fermacell AESTUVER focus

Cladding for structural members according to EN 13381-4 (2013)

Last updated: July 2014

AESTUVER fire-protection board

AESTUVER fire-protection boards are cement-bonded, glass fibre-reinforced lightweight concrete boards with high fire safety standards.

- As fire-protection inlays or mounting board in construction elements and systems that have to meet particularly high fire safety standards
- Weather resistant – frost resistant – water resistant Fire-protection solutions for construction elements that have to withstand extreme environmental conditions (climate)
- Aesthetic surface finish – smooth material surfaces provide for an excellent bond with adhesives and coatings

Environmental Product Declaration (EPD)

Technical data – AESTUVER fire-protection board

Characteristics	
Apparent density ρ_k (dry)	approx. 640 – ca. 950 kg/m³
Flexural strength (based on EN 12467 ±10%) [1]	3,5 N/mm²
Water vapour diffusion resistance factor μ (in accordance with EN ISO 12572) [1]	approx. 54
Thermal conductivity λ_R (in accordance with DIN EN 12667) [1]	approx. 0.21 W/mK
Extension / shrinkage reaction to changes in RH of air of 30% (20°C) (in accordance with EN 318)	± 0.1%
Equilibrium moisture at 65% RH of air and 20°C air temp. (in accordance with DIN EN ISO 12570)	approx. 7 wt.%
Compressive strength (in accordance with EN 789) [1]	approx. 9 N/mm²
Alkalinity (pH value)	approx. 12
Bending elasticity modulus in N/mm² (based on EN 12467 ±10%) [1]	3000 N/mm²
Application category with respect to intended use (in accordance with ETAG 018-1)	type 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Application category with respect to climatic conditions (in accordance with ETAG 018-1)	type Z1, Z2, Y, X

[1] Value for a 20-mm board | Details for other board thicknesses on request

Approvals	
European Technical Approval	ETA 11/0458
National approval (emission-rated product)	AbZ Z-200.3-23
Construction material class (in accordance with DIN EN 13501-1)	non-combustible, A1
IMO FTPC part 1	non-combustible
Construction element classification	national/international

Dimensional tolerance at equilibrium moisture for standard board sizes	
Length, width	±1 mm
Diagonal difference	≤2 mm
Thickness	±1 mm

Dimensions in mm *									
Thickness in mm	10	12	15	20	25	30	40	50	60
2600 x 1250	●	●	●	●	●	●	●	●	●
3000 x 1250	●	●	●	●	●	●	●	●	●

* Board thickness 8 mm, custom sizes on request

Title:

fermacell AESTUVER was able to convincingly demonstrate its fire-protection expertise in the Hamburg Dockland. This project underlines the performance in fire-protection and the resistance to atmospheric corrosion.

Safe fire-protection cladding for steel components

In order to ensure the structural integrity of a building even in the case of fire, beams and columns must be protected against excessively high temperatures. AESTUVER fire-protection boards can be used as cladding rated for fire-protection (R15 to R360) that meets European fire safety requirements.

This brochure is intended to determine the required thickness of AESTUVER fire-protection boards for cladding steel columns and beams.

Areas of application

- Cladding for structural members according to EN 13381-4 for structural steels corresponding to EN 10025-1 and steel grades ≥S235
- Interior and exterior (fully exposed to weather – Type X classification according to ETA-11/0458)

Single-layer solutions

- Board thickness from 15 to 60 mm

Length of fire-protection boards

- ≤1,250 mm

Classification

AESTUVER fire-protection boards have been tested in accordance with EN 13381-4 (2013) and classified pursuant to EN 13501.

The classification reports are available for download at www.fermacell-aestuver.com.

Ratio number of staples/ cladding thickness

Stapled cladding for beams and columns can be implemented as follows:

- Staple spacing 75 mm = greater cladding thickness
- Staple spacing 50 mm = lesser cladding thickness
- Screw spacing 150 mm = board thickness 60 mm

The required cladding thickness depends on the following factors:

- Type of steel component to be clad
- Calculated P/A value or profile factor (0 m^{-1} to 380 m^{-1})
- Type and quantity of fixings
- Required fire resistance classification (R15 to R360)
- Allowable steel temperature (350°C to 750°C)

Procedure for dimensioning cladding thickness at a glance

1.
Select steel component to be clad.

→ **See graphic on page 4**

2.
Calculate the P/A value using the appropriate formula for the steel component.

→ **See table on page 5**

3.
The steel component, the calculated P/A value, and the type and quantity of fixings are used to derive the corresponding classification report.

→ **See graphic on page 4**

4.
Select the table for the required fire resistance duration in the classification report.

→ **See the download area at www.fermacell-aestuver.com**

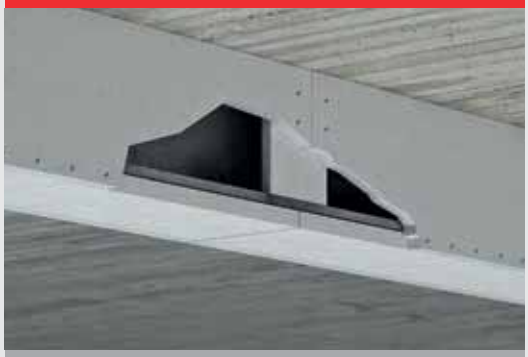
5.
Allowable steel temperature and derived P/A factor reveal the required cladding thickness.

→ **See classification example on page 6**

Selection of appropriate classification report

Selection of the steel component as well as the type and quantity of fixings

Beam – cladding on three sides
P/A: 62* to 275



Board thickness:
15 to 50 mm

Classification:
R15 to R240

Low number of staples

Staple spacing:
75 mm

Classification report R0498a

Greater board thickness

High number of staples

Staple spacing:
50 mm

Classification report R0498b

Lesser board thickness

Beams and columns – cladding on three and four sides
P/A: 46 to 380

Board thickness:
15 to 50 mm

Classification:
R15 to R360

High number of staples

Staple spacing:
50 mm

Classification report R0459a

Lesser board thickness

Classification:
R15 to R240

Low number of staples

Staple spacing:
75 mm

Classification report R0343e

Greater board thickness

Board thickness:
60 mm

Classification:
R15 to R360

Screwed

Screw spacing:
150 mm

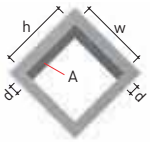
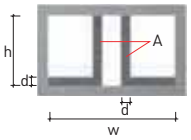
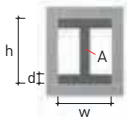
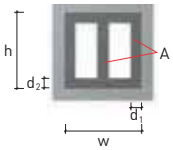
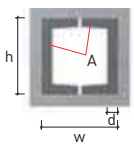
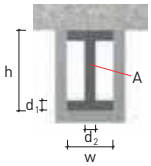
Classification report R0459b

* For a steel component "Beam – cladding on three sides" requiring cladding and a calculated P/A factor <62, the classification reports under "Beams and columns – cladding on three and four sides" must be selected

The classification reports needed for dimensioning the cladding thickness are available for download at www.fermacell-aestuver.com.

Calculation of P/A factor

Calculation formulas for determining the P/A factor

Fire-protection board cladding			
Design features w, h, and d in cm; area A in cm²		Fire-protection requirement	P/A m^{-1}
1	Flange 	Four sides	$\frac{200}{d}$
2	Angle 	Four sides	$\frac{200}{d}$
3	Angle 	Four sides	$\frac{2w + 2h}{A} \times 10^2$
4	Double-angle 	Four sides	$\frac{2w + 2h}{A} \times 10^2$
5	Hollow profile, columns 	Four sides	$\frac{100}{d}$
6	Beams or columns 	Four sides	$\frac{2w + 2h}{A} \times 10^2$
7	Beams or columns 	Four sides	$\frac{2w + 2h}{A} \times 10^2$
8	Beams or columns 	Four sides	$\frac{2w + 2h}{A} \times 10^2$
9	Beams 	Three sides	$\frac{2h + w}{A} \times 10^2$

Example of P/A calculation

(beam – cladding on three sides)

Fire-protection board cladding no. 9

P = profile perimeter exposed to flame
A = area of steel profile

h = profile height
w = profile width
} 2 × h + w = U

HEA 160 steel profile
Height (h) = 15.2 cm
Width (w) = 16 cm
Profile area (A) = 38.8 cm²

Cladding on three sides:

$$P/A = \frac{2 \times h + w}{A} \times 10^2 = \frac{2 \times 15.2 + 16}{38.8} \times 10^2$$

$$= 119.6\ m^{-1}$$

P/A = 120 m^{-1}

Dimensioning example: determining cladding thickness in selected classification report

1.

You have selected the steel component to be clad (page 4).

→ **Beam**

2.

You have calculated the P/A factor (page 5).

→ **P/A factor: 120**

3.

The corresponding classification report is derived from the steel component, the P/A factor, and the type and quantity of fixings.

→ **Classification report: R0498a**

4.

You have selected the table in the classification report for the required fire resistance duration.

→ **Fire resistance duration: 60 minutes (R 60)**

5.

The allowable steel temperature and the derived P/A factor show the required cladding thickness.

→ **Allowable steel temperature: 500°C**

Excerpt from classification report R0498a 3

Fire resistance classification R 60 4									
P/A factor (m^{-1})	Steel temperature 5								
	350°C	400°C	450°C	500°C	550°C	600°C	650°C	700°C	750°C
	Required board thickness for fire-protection material (mm)								
0	17.1	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
61.8	17.1	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
70	18.9	15.4	14.2	14.2	14.2	14.2	14.2	14.2	14.2
80	20.7	16.9	14.2	14.2	14.2	14.2	14.2	14.2	14.2
90	22.1	18.3	14.8	14.2	14.2	14.2	14.2	14.2	14.2
100	23.3	19.4	15.8	14.2	14.2	14.2	14.2	14.2	14.2
110	24.3	20.3	16.7	14.2	14.2	14.2	14.2	14.2	14.2
120 2	25.1	21.2	17.4	**14.2**	14.2	14.2	14.2	14.2	14.2
130	25.8	21.9	18.1	14.5	14.2	14.2	14.2	14.2	14.2
140	26.5	22.5	18.7	15	14.2	14.2	14.2	14.2	14.2
150	27	23.1	19.2	15.4	14.2	14.2	14.2	14.2	14.2
160	27.5	23.6	19.7	15.9	14.2	14.2	14.2	14.2	14.2
170	28	24	20.1	16.3	14.2	14.2	14.2	14.2	14.2
180	28.4	24.4	20.5	16.6	14.2	14.2	14.2	14.2	14.2
190	28.7	24.8	20.9	16.9	14.2	14.2	14.2	14.2	14.2
200	29.1	25.1	21.2	17.3	14.2	14.2	14.2	14.2	14.2
210	29.3	25.4	21.5	17.5	14.2	14.2	14.2	14.2	14.2
220	29.6	25.7	21.8	17.8	14.2	14.2	14.2	14.2	14.2
230	29.9	26	22	18	14.2	14.2	14.2	14.2	14.2
240	30.1	26.2	22.3	18.3	14.2	14.2	14.2	14.2	14.2
250	30.3	26.5	22.5	18.5	14.3	14.2	14.2	14.2	14.2
260	30.5	26.7	22.7	18.7	14.5	14.2	14.2	14.2	14.2
270	30.7	26.9	22.9	18.8	14.7	14.2	14.2	14.2	14.2
278.9	30.8	27	23.1	19	14.8	14.2	14.2	14.2	14.2

Result

- Required cladding thickness: 14.2 mm
- Selected thickness of AESTUVER fire-protection board: 15 mm

Processing guideline

Mounting
AESTUVER fire-protection boards should be fixed in accordance with the instructions and illustrations in the classification reports. The fixing sizes provided in the reports must be followed.

Fixings
The following fixings should be considered for mounting AESTUVER fire-protection boards:

- Staples for cladding thicknesses from 15 to 50 mm
- Screws for cladding thicknesses of 60 mm

More information about the fixings can be found in the design details (pages 8–15). Directly screwing the AESTUVER fire-protection boards to the steel beam is not permissible.

When selecting fixings, corrosion protection requirements must be considered.

Beam and column details
The allowable profile heights and widths can be found in the classification reports.

Maximum profile width:

- 600 mm

The maximum profile height can be calculated as follows:

- 496.5 mm + 2×width of weld seam + 2×flange thickness

Flange details

- Spacing between cladding and flange: 0 to 50 mm

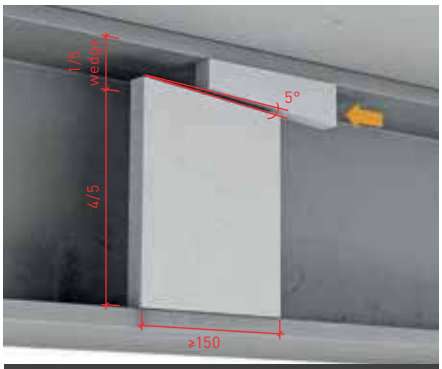
The butt joints of the flanges do not require backing. The joints of the fire-protection cladding do not require sealing.

Nogging dimensions

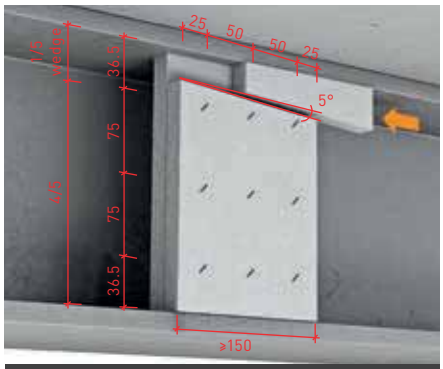
- Width: 150 mm
- Single-layer variant (classification reports R0498a, R0343e, R0459b): d = 15 or 20 mm
- Dual-layer variant (classification reports R0498b, R0459a): d = 2×15 mm or 2×20 mm

Wall and ceiling penetration
For all wall and ceiling penetrations, intermediate cavities must be closed off (A1 rock wool according to EN 13501-1 or other suitable materials).

Butt joint detail of fire-protection cladding



Detail option for single-layer nogging



Detail option for dual-layer nogging

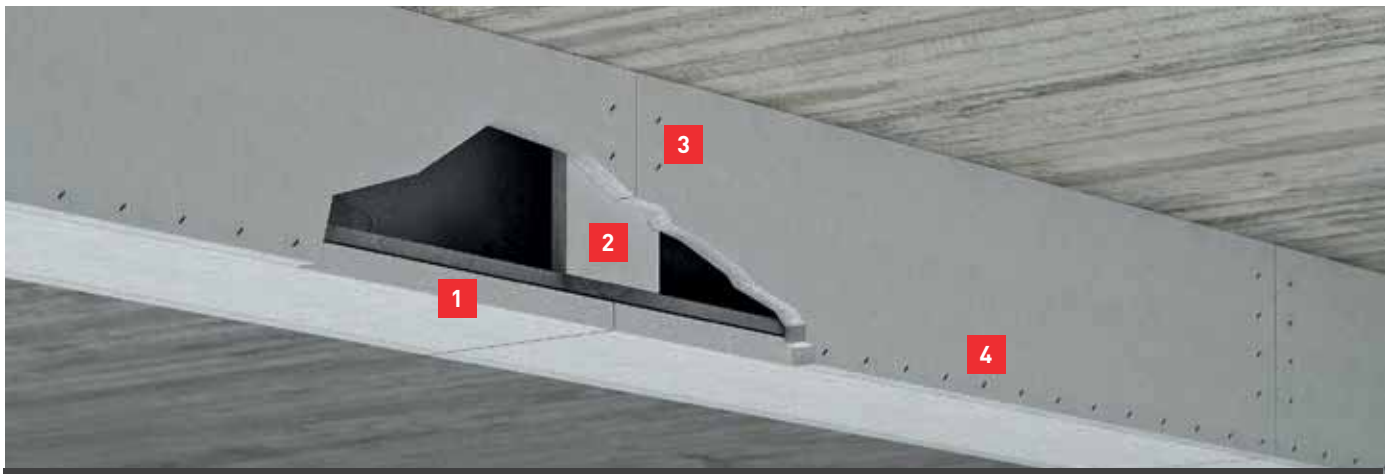
Further details can be found in the classification reports.

Design details – beams

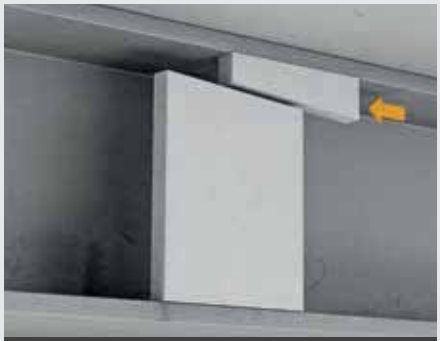
Classification report R0498a

AESTUVER fire-protection boards 15 to 50 mm, stapled

Staple spacing and size 1 Board thickness	2 Nogging thickness	3 Vertical staples	4 Longitudinal staples
15 mm	15 mm	Length: min. 30 mm Width/diameter: 11.25 × 1.53 mm Spacing: 50 mm, one row	40 × 11.25 × 1.53 mm Spacing: 75 mm
20 mm	20 mm	Length: min. 40 mm Width/diameter: 11.25 × 1.53 mm Spacing: 50 mm, one row	45 × 11.25 × 1.53 mm Spacing: 75 mm
25 mm	20 mm	Length: min. 45 mm Width/diameter: 11.25 × 1.53 mm Spacing: 50 mm, one row	50 × 11.25 × 1.53 mm Spacing: 75 mm
30 mm	20 mm	Length: min. 50 mm Width/diameter: 11.25 × 1.53 mm Spacing: 50 mm, one row	60 × 11.25 × 1.53 mm Spacing: 75 mm
40 mm	20 mm	Length: min. 60 mm Width/diameter: 11.25 × 1.53 mm Spacing: 50 mm, one row	80 × 11.25 × 2.00 mm Spacing: 75 mm
50 mm	20 mm	Length: min. 70 mm Width/diameter: 11.25 × 1.53 mm Spacing: 50 mm, one row	80 × 11.25 × 2.00 mm Spacing: 75 mm



Beam with cladding on three sides



Nogging design

Beam (sectional view)

The **classification report R0498a** is available as PDF download at www.fermacell-aestuver.com.

Classification report R0498b

AESTUVER fire-protection boards 15 to 50 mm, stapled

Staple spacing and size 1 Board thickness	2 Nogging thickness	3 Vertical staples	4 Longitudinal staples
15 mm	2×15 mm	Length: min. 40 mm Width/diameter: 11.25×1.53 mm Spacing: 50 mm, two rows	40×11.25×1.53 mm Spacing: 100 mm
20 mm	2×20 mm	Length: min. 45 mm Width/diameter: 11.25×1.53 mm Spacing: 50 mm, two rows	45×11.25×1.53 mm Spacing: 50 mm
25 mm	2×20 mm	Length: min. 50 mm Width/diameter: 11.25×1.53 mm Spacing: 50 mm, two rows	50×11.25 ×1.53 mm Spacing: 50 mm
30 mm	2×20 mm	Length: min. 60 mm Width/diameter: 11.25×1.53 mm Spacing: 50 mm, two rows	60×11.25×1.53 mm Spacing: 50 mm
40 mm	2×20 mm	Length: min. 70 mm Width/diameter: 11.25×1.53 mm Spacing: 50 mm, two rows	80×11.25×2.00 mm Spacing: 50 mm
50 mm	2×20 mm	Length: min. 80 mm Width/diameter: 11.25×2.00 mm Spacing: 50 mm, two rows	80×11.25×2.00 mm Spacing: 50 mm

Beam with cladding on three sides

Wedged nogging

Beam (sectional view)

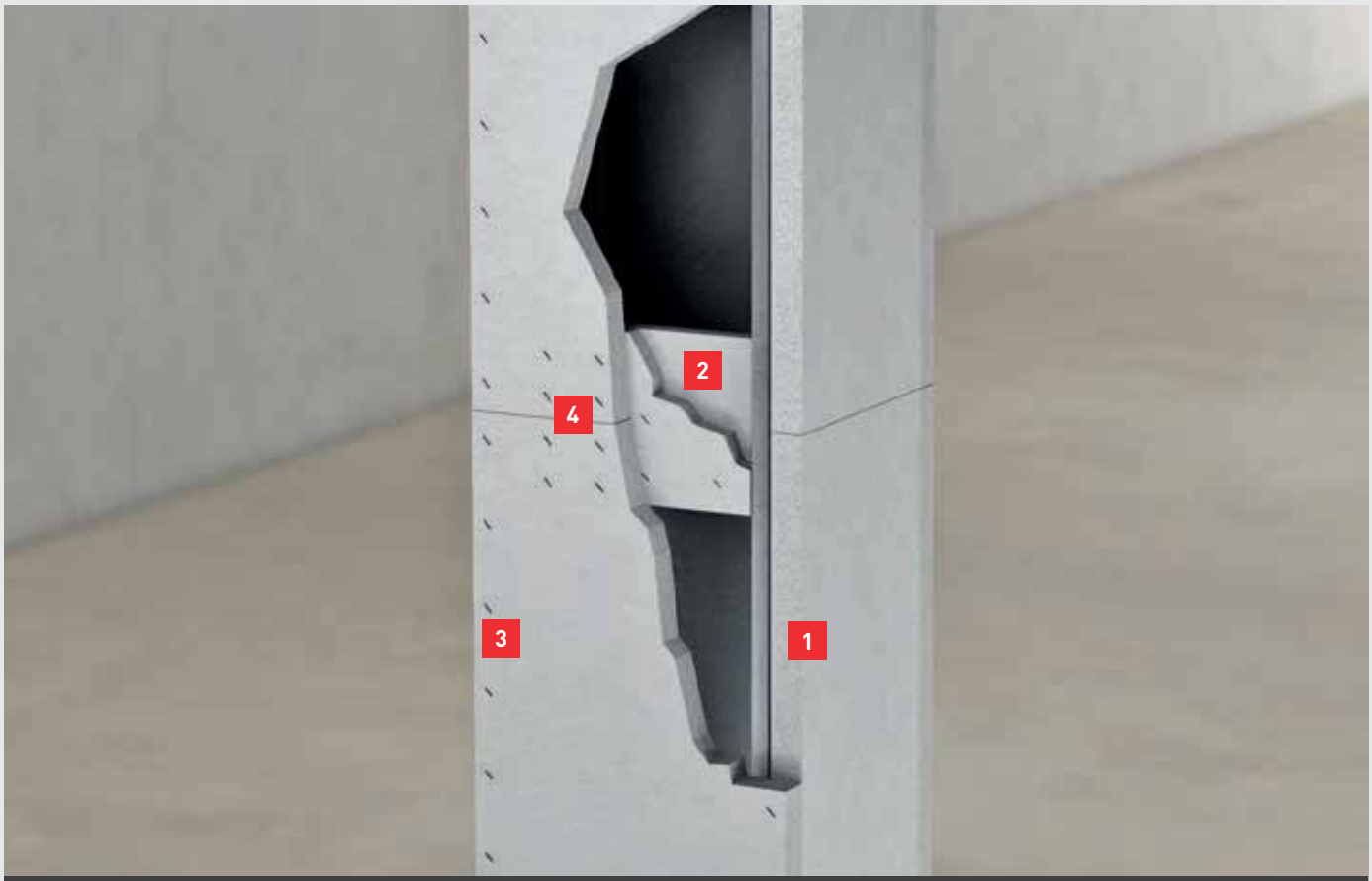
The **classification report R0498b** is available as PDF download at www.fermacell-aestuver.com.

Design details – beams and columns

Classification report R0459a

AESTUVER fire-protection boards 15 to 50 mm, stapled

Staple spacing and size			
1 Board thickness	2 Nogging thickness	3 Vertical staples	4 Longitudinal staples
15 mm	2×15 mm	Length: min. 40 mm Width/diameter: 11.25×1.53 mm Spacing: 50 mm, two rows	40×11.25×1.53 mm Spacing: 100 mm
20 mm	2×20 mm	Length: min. 45 mm Width/diameter: 11.25×1.53 mm Spacing: 50 mm, two rows	45×11.25×1.53 mm Spacing: 50 mm
25 mm	2×20 mm	Length: min. 50 mm Width/diameter: 11.25×1.53 mm Spacing: 50 mm, two rows	50×11.25 ×1.53 mm Spacing: 50 mm
30 mm	2×20 mm	Length: min. 60 mm Width/diameter: 11.25×1.53 mm Spacing: 50 mm, two rows	60×11.25×1.53 mm Spacing: 50 mm
40 mm	2×20 mm	Length: min. 70 mm Width/diameter: 11.25×1.53 mm Spacing: 50 mm, two rows	80×11.25×2.00 mm Spacing: 50 mm
50 mm	2×20 mm	Length: min. 80 mm Width/diameter: 11.25×2.00 mm Spacing: 50 mm, two rows	80×11.25×2.00 mm Spacing: 50 mm

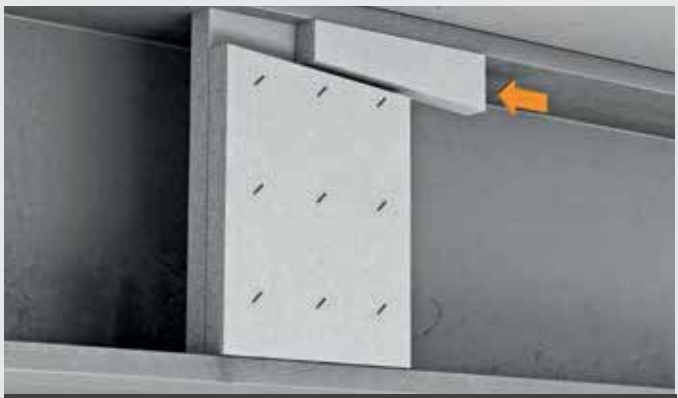


Columns with cladding on three and four sides

Beam with cladding on three sides

Beam (sectional view)

Column (sectional view)



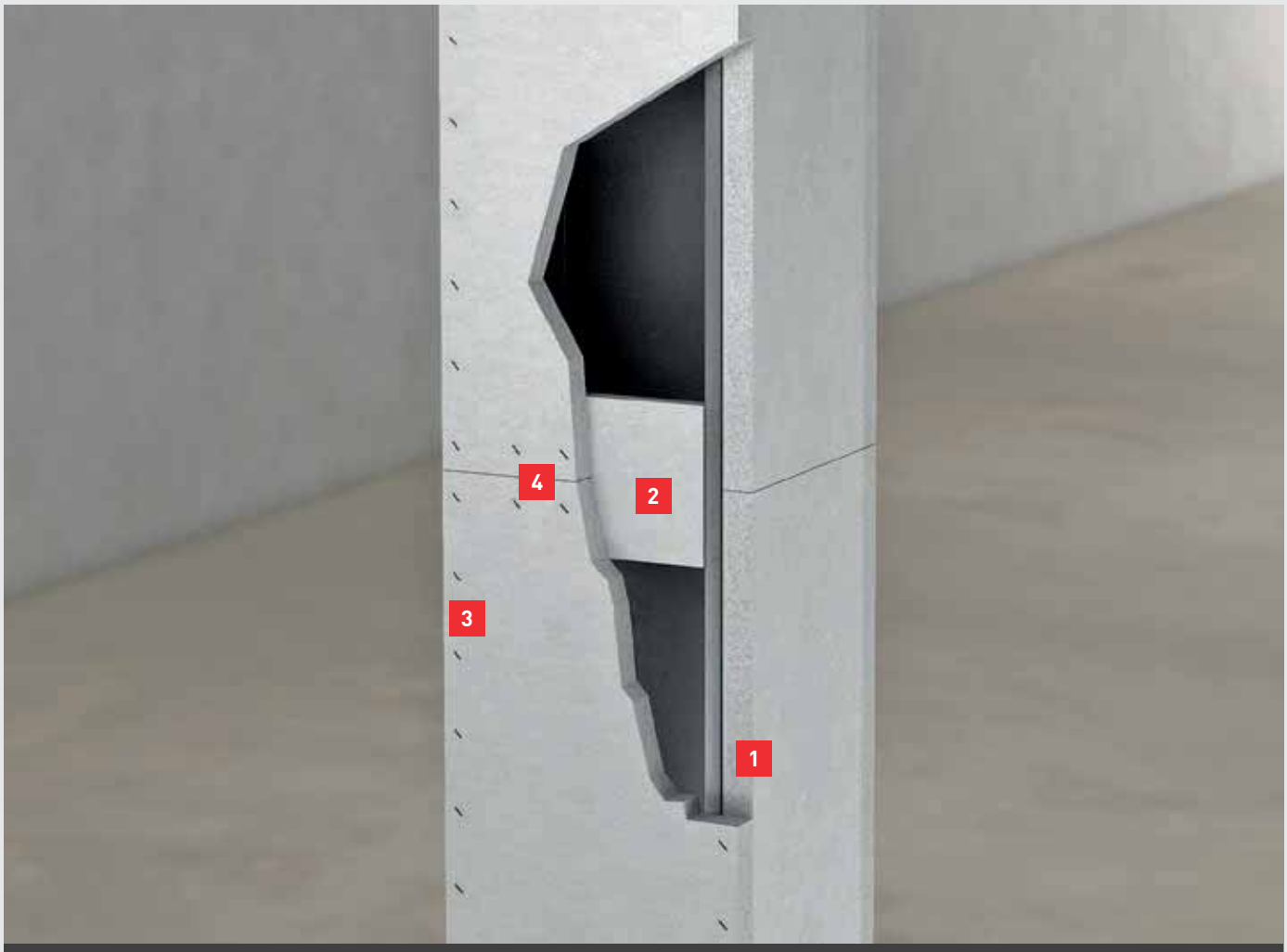
Wedged nogging

The **classification report R0459a** is available as PDF download at www.fermacell-aestuver.com.

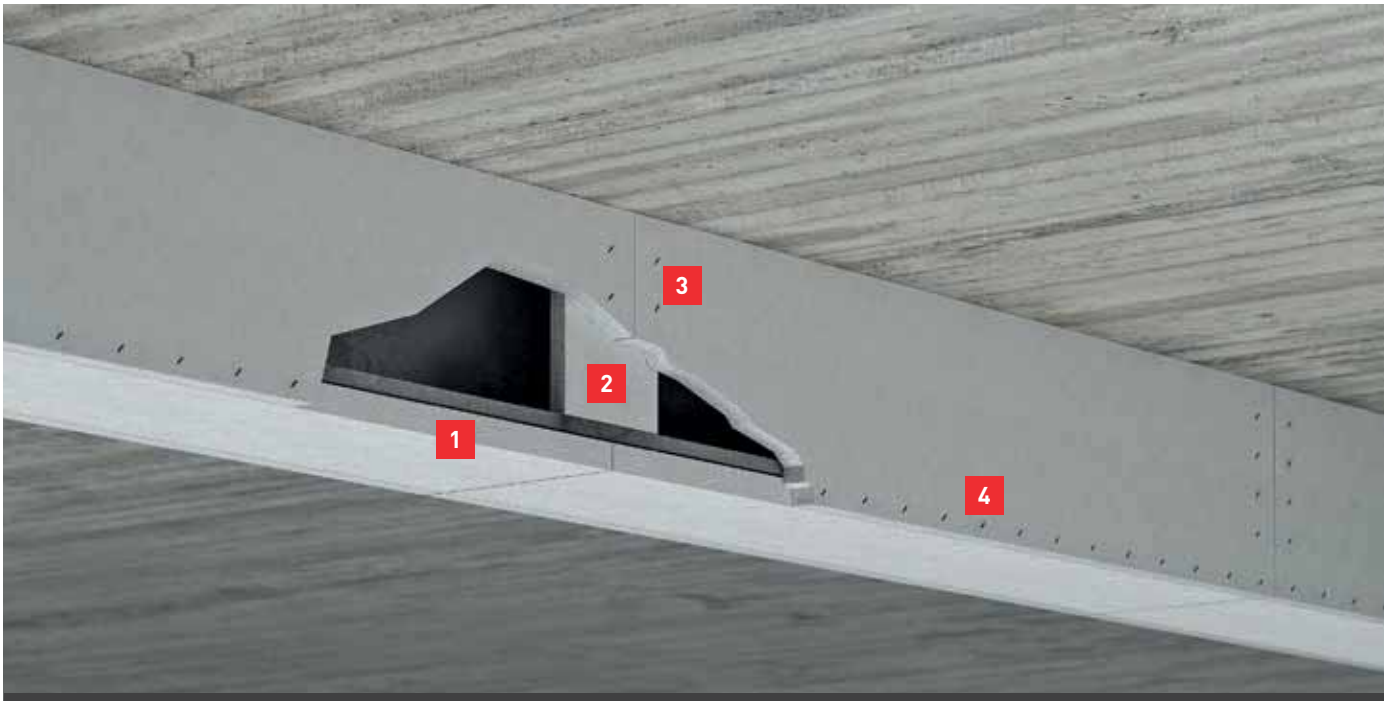
Classification report R0343e

AESTUVER fire-protection boards 15 to 50 mm, stapled

Staple spacing and size			
1 Board thickness	2 Nogging thickness	3 Vertical staples	4 Longitudinal staples
15 mm	15 mm	Length: min. 30 mm Width/diameter: 11.25 × 1.53 mm Spacing: 50 mm, one row	40 × 11.25 × 1.53 mm Spacing: 75 mm
20 mm	20 mm	Length: min. 40 mm Width/diameter: 11.25 × 1.53 mm Spacing: 50 mm, one row	45 × 11.25 × 1.53 mm Spacing: 75 mm
25 mm	20 mm	Length: min. 45 mm Width/diameter: 11.25 × 1.53 mm Spacing: 50 mm, one row	50 × 11.25 × 1.53 mm Spacing: 75 mm
30 mm	20 mm	Length: min. 50 mm Width/diameter: 11.25 × 1.53 mm Spacing: 50 mm, one row	60 × 11.25 × 1.53 mm Spacing: 75 mm
40 mm	20 mm	Length: min. 60 mm Width/diameter: 11.25 × 1.53 mm Spacing: 50 mm, one row	80 × 11.25 × 2.00 mm Spacing: 75 mm
50 mm	20 mm	Length: min. 70 mm Width/diameter: 11.25 × 1.53 mm Spacing: 50 mm, one row	80 × 11.25 × 2.00 mm Spacing: 75 mm



Columns with cladding on three and four sides



Beam with cladding on three sides

Beam (sectional view)

Column (sectional view)

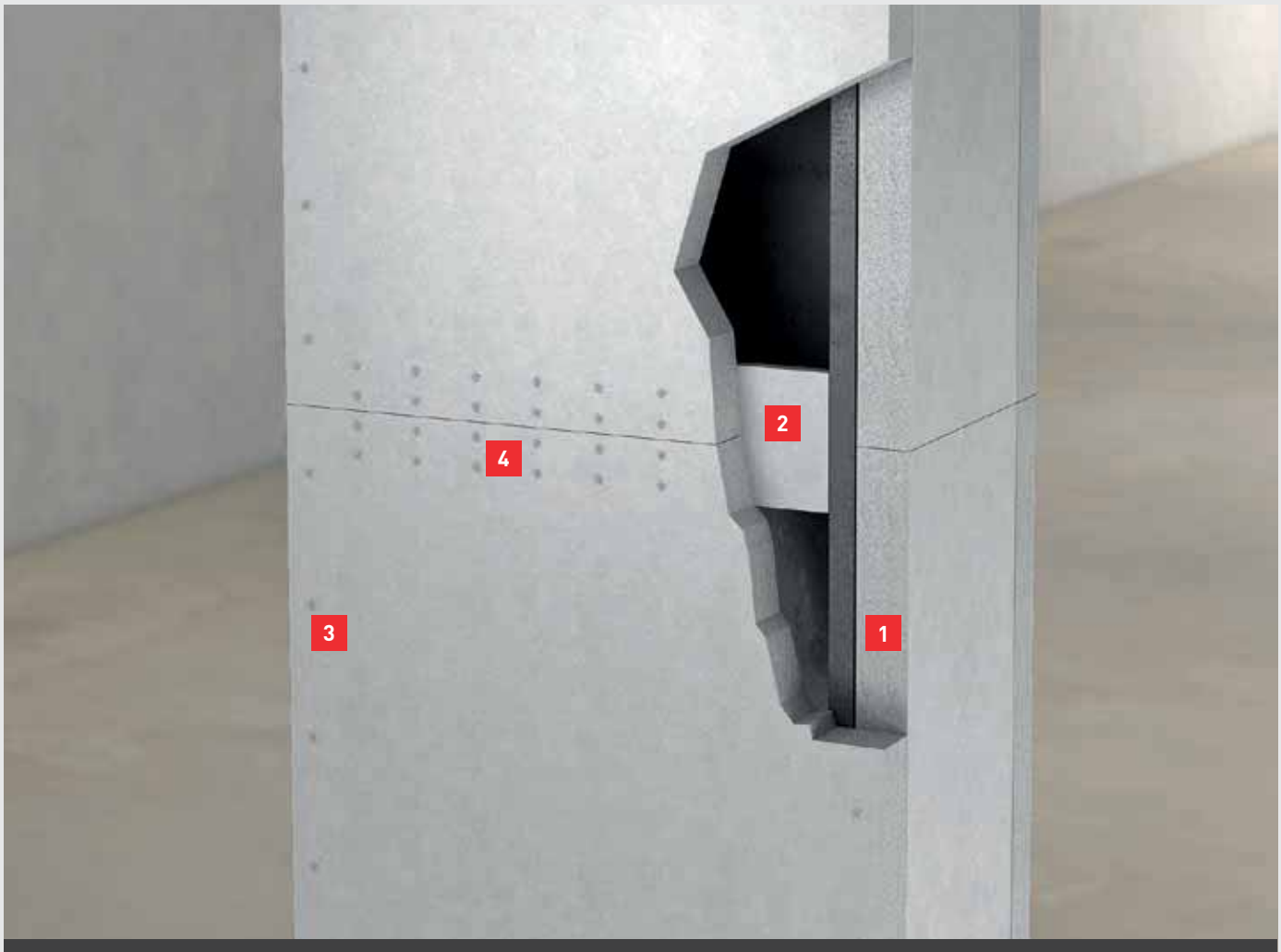
Wedged nogging

The **classification report R0343e** is available as PDF download at www.fermacell-aestuver.com.

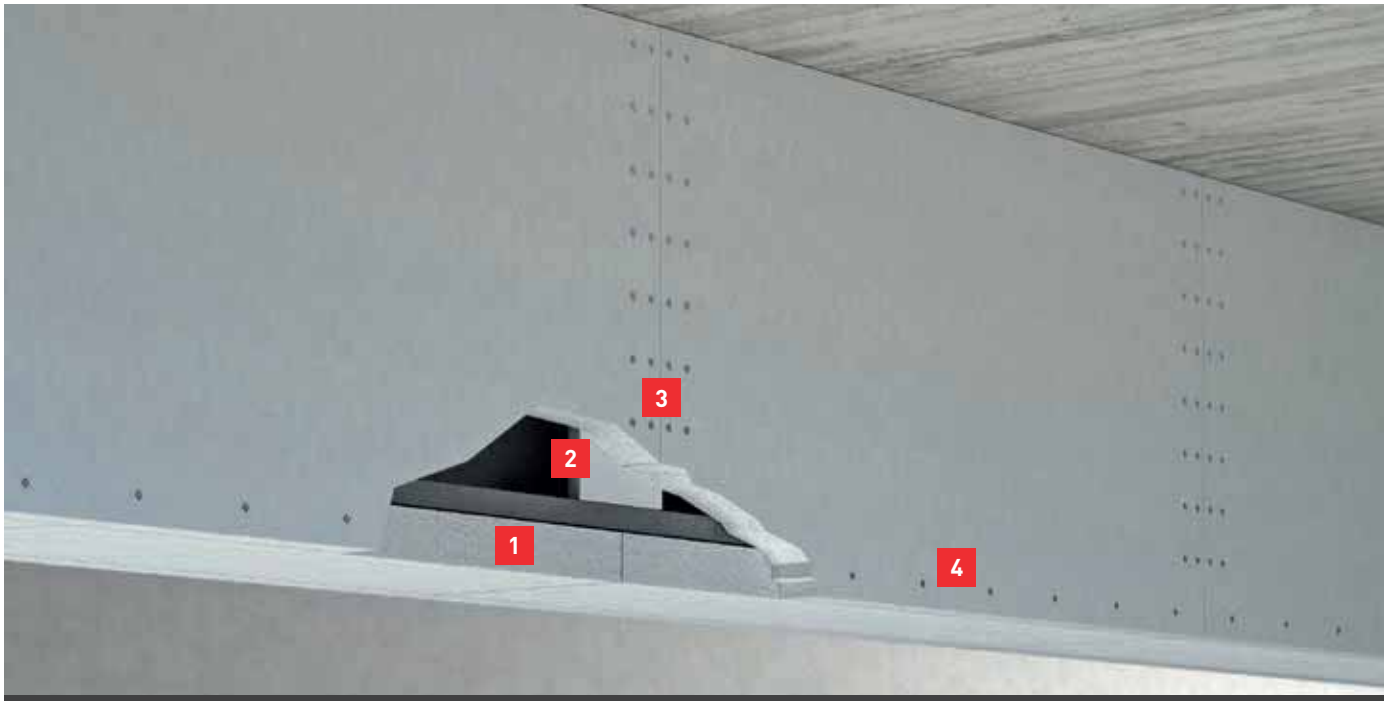
Classification report R0459b

AESTUVER fire-protection boards, 60 mm, screwed

Screw spacing and size			
1 Board thickness	2 Nogging thickness	3 Nogging screws	4 Longitudinal screws
60 mm	20 mm	Length: min. 80 mm Width/diameter: 5 mm Spacing: 75 mm, two rows	5 × 120 mm Spacing: 150 mm



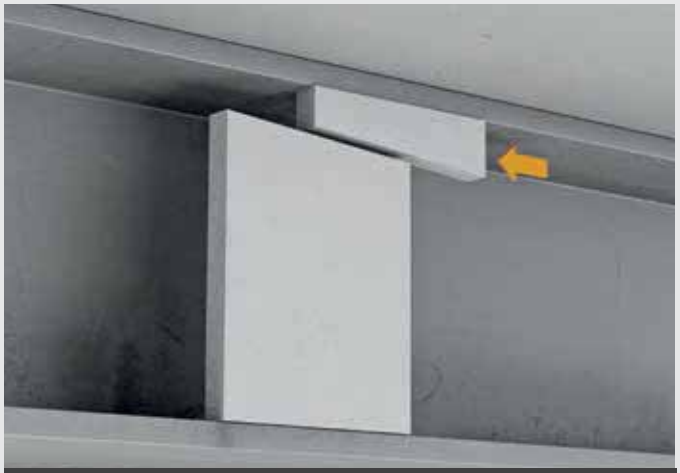
Columns with cladding on three and four sides



Beam with cladding on three sides

Beam (sectional view)

Column (sectional view)



Wedged nogging

The **classification report R0459b** is available as PDF download at www.fermacell-aestuver.com.

Fermacell
Unit 2, The Courtyard
Reddicap Trading Estate
Sutton Coldfield
West Midlands, B75 7BU
Telephone: 0121 311 3480
Fax: 0121 311 1882
E-Mail: fermacell-uk@xella.com

www.fermacell-aestuver.com

fermacell®
AESTUVER

For the latest version of this brochure, please visit our website www.fermacell-aestuver.com

Last updated: 07/2014

FC-025-00001/k/07.14