Austrian Institute of Construction Engineering
Schenkenstrasse 4 | T +43 1 533 65 50
1010 Vienna | Austria | F +43 1 533 64 23
www.oib.or.at | mail@oib.or.at

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European Technical Assessment

ETA-16/0162 of 06.08.2018

General part

Technical Assessment Body issuing the European Technical Assessment	Österreichisches Institut für Bautechnik (OIB) Austrian Institute of Construction Engineering
Trade name of the construction product	PHE – element
Product family to which the construction product belongs	Prefabricated wood slab element made of mechanically jointed square-sawn timber members to be used as a structural element in buildings
Manufacturer	Massiv-Holz-Mauer (MHM) Entwicklungs GmbH Auf der Geigerhalde 41 87459 Pfronten-Weißbach Germany
Manufacturing plants	See Annex 1
This European Technical Assessment contains	17 pages including 6 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	European Assessment Document EAD 130011-00-0304 “Prefabricated wood slab element made of mechanically jointed square-sawn timber members to be used as a structural element in buildings”. European Technical Assessment ETA-16/0162 of 25.04.2016.

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Remarks

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Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may be made with the written consent of Austrian Institute of Construction Engineering. Any partial reproduction has to be identified as such.

Specific parts

1 Technical description of the product

1.1 PHE – element

This European Technical Assessment (ETA)[1] applies to the prefabricated wood slab element made of mechanically jointed square-sawn timber members "PHE – element". The PHE – element is made of upright softwood boards which are jointed together with fluted aluminium nails. The adjacent softwood boards are arranged parallel to each other, see Annex 2, Figure 1.

The principle structure of the PHE – element is shown in Annex 2, Figure 1 and Figure 2. Surfaces can be rough. Outer surfaces of cover layers may be planed.

The PHE – element consists of up to fifty-seven adjacent layers which are arranged parallel to each other.

The PHE – element and the boards for its manufacturing correspond to the specifications given in the Annexes 2 and 4. The material characteristics, dimensions and tolerances of the PHE – element, not indicated in these Annexes, are given in the technical file[2] of the European Technical Assessment.

The application of wood preservatives and flame retardants is not subject of the European Technical Assessment.

1.2 Components

1.2.1 Boards

The specification of the boards is given in Annex 4, Table 3. Boards are visually or machine strength graded. Only technically dried wood shall be used.

Wood species is European spruce or equivalent softwood.

1.2.2 Fluted aluminium nails

The fluted aluminium nails for mechanically jointing the single boards are described in Annex 3. The dimension of the fluted aluminium nails is 2.5 x 50 mm. They are made of aluminium. The fluted aluminium nails may be CE-marked.

[1] In 2016 ETA-16/0162 was firstly issued as European Technical Assessment ETA-16/0162 of 25.04.2016 and amended to ETA-16/0162 of 06.08.2018.

[2] The technical file of the European Technical Assessment is deposited at Österreichisches Institut für Bautechnik and, in so far as is relevant to the tasks of the notified product certification body involved in the assessment and verification of constancy of performance procedure, is handed over to the notified product certification body.

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

2.1 Intended use

The PHE – element is intended to be used as a structural element in buildings to construct walls, floors and roofs loaded perpendicular to the plane. Loading in plane of the PHE – element is not allowed without suitable and statically verified constructional measures (e.g. perforated metal sheets used as wind brace, board formwork used as shear field, cladding of wood-based panels, additional screwing in direction of the fluted aluminium nails).

The PHE – element is subjected to static and quasi static actions only.

The PHE – element is intended to be used in service classes 1 and 2 according to EN 1995-1-1[3] at low and moderate exposure to corrosion (corrosive categories C1, C2 and C3 according to EN 12944-2).

Members which are directly exposed to the weather shall be provided with an effective protection for the PHE – element in service. Within a roof construction, the PHE – element will not contribute to the water tightness, but will receive a suitable waterproofing and roof covering. Waterproofing and roof covering are not subject of the European Technical Assessment.

2.2 General assumptions

The PHE – element is manufactured in accordance with the provisions of the European Technical Assessment using the manufacturing process as identified in the inspection of the manufacturing plant by Österreichisches Institut für Bautechnik and laid down in the technical file.

The manufacturer shall ensure that the requirements in accordance with the Clauses 1, 2 and 3 as well as with the Annexes of the European Technical Assessment are made known to those who are concerned with design and execution of the works.

Layers of rough boards shall be jointed together to the required width of the prefabricated wood slab element. The individual boards may be jointed in longitudinal direction by means of finger joints according to EN 14080, there shall be no butt joints.

Nailing of the single boards must be performed by an automatic nail device type “Pressbett” of company Hans Hundegger AG.

Edge distances between nailed boards are shown in Annex 2, Figure 2.

<u>Design</u>

The European Technical Assessment only applies to the manufacture and use of the PHE – element. Verification of stability of the works including application of loads on the product is not subject to the European Technical Assessment.

The following conditions shall be observed:

- Design of the PHE – element is carried out under the responsibility of an engineer experienced in such products.
- Design of the works shall account for the protection of the PHE – element.
- The PHE – element is installed correctly.
- Serial toppling (rolling-shear) shall be avoided by suitable design provisions.

Design of the prefabricated wood slab element may be according to EN 1995-1-1 and EN 1995-1-2, taking into account the Annex 4 of the European Technical Assessment.

Standards and regulations in force at the place of use shall be considered.

[3] Reference documents are listed in Annex 6.

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Packaging, transport, storage, maintenance, replacement and repair

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

Installation

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

During construction PHE – elements shall be protected against moisture.

Fixing of objects

All fixed objects that are subject to tensile forces shall in any case be anchored in the PHE – element with a sufficient anchoring depth.

In general the edges of the individual boards shall be considered as edges for the fasteners. For tension loads perpendicular to the prefabricated wood slab element sufficient load distribution must be ensured.

The specifications of the installation instructions shall be observed.

2.3 Working life/Durability

The provisions made in the European Technical Assessment (ETA) are based on an assumed intended working life of the PHE – element of 50 years, when installed in the works, provided that the element is subject to appropriate installation, use and maintenance (see Clause 2.2). These provisions are based upon the current state of the art and the available knowledge and experience[4].

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA nor by the Technical Assessment Body, but are regarded only as a means for choosing the appropriate products in relation to the expected economically reasonable working life of the works.

[4] The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

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

3.1 Essential characteristics of the product

Table 1: Essential characteristics of the product and product performance

№	Essential characteristic	Product performance
Basic Works Requirement 1: Mechanical resistance and stability [1)]		
1	Bending [2) 3)]	Annex 4
2	Compression	Annex 4
3	Tension [3)]	Annex 4
4	Shear [2) 3)]	Annex 4
5	Fixing of objects	2.2
6	Creep and duration of the load	Annex 4
7	Dimensional stability	Annex 4
8	In-service environment	Annex 4
9	Bond integrity of finger joints	Annex 4
Basic Works Requirement 2: Safety in case of fire		
10	Reaction to fire	Annex 4
11	Resistance to fire	No performance assessed.
Basic Works Requirement 3: Hygiene, health and the environment		
12	Water vapour permeability – Water vapour transmission	Annex 4
Basic Works Requirement 4: Safety and accessibility in use		
13	Same as BWR 1	
Basic Works Requirement 5: Protection against noise		
14	Airborne sound insulation	Annex 4
15	Impact sound insulation	Annex 4
Basic Works Requirement 6: Energy economy and heat retention		
16	Thermal conductivity	Annex 4
17	Air tightness	Annex 4
18	Thermal inertia	Annex 4

1) These characteristics also relate to BWR 4.

2) Load bearing capacity and stiffness regarding mechanical actions perpendicular to the element.

3) Load bearing capacity and stiffness regarding mechanical actions in plane of the element.

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3.2 Assessment methods

3.2.1 General

The assessment of the essential characteristics in Clause 3.1 of the PHE – element for the intended use, and in relation to the requirements for mechanical resistance and stability, for safety in case of fire, for hygiene, health and the environment, for safety and accessibility in use, for protection against noise and for energy economy and heat retention in use in the sense of the basic requirements for construction works № 1 to 6 of Regulation (EU) № 305/2011 has been made in accordance with the European Assessment Document EAD 130011-00-0304, Prefabricated wood slab element made of mechanically jointed square-sawn timber members to be used as a structural element in buildings.

3.2.2 Identification

The European Technical Assessment for the PHE – element is issued on the basis of agreed data that identify the assessed product. Changes to materials, to composition, to characteristics of the product, or to the production process could result in these deposited data being incorrect. Österreichisches Institut für Bautechnik should be notified before the changes are implemented, as an amendment of the European Technical Assessment is possibly necessary.

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

4.1 System of assessment and verification of constancy of performance

According to Commission Decision 97/176/EC the system of assessment and verification of constancy of performance to be applied to the PHE – element is System 1. System 1 is detailed in Commission Delegated Regulation (EU) № 568/2014 of 18 February 2014, Annex, 1.2., and provides for the following items

(a) The manufacturer shall carry out

(i) factory production control;

(ii) further testing of samples taken at the manufacturing plant by the manufacturer in accordance with a prescribed test plan[5];

(b) The notified product certification body shall decide on the issuing, restriction, suspension or withdrawal of the certificate of constancy of performance of the construction product on the basis of the outcome of the following assessments and verifications carried out by that body:

(i) an assessment of the performance of the construction product carried out on the basis of testing (including sampling), calculation, tabulated values or descriptive documentation of the product;

(ii) initial inspection of the manufacturing plant and of factory production control;

(iii) continuous surveillance, assessment and evaluation of factory production control.

4.2 AVCP for construction products for which a European Technical Assessment has been issued

Notified bodies undertaking tasks under System 1 shall consider the European Technical Assessment issued for the construction product in question as the assessment of the performance of that product. Notified bodies shall therefore not undertake the tasks referred to in point 4.1 (b)(i).

[5] The prescribed test plan has been deposited with Österreichisches Institut für Bautechnik and is handed over only to the notified product certification body involved in the procedure for the assessment and verification of constancy of performance. The prescribed test plan is also referred to as control plan.

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5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

5.1 Tasks for the manufacturer

5.1.1 Factory production control

In the manufacturing plant the manufacturer shall establish and continuously maintain a factory production control. All procedures and specification adopted by the manufacturer shall be documented in a systematic manner. The factory production control shall ensure the constancy of performances of the PHE – element with regard to the essential characteristics.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the control plan. The incoming raw materials shall be subject to controls by the manufacturer before acceptance. Check of incoming materials shall include control of inspection documents presented by the manufacturer of the raw materials.

The frequencies of controls conducted during manufacturing and on the assembled product are defined by taking account of the manufacturing process of the product and are laid down in the control plan.

The results of factory production control are recorded and evaluated. The records include at least the following data:

- Designation of the product, basic materials and components
- Type of control or test
- Date of manufacture of the product and date of testing of the product or basic materials or components
- Results of controls and tests and, if appropriate, comparison with requirements
- Name and signature of person responsible for factory production control

The records shall be kept at least for ten years time after the construction product has been placed on the market and shall be presented to the notified product certification body involved in continuous surveillance. On request they shall be presented to Österreichisches Institut für Bautechnik.

5.1.2 Declaration of performance

The manufacturer is responsible for preparing the declaration of performance. When all the criteria of the assessment and verification of constancy of performance are met, including the certificate of conformity issued by the notified product certification body, the manufacturer shall draw up a declaration of performance.

5.2 Tasks for the notified product certification body

5.2.1 Initial inspection of the manufacturing plant and of factory production control

The notified product certification body shall verify the ability of the manufacturer for a continuous and orderly manufacturing of the PHE – element according to the European Technical Assessment. In particular the following items shall be appropriately considered

- Personnel and equipment
- The suitability of the factory production control established by the manufacturer
- Full implementation of the control plan

5.2.2 Continuous surveillance, assessment and evaluation of factory production control

The notified product certification body shall visit the factory at least twice a year for routine inspection. In particular the following items shall be appropriately considered

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- The manufacturing process including personnel and equipment
- The factory production control
- The implementation of the control plan

The results of continuous surveillance are made available on demand by the notified product certification body to Österreichisches Institut für Bautechnik. When the provisions of the European Technical Assessment and the control plan are no longer fulfilled, the certificate of constancy of performance is withdrawn by the notified product certification body.

Issued in Vienna on 06.08.2018
by Österreichisches Institut für Bautechnik

The original document is signed by:

Rainer Mikulits

Managing Director

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Manufacturing plant in Germany

Rottmüller® Systemholz GmbH
Thalacker 5
83043 Bad Aibling

Manufacturing plant in Austria

GT – Holzbau
Geißelbacher GmbH
Hart 1
9473 Lavamünd

Manufacturing plant in Switzerland

Strüby Holzbau AG
Produktionszentrum Root
Leisibachstrasse 11
6037 Root

Manufacturing plant in Belarus

GREENWOOD SYSTEMS OOO
225306 Region Brest, Kobrin,
Pervomayskaya
Brest Region/Brestkaja Bezirk
d.94 / Republic of Belarus

PHE – element	Annex 1
Manufacturing plants	of European Technical Assessment ETA-16/0162 of 06.08.2018

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Figure 1: Principle structure of the PHE - element

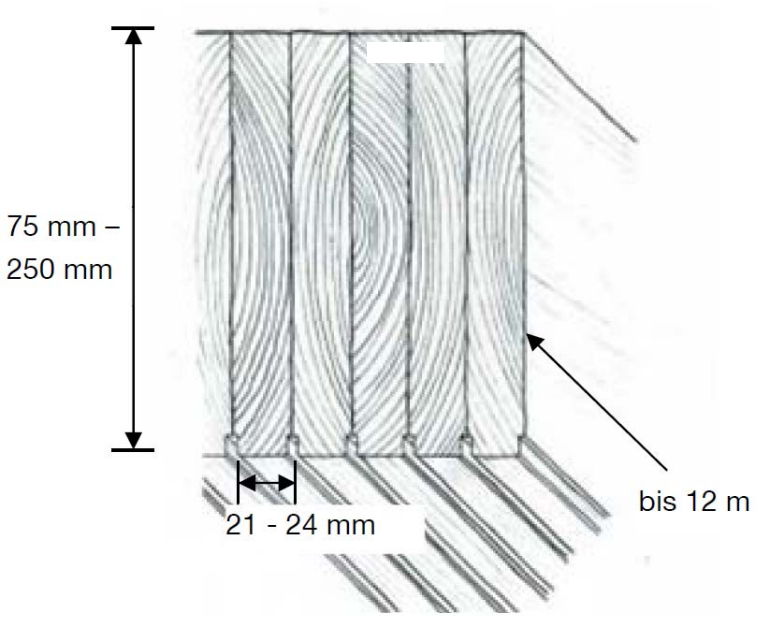
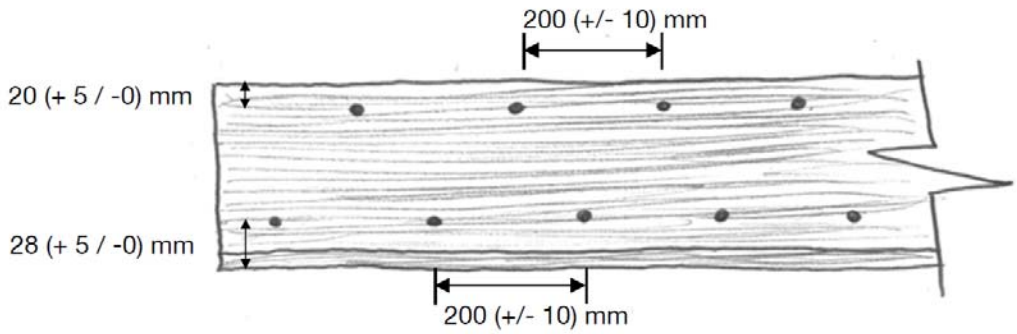


Figure 2: Nailing patterns for PHE – element



PHE – element	Annex 2
Structure of the PHE– element	of European Technical Assessment ETA-16/0162 of 06.08.2018

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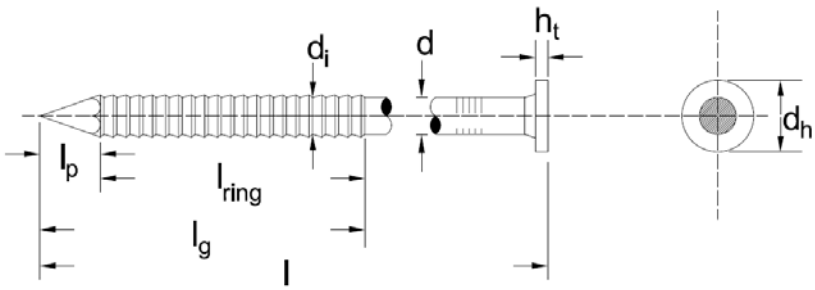
Figure 3: Geometry of fluted aluminium nail



l	length
l_{ring}	threaded length
l_p	length of the tip
d_i	inner thread diameter
d	diameter
d_h	head diameter
h_t	thickness of the head

Table 2: Specification of fluted aluminium nail

Nail characteristics		Unit	Value
Nominal diameter	d	mm	2.5
Nominal length	l	mm	50
Characteristic tensile strength	$F_{tens,k}$	N	1400
Characteristic yield moment	$M_{y,k}$	N	800
Characteristic withdrawal capacity of the shaft	$F_{ax,k,Shaft}$	N	610
Characteristic withdrawal capacity of the nail	$F_{ax,k}$	N	485
Slip modulus	K_{ser}	N/mm	300

PHE – element	Annex 3
Fluted aluminium nail	of European Technical Assessment ETA-16/0162 of 06.08.2018

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Table 3: Dimensions and specifications

Item		Dimension / Specification
PHE – element		
Thickness	mm	75 to 250
Width	m	≤ 1.2
Length	m	≤ 12.0
Number of boards	—	up to 57
Board		
Surface	—	rough
Thickness	mm	23 ± 2
Width	mm	75 to 250
Ratio width to thickness	—	≥ 4 : 1
Flat boards shall be graded according to EN 14081-1 in order to be assigned to a grading class according to EN 1912. Cover layer and inner layer	—	 S 7 or better with additional requirements of S 10 regarding bow
Moisture of wood according to EN 13183-2	%	13^{+2}_{-5}
Finger joints	—	EN 14080

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Table 4: Product characteristics of the PHE – element

BWR	Essential characteristic	Assessment method	Level / Class / Description	
1	**Mechanical resistance and stability**			
	1. Load bearing capacity and stiffness regarding mechanical actions perpendicular to the PHE - element			
	Grading class of boards	EN 1912	S 7 or better with additional requirements of S 10 regarding bow	
	Modulus of elasticity – parallel to the grain of the boards $E_{0,\,mean}$ – perpendicular to the grain of the boards $E_{90,\,mean}$	EAD 130011-00-0304 2.2.1 EN 338	h < 150 mm [1)] 9 200 MPa [3)] 270 MPa	h ≥ 200 mm [1)] 10 000 MPa
	Shear modulus – parallel to the grain of the boards $G_{090,\,mean}$	EN 338	500 MPa	
	Bending strength – parallel to the grain of the boards $f_{m,\,k}$	EAD 130011-00-0304 2.2.1	20 MPa [2)]	
	Tensile strength In general PHE – elements are unsuitable for tension perpendicular to the plane of the slab. Fasteners shall be applied to overcome such design situations.			
	Compressive strength – perpendicular to the grain of the boards $f_{c,\,90,\,k}$	EN 338	2.2 MPa	
	Shear strength – parallel to the grain of the boards $f_{v,\,090,\,k}$	EAD 130011-00-0304 2.2.4	3.2 MPa	

[1)] linear interpolation between 150 ≤ h ≤ 200 may be applied
[2)] k_h according to EN 1995-1-1 may be used for h < 150 mm
[3)] 1 MPa = 1 N/mm²

PHE – element	Annex 4
Characteristic data of PHE – element	of European Technical Assessment ETA-16/0162 of 06.08.2018

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BWR	Essential characteristic	Assessment method	Level / Class / Description
1	**Mechanical resistance and stability**		
	2. Load bearing capacity and stiffness regarding mechanical actions in plane of the PHE - element		
	Loading in plane of the PHE – element is not allowed without suitable and statically verified constructional measures (e.g. perforated metal sheets used as wind brace, board formwork used as shear field, cladding of wood-based panels, additional screwing in direction of the fluted aluminium nails). No performance assessed.		
	3. Other mechanical actions		
	Creep and duration of load	EN 1995-1-1	
	Dimensional stability Moisture content during service shall not change to such an extend that adverse deformation will occur.		
	In-service environment – Service classes	EN 1995-1-1	1 and 2
	Bond integrity of finger joints	EN 14080	Pass
2	**Reaction to fire**		
	Solid wood panels excluding floorings (ρ_{min}=400kg/m³)	Commission Decision 2003/43/EC as amended	Euroclass D-s2, d0
	Floorings of solid wood panels (ρ_{min}=400kg/m³)		Euroclass D_{fl}-s1
3	**Hygiene, health and environment**		
	Vapour permeability, μ, for the timber	EN ISO 10456	50 (dry) to 20 (wet)
	The elements are open for water vapour diffusion. Harmful condensation within the element shall be avoided in intended use conditions. This can be proven case by case by the manufacturer by a calculation according to EN ISO 13788, when needed.		
4	**Safety and accessibility in use**		
	Same as BWR 1.		

PHE – element	Annex 4
Characteristic data of PHE – element	of European Technical Assessment ETA-16/0162 of 06.08.2018

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BWR	Essential characteristic	Assessment method	Level / Class / Description
5	**Protection against noise**		
	Airborne sound insulation	EN ISO 10140-2, EN ISO 717-1	for R_w (C; C_{tr}), see Annex 5
	Impact sound insulation	EN ISO 10140-3, EN ISO 717-2	for $L_{n,w}$ (C_I) see Annex 5
6	**Energy economy and heat retention**		
	Thermal resistance λ	EN ISO 10456	0.13 W/(m·K)
	Air tightness	No performance assessed. Wind tightness is required in particular if dry lining is used. Adequate air tightness has to be provided by the manufacturer.	
	Thermal inertia, specific heat capacity c_p	EN ISO 10456	1 600 J/(kg·K)

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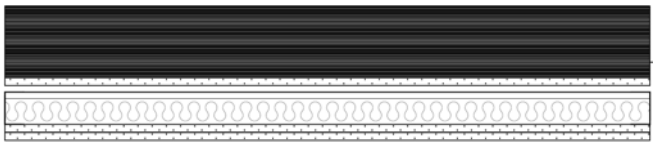
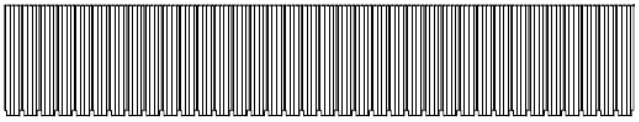
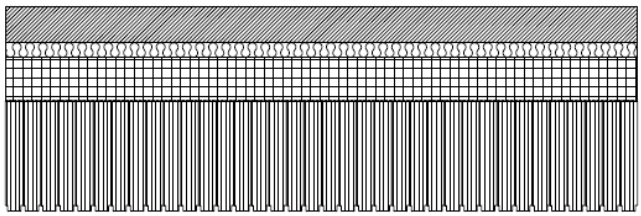
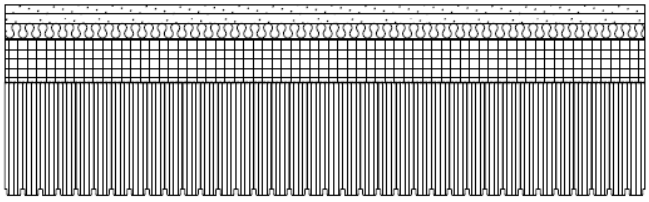
Example for airborne and impact sound insulation

№	Wall element		
W 1	12.5 mm 12.5 mm 50 mm 40 mm 10 mm 12.5 mm 110 mm	Gypsum fibre board, m' = 15.3 kg/m² Gypsum fibre board, m' = 15.3 kg/m² CW-/UW-profiles, e = 625 mm Stone wool insulation board, ρ = 36.7 kg/m³ Distance/air Gypsum fibre board, m' = 15.3 kg/m² PHE – element, m' = 59.8 kg/m²	**$R_w(C; C_{tr})$ = 64 (-3; -9) dB** 

№	Floor element		
F 1	0.2 mm 152 mm	PE-foil (trickle protection) PHE – element, m' = 71.2 kg/m²	**$R_w(C; C_{tr})$ = 32 (0; -1) dB** **$L_{n,w}(C_I)$ = 80 (-3) dB** 
F 2	50 mm 20 mm 60 mm 0.2 mm 152 mm	Cement screed, m' = 120 kg/m² Impact sound insulation board of mineral wool, m' = 2.9 kg/m² Ballast weight, m' = 90.2 kg/m² PE-foil (trickle protection) PHE – element, m' = 71.2 kg/m²	**$R_w(C; C_{tr})$ = 72 (-2; -9) dB** **$L_{n,w}(C_I)$ = 47 (0) dB** 
F 3	25 mm 20 mm 60 mm 0.2 mm 152 mm	Dry screed, m' = 29.9 kg/m² Wood fibre insulation board, m' = 3.2 kg/m² Ballast weight, m' = 90.2 kg/m² PE-foil (trickle protection) PHE – element, m' = 71.2 kg/m²	**$R_w(C; C_{tr})$ = 65 (-3; -10) dB** **$L_{n,w}(C_I)$ = 54 (0) dB** 

PHE – element	Annex 5
Protection against noise	of European Technical Assessment ETA-16/0162 of 06.08.2018

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EAD 130011-00-0304, European Assessment Document for “Prefabricated wood slab element made of mechanically jointed square-sawn timber members to be used as a structural element in buildings”

EN 338 (10.2009), Structural timber – Strength classes

EN 1912 (04.2012) +AC (08.2013), Structural Timber – Strength classes – Assignment of visual grades and species

EN 1995-1-1 (11.2004), +AC (06.2006), +A1 (06.2008), +A2 (05.2014), Eurocode 5 – Design of timber structures - Part 1-1: General – Common rules and rules for buildings

EN 1995-1-2 (11.2004), +AC (06.2006), +AC (03.2009), Eurocode 5 – Design of timber structures – Part 1-2: General – Structural fire design

EN 13183-2 (04.2002) and AC (09.2003), Moisture content of a piece of sawn timber – Part 2: Estimation by electrical resistance method

EN 14080 (06.2013), Timber structures – Glued laminated timber and glued solid timber – Requirements

EN 14081-1 (02.2011), Timber structures – Strength graded structural timber with rectangular cross section – Part 1: General requirements

EN ISO 717-1 (03.2013), Acoustics –Rating of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation

EN ISO 717-2 (03.2013), Acoustics –Rating of sound insulation in buildings and of building elements – Part 2: Impact sound insulation

EN ISO 10140-2 (09.2010), Acoustics – Laboratory measurement of sound insulation of building elements – Part 2: Measurement of airborne sound insulation

EN ISO 10140-3 (09.2010), Acoustics – Laboratory measurement of sound insulation of building elements – Part 3: Measurement of impact sound insulation

EN ISO 10456 (12.2007), +AC (12.2009), Building materials and products - Hygrothermal properties – Tabulated design values and procedures for determining declared and design thermal values

EN ISO 12944-2 (05.1998), Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 2: Classification of environments

EN ISO 13788 (07.2001), Hygrothermal performance of building components and building elements – Internal surface temperature to avoid critical surface humidity and interstitial condensation – Calculation methods