frameless encasement, stapled with Fireboard strips

Dimensions in mm

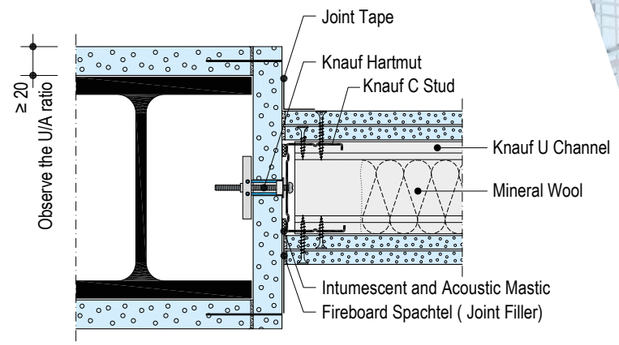


- In case of single-layer board encasement, back with Fireboard strips of thickness “t” minimum 25mm and width ≥150mm on the board joint. In case of 15mm board thickness, Fireboard strips with “t” of minimum 20mm are sufficient
- Staple all board layers with steel staples to DIN 18182 or EN 14566, with steel wire diameter ≥1.34mm, with backing made of Fireboard strips as well as in the face side in the corners
- Stagger the board joints by ≥200mm with multi-layer boarding

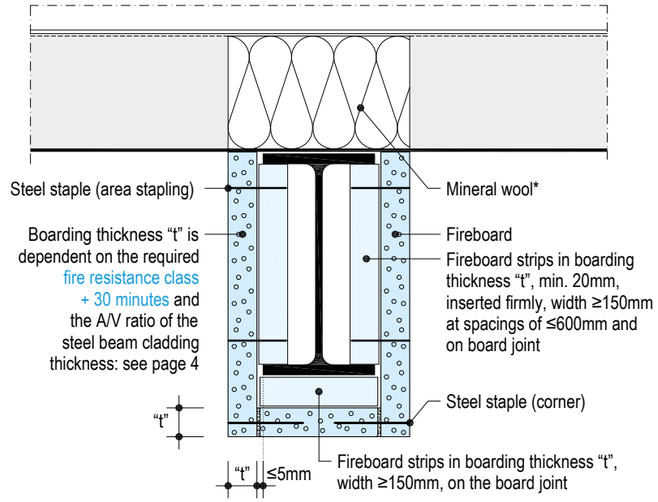
Fireboard Strips Type A two-part	Fireboard Strips Type B one-part
	

WALL CONNECTIONS

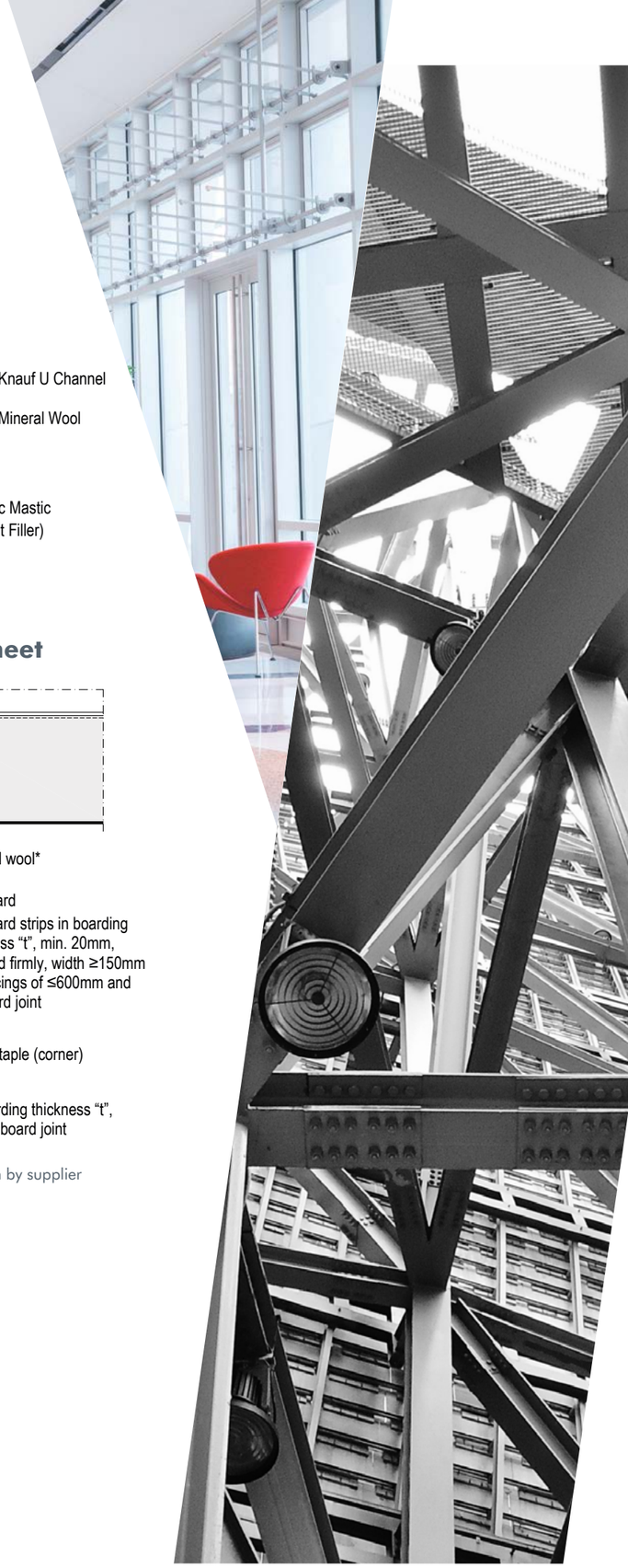
Wall connection (steel column)



Application with trapezoid metal sheet



* **Recommendation:** Fire protection mineral wool [consultation by supplier of product required] to maintain performance of detail.



MATERIAL REQUIREMENTS

The following guides show the typical quantity of product needed for Knauf Frameless Encasement systems when installed.

Material requirement per m Fireboard encasement

Without allowance for loss and waste
• not provided by Knauf = *printed in italics*

Steel beam frameless encasement

① 3-sided, without substructure
Steel beam IPE 240 4500mm long 25mm Fireboard stapled

Steel column frameless encasement

② 4-sided, without substructure
Steel column HEB 140 3500mm long 25mm Fireboard stapled

Description	Unit	Quantity as average value ①	②
Boarding			
Fireboard 25mm (board strips)	m^2	0.17	0.12
Fireboard 25mm	m^2	0.75	0.9
Stapling (See respective system for required lengths)			
Steel staples - surface stapling	pcs	24	16
Steel staples - corner stapling	pcs	19	37
Jointing			
Fireboard Spachtel (Joint Filler)	kg	0.85	0.85
or Fireboard Spachtel (Joint Filler + 1mm surface skim coat)	kg	1.1	1.2
or Fireboard Spachtel (Joint Filler + 3mm surface skim coat)	kg	2.65	3.0

INSTALLATION GUIDES - CONSTRUCTION, APPLICATION, JOINTING AND COATING

The following guides show how the Knauf Fire Encasement systems should be installed.

Construction

Fire protection encasements of steel beams and columns using Knauf Fireboard are possible up to fire resistance class F240.

Knauf Fireboards are special A1 glass reinforced gypsum boards for fire protection, type GM-F acc. to EN 15283-1.

Knauf Fireboard is available in thicknesses of 15, 20, 25 and 30mm.

Fireboard Steel Beam and Steel Column Encasements are made of Fireboard strips without substructure.

Application

Steel Beam and Column Frameless Encasement

- Insert Knauf Fireboard strips ("t" ≥cladding thickness, min. 20mm, b ≥150mm) firmly between steel beam flanges or lay them on the bottom side as backing (with single board cladding) or at board joints at a spacing of max. 600mm
- Fasten the Knauf Fireboards on the board strips and at corners by means of staples at a spacing of ≤ 100mm, or at spacings ≤50mm at board joints. Use steel staples acc. to DIN 18182 or EN 14566
- Stagger the board joints by ≥200mm

Jointing

Knauf Fireboard-Spachtel and Knauf Glasfaser-Fugendeckstreifen are both used to fill Knauf Fireboard joints and to create a smooth surface finish if required for subsequent decoration.

Application

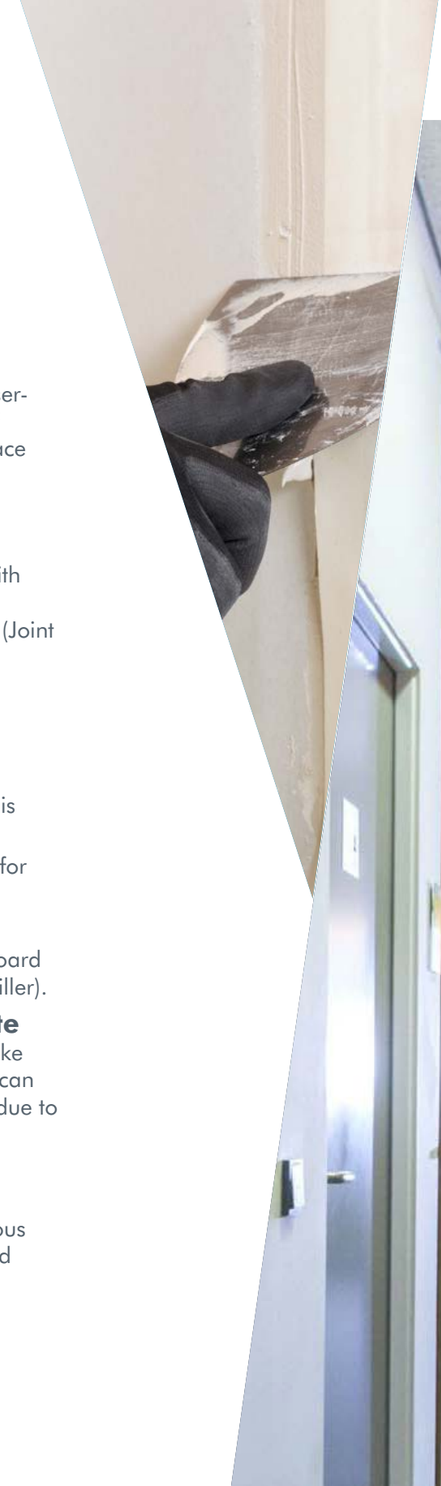
- Fill all board joints of outer board layers with Knauf Fireboard-Spachtel (Joint Filler) and embed Knauf Glasfaser-Fugendeckstreifen (Joint Tape)
- Fill in visible staples with Knauf Fireboard-Spachtel (Joint Filler)
- As a substrate for direct lining or coating, additional skimming of the entire surface with Knauf Fireboard-Spachtel (Joint Filler) is recommended
- The use of corner trims are recommended for columns

Connection Joints

Fill the connection joints of all encasement board layers with Knauf Fireboard-Spachtel (Joint Filler).

Application temperature / climate

- Filling and covering of joints should only take place when no more longitudinal changes can be expected, i.e. expansion or contraction due to humidity or temperature changes
- Do not apply filling at room or substrate temperatures below +10°C
- In case of mastic asphalt screed, cementitious screed and self-levelling screed, fill in board joints after screed has been applied



Pretreatment

- Before further coating or lining is applied, the filled surface must be free of dust
- Ensure that the primer and the subsequent paint / coating / lining are compatible
- In order to compensate for the differences in absorption of surfaces, a coating of Knauf Fireboard-Spachtel is required

Suitable coatings and linings

- Wallpapers
- Paper, fleece, textile and synthetic wallpapers
  Use only adhesives made of methyl cellulose
- Plaster and filler materials
- Top coats (e.g. Knauf Airless Finish)
- Full surface skimming (e.g. Knauf Fireboard-Spachtel)
- Dispersion paint
- Silicate-based emulsion paints with suitable primer
- Emulsion

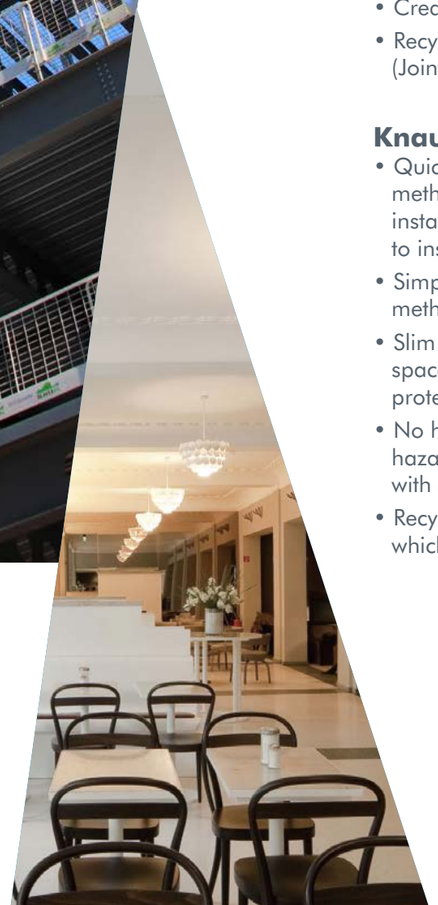
Unsuitable coatings and linings

- Alkaline coats such as lime, water glass paints and silicate-based paints, without a suitable primer

Notes

After wallpapering or after application of plasters, quick drying must be ensured through adequate airing. Other coatings or layers and vapour barriers up to about 0.5mm thickness as well as claddings (with the exception of sheet steel), do not have any influence on the technical fire resistance classification of Knauf Fireboard Steel Column and Beam Encasements.

SUSTAINABILITY



Knauf is committed to build a more sustainable world.

We are working to ensure that our People, Planet, Prosperity strategy is considered in all areas of our business where we have an influence. We are reducing our carbon footprint, improving the recycled content of our products, taking care of our people and increasing our social value. Every Knauf product contributes to sustainability in its own way – please see details of this product below.

LEED

Building assessment systems ensure the sustainable quality of buildings and constructional structures by a detailed assessment of ecological, economic, social, functional and technical aspects. The certification systems of LEED (Leadership in Energy and Environmental Design) are of particular relevance.

Knauf Fireboard Beam and Column Encasements can positively influence many of these criteria.

LEED - Materials and resources
- Credit: Recycled content
- Recycled content in Fireboard Spachtel (Joint Filler)

Knauf Sustainability

- Quick to construct. Time saving installation method, removing the need for subframe installation makes this system inherently quicker to install
- Simple to install. Uses standard dry lining methods and site tools for installation
- Slim construction. Achieves greater saleable floor space without detriment to performance and protection of the structural elements of a building
- No hazardous chemicals. The products are not hazardous, boards are easily cut and installed with minimal dust
- Recyclable. Allowing a closed loop approach which is better for the environment

CITB Accredited Training Organisation

The Learning Zones at Immingham and Sittingbourne are CITB approved training facilities and offer various courses for the construction industry. We believe in future-proofing and protecting the workforce.

We build for the world we live in.

We provide the best possible training on the large variety of systems and products that we supply, and make our courses widely available to those who request them. Whether the trainees are already skilled tradespeople, wishing to add to their existing knowledge, or people with no previous experience, there is a course in our range to benefit all.

We are happy to advise on the suitability of different courses and the content can be adapted to suit the requirements of the delegates.

All work carried out on the Knauf courses will be in a simulated site environment, and to industry standards, using British Standard and European Codes of Practice for accuracy and finish.

Contact us to find out more about the latest courses available.

Courses available

- **Drylining – Direct bonding and metal lining systems**
- **Fire protection – Encasement systems**
- **General overview of interior products and systems**
- **Metal stud partitions, shaft wall, wall linings**
- **Metal suspended ceiling systems**
- **Flooring – Brio and GIFA systems**
- **Façades – Steel framing systems**
- **Taping and jointing**
- **Renders and external wall insulation (EWI)**
- **Demountable ceiling systems**
- **Drywall for site managers / Quality Control**
- **Airless spray finishing**

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