



European Technical Assessment

ETA 09/0057
of 24.12.2015



General part

Trade name of the construction product	TECBOR® A and TECBOR® B
Product family to which the construction product belongs	Fire protective boards
Manufacturer	TECRESA Protección Pasiva SL Parque Leganés Tecnológico Margarita Salas 6 ES-28919 Leganés (Madrid) Spain
Manufacturing plant(s)	According to Annex N kept by ITeC
This European Technical Assessment contains	19 pages including 4 Annexes which form an integral part of this assessment and Annex N, which contains confidential information and is not included in the European Technical Assessment when that assessment is publicly available
This European Technical Assessment is issued in accordance with Regulation (EU) 305/2011, on the basis of	ETAG 018 <i>Fire Protective Products, Part 1: General (April 2013) and Part 4: Fire protective board, board and mat products and kits (December 2011)</i> , used as European Assessment Document (EAD)
This version replaces	ETA 09/0057, issued on 25.06.2013

General comments

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full (excepted the confidential Annex(es)).

Specific parts of the European Technical Assessment

1 Technical description of the product

TECBOR® A and TECBOR® B are fire protective boards of magnesite and other components, finished with a glass fibre mesh and a thin cellulose layer on both faces. The boards are off-white with one face smoother, which is installed in the outer position. Both boards are manufactured by TECRESA Protección Pasiva SL. The dimensions and density of the boards are given in table 1.

Table 1: Dimensions and density of boards.

	TECBOR® A		TECBOR® B		
	Nominal value	Tolerance	Nominal value	Tolerance	
Density (kg/m ³)	(dry at 40 °C)	700	± 10 %	650	± 10 %
	(23 °C, 50 % RH)	730	± 10 %	680	± 10 %
Length (mm)	2300	± 5 mm	2300	± 5 mm	
Width (mm)	1220	± 3 mm	1220	± 3 mm	
Thickness (mm)	12	± 1 mm	20	+ 2 / - 1 mm	

Assembled systems require additional components as described in Annex 2 and 3 of this ETA. Those components are not covered by this ETA and cannot be CE marked on the basis of this ETA.

2 Specification of the intended use(s) in accordance with the applicable EAD

TECBOR® A and TECBOR® B are intended for the fire protection of elements or to be used in assemblies as specified in table 2, which also shows the related environmental use conditions.

Table 2: Intended use categories related to the protected element and the environmental conditions.

Product	Fire protection uses		Environmental conditions
	ETAG 018-1 reference	Element intended to be protected	ETAG 018-4 reference
TECBOR® A	Type 8	Fire separating assemblies with no load-bearing requirements	Type Z ₂
TECBOR® B	Type 9	Technical services assemblies in buildings	

This ETA covers assemblies installed in accordance with the provisions given in Annex 2 and 3.

The environmental use categories are specified in ETAG 018 Part 4, section 2.2.2:

- Type Z₂: internal conditions excluding temperatures below 0°C, with humidity lower than 85% RH.

The provisions made in this ETA are based on a working life of the TECBOR® A and TECBOR® B boards for fire protection of at least 25 years, provided that the conditions laid down in the manufacturer's instructions for the installation, use and maintenance are met. These provisions are based upon the current state of the art and the available knowledge and experience.

The indications given on the working life cannot be interpreted as a guarantee, but are to be regarded only as a means for choosing the appropriate product(s) in relation to the expected economically reasonable working life of the works.

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

3.1 Performance of the product

The assessment of TECBOR® A and TECBOR® B boards for the intended use considering the basic requirements for construction works 2, 3, 4, 5 and 6 was performed following the ETAG 018 for *Fire Protective Products, Part 1: General (April 2013) and Part 4: Fire protective board, board and mat products and kits (December 2011)*, used as EAD.

Table 3: Performance of the product.

Product: TECBOR® A and TECBOR® B		Intended use: Fire protection	
Basic requirement	Essential characteristic		Performance
BWR 2 Safety in case of fire	Reaction to fire		A1
	Resistance to fire		See Annexes
BWR 3 Hygiene, health and the environment	Release of dangerous substances		No dangerous substances (see 3.2.3)
BWR 4 Safety and accessibility in use	Flexural strength (MOR)	TECBOR® A	6,7 MPa
		TECBOR® B	3,0 MPa
	Dimensional stability		< 0,5 %
BWR 5 Protection against noise	Airborne sound insulation	TECBOR® A	See 3.2.6
	Sound absorption	TECBOR® B	$\alpha_w = 0,10$
BWR 6 Energy economy and heat retention	Thermal insulation, $\lambda_{U,90/90(23/50)}$	TECBOR® A	0,292 W/m·K
		TECBOR® B	0,224 W/m·K
	Water vapour transmission (μ -value)	TECBOR® A	4 - 5
		TECBOR® B	3 - 4
General aspects relating to the performance of the product	Perpendicular tensile strength	TECBOR® A	1,21 MPa
		TECBOR® B	0,68 MPa
	Parallel tensile strength	TECBOR® A	1,59 MPa
		TECBOR® B	0,81 MPa
	Compressive strength (σ_{10})	TECBOR® A	7,07 MPa
		TECBOR® B	4,64 MPa
	Durability		Type Z ₂

3.2 Methods used for the assessment

3.2.1 Reaction to fire

The performance of TECBOR® A and TECBOR® B boards has been determined according to EN 13501-1. TECBOR® A and TECBOR® B slabs have been tested according to EN ISO 1182, EN ISO 1716 and EN 13823.

3.2.2 Fire resistance

The resistance to fire performance, according to EN 13501-2 and EN 13501-3, of assemblies using the fire protective boards is presented in Annex 2 and 3.

3.2.3 Release of dangerous substances

According to the manufacturer's declaration, the products' specification has been compared with the regulated dangerous substances given in the *Indicative list of regulated dangerous substances possibly associated with construction products under the CPD*¹, in Annex VI of Regulation (EC) 1272/2008 and in EOTA TR 034², to verify that they do not contain such substances.

According to the manufacturer's declaration, the boards do not have components containing formaldehyde.

In addition to the specific clauses relating to dangerous substances contained in this ETA, there may be other requirements applicable to the products falling within its scope. In order to meet the provisions of the EU Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

3.2.4 Flexural strength

TECBOR® A and TECBOR® B boards have been tested according to EN 12467.

Table 4: Modulus of rupture.

	TECBOR® A	TECBOR® B
Mean value of MOR (MPa)	7,24	3,58
Minimum value of MOR declared by the manufacturer (MPa)	6,7	3,0

3.2.5 Dimensional stability

TECBOR® A and TECBOR® B boards, tested according to EN 318, show dimensional changes associated with changes in relative humidity lower than 0,5 % in all test results.

3.2.6 Airborne sound insulation

TECBOR® A board in conjunction with a masonry separating wall, as described in Annex 2, has been rated according to EN ISO 717-1.

- $R_A = 49,2$ dBA
- $R_w (C;C_{tr}) = 50 (-1;-6)$ dB

¹ DS 041/051 Rev.12, 22 March 2012, EC Expert Group on Dangerous Substances in the field of Construction Products.

² EOTA Technical Report 034 *General BWR3 Checklist for EADs/ETAs - Dangerous substances*, of October 2015.

3.2.7 Sound absorption

TECBOR® B has been tested according to EN ISO 354 and rated (α_w) to EN ISO 11654, taking into account its use in fire protective board ducts.

3.2.8 Thermal insulation

TECBOR® A and TECBOR® B boards have been tested according to EN 12664 and the obtained thermal characteristics are given in the next table.

Table 5: Thermal characteristics.

		TECBOR® A	TECBOR® B	
$\lambda_{10,dry,90/90}$	(W/m·K)	0,270	0,190	Conductivity fractile value at 10 °C at dry conditions, representing at least 90 % of the production with a confidence level of 90 %.
$u_{23,50}$	(kg/kg)	0,033	0,036	Moisture content mass/mass at 23 °C / 50 % R.H.
$f_{u,1}$	(kg/kg)	2,41	4,59	Moisture content conversion coefficient mass by mas
$\lambda_{U,90/90(23/50)}$	(W/m·K)	0,292	0,224	Design value of conductivity declared at 23 °C and 50 % R.H.

3.2.9 Water vapour transmission

TECBOR® A and TECBOR® B boards have been tested according to EN ISO 12572, test conditions C. The declared values of the water vapour diffusion resistance coefficient (μ -value), at humid conditions, are given in table 3.

3.2.10 General aspects relating to the performance of the product

In addition to the essential characteristics related to BWR 4, the following mechanical characteristics have been determined:

- Minimum perpendicular tensile strength, according to EN 1607
- Minimum parallel tensile strength, according to EN 1608
- Minimum compressive strength at 10% relative deformation, according to EN 826.

Durability assessment of boards, both TECBOR® A and TECBOR® B, confirms a working life of 25 years for the intended use Z₂ (internal use). According to ETAG 018-4, resistance to deterioration caused by water, resistance to soak/dry, resistance to freeze/thaw and resistance to heat/rain are characteristics not relevant for the intended use Z₂.

Aspects relating to TECBOR® B boards for the intended use as self-supporting ventilation ducts are given in Annex 3 in accordance with EN 13403.

The ETA is issued for the boards on the basis of agreed data/information, deposited with the ITeC, in accordance with ETAG 018 Part 4, section 5.2.7.2.

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

According to the Decision 1999/454/EC of the European Commission, the system of AVCP (see EC delegated regulation (EU) No 568/2014 amending Annex V to Regulation (EU) 305/2011) given in the following table applies.

Table 4: AVCP System.

Product(s)	Intended use(s)	Level(s) or class(es)	System(s)
Fire protective products	For fire compartmentation and/or fire protection or fire performance	Any	1

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

All the necessary technical details for the implementation of the AVCP system are laid down in the *Control Plan* deposited with the ITeC³ and the factory production control shall be in accordance with it. The following table specifies properties that should be controlled and minimum frequencies of control.

Table 6: FPC test plan for boards TECBOR® A and TECBOR® B.

Property	Minimum frequency
Incoming material	Every delivery
Weight loss on heating (reaction to fire)	1 per week
Dimensional stability at high temperatures (fire resistance)	1 per week
Insulation efficiency (small oven test)	1 per month
Dimensional stability related to relative humidity	1 per year
Thermal resistance	1 per 2 years
Water vapour transmission coefficient	1 per 2 years
Length, width, thickness	1 per day, per dimension
Apparent density	1 per batch
Flexural strength	1 per batch

Issued in Barcelona on 24 December 2015
by the Catalonia Institute of Construction Technology.



Ferran Bermejo Nualart
Technical Director, ITeC

³ The *Control Plan* is a confidential part of the ETA and only handed over to the notified product certification body involved in the assessment and verification of constancy of performance.

ANNEX 1. Fire resistance performance and installation provisions for the assemblies related to the intended uses of TECBOR® A and TECBOR® B

A.1.1 Overview of fire resistance performance

The fire protective assemblies in Table A.1.1 have been assessed within the framework of this ETA.

Table A.1.1: Classification of the fire protective assemblies.

Assembly	Classification	Test standards	Intended use according to ETAG 018	Installation details
Fire separating wall using TECBOR® A with no load-bearing requirements	EI 240 EN 13501-2, see Annex 2	EN 1364-1	Type 8	Annex 2
Technical services assemblies in buildings using TECBOR® B	EI 120 (ve i ↔ o) EN 13501-3, see Annex 3	EN 1366-1	Type 9	Annex 3

A.1.2 Installation and design provisions

System installation should be carried out in accordance with the manufacturer's instructions and the provisions given in the following Annexes.

A.1.2.1 Tools and equipment

The boards shall be cut and machined with a universal circular saw or a conventional hand cutter. When machining the boards with power tools, dust results and it should be extracted by a vacuum cleaner to avoid inhalation.

A.1.2.2 Joints

The fire protective boards shall be butt jointed and a joint paste used in accordance with specification Annex 2 and 3.

A.1.2.3 Surface

Influence of surface treatment (such as plastering, paints, tiles, wallpaper) on the performance of the boards has not been assessed within the framework of this ETA.

ANNEX 2. Specification and assessment of fire protection of a masonry separating wall with no load-bearing requirements (intended use Type 8), clad with boards TECBOR® A 12 mm and exposed to fire from the protected side

A.2.1 Classification

The assembly described in this Annex has been tested according to EN 1364-1 and classified EI 240 in accordance with EN 13501-2.

A.2.2 Masonry wall

Brickwork wall made of vertically perforated clay masonry units with the following characteristics according to EN 771-1:

- Category I
- Width ≥ 123 mm
- Apparent density ≥ 950 kg/m³
- Percentage of voids ≤ 55 %

The bricks are jointed with Portland cement mortar. A plaster layer 10 mm thick has been applied to the non-protected wall face.

A.2.3 Substructure

The substructure onto which the boards are installed consists of steel W-profiles (see table A.2.1). First a framework of W-profiles should be fixed to the perimeter of the wall. Then vertical W-profiles are fixed every 610 mm \pm 30 mm, except at those points where it is not possible. At those points, the separation should be reduced. Short steel W-profiles should be installed horizontally under the horizontal board joints (see Figure A.2.1). Steel W-profiles are fixed to the masonry wall with plastic anchors (see table A.2.1) as specified in Figure A.2.1 and A.2.2.

Table A.2.1: Specification for the components.

Element	Identification	Characteristics	Mounting and fixing
W metal frame profiles	Galvanized steel profiles according to EN 14195 or equivalent	- Width: 85 mm - Height: 15 mm - Thickness: $\geq 0,8$ mm	- Framework on the perimeter of the wall - Vertical profiles, placed at 610 \pm 30 mm - Short horizontal profiles under horizontal board joints
Frame plastic anchors	Galvanized steel screw and polyamide PA 6 sleeve	- Diameter: 10 mm - Anchorage depth ≥ 60 mm	Used to fix steel W-profiles to masonry wall at 250 mm \pm 20 mm centres

A.2.4 Fire protective boards

Boards TECBOR® A 12 mm are installed in a single layer. The first board (1220 x 2300 mm) is placed on one end W-profile, in vertical position, fitted close to floor and wall.

Boards are fixed to the W-profiles with phosphated steel self-tapping screws at 250 \pm 20 mm centres. Distance of self-tapping screws to the board joints is of approximately 15 mm (see Detail A for vertical

joint and Detail C for horizontal joint). The screw heads are sealed with joint paste TECBOR® (see table A.2.3).

Both vertical and horizontal joints must always be placed on a W-profile with a maximum joint width of 1 mm. Horizontal board joints must be staggered at minimum distance of 300 mm (see Figure A.2.1).

The maximum height of wall to be protected is 4 m.

Table A.2.2: Specifications for the components.

Element	Identification	Characteristics	Mounting and fixing
Boards	Fire protective board TECBOR® A	Length: 2300 mm Width: 1220 mm Thickness: 12 mm	Applied in a single layer, screwed onto the steel W-profiles
Screws	Phosphated steel self-tapping screws according to EN 14566 or equivalent	Ø 3,5 x 25 mm	Used to fix TECBOR® A board to W-profile at 250 ± 20 mm centres

A.2.5 Joints

All joints between boards are completely filled with joint paste TECBOR®, as well as the joints between boards and floor, and between boards and walls (see Details A, B and C). All joints are sealed with joint paste TECBOR®.

Table A.2.3: Specifications for the components.

Element	Identification	Characteristics	Mounting and fixing
Joint material	Joint paste TECBOR®	White powdered product based on calcium carbonate, resin and admixtures. The joint paste is supplied in bags, as a dry mix, or in containers, as a paste.	Used for filling and sealing all joints

A.2.6 Details

All mounting and fixing details shall be executed according to the next figures.

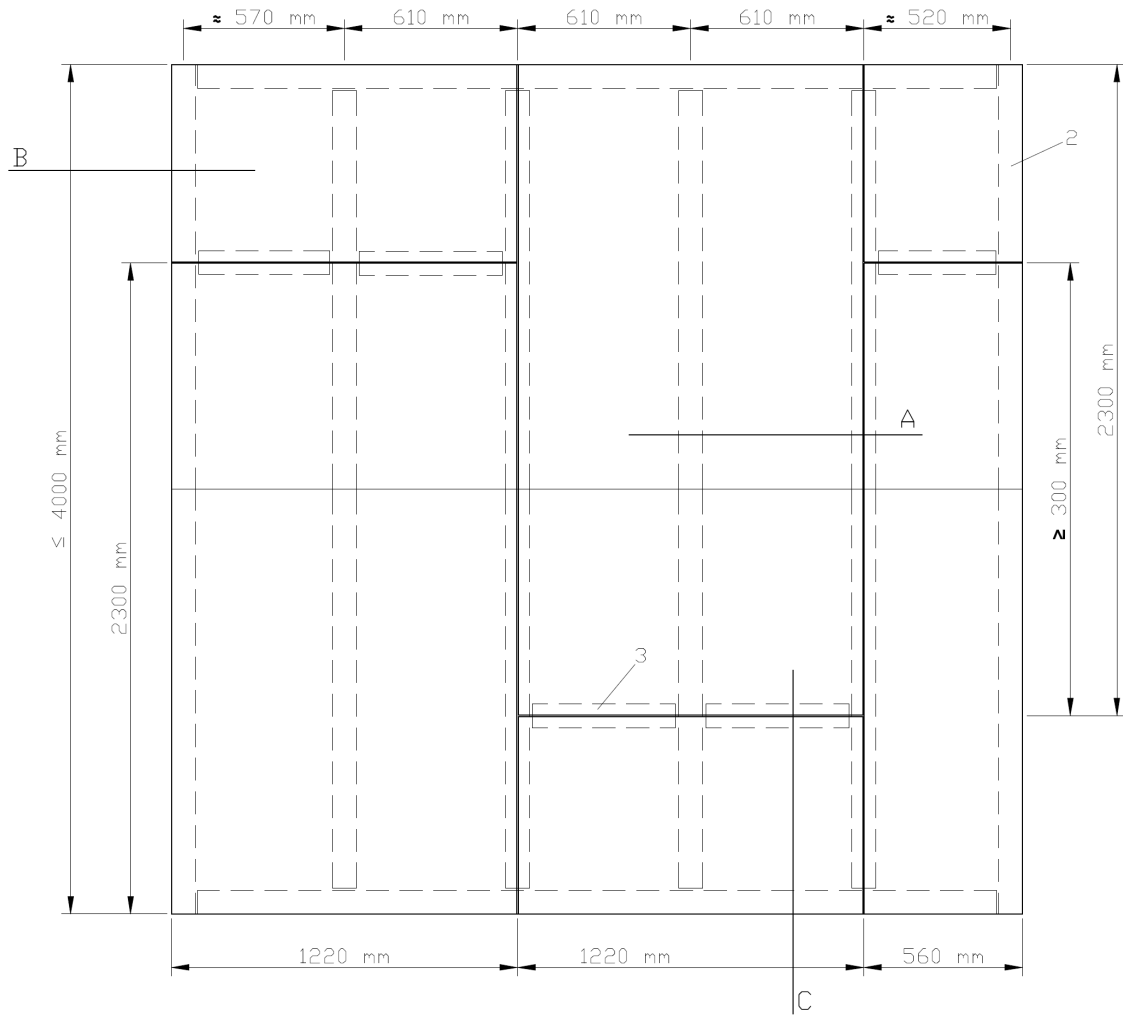
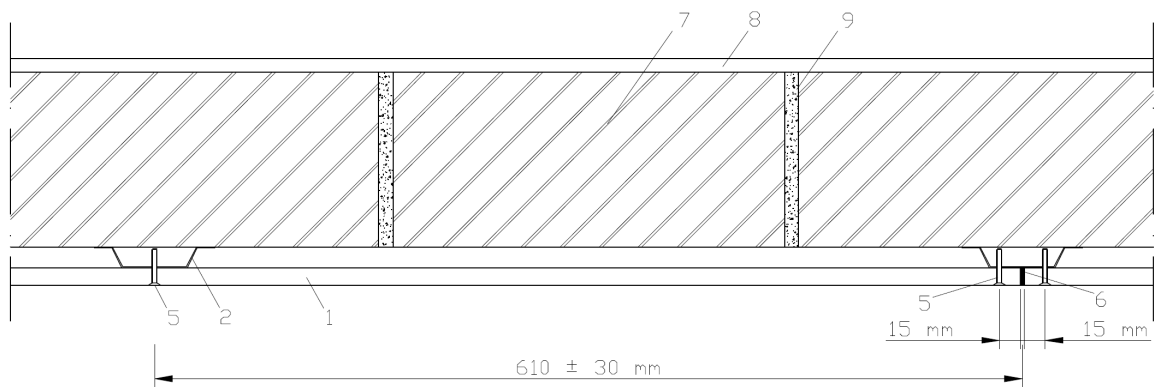
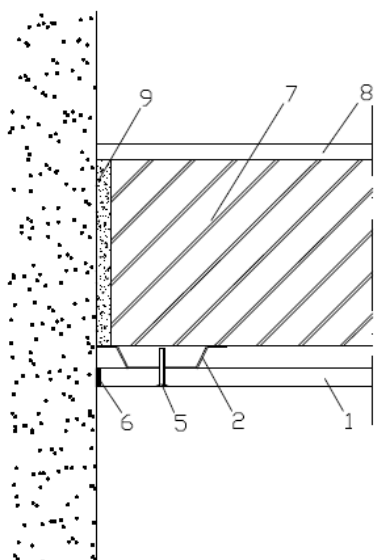


Figure A.2.1: Front view of a wall of 3 m width.

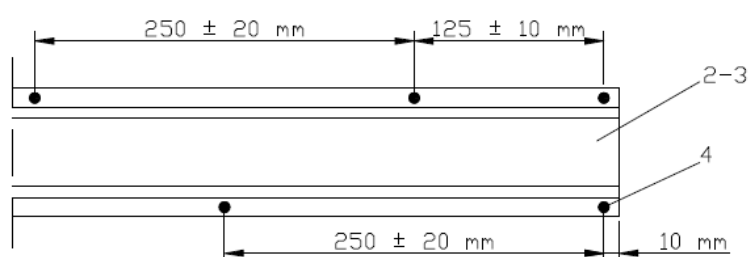
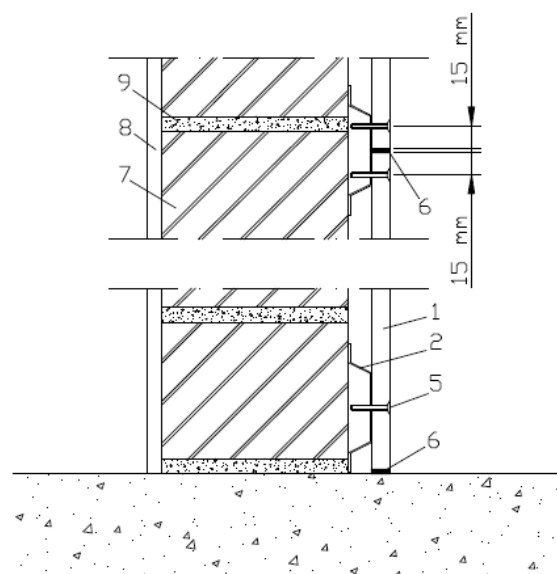
Detail A



Detail B



Detail C

**Figure A.2.2:** Detail of the metal frame fixings.

Key

- 1 Board TECBOR® A 12 mm
- 2 W metal frame profile according to EN 14195 (85 x 15 x 0,8) mm
- 3 Short W metal frame profile according to EN 14195 (85 x 15 x 0,8) mm
- 4 Plastic anchor Ø 10 x 60 mm
- 5 Phosphated self-tapping screw Ø 3,5 x 25 mm
- 6 Joint paste TECBOR®
- 7 Brickwork wall ≥ 12,3 cm thick, vertically perforated clay masonry units
- 8 Plaster layer ≥ 10 mm thick
- 9 Portland cement mortar

ANNEX 3. Specification and assessment of a vertical ventilation duct (intended use Type 9), composed of fire protective boards TECBOR® B 20 mm, exposed to fire from both outside and inside

A.3.1 Classification

The assembly described in this Annex has been tested according to EN 1366-1 and is classified EI 120 (ve i ↔ o) in accordance with EN 13501-3.

A.3.2 Supporting structure

The continuous self-supporting vertical ventilation duct is composed of two layers of fire protective boards TECBOR® B 20 mm (see clause A.3.3 for details of the duct composition). The duct starts at ground level and penetrates a steel reinforced concrete slab with a minimum thickness of 150 mm. The duct is not supported at the floor opening.

A.3.3 Fire protective boards and reinforcement profiles

Boards TECBOR® B 20 mm are placed to form a two layer continuous self-supporting vertical duct with a reinforcement profile between them. They are installed with the smoother face oriented towards the outside, in both layers.

The first layer (inner layer) is made of TECBOR® B 20 mm boards fixed with phosphated steel self-tapping screws with minimum dimensions of Ø 3,5 x 45 mm, placed at 250 ± 20 mm centres.

At each corner of the first layer, a galvanized steel L profile 40x40x2 mm is fixed with phosphated steel self-tapping screws with minimum dimensions of Ø 3,5 x 45 mm, placed at 250 ± 20 mm centres (see Figure A.3.2).

The start from the floor is carried out as indicated in Figure A.3.1.

The second layer (outer layer) is made of TECBOR® B 20 mm boards fixed to the galvanized steel L profiles with zinc or phosphated steel self-drilling screws with minimum dimensions of Ø 3,5 x 45 mm and placed at 250 ± 20 mm centres (see Figure A.3.2).

Horizontal joints between boards of the second layer are not coincident with any horizontal joint of the inner layer. The horizontal joints of the outer layer are protected by board strips as specified in clause A.3.4.1.

The maximum dimensions of the duct are 1250 mm x 1000 mm (see Figure A.3.2). The maximum height is 4,15 m.

Table A.3.1: Specifications for the components.

Element	Identification	Characteristics	Mounting and fixing
Boards	Fire protective board TECBOR® B	Length:2300 mm Width: 1220 mm Thickness: 20 mm	Installed to form a two layers rectangular vertical duct
L metal frame profiles	Galvanized steel profiles according to EN 14195 or equivalent	40 x 40 x 2 mm	L profiles fixed to the corners of the inner layer of the duct

Table A.3.1: Specifications for the components.

Element	Identification	Characteristics	Mounting and fixing
Screws first layer & profile / board	Phosphated steel self-tapping screws according to EN 14566 or equivalent	$\geq \varnothing 3,5 \times 45 \text{ mm}$	Used to fix: <ul style="list-style-type: none"> - boards TECBOR® B of inner layer at $250 \pm 20 \text{ mm}$ centres - L profiles to inner layer at $250 \pm 20 \text{ mm}$ centres
Screws second layer	Zinc or phosphated steel self-drilling screws according to EN 14566 or equivalent	$\geq \varnothing 3,5 \times 45 \text{ mm}$	Used to fix the outer layer to L profiles at $250 \pm 20 \text{ mm}$ centres

A.3.4 Joints

A.3.4.1 Board joints

All board joints are completely filled and sealed with joint paste TECBOR®.

The horizontal joints of the outer layer are protected by TECBOR® B 20 mm board strips (minimum 250 mm width) fixed to the outside surface of the duct with two phosphated steel self-tapping screws with minimum dimensions of $\varnothing 3,5 \times 45 \text{ mm}$ placed at both sides of the joint at $210 \pm 20 \text{ mm}$ and at $250 \pm 20 \text{ mm}$ centres around the duct (see Figure A.3.1).

Board strips are also installed around the base of the duct (minimum 100 mm width), with the same fixings and the same separation between centres.

Table A.3.2: Specifications for the components.

Element	Identification	Characteristics	Mounting and fixing
Joint material	Joint paste TECBOR®	White powdered product based on calcium carbonate, resin and admixtures. The joint paste is supplied in bags, as a dry mix, or in containers, as a paste.	Used for filling and sealing all joints
Board strips on joints	Fire protective board TECBOR® B	Thickness: 20 mm Width $\geq 250 \text{ mm}$	Installed around the duct, centred on the joints
Board strips around the base of the duct	Fire protective board TECBOR® B	Thickness: 20 mm Width $\geq 100 \text{ mm}$	Placed around the duct, standing on the floor
Screws board strips	Phosphated steel self-tapping screws according to EN 14566 or equivalent	$\geq \varnothing 3,5 \times 45 \text{ mm}$	Placed at both sides of the joint at $210 \pm 20 \text{ mm}$ and at $250 \pm 20 \text{ mm}$ centres around the duct

A.3.4.2 Penetration seal

The gap between the slab and the duct (50 mm approximately) is filled with mineral wool, with A1 fire classification according to EN 13501-1 and a minimum density of 144 kg/m^3 . The mineral wool is sealed at top and bottom with joint paste TECBOR® of 1 mm thickness (see Figure A.3.3).

At top and bottom of the concrete slab, a horizontal TECBOR® B board strip (20 mm thickness and minimum 300 mm width) is fixed around the duct to the slab with $\varnothing 10 \times 100 \text{ mm}$ plastic anchors of

hexagonal head (minimum of two anchors to each strip). TECBOR® B strips must be fitted to the perimeter of the duct and covering the mineral wool.

On top of the above strips, a vertical TECBOR® B board strip (20 mm thickness and minimum 250 mm width) is placed around the vertical duct. Galvanised steel L profile 40x40x0,6 mm is fitted to the inside corner, between the horizontal and vertical TECBOR® B board strips, and fixed to them with phosphated steel self-tapping screws (Ø 3,5 x 15 mm). Vertical TECBOR® B 20 mm board strips are also fixed to each other at the corners, with a minimum of two phosphated steel self-tapping screws with minimum dimensions of Ø 3,5 x 45 mm.

The ends of TECBOR® B strips, both vertical and horizontal, are sealed with joint paste TECBOR®.

Table A.3.3: Specifications for the components.

Element	Identification	Characteristics	Mounting and fixing
Sealing material	Mineral wool according to EN 13162	Fire classification according to EN 13501-1: A1 Density $\geq 144 \text{ kg/m}^3$	Cut to size and installed in the gap between the slab and the duct
Board strips in the penetration seal (horizontal)	Fire protective board TECBOR® B	Thickness: 20 mm Width $\geq 300 \text{ mm}$	At top and bottom of the concrete slab around the duct perimeter
Strip anchors	Plastic anchor Galvanized steel screw and polyamide PA 6 sleeve	$\geq \text{Ø } 10 \times 100 \text{ mm}$ Hexagon head screw 13 mm	Used to fix TECBOR® B horizontal strips to concrete slab
Board strips in the penetration seal (vertical)	Fire protective board TECBOR® B	Thickness: 20 mm Width $\geq 250 \text{ mm}$	At the top side of horizontal strips around the duct perimeter
L metal profiles	Galvanized steel profiles according to EN 14195 or equivalent	40 x 40 x 0,6 mm	Installed on the upper corner between horizontal and vertical TECBOR® B board strips
Screws L profiles / Board strips	Phosphated steel self-tapping screws according to EN 14566 or equivalent	Ø 3,5 x 15 mm	Used to fix L profiles to horizontal and vertical TECBOR® B board strips
Joint material	Joint paste TECBOR®	White powdered product based on calcium carbonate, resin and admixtures. The joint paste is supplied in bags, as a dry mix, or in containers, as a paste.	Used for filling and sealing all joints

A.3.5 Aspects relating to the boards forming self-supporting ventilation ducts

TECBOR® B has been assessed in accordance with EN 13403 as given in the next clauses.

A.3.5.1 Erosion and emission of particles

Tested according to EN 13403, the requirements concerning the maximum particle concentration are fulfilled and the material from the inside surface does not break away, flake off or show evidence of delamination or erosion.

A.3.5.2 Resistance against pressure

Tested according to EN 13403 at an internal air test pressure of 300 Pa, the duct made of boards TECBOR® B does not show evidence of cracking or splits. The joint material remains intact and the duct does not show evidence of damage that makes it useless.

A.3.5.3 Airtightness

Tested according to EN 1507, the duct made of boards TECBOR® B has an airtightness class C. The walls of the duct fulfil the requirements on protuberances and/or cracks according to EN 13403.

A.3.5.4 Microbial proliferation

Tested according to EN 13403, the ductwork using boards TECBOR® B does not show evidence of microbial proliferation.

A.3.5.5 Stiffness

Considering that the ducts are composed of a double layer of TECBOR® B, the complete duct wall has been tested according to EN 13403, instead of a single board. Stiffness of the double layer of boards corresponds to stiffness class R5.

A.3.6 Details

All mounting and fixing details shall be executed according to the next figures.

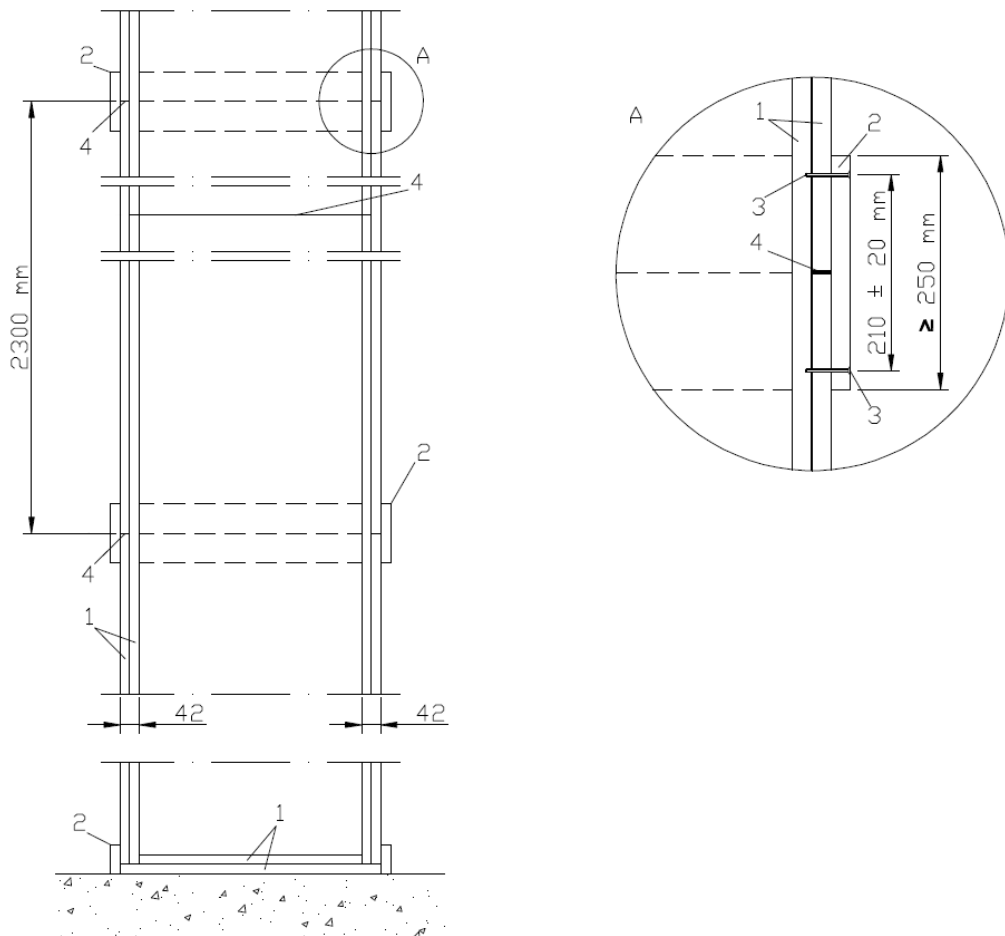


Figure A.3.1: Vertical section.

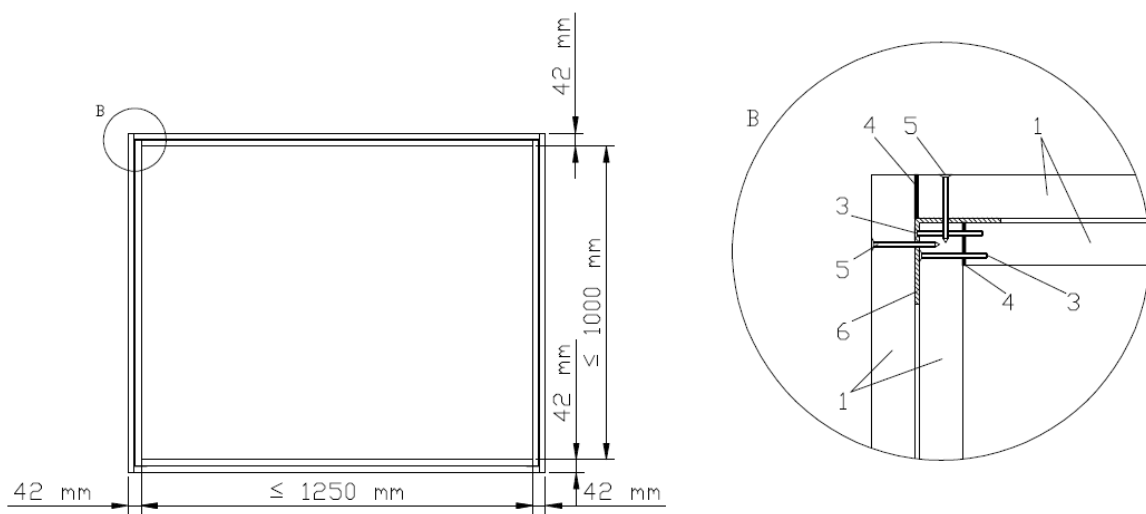


Figure A.3.2: Transversal section.

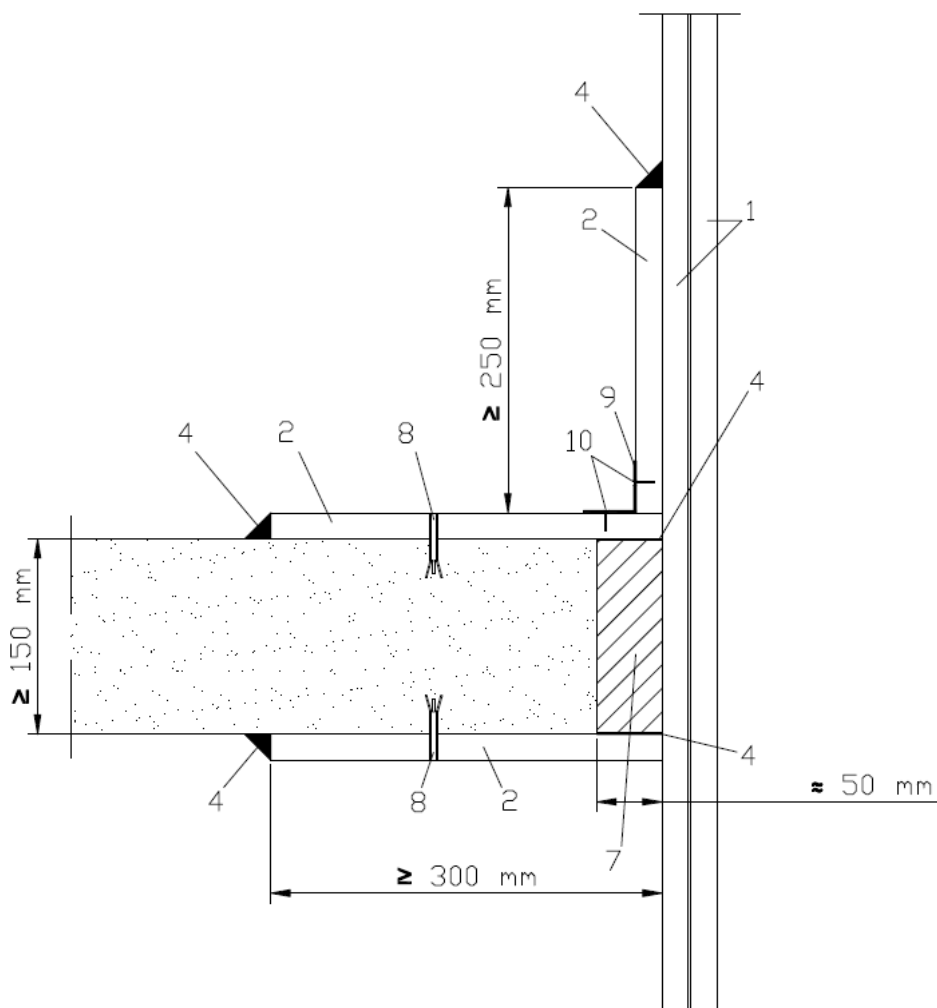


Figure A.3.3: Concrete slab penetration.

Key

- 1 Board TECBOR® B 20 mm
- 2 Board strip TECBOR® B 20 mm
- 3 Phosphated self-tapping screw $\geq \text{Ø } 3,5 \times 45 \text{ mm}$
- 4 Joint paste TECBOR®
- 5 Zinc or phosphated self-drilling screw $\geq \text{Ø } 3,5 \times 45 \text{ mm}$
- 6 L metal frame profile according to EN 14195 (40 x 40 x 2) mm
- 7 Mineral wool, density $\geq 144 \text{ kg/m}^3$
- 8 Plastic anchor $\geq \text{Ø } 10 \times 100 \text{ mm}$
- 9 L metal frame profile according to EN 14195 (40 x 40 x 0,6) mm
- 10 Phosphated self-tapping screw $\geq \text{Ø } 3,5 \times 15 \text{ mm}$

ANNEX 4. References

EN 12467:2004	<i>Fibre-cement flat sheets – Product specification and test methods.</i>
EN 12664:2001	<i>Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Dry and moist products of medium and low thermal resistance.</i>
EN 13162:2012+A1:2015.	<i>Thermal insulation products for buildings - Factory made mineral wool (MW) products – Specification.</i>
EN 13403:2003	<i>Ventilation for buildings - Non-metallic ducts - Ductwork made from insulation ductboards.</i>
EN 13501-1:2007+A1:2009	<i>Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.</i>
EN 13501-2:2007	<i>Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests, excluding ventilation services.</i>
EN 13501-3:2005	<i>Fire classification of construction products and building elements - Part 3: Classification using data from fire resistance tests on products and elements used in building service installations: fire resisting ducts and fire dampers.</i>
EN 1364-1:1999	<i>Fire resistance tests for non-loadbearing elements – Part 1: Walls.</i>
EN 1366-1:1999	<i>Fire resistance tests for service installations – Part 1: Ducts.</i>
EN 13823:2010	<i>Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item.</i>
EN 14195:2014	<i>Metal framing components for gypsum board systems - Definitions, requirements and test methods.</i>
EN 14566:2008+A1:2009	<i>Mechanical fasteners for gypsum plasterboard systems - Definitions, requirements and test methods.</i>
EN 1507:2006	<i>Ventilation for buildings - Sheet metal air ducts with rectangular section - Requirements for strength and leakage.</i>
EN 1607:1996	<i>Thermal insulating products for building applications – Determination of tensile strength perpendicular to faces.</i>
EN 1608:1996	<i>Thermal insulating products for building applications – Determination of tensile strength parallel to faces.</i>
EN 318:2002	<i>Wood based panels - Determination of dimensional changes associated with changes in relative humidity.</i>
EN 771-1:2011+A1:2015	<i>Specification for masonry units - Part 1: Clay masonry units.</i>
EN 826:1996	<i>Thermal insulating products for building applications – Determination of compression behaviour.</i>
EN ISO 11654:1997	<i>Acoustics - Sound absorbers for use in buildings - Rating of sound absorption.</i>
EN ISO 1182:2010	<i>Reaction to fire tests for products - Non-combustibility test.</i>
EN ISO 12572:2001	<i>Hygrothermal performance of building materials and products - Determination of water vapour transmission properties.</i>
EN ISO 1716:2010	<i>Reaction to fire tests for products - Determination of the gross heat of combustion (calorific value).</i>
EN ISO 354:2003	<i>Acoustics - Measurement of sound absorption in a reverberation room.</i>
EN ISO 717-1:1996	<i>Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation.</i>