Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

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European Technical Assessment

ETA-11/0458 of 30 September 2014

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	"AESTUVER" fire protective board
Product family to which the construction product belongs	Fire protective board
Manufacturer	Fermacell GmbH Düsseldorfer Landstraße 395 47259 Duisburg DEUTSCHLAND
Manufacturing plant	10
This European Technical Assessment contains	44 pages including 38 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	Guideline for European technical approval of "Fire Protective Products", ETAG 018 Part 4: "Fire protective board, slab and mat products and kits", December 2011, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation(EU) No 305/2011.
This version replaces	ETA-11/0458 issued on 27 June 2013

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Specific part

1 Technical description of the product

"AESTUVER" is a special cement-bonded, glass fibre-reinforced board, produced from a mixture of cement, lightweight mineral aggregates and water. The fire protective board has a multi-layer design.

Table 1 Dimensions and dry bulk density of "AESTUVER" fire protective boards

Board thickness[1] mm	Length/width mm	Tolerance mm	Dry bulk density kg/m³
10 ± 1	≤ 3000 x ≤ 1250	± 2	950 ± 15 %
15 ± 1			800 ± 15 %
20 ± 1			700 ± 15 %
25 ± 1			690 ± 15 %
30 ± 1			680 ± 15 %
40 ± 1			650 ± 15 %
50 ± 1			650 ± 15 %
60 ± 1			640 ± 15 %

Details on the materials used and the manufacturing process of "AESTUVER" fire protective boards are deposited with Deutsches Institut für Bautechnik.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The "AESTUVER" fire protective board may be used as a fire-protective cladding for building components or as a component of fire-resistant building components.

"AESTUVER" fire protective boards are intended to be used in accordance with the use categories 1 to 10 given in ETAG 018-1.

"AESTUVER" fire protective boards are suitable for indoor and outdoor use.

Not all use categories have been evaluated with regard to fire resistance within the framework of this European Technical Assessment. Annex B of this Assessment lists all designs for which the fire-resistance performance has been verified within the framework of this European Technical Assessment. Concerning fire resistance performance, this Assessment only applies to claddings and building components designed in accordance with the specifications given in Annex B.

The performances given in section 3 are only valid if the "AESTUVER" fire protective boards are used in compliance with

- the specifications and conditions given in Annexes A and B and
- the manufacturer's instructions as stated in section 5.

The performances have been evaluated for fire protective boards without additional laminates or coatings on the surfaces.

1 Intermediate board thicknesses are possible.

The verifications and assessment methods on which this European Technical Assessment is based lead the assumption of working life of the "AESTUVER" fire protective boards of 25 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Not applicable

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1 in accordance with EN 13501-1 See Annex A
Resistance to fire	See Annexes A and B

3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Water permeability	Resistant in accordance with EN 12467
Content and/or release of dangerous substances	Contains no dangerous substances in accordance with TR 034

For dangerous substances falling under the scope of the CPR for which:

- no assessment and verification methods are given (or cannot be found in TR 034), or
- "npd" is declared, or
- the chosen verification and assessment method does not comply with the regulatory requirement of a particular Member State

there might be the necessity for an additional assessment.

3.4 Safety and accessibility (BWR 4)

Essential characteristic	Performance
Flexural strength	See Annex A
Dimensional stability	See Annex A
Tensile strength perpendicular to the plane of the board	See Annex A
Tensile strength parallel to the plane of the board	See Annex A
Compressive strength	See Annex A

3.5 Protection against noise (BWR 5)

No performance determined.

3.6 Energy economy and heat retention (BWR 6)

Essential characteristic	Performance
Thermal resistance	No performance determined
Water vapour transmission resistance value	See Annex A

3.7 Sustainable use of natural resources (BWR 7)

For the sustainable use of natural resources no performance was investigated for this product.

3.8 General aspects

The verification of durability is part of testing the essential characteristics.

"AESTUVER" fire protective boards are suitable for use in the following use categorie specified in ETAG 018-4, with no essential changes in their fire protective properties to be expected:

Type X: Fire protective boards intended for all uses (internal, semi-exposed and exposed)

Concerning durability, the following characteristics have been tested:

Essential characteristic	Performance
Resistance to deterioration caused by water	Resistant in accordance with EN 12467
Resistance to soak/dry	Resistant in accordance with EN 12467
Resistance to freeze/thaw	Resistant in accordance with EN 12467
Resistance to heat/rain	Resistant in accordance with EN 12467

Durability is only ensured if the specifications of intended use according to Annexes A and B and the manufacturer's instructions in section 5 are taken into account.

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

According to Decision of the Commission of 22 June 1999 (1999/454/EC) (OJ L 178/52 of 14.7.1999, p. 3), as amended by Decision of the Commission of 8 January 2001 (2001/596/EC) (OJ L 209/33 of 2.8.2001, p. 2) , the system of assessment and verification of constancy of performance (see Annex V and Article 65 Paragraph 2 to Regulation (EU) No 305/2011) given in the following table applies.

Product	Intended use	Level or class *(resistance to fire)*	System of assessment and verification of constancy of performance
"AESTUVER" fire protective board	fire protective cladding for building components or component of fire-resistant building components	any	1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

The technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

The manufacturer shall provide instructions on processing, packaging, transport, storage and use, maintenance and repair of the construction product.

Issued in Berlin on 30 September 2014 by Deutsches Institut für Bautechnik

Prof. Gunter Hoppe
Head of Department

beglaubigt:
von Hoerschelmann

Deutsches Institut für Bautechnik DIBt

1 Performance of the product

1.1 Safety in case of fire

1.1.1 Reaction to fire of "AESTUVER" fire protective board

Persuant to Commission Decisions 96/603/EC and 2000/605/EC[1], the uncoated "AESTUVER" fire protective boards are classified in class A1 in accordance with EN 13501-1.

1.1.2 Resistance to fire

For the resistance-to-fire performance of claddings or building components using "AESTUVER" fire protective boards, see Annex B.

1.2 Energy economy and heat retention

1.2.1 Water vapour transmission resistance value in accordance with EN ISO 12572, test condition A

Thickness d	Water vapour transmission resistance value μ
10 mm	36
15 mm	25
20 mm	54

[1] Official Journal of the European Communities L 267/23 of 19.10.1996 and L258/36 of 12.10.2000

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1.3 Safety and accessibility

1.3.1 Flexural strength

Mean value of the modulus of rupture (MOR) of the "AESTUVER" fire protective boards determined in accordance with EN 12467, section 7.3.2

Thickness d	Mean value of the modulus of rupture (MOR)
≥ 10 mm	at least 3.5 MPa
≥ 15 mm	at least 3.0 MPa
≥ 30 mm	at least 2.0 MPA
60 mm	at least 1.5 MPA

1.3.2 Dimensional stability

Relative change in length and thickness of the "AESTUVER" fire protective boards after a change in the relative humidity, tested in accordance with EN 318

Thickness d	Relative change in length
10 mm and 20 mm	0.3 mm/m when the relative air humidity changes from 65 % to 85 %*
	-0.4 mm/m when the relative air humidity changes from 65 % to 30 %**

Thickness d	Relative change in thickness
10 mm	0.0 % when the relative air humidity changes from 65 % to 85 %*
	-0.1 % when the relative air humidity changes from 65 % to 30 % **
20 mm	0.1 % when the relative air humidity changes from 65 % to 85 %*
	-0.1 % when the relative air humidity changes from 65 % to 30 % **

* swelling behaviour

** shrinking behaviour

1.3.3 Tensile strength perpendicular to the plane of the board in accordance with EN 319

Thickness d	Average tensile strength perpendicular to the plane of the board
10 mm	at least 1,5 MPa
20 mm	at least 0,8 MPa

1.3.4 Tensile strength parallel to the plane of the board in accordance with EN 789, section 9

Thickness d	Average tensile strength parallel to the plane of the board
10 mm	at least 1,5 MPa
20 mm	at least 2,6 MPa

1.3.5 Compressive strength in accordance with EN 789, section 8

Thickness d	Average compressive strength
10 mm	at least 24,4 MPa
20 mm	at least 9,3 MPa

"AESTUVER" fire protective board	**Annex A 2**
Performance of the product Safety and accessibility	

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2 Designs for which the fire-resistance has been verified within the framework of this European Technical Assessment

Table 2 provides an overview of the fire resistance classes of all designs for which the fire resistance performance has been evaluated in the context of this European Technical Assessment.

For the designs listed in this table and executed in accordance with the specifications given in these Annexes, the fire resistance performance given shall be deemed verified within the framework of this European Technical Assessment.

Table 2

Designs evaluated with regard to fire-resistance within the framework of this ETA	Classification in accordance with EN 13501-2	Test method	Intended use according to ETAG 018-1 (use category)	Details	Date of addition to this ETA
Load-bearing steel elements cladded by 15 to 60 mm thick "AESTUVER" fire protective boards	R 15 to R 240	EN 1363-1 and EN 13381-4	Type 4	Annex **C** Pages 10 to 39	30 September 2014
Trapezoidal steel profile ceiling (load-bearing) cladded by 15 mm thick "AESTUVER" fire protective boards	RE 120 REI 30	EN 1363-1 and EN 1365-2	Type 10	Annex **D** Pages 40 to 44	5 January 2012 Revised: 27 June 2013

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3 Load-bearing steel elements cladded with "AESTUVER" fire protective boards (use category 4)

3.1 Classification

The designs listed in Annex B, Table 2, have been tested and assessed in accordance with EN 1363-1 and EN 13381-4 and found to fulfil the requirements of classes R 15 to R 240 (depending on the design variants 1 to 5, see below) in accordance with EN 13501-2.

This fire resistance performance can only be guaranteed if the requirements set out in sections 3.2 to 3.6 and Annexes C 4 to C 30 are met.

3.2 Steel beams and steel columns (without openings in the web)

Standard	Steel grade	Type of the profile	Beam maximum height web	Column maximum width
EN 10025-1	S235 to S450	IPE, HEA, HEM	496,5 mm (total height beam: plus 2 x thickness flange and weld)	600 mm
		Angles, U-channels and T-sections		
		Hollow sections		

3.3 Fastening of the fire protective boards

Fastening	Staples (Design variant 1 to 4)	Screws (Design variant 5)
Standard	EN 14592	ETA-11/0284; EN 14592
Dimensions, position and spacing	Design variant 1 see Annex C 4 to C 9	See Annex C 28 to 30
	Design variant 2 see Annex C 10 to C 15	
	Design variant 3 see Annex C 16 to C 21	
	Design variant 4 see Annex C 22 to C 27	

3.4 Conditions for installing the fire protective boards

- The fire protective boards shall be butt-jointed. The distance between the fire protective boards and the flange of the steel sections shall be 5 to 50 mm.
- The joints between the fire protective boards shall be lined with one-piece or two-piece "noggins" consisting of the fire protective boards. The dimensions of the noggins shall be:
  - width 150 mm
  - thickness 1 x 15 mm (design variants 2 and 4) and 2 x 15 mm (design variants 1 and 3)
  - thickness 1 x 20 mm (design variants 2, 4 and 5) and 2 x 20 mm (design variants 1 and 3)
- In the joint areas of fire protective boards which are adjacent to the flanges of the steel sections no noggins need to be installed.
- For installation variants, see Annex C3.
- All joints between the cladded steel elements and the adjacent fire-resistant separating building components shall be filled and completely closed with suitable materials with a reaction-to-fire class A1/A2-s1,d0 in accordance with EN 13501-1 and a melting point of > 1000°C.

"AESTUVER" fire protective board	**Annex C 1**
Use category 4 - Protection of load-bearing steel elements Design of the steel elements and the fire protective boards	

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3.5 Design variants

AESTUVER fire protection boards: EN 13381-4 (2013)

Beams		Beams/ Columns		
Number of exposed sides: 3		Number of exposed sides: 3/4		
thickness of board: 15 - 50 mm		thickness of board: 15 - 50 mm		thickness of board: 60 mm
section factor range: 62 - 279		section factor range: 46 - 380		section factor range: 46 - 380
classes of fire resistance: R15 - R180	classes of fire resistance: R15 - R150	classes of fire resistance: R15 - R180	classes of fire resistance: R15 - R150	classes of fire resistance: R15 - R240
staples (high amount) two rows of staples vertically, staples [distance]: 50 mm → lower thickness of board	**staples (low amount)** staples [distance]: 75 mm → higher thickness of board	**staples (high amount)** two rows of staples vertically, staples [distance]: 50 mm → lower thickness of board	**staples (low amount)** staples [distance]: 75 mm → higher thickness of board	**screws** screws [distance]: 150 mm
design variant 1	design variant 2	design variant 3	design variant 4	design variant 5
from page 13 annex C4	from page 19 annex C10	from page 25 annex C16	from page 31 annex C22	from page 37 annex C28
Applicable for beams only.		Applicable for beams and columns. To be used for beams if section factor > 279.		

"AESTUVER" fire protective board

Use category 4 - Protection of load-bearing steel elements
Design variants

Annex C 2

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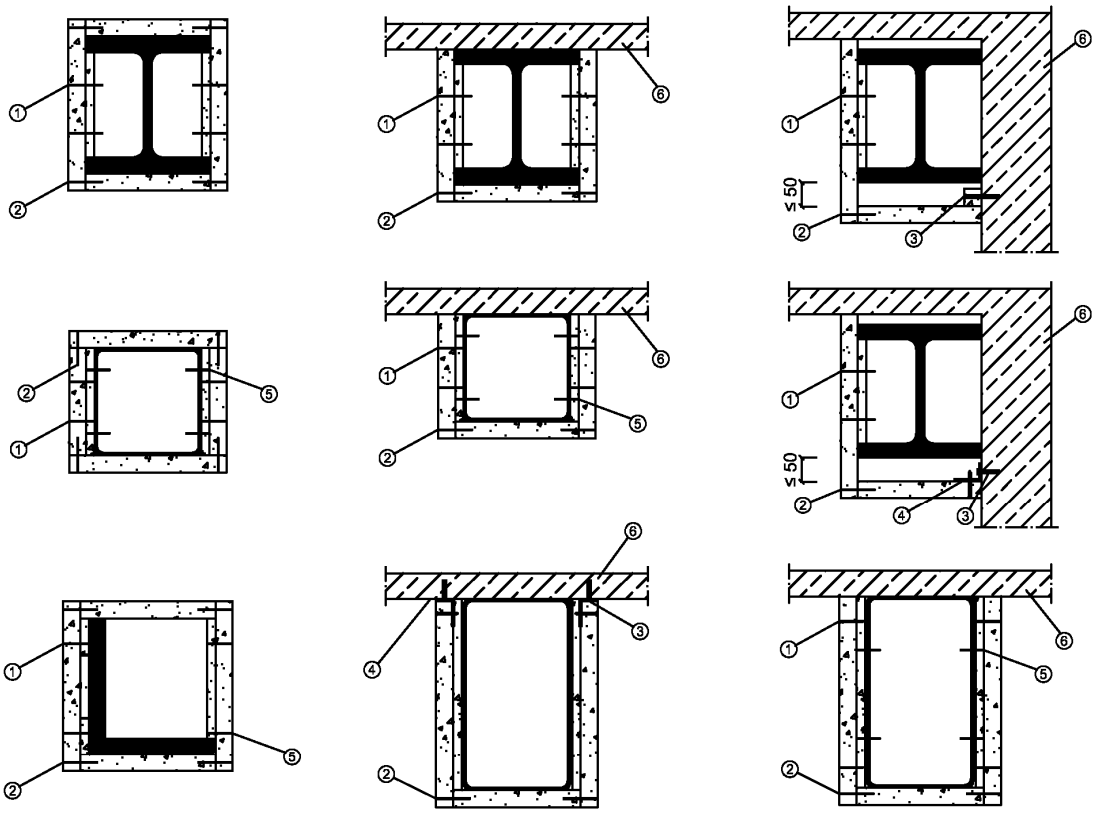
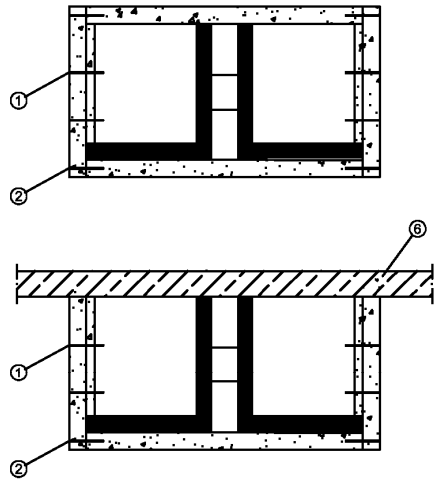
3.6 Installation variants





① **staple/ screw, vertical**
staple or screw according to table
to be found in annex C4/ C10/ C16/ C22/ C28

② **staple/ screw, longitudinal**
staple or screw according to table
to be found in annex C4/ C10/ C16/ C22/ C28

③ **nail anchor M6 (e.g. Fischer FNA II or equivalent)**
spacing of anchors ≤ 500 mm
Minimum embedment depth into the concrete and clamping length according to manufacturer's information.

④ **steel bracket**
20/40/1,0 mm

⑤ **counter sunk drilling screw**
minimum diameter = 4 mm
spacing of screws, vertical ≤ 100 mm
Length of the screws and minimum thread depth into the steel section according to manufacturer's information.

⑥ **adjacent separating building element (solid wall or ceiling)**
Fire resistance at least equivalent to the one of the protected steel sections.

"AESTUVER" fire protective board	**Annex C 3**
Use category 4 - Protection of load-bearing steel elements Installation variants	

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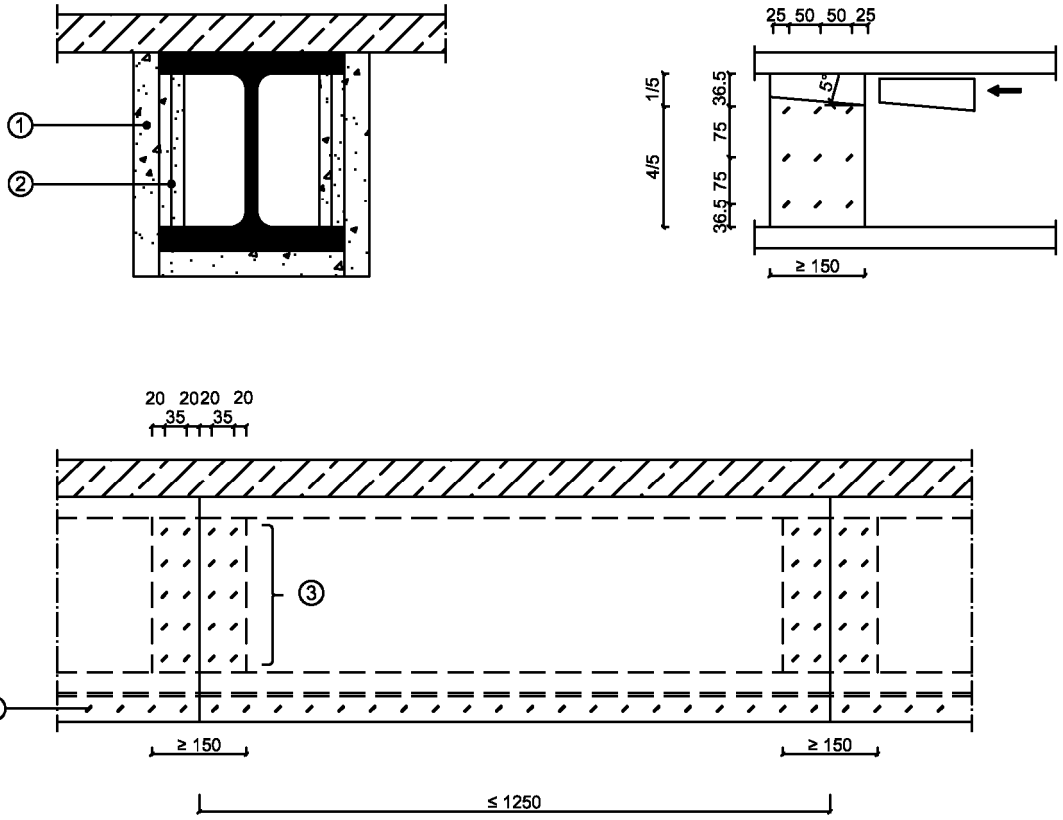

[dimensions in mm]

① AESTUVER protective board
thickness = 15-50 mm

② AESTUVER protective board ("nogging")
thickness = 15 mm or 20 mm

③ staple (vertical, two rows)
length = 40-80 mm

④ staple (longitudinal)
length = 40-80 mm

① board thickness	② nogging thickness	③ staples vertical	④ staples longitudinal
15 mm	2x 15 mm	length: min. 40 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, two rows	40 x 11.25 x 1.53 mm spacing: 100 mm
20 mm	2x 20 mm	length: min. 45 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, two rows	45 x 11.25 x 1.53 mm spacing: 50 mm
25 mm	2x 20 mm	length: min. 50 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, two rows	50 x 11.25 x 1.53 mm spacing: 50 mm
30 mm	2x 20 mm	length: min. 60 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, two rows	60 x 11.25 x 1.53 mm spacing: 50 mm
40 mm	2x 20 mm	length: min. 70 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, two rows	80 x 11.25 x 2.00 mm spacing: 50 mm
50 mm	2x 20 mm	length: min. 80 mm width/diameter: 11.25 x 2.00 mm spacing: 50 mm, two rows	80 x 11.25 x 2.00 mm spacing: 50 mm

"AESTUVER" fire protective board

Annex C 4

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 1 – Cladded steel beams
Fastening of the fire protective boards with staples (high amount in two rows)

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Fire resistance classification R 30									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	15	15	15	15	15	15	15	15	15
61,8	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	20	15	15	15	15	15	15	15	15
200	20	15	15	15	15	15	15	15	15
210	20	15	15	15	15	15	15	15	15
220	20	15	15	15	15	15	15	15	15
230	20	15	15	15	15	15	15	15	15
240	20	15	15	15	15	15	15	15	15
250	20	15	15	15	15	15	15	15	15
260	20	15	15	15	15	15	15	15	15
270	20	15	15	15	15	15	15	15	15
278,9	20	15	15	15	15	15	15	15	15

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 1 – Cladded steel beams
Fastening of the fire protective boards with staples (high amount in two rows)

Annex C 5

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Fire resistance classification R 60									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	20	15	15	15	15	15	15	15	15
61,8	20	15	15	15	15	15	15	15	15
70	20	15	15	15	15	15	15	15	15
80	20	20	15	15	15	15	15	15	15
90	25	20	15	15	15	15	15	15	15
100	25	20	20	15	15	15	15	15	15
110	25	20	20	15	15	15	15	15	15
120	25	20	20	15	15	15	15	15	15
130	25	25	20	15	15	15	15	15	15
140	25	25	20	15	15	15	15	15	15
150	30	25	20	20	15	15	15	15	15
160	30	25	20	20	15	15	15	15	15
170	30	25	20	20	15	15	15	15	15
180	30	25	20	20	15	15	15	15	15
190	30	25	20	20	15	15	15	15	15
200	30	25	25	20	15	15	15	15	15
210	30	25	25	20	15	15	15	15	15
220	30	25	25	20	15	15	15	15	15
230	30	25	25	20	15	15	15	15	15
240	30	25	25	20	15	15	15	15	15
250	30	25	25	20	15	15	15	15	15
260	30	30	25	20	15	15	15	15	15
270	30	30	25	20	15	15	15	15	15
278,9	30	30	25	20	15	15	15	15	15

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 1 – Cladded steel beams
Fastening of the fire protective boards with staples (high amount in two rows)

Annex C 6

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Fire resistance classification R 90									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	30	25	20	20	15	15	15	15	15
61,8	30	25	20	20	15	15	15	15	15
70	30	25	25	20	20	15	15	15	15
80	30	30	25	20	20	15	15	15	15
90	35	30	25	25	20	20	15	15	15
100	35	30	30	25	20	20	15	15	15
110	35	30	30	25	20	20	15	15	15
120	35	35	30	25	25	20	15	15	15
130	40	35	30	25	25	20	20	15	15
140	40	35	30	30	25	20	20	15	15
150	40	35	30	30	25	20	20	15	15
160	40	35	30	30	25	20	20	15	15
170	40	35	35	30	25	25	20	15	15
180	40	35	35	30	25	25	20	15	15
190	40	40	35	30	25	25	20	15	15
200	40	40	35	30	25	25	20	15	15
210	40	40	35	30	25	25	20	15	15
220	45	40	35	30	30	25	20	20	15
230	45	40	35	30	30	25	20	20	15
240	45	40	35	30	30	25	20	20	15
250	45	40	35	30	30	25	20	20	15
260	45	40	35	30	30	25	20	20	15
270	45	40	35	35	30	25	20	20	15
278,9	45	40	35	35	30	25	20	20	15

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 1 – Cladded steel beams
Fastening of the fire protective boards with staples (high amount in two rows)

Annex C 7

Deutsches Institut für Bautechnik DIBt

Fire resistance classification R 120									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	40	35	30	25	25	20	20	15	15
61,8	40	35	30	25	25	20	20	15	15
70	40	35	30	30	25	25	20	20	15
80	45	40	35	30	25	25	20	20	20
90	45	40	35	30	30	25	25	20	20
100	45	40	40	35	30	25	25	20	20
110	50	45	40	35	30	30	25	25	20
120	50	45	40	35	35	30	25	25	20
130	50	45	40	35	35	30	25	25	20
140	50	45	40	40	35	30	30	25	20
150	50	45	45	40	35	30	30	25	20
160	-	50	45	40	35	35	30	25	25
170	-	50	45	40	35	35	30	25	25
180	-	50	45	40	35	35	30	25	25
190	-	50	45	40	40	35	30	30	25
200	-	50	45	40	40	35	30	30	25
210	-	50	45	45	40	35	30	30	25
220	-	50	45	45	40	35	30	30	25
230	-	50	50	45	40	35	35	30	25
240	-	50	50	45	40	35	35	30	25
250	-	50	50	45	40	35	35	30	25
260	-	50	50	45	40	35	35	30	25
270	-	-	50	45	40	40	35	30	25
278,9	-	-	50	45	40	40	35	30	25

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 1 – Cladded steel beams
Fastening of the fire protective boards with staples (high amount in two rows)

Annex C 8

Deutsches Institut für Bautechnik DIBt

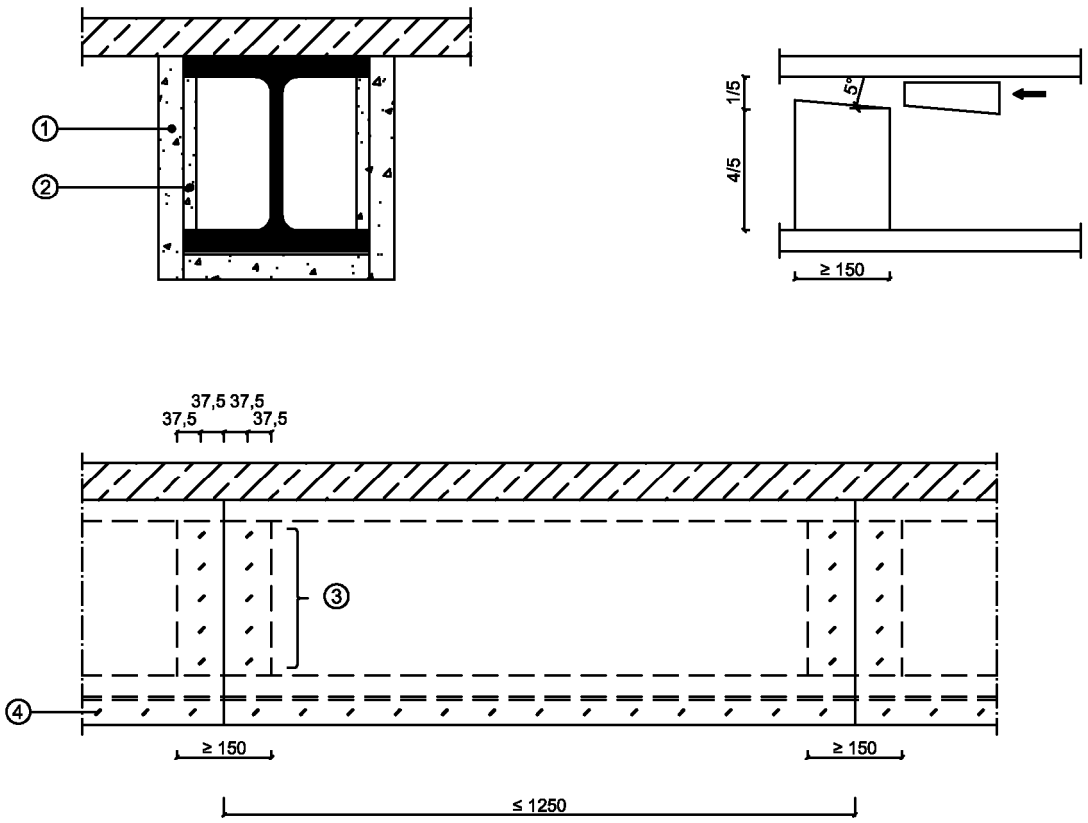
Fire resistance classification R 180									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	-	-	50	45	40	35	30	30	25
61,8	-	-	50	45	40	35	30	30	25
70	-	-	50	45	40	40	35	30	30
80	-	-	-	50	45	40	35	35	30
90	-	-	-	50	45	45	40	35	35
100	-	-	-	-	50	45	40	40	35
110	-	-	-	-	50	45	45	40	35
120	-	-	-	-	-	50	45	40	40
130	-	-	-	-	-	50	45	45	40
140	-	-	-	-	-	50	50	45	40
150	-	-	-	-	-	-	50	45	40
160	-	-	-	-	-	-	50	45	45
170	-	-	-	-	-	-	50	50	45
180	-	-	-	-	-	-	-	50	45
190	-	-	-	-	-	-	-	50	45
200	-	-	-	-	-	-	-	50	45
210	-	-	-	-	-	-	-	50	50
220	-	-	-	-	-	-	-	50	50
230	-	-	-	-	-	-	-	-	50
240	-	-	-	-	-	-	-	-	50
250	-	-	-	-	-	-	-	-	50
260	-	-	-	-	-	-	-	-	50
270	-	-	-	-	-	-	-	-	50
278,9	-	-	-	-	-	-	-	-	50

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 1 – Cladded steel beams
Fastening of the fire protective boards with staples (high amount in two rows)

Annex C 9

Deutsches Institut für Bautechnik DIBt



[dimensions in mm]

① AESTUVER protection board
thickness = 15-50 mm

② AESTUVER protection board ("nogging")
thickness = 15 mm or 20 mm

③ staple (vertical, one row)
length = 30-70 mm

④ staple (longitudinal)
length = 40-80 mm

① board thickness	② nogging thickness	③ staples vertical	④ staples longitudinal
15 mm	15 mm	length: min. 30 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, one row	40 x 11.25 x 1.53 mm spacing: 75 mm
20 mm	20 mm	length: min. 40 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, one row	45 x 11.25 x 1.53 mm spacing: 75 mm
25 mm	20 mm	length: min. 45 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, one row	50 x 11.25 x 1.53 mm spacing: 75 mm
30 mm	20 mm	length: min. 50 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, one row	60 x 11.25 x 1.53 mm spacing: 75 mm
40 mm	20 mm	length: min. 60 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, one row	80 x 11.25 x 2.00 mm spacing: 75 mm
50 mm	20 mm	length: min. 70 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, one row	80 x 11.25 x 2.00 mm spacing: 75 mm

"AESTUVER" fire protective board

Annex C 10

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 2 – Cladded steel beams
Fastening of the fire protective boards with staples (low amount in one row)

Deutsches Institut für Bautechnik DIBt

Fire resistance classification R 30									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	15	15	15	15	15	15	15	15	15
61,8	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	20	15	15	15	15	15	15	15	15
200	20	15	15	15	15	15	15	15	15
210	20	15	15	15	15	15	15	15	15
220	20	15	15	15	15	15	15	15	15
230	20	15	15	15	15	15	15	15	15
240	20	15	15	15	15	15	15	15	15
250	20	15	15	15	15	15	15	15	15
260	20	15	15	15	15	15	15	15	15
270	20	15	15	15	15	15	15	15	15
278,9	20	15	15	15	15	15	15	15	15

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 2 – Cladded steel beams
Fastening of the fire protective boards with staples (low amount in one row)

Annex C 11

Deutsches Institut für Bautechnik DIBt

Fire resistance classification R 60									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	20	15	15	15	15	15	15	15	15
61,8	20	15	15	15	15	15	15	15	15
70	20	20	15	15	15	15	15	15	15
80	25	20	15	15	15	15	15	15	15
90	25	20	15	15	15	15	15	15	15
100	25	20	20	15	15	15	15	15	15
110	25	25	20	15	15	15	15	15	15
120	30	25	20	15	15	15	15	15	15
130	30	25	20	15	15	15	15	15	15
140	30	25	20	20	15	15	15	15	15
150	30	25	20	20	15	15	15	15	15
160	30	25	25	20	15	15	15	15	15
170	30	25	25	20	15	15	15	15	15
180	30	30	25	20	15	15	15	15	15
190	30	30	25	20	15	15	15	15	15
200	35	30	25	20	15	15	15	15	15
210	35	30	25	20	15	15	15	15	15
220	35	30	25	20	15	15	15	15	15
230	35	30	25	20	15	15	15	15	15
240	35	30	25	20	15	15	15	15	15
250	35	30	25	20	15	15	15	15	15
260	35	30	25	20	15	15	15	15	15
270	35	30	25	20	15	15	15	15	15
278,9	35	30	25	20	15	15	15	15	15

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 2 – Cladded steel beams
Fastening of the fire protective boards with staples (low amount in one row)

Annex C 12

Deutsches Institut für Bautechnik DIBt

Fire resistance classification R 90									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	30	30	25	20	20	15	15	15	15
61,8	30	30	25	20	20	15	15	15	15
70	35	30	25	20	20	15	15	15	15
80	35	30	30	25	20	20	15	15	15
90	40	35	30	25	20	20	15	15	15
100	40	35	30	25	25	20	15	15	15
110	40	35	30	30	25	20	15	15	15
120	45	40	35	30	25	20	20	15	15
130	45	40	35	30	25	20	20	15	15
140	45	40	35	30	25	25	20	15	15
150	45	40	35	30	30	25	20	15	15
160	45	40	35	30	30	25	20	15	15
170	45	40	35	35	30	25	20	15	15
180	45	40	40	35	30	25	20	15	15
190	45	45	40	35	30	25	20	20	15
200	50	45	40	35	30	25	20	20	15
210	50	45	40	35	30	25	20	20	15
220	50	45	40	35	30	25	25	20	15
230	50	45	40	35	30	25	25	20	15
240	50	45	40	35	30	30	25	20	15
250	50	45	40	35	30	30	25	20	15
260	50	45	40	35	35	30	25	20	15
270	50	45	40	35	35	30	25	20	15
278,9	50	45	40	40	35	30	25	20	15

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 2 – Cladded steel beams
Fastening of the fire protective boards with staples (low amount in one row)

Annex C 13

Deutsches Institut für Bautechnik DIBt

Fire resistance classification R 120									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	45	40	35	30	25	25	20	20	15
61,8	45	40	35	30	25	25	20	20	15
70	50	40	35	35	30	25	25	20	20
80	50	45	40	35	30	30	25	20	20
90	-	45	40	35	35	30	25	25	20
100	-	50	45	40	35	30	25	25	20
110	-	50	45	40	35	35	30	25	20
120	-	50	45	40	40	35	30	25	25
130	-	-	50	45	40	35	30	25	25
140	-	-	50	45	40	35	30	30	25
150	-	-	50	45	40	35	35	30	25
160	-	-	50	45	40	40	35	30	25
170	-	-	50	50	45	40	35	30	25
180	-	-	-	50	45	40	35	30	25
190	-	-	-	50	45	40	35	30	30
200	-	-	-	50	45	40	35	35	30
210	-	-	-	50	45	40	40	35	30
220	-	-	-	50	45	45	40	35	30
230	-	-	-	50	45	45	40	35	30
240	-	-	-	50	50	45	40	35	30
250	-	-	-	-	50	45	40	35	30
260	-	-	-	-	50	45	40	35	30
270	-	-	-	-	50	45	40	35	30
278,9	-	-	-	-	50	45	40	35	30

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 2 – Cladded steel beams
Fastening of the fire protective boards with staples (low amount in one row)

Annex C 14

Deutsches Institut für Bautechnik DIBt

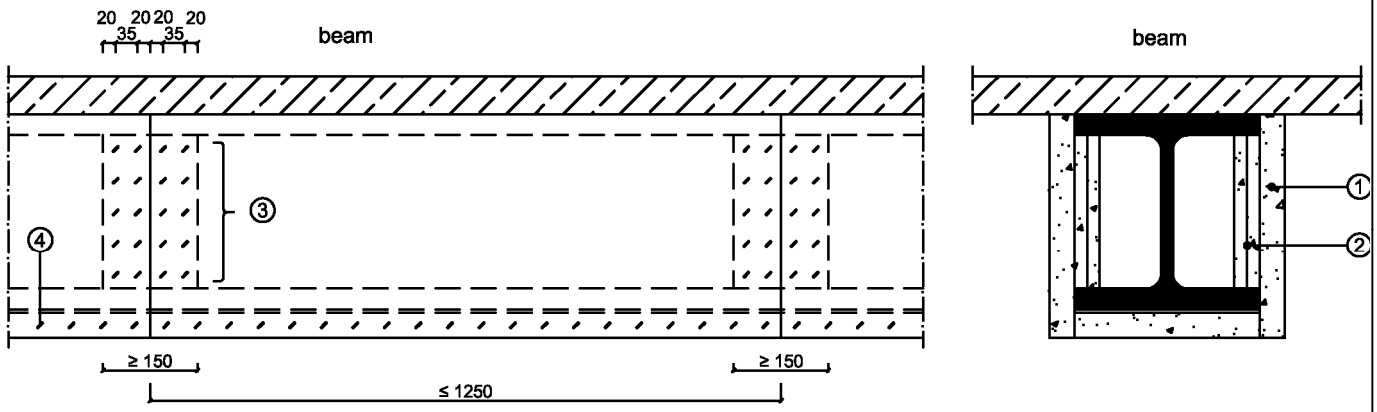
Fire resistance classification R 150									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	-	50	45	40	35	35	30	25	25
61,8	-	50	45	40	35	35	30	25	25
70	-	-	50	45	40	35	30	30	25
80	-	-	50	45	40	40	35	30	30
90	-	-	-	50	45	40	35	35	30
100	-	-	-	50	45	45	40	35	30
110	-	-	-	-	50	45	40	35	35
120	-	-	-	-	50	45	40	40	35
130	-	-	-	-	-	50	45	40	35
140	-	-	-	-	-	50	45	40	35
150	-	-	-	-	-	50	45	40	40
160	-	-	-	-	-	50	50	45	40
170	-	-	-	-	-	-	50	45	40
180	-	-	-	-	-	-	50	45	40
190	-	-	-	-	-	-	50	45	45
200	-	-	-	-	-	-	50	50	45
210	-	-	-	-	-	-	-	50	45
220	-	-	-	-	-	-	-	50	45
230	-	-	-	-	-	-	-	50	45
240	-	-	-	-	-	-	-	50	45
250	-	-	-	-	-	-	-	50	50
260	-	-	-	-	-	-	-	-	50
270	-	-	-	-	-	-	-	-	50
278,9	-	-	-	-	-	-	-	-	50

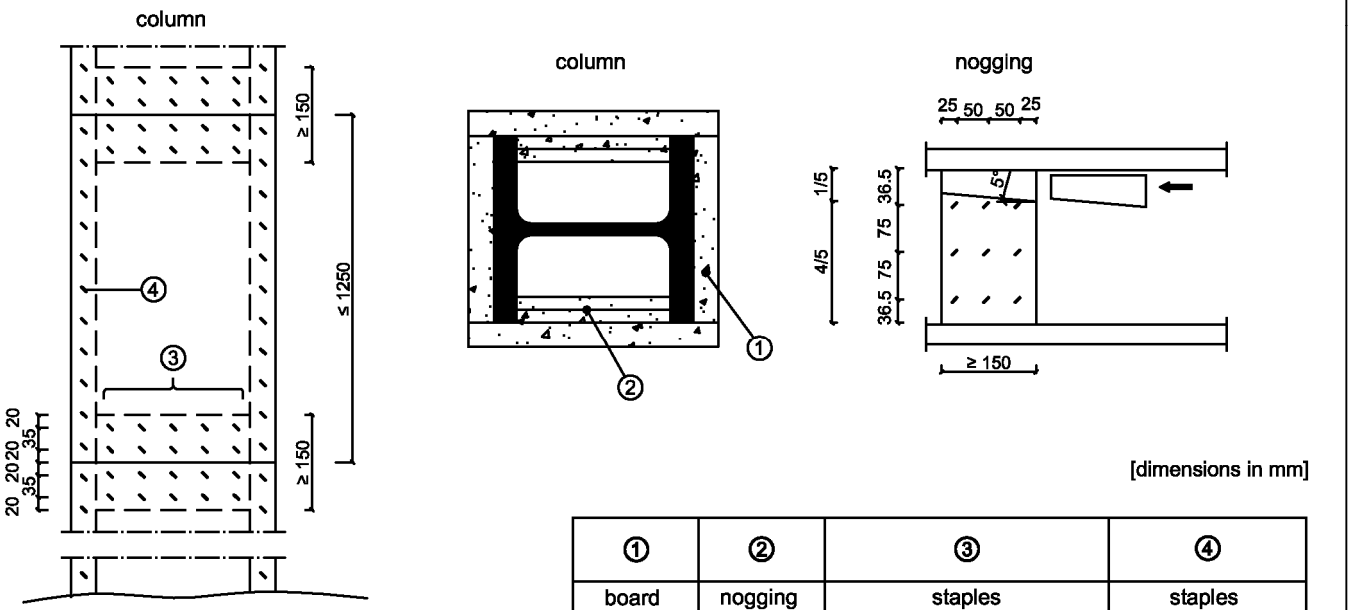
"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 2 – Cladded steel beams
Fastening of the fire protective boards with staples (low amount in one row)

Annex C 15

Deutsches Institut für Bautechnik





[dimensions in mm]

① board thickness	② nogging thickness	③ staples vertical	④ staples longitudinal
15 mm	2x 15 mm	length: min. 40 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, two rows	40 x 11.25 x 1.53 mm spacing: 100 mm
20 mm	2x 20 mm	length: min. 45 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, two rows	45 x 11.25 x 1.53 mm spacing: 50 mm
25 mm	2x 20 mm	length: min. 50 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, two rows	50 x 11.25 x 1.53 mm spacing: 50 mm
30 mm	2x 20 mm	length: min. 60 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, two rows	60 x 11.25 x 1.53 mm spacing: 50 mm
40 mm	2x 20 mm	length: min. 70 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, two rows	80 x 11.25 x 2.00 mm spacing: 50 mm
50 mm	2x 20 mm	length: min. 80 mm width/diameter: 11.25 x 2.00 mm spacing: 50 mm, two rows	80 x 11.25 x 2.00 mm spacing: 50 mm

① AESTUVER protection board
thickness = 15-50 mm

② AESTUVER protection board ("nogging")
thickness = 15 mm or 20 mm

③ staple (vertical, two rows)
length = 40-80 mm

④ staple (longitudinal)
length = 40-80 mm

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 3 – Cladded steel beams and columns
Fastening of the fire protective boards with staples (high amount in two rows)

Annex C 16

Deutsches Institut für Bautechnik DIBt

Fire resistance classification R 30									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	15	15	15	15	15	15	15	15	15
45,9	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	20	15	15	15	15	15	15	15	15
120	20	15	15	15	15	15	15	15	15
130	20	15	15	15	15	15	15	15	15
140	20	15	15	15	15	15	15	15	15
150	20	15	15	15	15	15	15	15	15
160	20	20	15	15	15	15	15	15	15
170	20	20	15	15	15	15	15	15	15
180	20	20	15	15	15	15	15	15	15
190	20	20	15	15	15	15	15	15	15
200	20	20	15	15	15	15	15	15	15
210	20	20	20	15	15	15	15	15	15
220	20	20	20	15	15	15	15	15	15
230	25	20	20	15	15	15	15	15	15
240	25	20	20	15	15	15	15	15	15
250	25	20	20	15	15	15	15	15	15
260	25	20	20	15	15	15	15	15	15
270	25	20	20	15	15	15	15	15	15
280	25	20	20	15	15	15	15	15	15
290	25	20	20	20	15	15	15	15	15
300	25	20	20	20	15	15	15	15	15
310	25	20	20	20	15	15	15	15	15
320	25	20	20	20	15	15	15	15	15
330	25	20	20	20	15	15	15	15	15
340	25	20	20	20	15	15	15	15	15
350	25	20	20	20	15	15	15	15	15
360	25	25	20	20	15	15	15	15	15
370	25	25	20	20	15	15	15	15	15
380,6	25	25	20	20	15	15	15	15	15

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 3 – Cladded steel beams and columns
Fastening of the fire protective boards with staples (high amount in two rows)

Annex C 17

Deutsches Institut für Bautechnik DIBt

Fire resistance classification R 60									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	20	15	15	15	15	15	15	15	15
45,9	20	15	15	15	15	15	15	15	15
50	20	15	15	15	15	15	15	15	15
60	25	20	15	15	15	15	15	15	15
70	25	20	20	15	15	15	15	15	15
80	25	25	20	15	15	15	15	15	15
90	30	25	20	20	15	15	15	15	15
100	30	25	25	20	15	15	15	15	15
110	30	25	25	20	20	15	15	15	15
120	30	30	25	20	20	15	15	15	15
130	35	30	25	25	20	20	15	15	15
140	35	30	25	25	20	20	15	15	15
150	35	30	30	25	25	20	20	15	15
160	35	30	30	25	25	20	20	15	15
170	35	30	30	25	25	20	20	20	15
180	35	35	30	25	25	25	20	20	15
190	35	35	30	30	25	25	20	20	15
200	35	35	30	30	25	25	20	20	20
210	40	35	30	30	25	25	20	20	20
220	40	35	30	30	25	25	25	20	20
230	40	35	30	30	30	25	25	20	20
240	40	35	35	30	30	25	25	20	20
250	40	35	35	30	30	25	25	20	20
260	40	35	35	30	30	25	25	25	20
270	40	35	35	30	30	25	25	25	20
280	40	35	35	30	30	25	25	25	20
290	40	35	35	30	30	30	25	25	20
300	40	35	35	30	30	30	25	25	20
310	40	40	35	35	30	30	25	25	25
320	40	40	35	35	30	30	25	25	25
330	40	40	35	35	30	30	25	25	25
340	40	40	35	35	30	30	25	25	25
350	40	40	35	35	30	30	25	25	25
360	40	40	35	35	30	30	30	25	25
370	40	40	35	35	30	30	30	25	25
380,6	40	40	35	35	30	30	30	25	25

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 3 – Cladded steel beams and columns
Fastening of the fire protective boards with staples (high amount in two rows)

Annex C 18

Deutsches Institut für Bautechnik DIBt

Fire resistance classification R 90									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	30	25	20	15	15	15	15	15	15
45,9	30	25	20	15	15	15	15	15	15
50	30	25	20	15	15	15	15	15	15
60	35	30	25	20	20	15	15	15	15
70	35	30	30	25	20	20	15	15	15
80	40	35	30	25	25	20	20	15	15
90	40	35	35	30	25	25	20	20	15
100	45	40	35	30	30	25	20	20	15
110	45	40	35	35	30	25	25	20	20
120	45	40	40	35	30	30	25	25	20
130	50	45	40	35	30	30	25	25	20
140	50	45	40	35	35	30	30	25	25
150	50	45	40	40	35	30	30	25	25
160	50	45	40	40	35	35	30	30	25
170	50	45	45	40	35	35	30	30	25
180	50	50	45	40	40	35	30	30	25
190	-	50	45	40	40	35	35	30	30
200	-	50	45	40	40	35	35	30	30
210	-	50	45	45	40	35	35	30	30
220	-	50	45	45	40	40	35	35	30
230	-	50	45	45	40	40	35	35	30
240	-	50	50	45	40	40	35	35	30
250	-	50	50	45	40	40	35	35	30
260	-	50	50	45	45	40	35	35	35
270	-	-	50	45	45	40	40	35	35
280	-	-	50	45	45	40	40	35	35
290	-	-	50	45	45	40	40	35	35
300	-	-	50	45	45	40	40	35	35
310	-	-	50	50	45	40	40	35	35
320	-	-	50	50	45	45	40	40	35
330	-	-	50	50	45	45	40	40	35
340	-	-	50	50	45	45	40	40	35
350	-	-	50	50	45	45	40	40	35
360	-	-	50	50	45	45	40	40	35
370	-	-	50	50	45	45	40	40	35
380,6	-	-	-	50	45	45	40	40	40

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 3 – Cladded steel beams and columns
Fastening of the fire protective boards with staples (high amount in two rows)

Annex C 19

Deutsches Institut für Bautechnik DIBt

Fire resistance classification R 120									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	40	35	30	25	20	15	15	15	15
45,9	40	35	30	25	20	15	15	15	15
50	40	35	30	25	20	20	15	15	15
60	45	40	35	30	25	25	20	15	15
70	50	45	40	35	30	25	25	20	20
80	-	45	40	35	35	30	25	25	20
90	-	50	45	40	35	30	30	25	25
100	-	50	45	40	40	35	30	30	25
110	-	-	50	45	40	35	35	30	30
120	-	-	50	45	40	40	35	35	30
130	-	-	50	50	45	40	35	35	30
140	-	-	-	50	45	40	40	35	35
150	-	-	-	50	45	45	40	35	35
160	-	-	-	50	50	45	40	40	35
170	-	-	-	-	50	45	45	40	35
180	-	-	-	-	50	45	45	40	40
190	-	-	-	-	50	50	45	40	40
200	-	-	-	-	-	50	45	45	40
210	-	-	-	-	-	50	45	45	40
220	-	-	-	-	-	50	50	45	40
230	-	-	-	-	-	50	50	45	45
240	-	-	-	-	-	50	50	45	45
250	-	-	-	-	-	-	50	45	45
260	-	-	-	-	-	-	50	50	45
270	-	-	-	-	-	-	50	50	45
280	-	-	-	-	-	-	50	50	45
290	-	-	-	-	-	-	50	50	45
300	-	-	-	-	-	-	-	50	50
310	-	-	-	-	-	-	-	50	50
320	-	-	-	-	-	-	-	50	50
330	-	-	-	-	-	-	-	50	50
340	-	-	-	-	-	-	-	50	50
350	-	-	-	-	-	-	-	50	50
360	-	-	-	-	-	-	-	-	50
370	-	-	-	-	-	-	-	-	50
380,6	-	-	-	-	-	-	-	-	50

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 3 – Cladded steel beams and columns
Fastening of the fire protective boards with staples (high amount in two rows)

Annex C 20

Deutsches Institut für Bautechnik DIBt

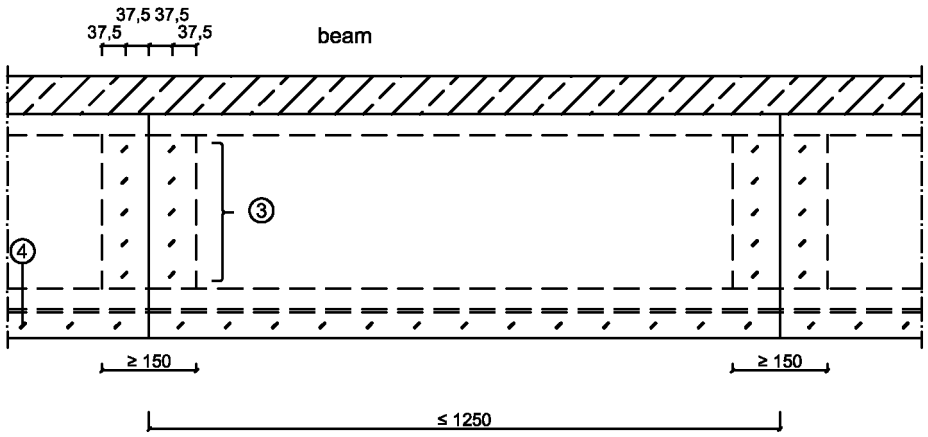
Fire resistance classification R 180									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	-	50	45	40	35	30	25	25	20
45,9	-	50	45	40	35	30	25	25	20
50	-	-	50	40	35	35	30	25	25
60	-	-	-	50	45	40	35	30	30
70	-	-	-	-	50	45	40	35	35
80	-	-	-	-	-	50	45	40	35
90	-	-	-	-	-	50	50	45	40
100	-	-	-	-	-	-	50	45	45
110	-	-	-	-	-	-	-	50	45
120	-	-	-	-	-	-	-	-	50
130	-	-	-	-	-	-	-	-	50
140	-	-	-	-	-	-	-	-	-
150	-	-	-	-	-	-	-	-	-
160	-	-	-	-	-	-	-	-	-
170	-	-	-	-	-	-	-	-	-
180	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-
240	-	-	-	-	-	-	-	-	-
250	-	-	-	-	-	-	-	-	-
260	-	-	-	-	-	-	-	-	-
270	-	-	-	-	-	-	-	-	-
280	-	-	-	-	-	-	-	-	-
290	-	-	-	-	-	-	-	-	-
300	-	-	-	-	-	-	-	-	-
310	-	-	-	-	-	-	-	-	-
320	-	-	-	-	-	-	-	-	-
330	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-
380,6	-	-	-	-	-	-	-	-	-

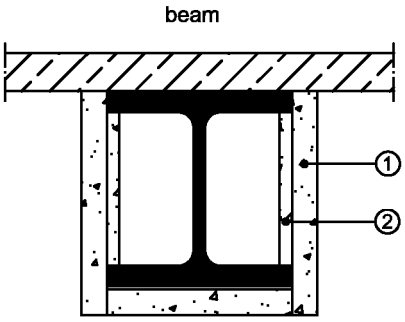
"AESTUVER" fire protective board

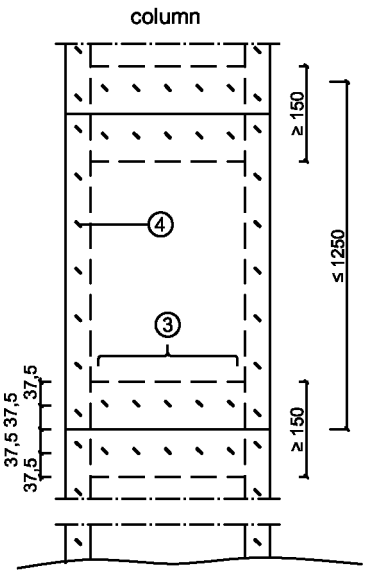
Use category 4 – Cladding for protection of load-bearing steel members
Design variant 3 – Cladded steel beams and columns
Fastening of the fire protective boards with staples (high amount in two rows)

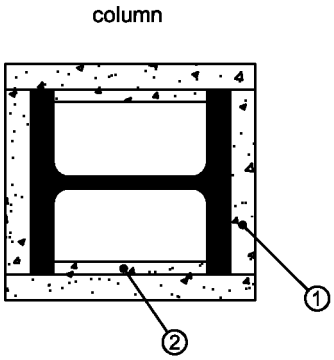
Annex C 21

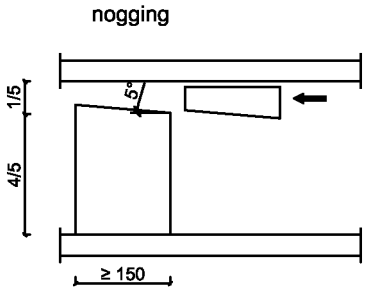
Deutsches Institut für Bautechnik DIBt











[dimensions in mm]

① AESTUVER protection board
thickness = 15-50 mm

② AESTUVER protection board ("nogging")
thickness = 15 mm or 20 mm

③ staple (vertical, one row)
length = 30-70 mm

④ staple (longitudinal)
length = 40-80 mm

① board thickness	② nogging thickness	③ staples vertical	④ staples longitudinal
15 mm	15 mm	length: min. 30 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, one row	40 x 11.25 x 1.53 mm spacing: 75 mm
20 mm	20 mm	length: min. 40 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, one row	45 x 11.25 x 1.53 mm spacing: 75 mm
25 mm	20 mm	length: min. 45 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, one row	50 x 11.25 x 1.53 mm spacing: 75 mm
30 mm	20 mm	length: min. 50 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, one row	60 x 11.25 x 1.53 mm spacing: 75 mm
40 mm	20 mm	length: min. 60 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, one row	80 x 11.25 x 2.00 mm spacing: 75 mm
50 mm	20 mm	length: min. 70 mm width/diameter: 11.25 x 1.53 mm spacing: 50 mm, one row	80 x 11.25 x 2.00 mm spacing: 75 mm

"AESTUVER" fire protective board

Annex C 22

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 4 – Cladded steel beams and columns
Fastening of the fire protective boards with staples (low amount in one row)

Deutsches Institut für Bautechnik DIBt

Fire resistance classification R 30									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	15	15	15	15	15	15	15	15	15
45,9	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	20	15	15	15	15	15	15	15	15
110	20	15	15	15	15	15	15	15	15
120	20	15	15	15	15	15	15	15	15
130	20	15	15	15	15	15	15	15	15
140	20	20	15	15	15	15	15	15	15
150	20	20	15	15	15	15	15	15	15
160	20	20	15	15	15	15	15	15	15
170	20	20	15	15	15	15	15	15	15
180	25	20	15	15	15	15	15	15	15
190	25	20	20	15	15	15	15	15	15
200	25	20	20	15	15	15	15	15	15
210	25	20	20	15	15	15	15	15	15
220	25	20	20	15	15	15	15	15	15
230	25	20	20	15	15	15	15	15	15
240	25	20	20	15	15	15	15	15	15
250	25	20	20	20	15	15	15	15	15
260	25	20	20	20	15	15	15	15	15
270	25	25	20	20	15	15	15	15	15
280	25	25	20	20	15	15	15	15	15
290	25	25	20	20	15	15	15	15	15
300	25	25	20	20	15	15	15	15	15
310	25	25	20	20	15	15	15	15	15
320	25	25	20	20	15	15	15	15	15
330	25	25	20	20	20	15	15	15	15
340	25	25	20	20	20	15	15	15	15
350	25	25	20	20	20	15	15	15	15
360	25	25	20	20	20	15	15	15	15
370	25	25	20	20	20	15	15	15	15
380,6	25	25	20	20	20	15	15	15	15

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 4 – Cladded steel beams and columns
Fastening of the fire protective boards with staples (low amount in one row)

Annex C 23

Deutsches Institut für Bautechnik DIBt

Fire resistance classification R 60									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	20	15	15	15	15	15	15	15	15
45,9	20	15	15	15	15	15	15	15	15
50	20	20	15	15	15	15	15	15	15
60	25	20	15	15	15	15	15	15	15
70	30	25	20	15	15	15	15	15	15
80	30	25	20	20	15	15	15	15	15
90	30	30	25	20	15	15	15	15	15
100	35	30	25	20	20	15	15	15	15
110	35	30	25	25	20	20	15	15	15
120	35	30	30	25	20	20	15	15	15
130	35	35	30	25	25	20	20	15	15
140	40	35	30	25	25	20	20	15	15
150	40	35	30	30	25	25	20	20	15
160	40	35	30	30	25	25	20	20	15
170	40	35	35	30	25	25	20	20	20
180	40	35	35	30	30	25	25	20	20
190	40	40	35	30	30	25	25	20	20
200	40	40	35	30	30	25	25	20	20
210	45	40	35	35	30	25	25	25	20
220	45	40	35	35	30	30	25	25	20
230	45	40	35	35	30	30	25	25	20
240	45	40	35	35	30	30	25	25	20
250	45	40	40	35	30	30	25	25	25
260	45	40	40	35	30	30	30	25	25
270	45	40	40	35	35	30	30	25	25
280	45	40	40	35	35	30	30	25	25
290	45	40	40	35	35	30	30	25	25
300	45	45	40	35	35	30	30	25	25
310	45	45	40	35	35	30	30	25	25
320	45	45	40	35	35	30	30	30	25
330	45	45	40	35	35	30	30	30	25
340	45	45	40	40	35	35	30	30	25
350	45	45	40	40	35	35	30	30	25
360	45	45	40	40	35	35	30	30	25
370	45	45	40	40	35	35	30	30	25
380,6	45	45	40	40	35	35	30	30	25

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 4 – Cladded steel beams and columns
Fastening of the fire protective boards with staples (low amount in one row)

Annex C 24

Deutsches Institut für Bautechnik DIBt

Fire resistance classification R 90									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	35	25	20	20	15	15	15	15	15
45,9	35	25	20	20	15	15	15	15	15
50	35	30	25	20	15	15	15	15	15
60	40	35	30	25	20	15	15	15	15
70	45	35	30	25	25	20	15	15	15
80	45	40	35	30	25	25	20	20	15
90	50	40	35	35	30	25	25	20	20
100	50	45	40	35	30	30	25	20	20
110	50	45	40	35	35	30	25	25	20
120	-	50	45	40	35	30	30	25	25
130	-	50	45	40	35	35	30	30	25
140	-	50	45	40	40	35	30	30	25
150	-	50	50	45	40	35	35	30	30
160	-	-	50	45	40	40	35	30	30
170	-	-	50	45	40	40	35	35	30
180	-	-	50	45	45	40	35	35	30
190	-	-	50	50	45	40	40	35	35
200	-	-	-	50	45	40	40	35	35
210	-	-	-	50	45	45	40	35	35
220	-	-	-	50	45	45	40	40	35
230	-	-	-	50	50	45	40	40	35
240	-	-	-	50	50	45	40	40	35
250	-	-	-	50	50	45	45	40	35
260	-	-	-	-	50	45	45	40	40
270	-	-	-	-	50	45	45	40	40
280	-	-	-	-	50	45	45	40	40
290	-	-	-	-	50	50	45	40	40
300	--	-	-	-	50	50	45	45	40
310	-	-	-	-	50	50	45	45	40
320	-	-	-	-	50	50	45	45	40
330	-	-	-	-	-	50	45	45	40
340	-	-	-	-	-	50	45	45	40
350	-	-	-	-	-	50	50	45	40
360	-	-	-	-	-	50	50	45	45
370	-	-	-	-	-	50	50	45	45
380,6	-	-	-	-	-	50	50	45	45

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 4 – Cladded steel beams and columns
Fastening of the fire protective boards with staples (low amount in one row)

Annex C 25

Deutsches Institut für Bautechnik DIBt

Fire resistance classification R 120									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	45	40	30	25	25	20	15	15	15
45,9	45	40	30	25	25	20	15	15	15
50	50	40	35	30	25	20	20	15	15
60	-	45	40	35	30	25	25	20	15
70	-	50	45	40	35	30	25	25	20
80	-	-	50	45	40	35	30	25	25
90	-	-	50	45	40	40	35	30	30
100	-	-	-	50	45	40	35	35	30
110	-	-	-	50	45	45	40	35	35
120	-	-	-	-	50	45	40	40	35
130	-	-	-	-	50	45	45	40	35
140	-	-	-	-	-	50	45	40	40
150	-	-	-	-	-	50	45	45	40
160	-	-	-	-	-	-	50	45	40
170	-	-	-	-	-	-	50	45	45
180	-	-	-	-	-	-	50	50	45
190	-	-	-	-	-	-	-	50	45
200	-	-	-	-	-	-	-	50	50
210	-	-	-	-	-	-	-	50	50
220	-	-	-	-	-	-	-	-	50
230	-	-	-	-	-	-	-	-	50
240	-	-	-	-	-	-	-	-	50
250	-	-	-	-	-	-	-	-	50
260	-	-	-	-	-	-	-	-	-
270	-	-	-	-	-	-	-	-	-
280	-	-	-	-	-	-	-	-	-
290	-	-	-	-	-	-	-	-	-
300	-	-	-	-	-	-	-	-	-
310	-	-	-	-	-	-	-	-	-
320	-	-	-	-	-	-	-	-	-
330	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-
380,6	-	-	-	-	-	-	-	-	-

"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 4 – Cladded steel beams and columns
Fastening of the fire protective boards with staples (low amount in one row)

Annex C 26

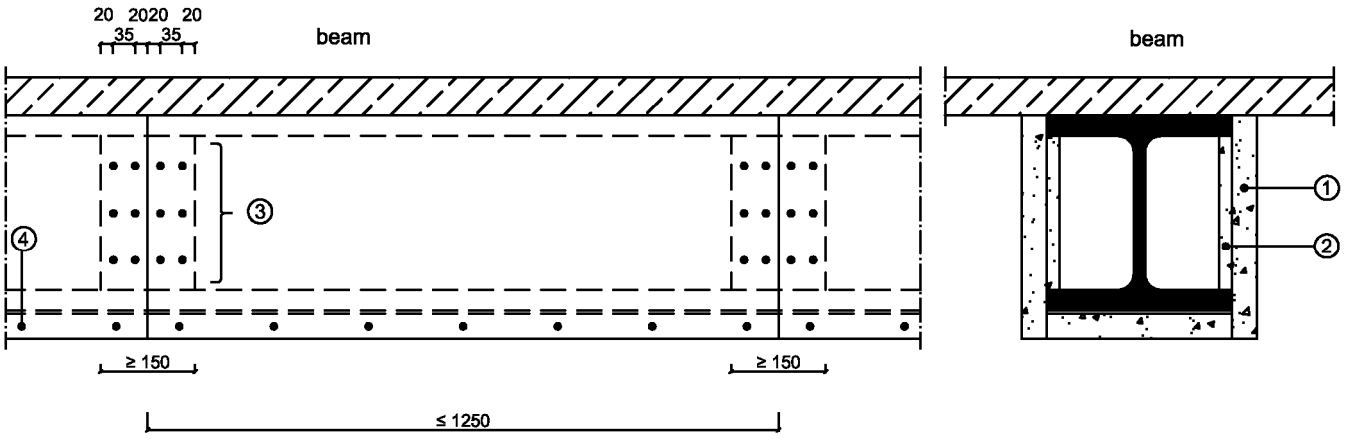
Deutsches Institut für Bautechnik DIBt

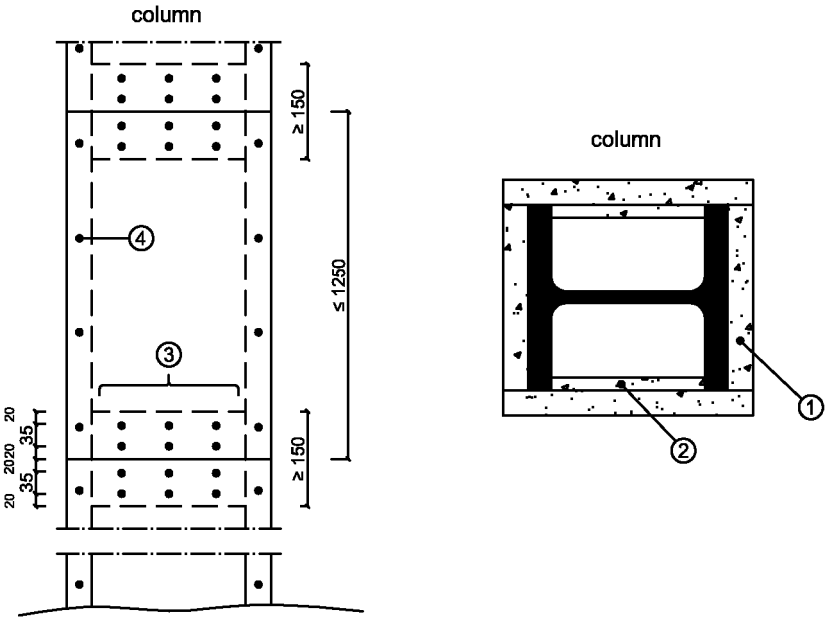
Fire resistance classification R 150									
Section factor	Design temperature								
(m^{-1})	350 °C	400 °C	450 °C	500 °C	550 °C	600 °C	650 °C	700 °C	750 °C
	Thickness of fire protection material to maintain steel temperature below design temperature (mm)								
0	-	50	45	35	30	25	25	20	15
45,9	-	50	45	35	30	25	25	20	15
50	-	-	45	40	35	30	25	25	20
60	-	-	50	45	40	35	30	30	25
70	-	-	-	50	45	40	35	35	30
80	-	-	-	-	50	45	40	35	35
90	-	-	-	-	-	50	45	40	40
100	-	-	-	-	-	-	50	45	40
110	-	-	-	-	-	-	50	50	45
120	-	-	-	-	-	-	-	50	45
130	-	-	-	-	-	-	-	-	50
140	-	-	-	-	-	-	-	-	50
150	-	-	-	-	-	-	-	-	-
160	-	-	-	-	-	-	-	-	-
170	-	-	-	-	-	-	-	-	-
180	-	-	-	-	-	-	-	-	-
190	-	-	-	-	-	-	-	-	-
200	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-
220	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-
240	-	-	-	-	-	-	-	-	-
250	-	-	-	-	-	-	-	-	-
260	-	-	-	-	-	-	-	-	-
270	-	-	-	-	-	-	-	-	-
280	-	-	-	-	-	-	-	-	-
290	-	-	-	-	-	-	-	-	-
300	-	-	-	-	-	-	-	-	-
310	-	-	-	-	-	-	-	-	-
320	-	-	-	-	-	-	-	-	-
330	-	-	-	-	-	-	-	-	-
340	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-
360	-	-	-	-	-	-	-	-	-
370	-	-	-	-	-	-	-	-	-
380,6	-	-	-	-	-	-	-	-	-

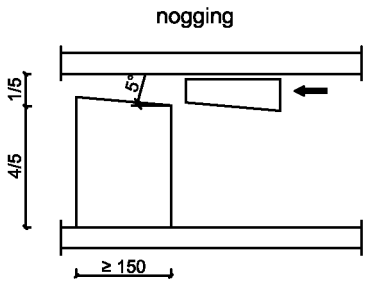
"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 4 – Cladded steel beams and columns
Fastening of the fire protective boards with staples (low amount in one row)

Annex C 27







[dimensions in mm]

① AESTUVER protection board
thickness = 60 mm

② AESTUVER protection board ("nogging")
thickness = 20 mm

③ screw (vertical, two rows)
length = 80 mm

④ screw (longitudinal)
length = 120 mm

①	②	③	④
board thickness	nogging thickness	screws vertical	screws longitudinal
60 mm	20 mm	length: min. 80 mm diameter: 5 mm spacing: 75 mm, two rows	5 x 120 mm spacing: 150 mm

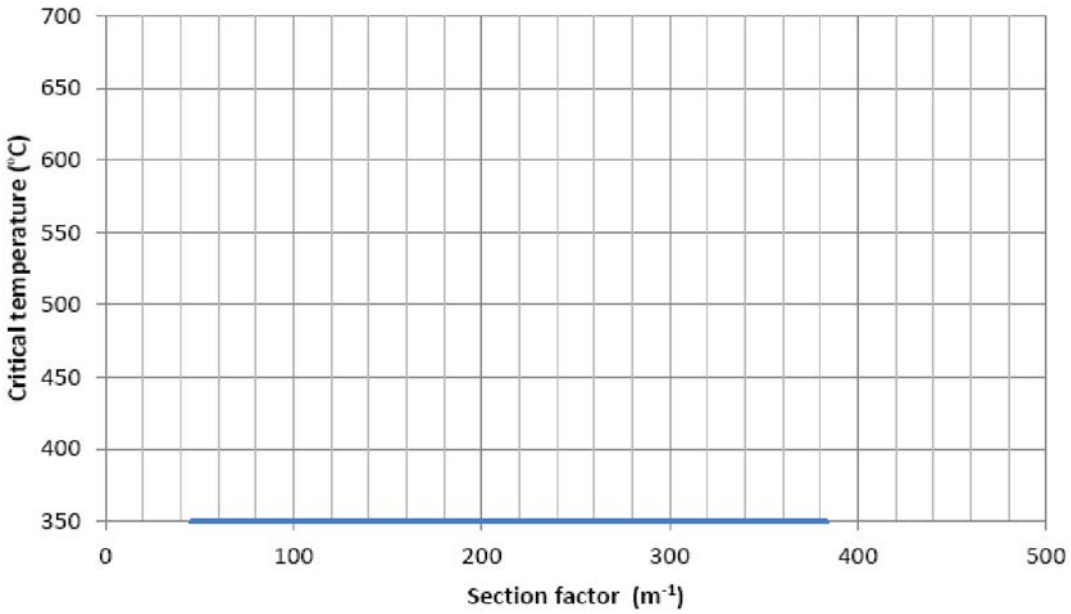
"AESTUVER" fire protective board

Use category 4 – Cladding for protection of load-bearing steel members
Design variant 5 – Cladded steel beams and columns
Fastening of the fire protective boards with screws

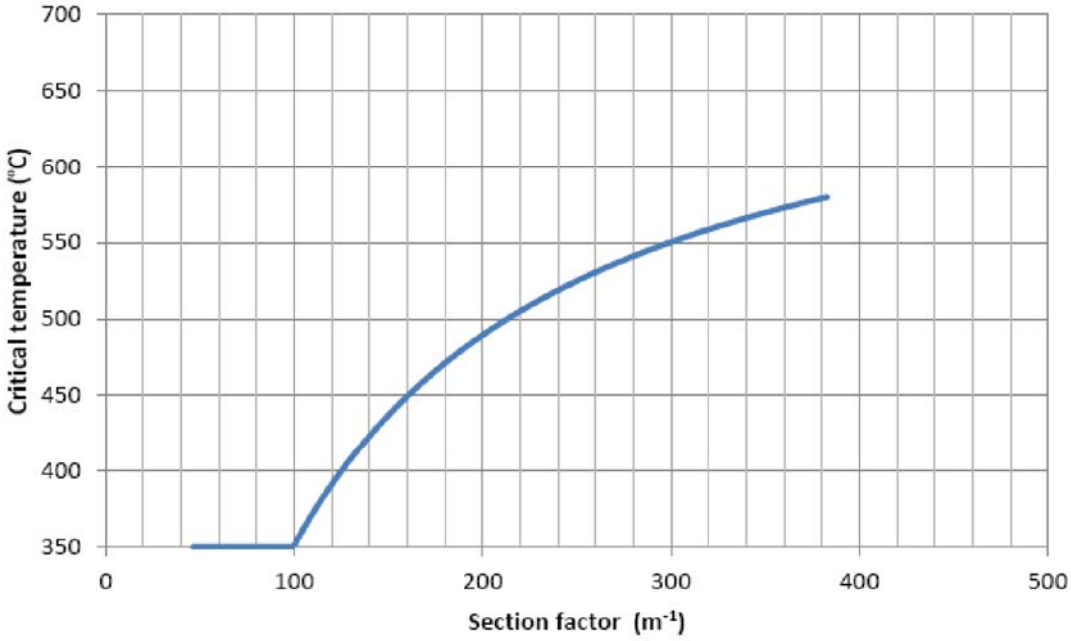
Annex C 28

Deutsches Institut für Bautechnik DIBt

R 15 - R 120



R 180



"AESTUVER" fire protective board	**Annex C 29**
Use category 4 – Cladding for protection of load-bearing steel members Design variant 5 – Cladded steel beams and columns Fastening of the fire protective boards with screws	

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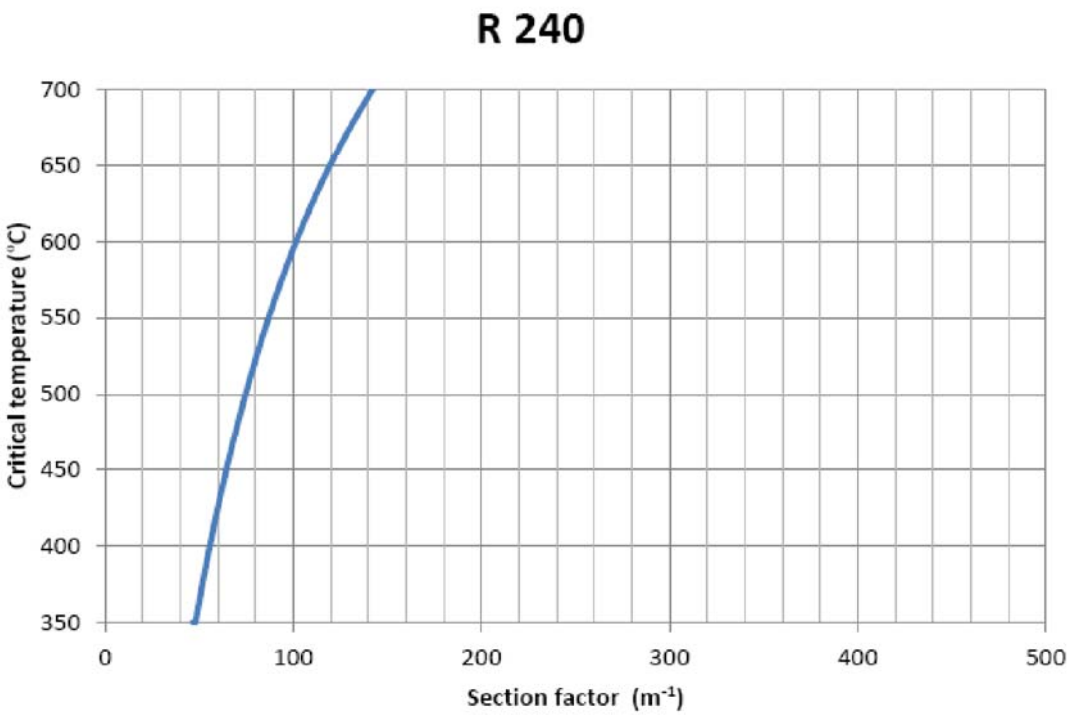

"AESTUVER" fire protective board	**Annex C 30**
Use category 4 – Cladding for protection of load-bearing steel members Design variant 5 – Cladded steel beams and columns Fastening of the fire protective boards with screws	

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4 Load-bearing trapezoidal steel profile ceiling cladded with 2-layers of 20 mm thick "AESTUVER" fire protective boards (use category 10)

4.1 Classification

The design listed in Annex B, Table 1, has been tested in accordance with EN 1363-1 and EN 1365-2 and found to fulfil the requirements of class REI 30 and RE 120 in accordance with EN 13501-2.

This fire resistance performance can only be guaranteed if the requirements set out in sections 4.2 to 4.6 hereafter and Annexes D 3 and D 4 are met

4.2 Trapezoidal steel profile ceiling in accordance with EN 14782

Sheet thickness [mm]	Spacing upper/lower flange [mm]	Permitted span [mm]
≥ 0,75	≤ 280	depending on stability requirements, deflection ≤ l/300 mm

The trapezoidal steel profiles can be arranged in positive or negative positions. The upper and lower flanges shall be sufficiently wide to secure the fire protective boards.

The suitability and the dimensions of the trapezoidal steel profiles and their fastening shall be determined by measurement or testing in accordance with the stability requirements applicable in the Member State of destination.

4.3 Fastening of the trapezoidal steel profile ceiling

	Fastened to the adjacent building component	Trapezoidal steel profiles fastened to one another
Position of the fastening devices	Perpendicular to the longitudinal profiles on the lower flange (double-sided), 2 screws per side	Parallel to the longitudinal profiles in the areas where the sheets overlap
Spacing of the fastening devices	≤ 280 mm	≤ 600 mm
Type of fastening devices	Suitable screws with sufficient corrosion protection - shaft diameter d ≥ 5.5 mm - head diameter d ≥ 10.5 mm - length l ≥ 20 mm	

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4.4 Fire protective boards

15 mm thick "AESTUVER" fire protective boards shall be used.

The fire protective boards shall be arranged in 2 layers beneath the trapezoidal steel profiles perendicular to the supporting direction of the trapezoidal steel profiles.

The fire protective boards shall be butt-jointed. The joints between the fire protective boards shall be staggered in accordance with Annex 4.

4.5 Fastening of the fire protective boards

The fire protective boards shall be fastened on 4 sides to the lower flanges of the trapezoidal steel profiles as described in Table 3. The distance to the edge of the board shall be no less than 25 mm.

Table 3

	1st layer of boards	2nd layer of boards
Position of the fixing	On every second lower flange	On every lower flange
Spacing of the fastening devices	≤ 600 mm	≤ 300 mm
Type of fastening device	Fermacell Powerpanel screws 3.9 x 40	Fermacell Powerpanel screws 3.9 x 55

The technical details of the Fermacell Powerpanel screws are deposited with Deutsches Institut für Bautechnik.

4.6 Connection to adjacent building components

The fire protective boards shall be arranged so that their faces join up with the separating fire-resistant building components, which shall be of at least the same fire resistance class as the trapezoidal steel profiles clad with the fire protective boards.

All joints between the faces of the fire protective boards and the adjacent fire-resistant separating building components shall be completely filled with dimensionally stable mineral wool produced from molten stone and then sealed. The mineral wool shall meet the requirements set out in EN 13162 and shall have a reaction-to-fire class A1/A2-s1,d0 in accordance with EN 13501-1.

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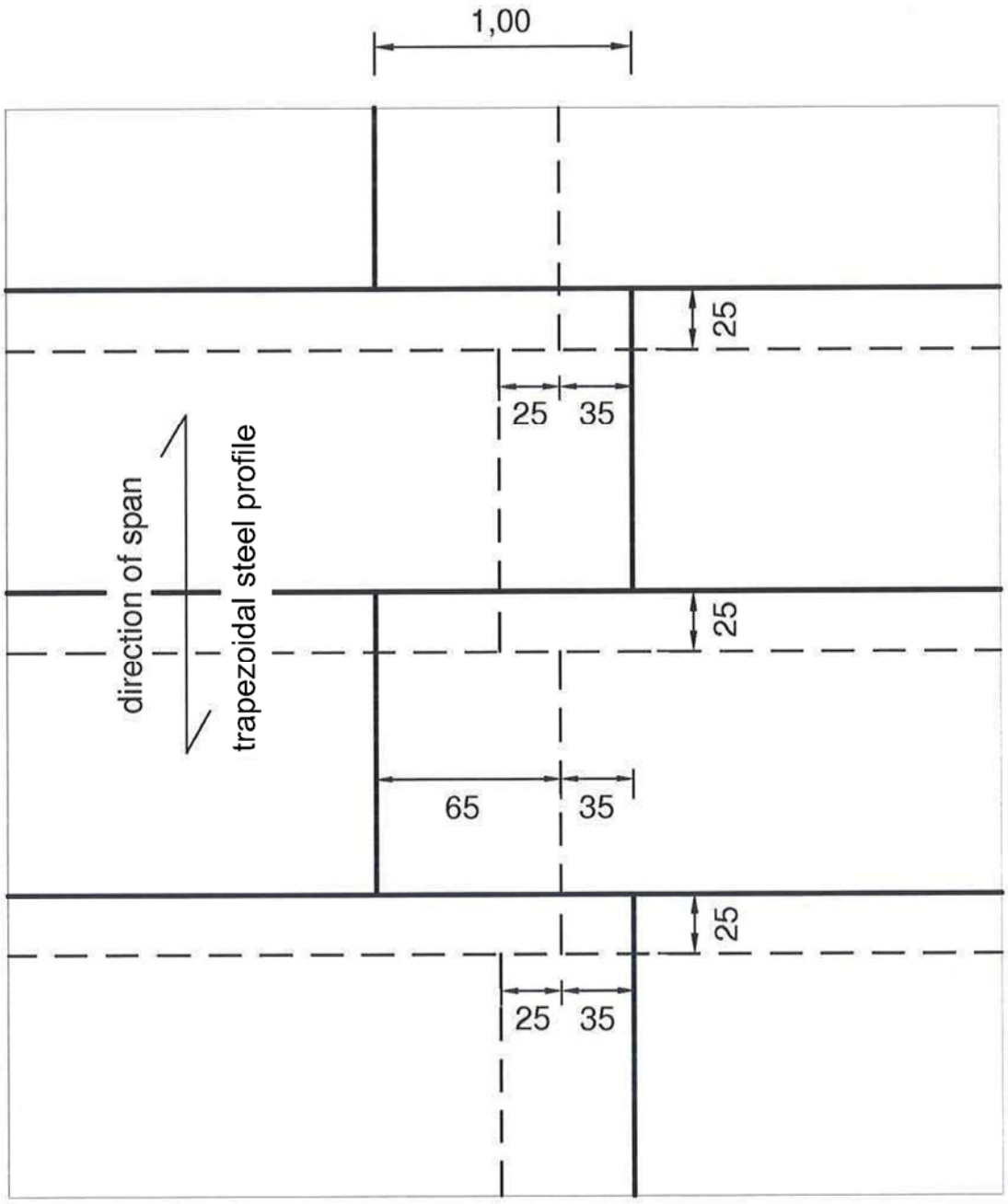
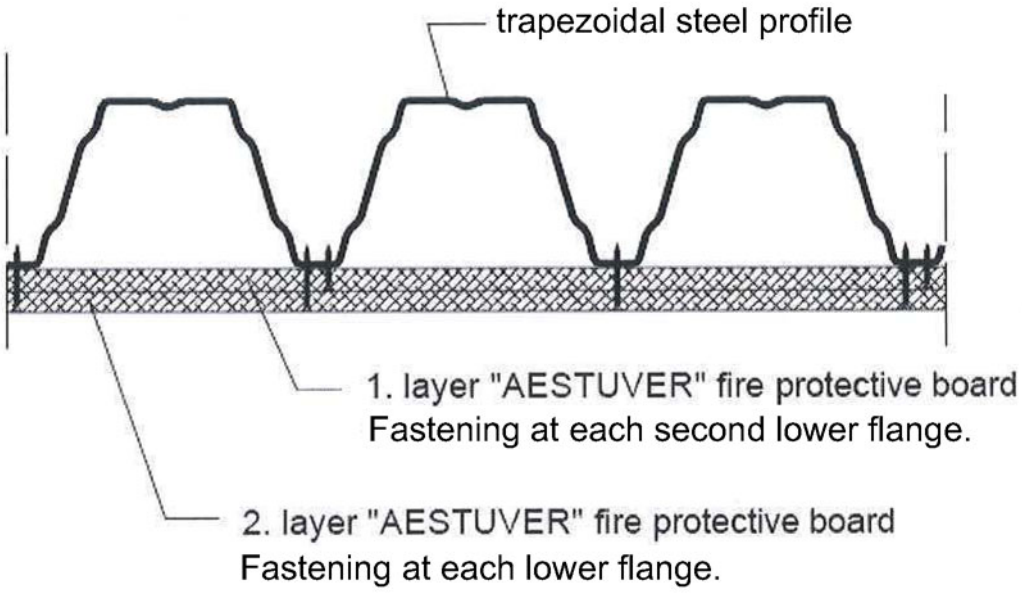


1. layer "AESTUVER" fire protective board (to trapezoidal steel profile)
2. layer "AESTUVER" fire protective board

"AESTUVER" fire protective board

Use category 10 - Cladding of a load-bearing trapezoidal steel profile ceiling
Top view

Annex D 3



	1. layer of board	2. layer of board
Position of fixing	At each second lower flange	At each lower flange
Center distance of fastening material	≤ 600 mm	≤ 300 mm
Fastening material	"Fermacell Powerpanel screw" 3.9 mm x 40 mm	"Fermacell Powerpanel screw" 3.9 mm x 55 mm

"AESTUVER" fire protective board

Use category 10 - Cladding of a load-bearing trapezoidal steel profile ceiling
Cross section

Annex D 4

Deutsches Institut für Bautechnik DIBt

5 REFERENCE LIST

ETAG No 018-1 (Edition November 2004, Amended September 2012, Amendment April 2013)
Guideline for European Technical Approval of fire protective products - Part 1: General

ETAG No 018-4 (Edition December 2011)
Guideline for European Technical Approval of fire protective products - Part 4: Fire protective board, slab and mat products and kits

EN 13501-1:2010-01	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
EN 13501-2:2008-01	Fire classification of construction products and building elements - Part 2: Classification using data from resistance tests, excluding ventilation services
EN 1363-1:1999-10	Fire Resistance tests – Part 1: General requirements
EN 1365-2:2000-02	Fire resistance tests for loadbearing elements – Part 2: Floors and roofs
EN 13381-4:2013-08	Test methods for determining the contribution to the fire resistance of structural members - Part 4: Applied passive protection to steel members
EN 10025-1:2005-02	Hot rolled products of structural steels Part 1: General technical delivery conditions
EN 13162:2009-02	Thermal insulation products for buildings – Factory made mineral wool (MW) products – Specification
EN 14782:2006-03	Self-supporting metal sheet for roofing, external cladding and internal lining - Product specification and requirements
EN 318:2002-06	Wood-based panels – Determination of dimensional changes associated with changes in relative humidity
EN 319:1993-08	Particleboards and fibreboards – Determination of tensile strength perpendicular to the plane of the board
EN 789:2005-01	Timber structures – Test methods – Determination of mechanical properties of wood based panels
EN 1062-3:2008-04	Beschichtungsstoffe – Beschichtungsstoffe und Beschichtungssysteme für mineralische Substrate und Beton im Außenbereich – Teil 3: Bestimmung der Wasserdurchlässigkeit
EN 1062-3:2008-04	Paints and varnishes – Coating materials and coating systems for exterior masonry and concrete Part 3: Determination of liquid water permeability
EN 12467:2006-12	Fibre cement flat sheets – Product specification and test methods
EN ISO 12572:2001-09	Hygrothermal performance of building materials and products - Determination of water vapour transmission properties