Authorised and notified according to Article 10 of the Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products

Österreichisches Institut für Bautechnik
Schenkenstrasse 4 | 1010 Vienna | Austria
T +43 1 533 65 50 | F +43 1 533 64 23
mail@oib.or.at | www.oib.or.at

Member of EOTA

European technical approval ETA-13/0645

English translation, the original version is in German

Handelsbezeichnung *Trade name*	**STEKO Holz-Bausystem** *STEKO – Modular construction system in wood*
Zulassungsinhaber *Holder of approval*	**STEKO Holz-Bausysteme AG** **Splügenstrasse 9** **9008 St. Gallen** **Schweiz**
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*	**Baukastensystem** *Modular construction system*
Geltungsdauer vom *Validity from* bis zum *to*	**28.06.2013** **27.06.2018**
Herstellwerk *Manufacturing plant*	**STEKO Holz-Bausysteme AG** **Splügenstrasse 9** **9008 St. Gallen** **Schweiz**
Diese Europäische technische Zulassung umfasst *This European technical approval contains*	**23 Seiten einschließlich 5 Anhängen** *23 Pages including 5 Annexes*

I LEGAL BASES AND GENERAL CONDITIONS

1 This European technical approval is issued by Österreichisches Institut für Bautechnik in accordance with:

1. Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1] – Construction Products Directive (CPD) –, amended by the Council Directive 93/68/EEC of 22 July 1993[2], and Regulation (EC) 1882/2003 of the European Parliament and of the Council of 29 September 2003[3];
2. *dem Vorarlberger Bauproduktegesetz, LGBl. Nr. 33/1994, in der Fassung LGBl. Nr. 65/2000, LGBl. Nr. 12/2010 und LGBl. Nr. 6/2011;*

   the Vorarlberg Construction Products Law, LGBl. № 33/1994, amended by LGBl. № 65/2000, LGBl. № 12/2010 and LGBl. № 6/2011;
3. Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex of Commission Decision 94/23/EC[4].

2 Österreichisches Institut für Bautechnik is authorised to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.

3 This European technical approval is not to be transferred to manufacturers or agents of the manufacturers other than those indicated on Page 1, or manufacturing plants other than those indicated on Page 1 of this European technical approval.

4 This European technical approval may be withdrawn by Österreichisches Institut für Bautechnik, in particular pursuant to information by the Commission on the basis of Article 5 (1) of Council Directive 89/106/EEC.

5 Reproduction of this European technical approval including transmission by electronic means shall be in full. However, partial reproduction may be made with the written consent of Österreichisches Institut für Bautechnik. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European technical approval.

6 The European technical approval is issued by the Approval Body in its official language. This version corresponds to the version circulated within EOTA. Translations into other languages have to be designated as such.

1 Official Journal of the European Communities № L 40, 11.02.1989, page 12
2 Official Journal of the European Communities № L 220, 30.08.1993, page 1
3 Official Journal of the European Union № L 284, 31.10.2003, page 1
4 Official Journal of the European Communities № L 17, 20.01.1994, page 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of products and intended uses

1.1 Definition of products

1.1.1 General

STEKO – modular construction system is composed of completely ready-made, standardized and industrially manufactured wood modules made of softwood.

STEKO – modular construction system is based on the three basic elements

**STEKO basic module,
footing and
header**

which can be stacked together without fasteners. End-plates are used to complete the structure. Interlocking of the special shaped bottom- and top side ensures a displacement-rigid connection between the individual elements. In addition hardwood dowels are mounted to guarantee alignment of the modules as well as compound in longitudinal direction.

The principle structure of the STEKO – modular construction system is shown in Annex 1.

The basic module is composed of five, crosswise glued layers of softwood. The inner core is assembled from battens arranged at a regular distance. Perpendicular to the battens a horizontal layer is arranged followed by the vertical surface layer with butt-joints on the narrow sides. Surfaces are planed.

Footing and header are made from solid wood or wood-based panels, respectively.

The STEKO – modular construction system shall be reinforced e.g. by coverings or battens or in other appropriate manner.

Beside thermal insulation products the STEKO basic modules can be provided with ballast weight or concrete. These materials do not contribute to the structural characteristics of the STEKO – modular construction system.

Cladding, covering, rain and snow protection, installations (e.g. electrical pipes), filling materials (e.g. insulation, sound absorber), thermal insulation and connection to the structure as well as application of wood preservatives and flame retardants are not subject to the European technical approval.

1.1.2 Boards and battens of STEKO basic module and end plate

Boards and battens of STEKO basic modules and end plates are made of European spruce of rectangular cross section, i.e. visually or machine strength graded timber. Only technically dried wood is used. There are no finger joints or butt joints in end grain.

For STEKO basic module, the boards/battens are bonded crosswise by means of an adhesive.

The boards of surface layer correspond to strength class C24 according to EN 338.

The boards of horizontal layer and battens correspond to strength class C16 according to EN 338.

1.1.3 Battens of footing and header

Battens used to form footing and headers are made of solid wood or wood based panels according to EN 13986 with the dimensions according to Annex 1. There are no finger joints or butt joints.

1.1.4 Hardwood dowels

The hardwood dowels which are mounted to guarantee alignment of the modules as well as compound in longitudinal direction are made of poplar. They shall be free of significant knots, abnormal direction of grain and significant reaction wood, fissures, rot, mould and insect infestation.

1.1.5 Reinforcement

Reinforcement for STEKO – modular construction system shall be reinforced e.g. by coverings or vertical battens or in other appropriate manner. They shall be connected to the substructure in an appropriate manner.

Transfer of normal forces from vertical loads shall be excluded according to plan.

1.1.6 Thermal insulation products

Thermal insulation products such as cellulose material etc. shall conform to a harmonised European standard or a European technical approval and do not contribute to the load bearing characteristics of the STEKO – modular construction system.

The thermal insulation products are not subject to the European technical approval.

1.1.7 Concrete

Concrete shall conform to a harmonised European standard and does not contribute to the load bearing characteristics of the STEKO – modular construction system.

The concrete is not subject to the European technical approval.

1.1.8 Ballast weight

Ballast weight such as sand etc. shall conform to a harmonised European standard or a European technical approval and do not contribute to the load bearing characteristics of the STEKO – modular construction system.

The ballast weight is not subject to the European technical approval.

1.2 Intended use

The STEKO – modular construction system is intended to be used in load-bearing and non load-bearing interior and exterior walls of buildings with a maximum of 3 storeys and a maximum distance between floors of 3.04 m.

The product shall be subjected to static and quasi static actions only.

The product is intended to be used in service classes 1 and 2 according to EN 1995-1-1. Members which are directly exposed to the weather shall be provided with an effective protection for the product in service.

The provisions made in the European technical approval (ETA) are based on an assumed intended working life for the STEKO – modular construction system of 50 years, provided the requirements for packaging, transport, and storage as well as use, maintenance and repair given in Clauses 4 and 5 are fulfilled. The indications given on the working life for the STEKO – modular construction system cannot be interpreted as a guarantee given by the manufacturer or by the Approval Body, but are to be regarded only as a means for selecting the appropriate product in relation to the expected, economically reasonable working life of the construction works.

2 Characteristics of product and methods of verification

2.1 Characteristics of product

2.1.1 STEKO – modular construction system

2.1.1.1 General

The elements of the STEKO – modular construction system corresponds to the information and drawings given in Annex 1. The performance characteristics data of the product are given in Annex 2, Table 1.

The dimensions of the product are specific to the project.

The material characteristics, dimensions, and tolerances of the product and its components not indicated in Annex 1 are given in the technical documentation[5] of the European technical approval.

2.1.1.2 Safety in case of fire

The classifications of the STEKO – modular construction system regarding reaction to fire and resistance to fire are given in Annex 2, Table 1.

2.1.1.3 Hygiene, health and environment

On dangerous substances STEKO – modular construction system conforms to the CUAP, ETA request № 02.04/11. A manufacturer's declaration to this effect has been submitted.

In addition to the specific clauses relating to dangerous substances contained in the European technical approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

2.1.1.4 Durability and serviceability

Durability and serviceability, including dimensional stability of the STEKO – modular construction system is given under the conditions of Clause 4.

The STEKO – modular construction system can be used in service classes 1 and 2 according to EN 1995-1-1

2.1.2 Components

2.1.2.1 Timber

Solid timber for boards and battens shall be visually or machine strength graded. Only technically dried wood shall be used.

Solid wood shall be classified according to EN 338.

2.1.2.2 Adhesive

The adhesive for bonding the basic modules of the STEKO – modular construction system shall conform to EN 15425.

2.1.2.3 Thermal insulation products

Thermal insulation products are not subject to the European technical approval. Thermal insulation products inserted into the basic modules of the STEKO – modular construction system shall conform to a harmonised European standard or a European technical approval and shall be CE marked.

[5] The technical documentation of the European Technical Approval is deposited at Österreichisches Institut für Bautechnik and, in so far as is relevant to the tasks of the approved body involved in the attestation of conformity procedure, is handed over to the approved body.

2.1.2.4 Concrete

Concrete is not subject to the European technical approval. Concrete inserted into the basic modules of the STEKO – modular construction system shall conform to a harmonised European standard.

2.1.2.5 Ballast weight

The ballast weight is not subject to the European technical approval. Ballast weight inserted into the basic modules of the STEKO – modular construction system shall conform to a harmonised European standard or a European technical approval and shall be CE marked.

2.2 Methods of verification

2.2.1 General

The assessment of fitness of the STEKO – modular construction system for the intended use in relation to the requirements for mechanical resistance and stability, for safety in case of fire, for hygiene, health and the environment, for safety in use, for protection against noise and for energy economy and heat retention in the sense of the Essential Requirements 1 to 6 of Council Directive 89/106/EEC as well as for durability and serviceability has been made in accordance with *CUAP „Modular construction system", version December 2012*, ETA request № 02.04/11.

2.2.2 Identification

The European technical approval for the STEKO – modular construction system is issued on the basis of agreed data, deposited with Österreichisches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to materials, to the composition or to characteristics of the product, or to the production process, which could result in this deposited data being incorrect, should be immediately notified to Österreichisches Institut für Bautechnik before the changes are introduced. Österreichisches Institut für Bautechnik will decide whether or not such changes affect the European technical approval, and, if so, whether further assessment or alterations to the European technical approval are considered necessary.

By the accompanying documentation the STEKO – modular construction system shall be clearly identifiable at delivery.

Thermal insulation products and ballast weights inserted into the basic modules of STEKO – modular construction system shall conform to a harmonised European standard or a European technical approval. Concrete inserted into the basic modules of STEKO – modular construction system shall conform to a harmonised European standard. At least density, mass per unit area and reaction to fire classification of the respective materials shall be specified. These materials are not subject to the European technical approval. Standards and regulations in force at the place of use should be observed.

The specifications of the inserted materials together with their essential performances have to be provided by the manufacturer of the STEKO – modular construction system.

3 Evaluation of conformity and CE marking

3.1 Attestation of conformity system

The system of conformity attestation assigned by the European Commission to this product shall be that laid down in the Council Directive 89/106/EEC of 21 December 1988, Annex III (2) (i), referred to as System 1. This system provides for.

Certification of the conformity of the product by an approved certification body on the basis of

(a) Tasks for the manufacturer

(1) Factory production control;

(2) Further testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan[6];

(b) Tasks for the approved body

(3) Initial type-testing of the product;

(4) Initial inspection of factory and of factory production control;

(5) Continuous surveillance, assessment and approval of factory production control.

3.2 Responsibilities

3.2.1 Tasks for the manufacturer

3.2.1.1 Factory production control

At the manufacturing plant the manufacturer has implemented and continuously maintains a factory production control system. All the elements, requirements and provisions adopted by the manufacturer are documented in a systematic manner in the form of written policies and procedures. The factory production control system ensures that the STEKO – modular construction system is in conformity with the European technical approval.

The factory production control shall address at least:

- Specifications of all materials and components incorporated in the STEKO – modular construction system
- Positions of structural members
- Overall dimensions of the single members of the STEKO – modular construction system
- Installation of thermal insulation products, concrete and ballast weight
- Tolerances of dimensions, squareness and flatness
- Markings for correct position and installation in the works, and special handling
- Packaging and protection during transport
- Ensure that specified moisture content levels are maintained during manufacture, storage at the factory, and during delivery and on site

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the prescribed test plan. The incoming raw materials shall be subject to controls and tests by the manufacturer before acceptance. Check of incoming materials shall include control of inspection documents (comparison with nominal values) presented by the manufacturer of the raw materials by verifying the dimensions and determining the material properties.

The frequencies of controls and tests 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 prescribed test 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

[6] The prescribed test plan has been deposited with Österreichisches Institut für Bautechnik and is handed over only to the approved body involved in the attestation of conformity procedure. The prescribed test plan is also referred to as control plan.

- 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 five years time and shall be presented to the approved body involved in continuous surveillance. On request they shall be presented to Österreichisches Institut für Bautechnik.

3.2.1.2 Declaration of conformity

The manufacturer is responsible for preparing the declaration of conformity. When all the criteria of the conformity attestation including certification are met, the manufacturer shall issue a declaration of conformity.

3.2.2 Tasks for the approved body

3.2.2.1 Initial type-testing of the product

For initial type-testing, the results of the tests performed as part of the assessment for the European technical approval may be used unless there are changes in the manufacturing process or manufacturing plant. In the case of changes, the necessary initial type-testing shall be agreed between Österreichisches Institut für Bautechnik and the approved body involved.

3.2.2.2 Initial inspection of factory and of factory production control

The approved body shall ascertain that, in accordance with the prescribed test plan, the factory, in particular personnel and equipment, and the factory production control, are suitable to ensure a continuously and orderly manufacturing of the STEKO – modular construction system with the specifications given in section II as well as in the Annexes of the European technical approval.

3.2.2.3 Continuous surveillance, assessment and approval of factory production control

The approved body shall visit the factory at least twice a year for routine inspection. It shall be verified that the system of factory production control and the specified manufacturing process are maintained, taking account of the prescribed test plan. On demand the results of continuous surveillance shall be made available by the approved body to Österreichisches Institut für Bautechnik. When the provisions of the European technical approval and the prescribed test plan are no longer fulfilled, the certificate of conformity shall be withdrawn by the approved body.

3.3 CE marking

The CE marking shall be affixed on the accompanying commercial documents. The symbol “CE” shall be followed by the identification number of the certification body and shall be accompanied by the following additional information:

- Name or identification mark and address of the manufacturer
- The last two digits of the year in which the CE marking was affixed
- Number of the certificate of conformity
- Number of the European technical approval
- Identification of the product by trade name
- Nominal length and height of STEKO elements
- Strength class and species of wood

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

The STEKO – modular construction system is manufactured in accordance with the provisions of the European technical approval using the manufacturing process as identified in the inspection of the manufacturing plant by Österreichisches Institut für Bautechnik and laid down in the technical documentation.

4.2 Design

The European technical approval only applies to the manufacture and use of the STEKO – modular construction system. Verification of stability of the works including application of loads on the products is not subject to the European technical approval.

Fitness for the intended use of the products is given under the following conditions:

- Design of the STEKO – modular construction system is carried under the responsibility of an engineer experienced in such products.
- Design of the works shall account for the protection of the STEKO – modular construction system.
- In service, the STEKO – modular construction system is not exposed to detrimental moisture. The definitions of service classes 1 and 2 according to EN 1995-1-1 apply.
- The single elements of STEKO – modular construction system are installed correctly.
- STEKO – modular construction system must be fixed in position horizonzontally, perpendicular to the surface of the wall at the top and the bottom.
- The STEKO – modular construction system shall be reinforced by coverings or vertical battens. A reinforcement of STEKO – modular construction system with vertical battens b/h = 100/80 mm of strength class C24 according to EN 338 at a regular distance of 960 mm leads to adequate bending capacity. Design of the reinforcement shall be done in individual cases.
- The transfer of horizontal loads in plane of the wall shall not lead to tension forces (open joint). Anchoring and transfer of tension forces shall be ensured through adequate constructions (e.g. threaded rods).

Design of the products may be according to EN 1995-1-1 and EN 1995-1-2, taking into account of Clause 2.1 and the Annexes 2 and 4 of the European technical approval. Standards and regulations in force at the place of use shall be considered.

4.3 Installation

4.3.1 General

The manufacturer shall prepare installation instructions in which the product-specific characteristics and the most important measures to be taken into consideration for installation are described. The installation instructions shall be available at every construction site and shall be deposited at Österreichisches Institut für Bautechnik.

Installation of STEKO – modular construction system shall be carried out by appropriately qualified personnel under the supervision of the person responsible for technical matters on site. An assembly plan shall be prepared for each structure, which contains the sequence in which the individual elements of the STEKO – modular construction system shall be installed and their designation. The assembly plan shall be available at the construction site.

Damaged products shall not be installed.

4.3.2 Ducts, services and holes

Ducts and services shall as far as possible be arranged not to affect the performances of the elements of STEKO – modular construction system. If there are ducts or services between the skins or passing through the product, their affect on the stability, the safety in case of fire and the building physics characteristics shall be taken into consideration. The same principles apply to holes cut for another purpose.

Cutting of battens and cutting of slots in the outer layers shall be avoided as much as possible and always requires special attention and assessment.

5 Recommendations for the manufacturer

5.1 General

The manufacturer shall ensure that the requirements in accordance with the Clauses 1, 2 and 4 as well as with the Annexes of the European technical approval are made known to those who are concerned with planning and execution of the works.

5.2 Recommendations on packaging, transport and storage

The STEKO – modular construction system shall be protected during transport and storage against any damage and detrimental moisture effects. Storage shall at all time be clear from the ground. Damaged products shall not be installed. The manufacturer's instruction for packaging, transport and storage shall be observed.

5.3 Recommendations on use, maintenance and repair

The assessment of the fitness for use is based on the assumption that maintenance is not required during the assumed intended working life.

Should repair prove necessary, an assessment shall be made in each case. Severe damage of a STEKO – modular construction system requires immediate actions regarding the mechanical resistance and stability of the works.

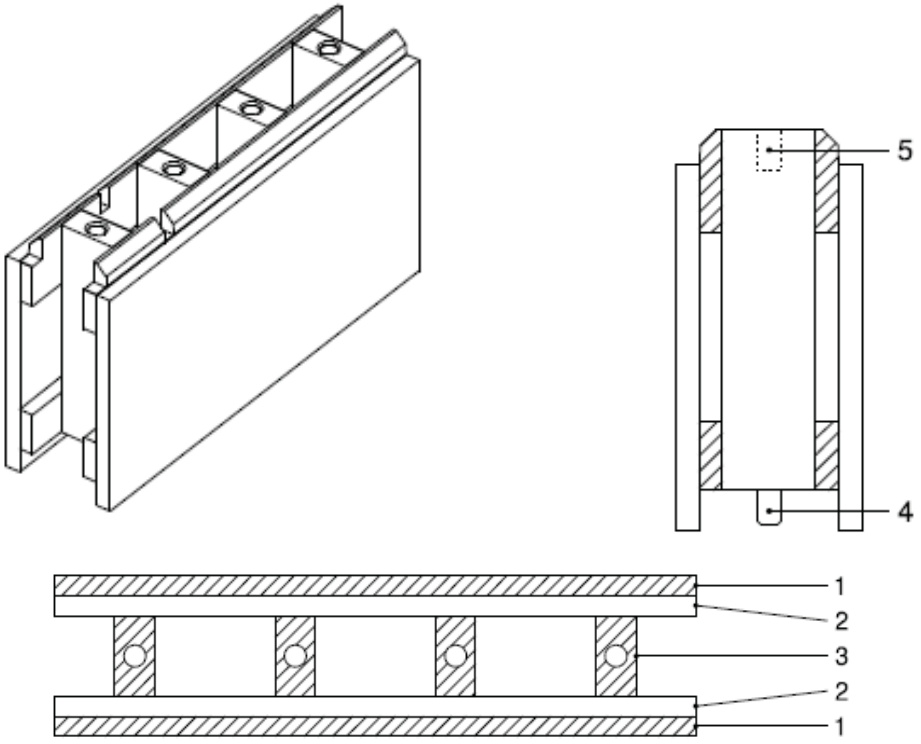
On behalf of Österreichisches Institut für Bautechnik

The original document is signed by:

Rainer Mikulits

Managing Director

Basic module of STEKO – Modular construction system



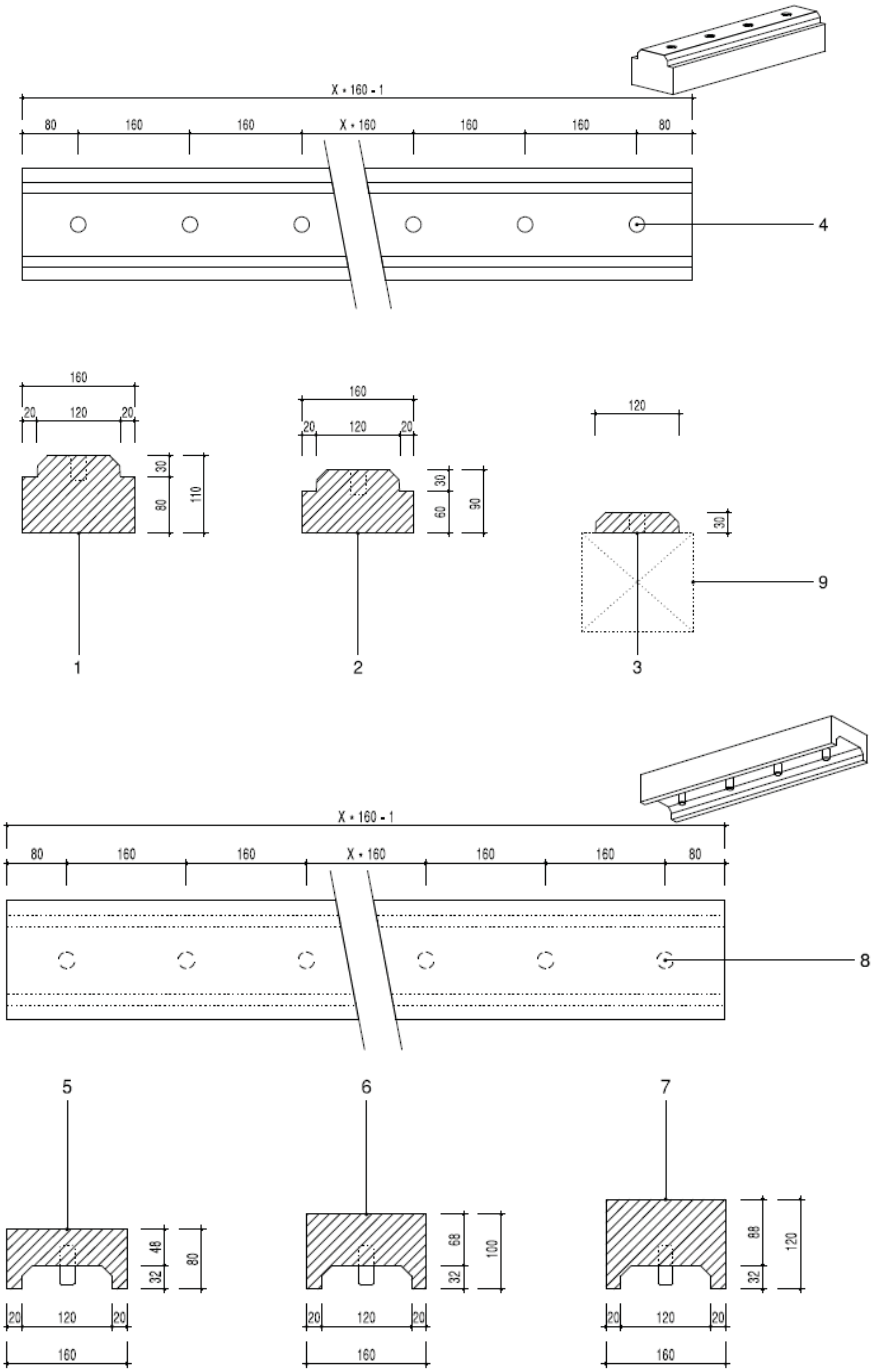
1 surface layer t_s = 20 mm
2 horizontal batten t_h = 20 mm
3 web 40 x 80 mm, spacing 160 mm
4 hardwood dowel d = 20 mm
5 bore hole d = 22 mm

Wall module	Length	Height	Width
-	mm	mm	mm
1-part[1)]	160	320 or 240	160
2-part[1)]	320	320 or 240	160
3-part[1)]	480	320 or 240	160
4-part	640	320 or 240	160

[1)] used for compensation; only for completing of single rows

STEKO – Modular construction system	Annex 1
Product specification	of European technical approval ETA-13/0645

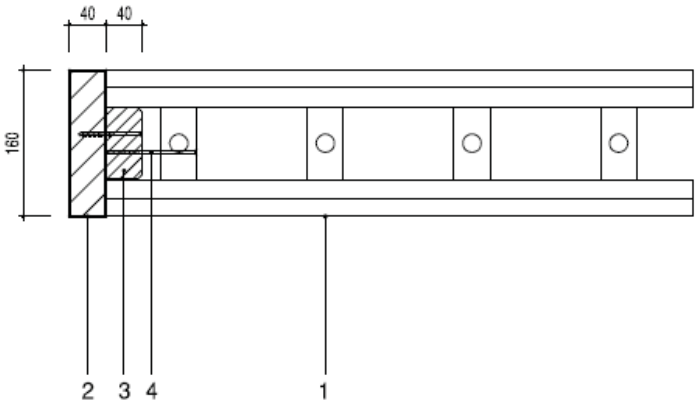
Footing and header of STEKO – Modular construction system



1	footing standard height 80 mm	5	header standard height 80 mm
2	footing reduced height 60 mm	6	header height 100 mm
3	footing batten	7	header height 120 mm
4	bore hole d = 22 mm	8	hardwood dowel d = 20 mm

STEKO – Modular construction system	Annex 1
Product specification	of European technical approval ETA-13/0645

End plate of STEKO – Modular construction system



1 STEKO basic module
2 end plate 40 x 160 mm or 20 x 160 mm
3 connecting batten
4 screw connection

STEKO – Modular construction system	Annex 1
Product specification	of European technical approval ETA-13/0645

Tabelle 1: Product characteristics and evaluation according to CUAP 02.04/11

Essential Requirement	Performance characteristic	Verification procedure	Class / Use category / Numeric value
1	Racking strength and stiffness	EN 1995-1-1 and/or Annex 4	-
	Interaction: moment – normal force		Input parameters for spring characteristics for nonlinear determination of load bearing capacity: STEKO modules: $E_1 = -0.1861*n_1^2 + 45.7* n_1 + 487$ N/mm² $E_2 = 80$ N/mm² $m_1 = 0.05* n_1$ kNm/m $m_2 = 0.07* (120 – n)$ kNm/m Support area Torsional stiffness: factor α = 0.15
	Moisture content	EN 13183-1	12 ± 2 %

[1)] The load bearing capacity is determined by calculation according to EN 1995-1-1 and Annex 4, applying the characteristic values of softwood of the respective strength class according to EN 338.

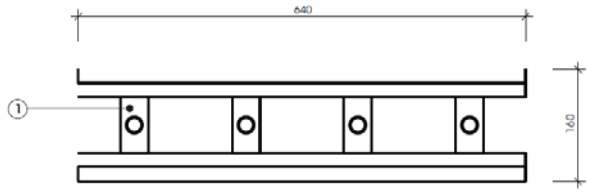
Essential Requirement	Performance characteristic	Verification procedure	Class / Use category / Numeric value
2	**Reaction to fire of STEKO – modular construction system**		
	Walls filled with cellulose fibres or mineral wool (melting point ≥ 1000°C) with minimum filling density of 38 to 65 kg/m³	EN 13501-1	D-s1, d0
	Floorings	The product does not include floorings.	
	Resistance to fire		
	Wall type 1[1)]	EN 13501-2	REI 60
	Wall type 2[2)]		REI 30
	Wall type 3[3)]		REI 30
	Wall type 4[4)]		REI 90
	Wall type 5[5)]		REI 30
	Wall type 6[6)]		REI 90
	[1)] Steko-Modules, butt jointed, filled with concrete, load 60kN/m [2)] Steko-Modules with plywood tongues, stabilization batten 77/77, e = 480 mm, filled with cellulose material (minimum filling density of 38 to 65 kg/m³, load 30kN/m [3)] Steko-Modules planked with 10 mm gypsum plasterboard on the fire side, not filled, load 30kN/m [4)] Steko-Modules, butt jointed, filled with reinforced concrete, load 30kN/m [5)] Steko-Modules, planked with 10 mm gypsum plasterboard on both sides, not filled, load 30kN/m [6)] Steko-Modules planked with a double layer of 10 mm gypsum plasterboard on both sides, not filled, load 30kN/m		
3	**Water vapour permeability and moisture resistance**		
	Softwood	EN ISO 10456	μ = 20 - 50
	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 testing or calculation according to EN ISO 13788, when needed.		
	Release of dangerous substances		
	Dangerous substances	CUAP 02.04/11, Clause 2.4.9	No dangerous substances

STEKO – Modular construction system	Annex 2
Performance characteristics	of European technical approval ETA-13/0645

Essential Requirement	Performance characteristic	Verification procedure	Class / Use category / Numeric value
4	**Impact resistance**		
	Sufficient based on long-term experiments.		
5	**Airborne sound insulation**		
	Exemplary performance of load bearing STEKO – modular construction system		
	Examples of STEKO – modular construction system as given in Annex 3	EN ISO 10140-2, EN ISO 717-1	For weighted sound reduction index, R_w (C; C_{tr}), see Annex 3
	Sound absorption		
	No performance determined. The modular construction system is not used as an internal finish.		
6	**Thermal resistance**		
	Input parameters for calculation of thermal resistance EN ISO 6946, EN ISO 10211		
	Thermal conductivity		
	Spruce wood	EN ISO 10456	λ = 0,13 W/(m · K)
	Other products (e.g. thermal insulation)	According to the specification of the product	
	Air permeability	EN 13829	Satisfactory
	Thermal inertia		
	Characteristic density		
	Spruce wood	EN 338	350 kg/m^3
	Other products (e.g. thermal insulation)	According to the specification of the product	
	Heat capacity		
	Spruce wood	EN ISO 10456	1 600 J/(kg · K)
	Other products (e.g. thermal insulation)	According to the specification of the product	
	Thermal conductivity see above		

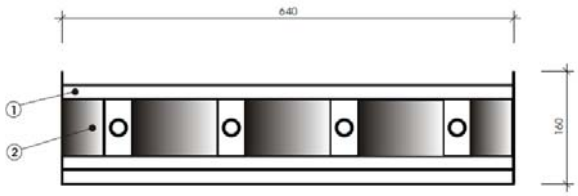
STEKO – Modular construction system	Annex 2
Performance characteristics	of European technical approval ETA-13/0645

Examples with improved airborne performance



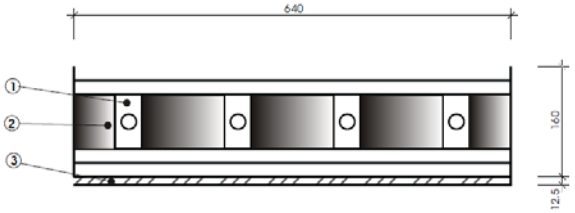
160 mm Spruce m' = 40 kg/m²

$R_w(C; C_{tr}) \geq 31$ (-1; -3) dB



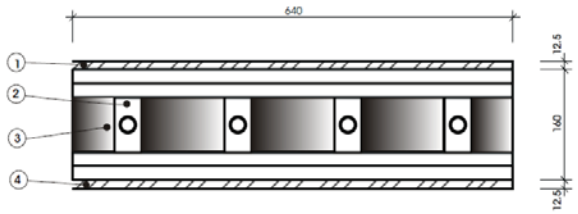
160 mm Spruce m' = 40 kg/m²
80 mm Thermal insulation m' = 6 kg/m²

$R_w(C; C_{tr}) \geq 33$ (-1; -2) dB



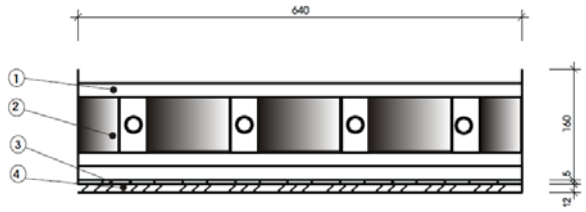
160 mm Spruce m' = 40 kg/m²
80 mm Thermal insulation m' = 6 kg/m²
12.5 mm Gypsum plasterboard m' = 12 kg/m²

$R_w(C; C_{tr}) \geq 38$ (-1; -3) dB



12.5 mm Gypsum plasterboard m' = 12 kg/m²
160 mm Spruce m' = 40 kg/m²
80 mm Thermal insulation m' = 6 kg/m²
12.5 mm Gypsum plasterboard m' = 12 kg/m²

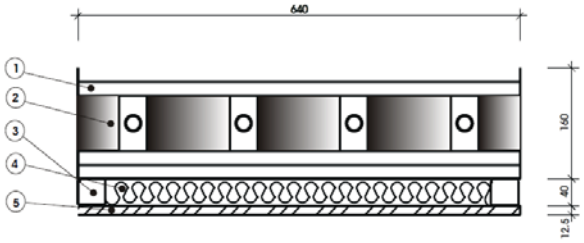
$R_w(C; C_{tr}) \geq 40$ (-1; -3) dB



160 mm Spruce m' = 40 kg/m²
80 mm Thermal insulation m' = 6 kg/m²
5 mm Insulating foil m' = 10 kg/m²
12 mm Particle board m' = 9 kg/m²

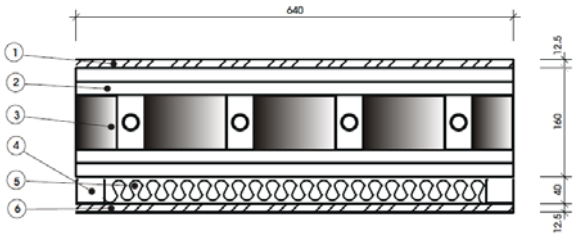
$R_w(C; C_{tr}) \geq 39$ (0; -2) dB

STEKO – Modular construction system	Annex 3
Airborne sound insulation	of European technical approval ETA-13/0645



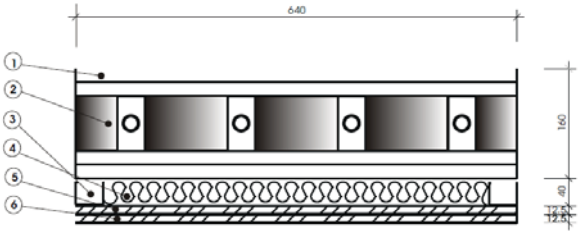
160 mm	Spruce m' = 40 kg/m²
80 mm	Thermal insulation m' = 6 kg/m²
40 mm	Metal supports
40 mm	Thermal insulation m' = 2 kg/m²
12.5 mm	Gypsum plasterboard m' = 12 kg/m²

$R_w(C; C_{tr}) \geq 56$ (-2; -8) dB



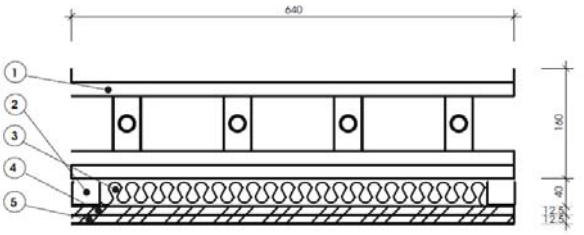
12.5 mm	Gypsum plasterboard m' = 12 kg/m²
160 mm	Spruce m' = 40 kg/m²
80 mm	Thermal insulation m' = 6 kg/m²
40 mm	Metal supports
40 mm	Thermal insulation m' = 2 kg/m²
12.5 mm	Gypsum plasterboard m' = 12 kg/m²

$R_w(C; C_{tr}) \geq 56$ (-1; -7) dB



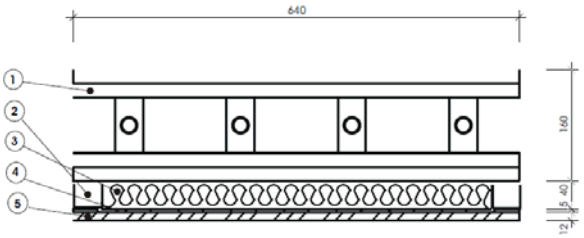
160 mm	Spruce m' = 40 kg/m²
80 mm	Thermal insulation m' = 6 kg/m²
40 mm	Metal supports
40 mm	Thermal insulation m' = 2 kg/m²
12.5 mm	Gypsum plasterboard m' = 12 kg/m²
12.5 mm	Gypsum plasterboard m' = 12 kg/m²

$R_w(C; C_{tr}) \geq 58$ (-2; -7) dB



160 mm	Spruce m' = 40 kg/m²
40 mm	Metal supports
40 mm	Thermal insulation m' = 2 kg/m²
12.5 mm	Gypsum plasterboard m' = 12 kg/m²
12.5 mm	Gypsum plasterboard m' = 12 kg/m²

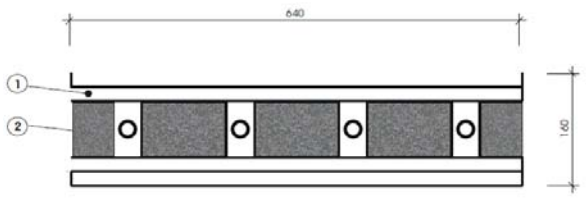
$R_w(C; C_{tr}) \geq 55$ (-2; -8) dB



160 mm	Spruce m' = 40 kg/m²
40 mm	Metal supports
40 mm	Thermal insulation m' = 2 kg/m²
5 mm	Insulating foil m' = 10 kg/m²
12.5 mm	Gypsum plasterboard m' = 12 kg/m²
12.5 mm	Gypsum plasterboard m' = 12 kg/m²

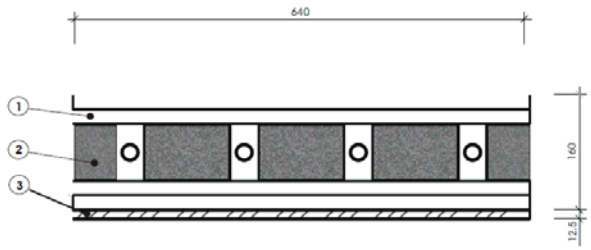
$R_w(C; C_{tr}) \geq 54$ (-2; -8) dB

STEKO – Modular construction system	Annex 3
Airborne sound insulation	of European technical approval ETA-13/0645



160 mm	Spruce m' = 40 kg/m²
80 mm	Sand m' = 140 kg/m²

$R_w(C; C_{tr}) \geq 48$ (-1; -3) dB



160 mm	Spruce m' = 40 kg/m²
80 mm	Sand m' = 140 kg/m²
12.5 mm	Gypsum plasterboard m' = 12 kg/m²

$R_w(C; C_{tr}) \geq 49$ (-1; -4) dB

STEKO – Modular construction system	Annex 3
Airborne sound insulation	of European technical approval ETA-13/0645

Verification of modular construction system under combined moment – normal force loading

Verification of compression stresses in wall and footing

Hereby, only the compressed area beneath the two cover layers shall be taken into account.

Verification of normal force load-bearing capacity

$$N_d \le \min\left\{\begin{array}{c} N_{crit,wall}\left(1-\frac{e}{e_k}\right)+N_{crit,V} \\ \frac{N_{crit,wall}+N_{crit,V}}{\frac{N_{crit,V}\cdot e}{f_{m,V,d}\cdot W_V}+1} \end{array}\right\} \qquad (1)$$

where

$$N_{crit,wall}=\frac{\pi^2\cdot E_W\cdot I_W}{l^2}$$

$$N_{crit,V}=\frac{\pi^2\cdot E_V\cdot I_V}{l^2}$$

E_W … modulus of elasticity of the wall; $E_W = 250 + 350\cdot\sigma_{c,d} \le 1500$ N/mm²

E_V … modulus of elasticity of reinforcement; $E_V=\frac{E_{0,05}}{\gamma_M}$

$E_{0,05}$ … characteristic value of modulus of elasticity of reinforcement

$\sigma_{c,d}$ … design value for compression stresses in cover layers

I_W … second moment of inertia of the wall; $I_W = 200\cdot 10^6$ mm⁴ per meter width of the wall

I_V … second moment of inertia of reinforcement around the horizontal wall-axis in the considered area

e … excentricity of normal force; $e=\frac{l}{200}+\frac{M_d}{N_d}$

l … height of the wall

M_d … design value of bending moment in the half height of the wall obtained for external forces with 1st order theorie

N_d … design value of centric normal force acting on the wall

e_k … core width; $e_k = 0{,}062$ m

$f_{m,V,d}$ … design value of bending strength of reinforcement

W_V … section modulus of reinforcement

Verification of bending load-bearing capacity

$$M_d \le N_d \left[\left(1 + \frac{N_{crit,V} - N_d}{N_{crit,wall}} \right) \cdot e_k - \frac{l}{200} \right] \quad (2)$$

where

N_d … design value of centric normal force acting on the wall (acting beneficially)

For the case that the terms under (1) and (2) fail, the verification of normal force and bending load-bearing capacity can be fulfilled under the following conditions:

$$N_d \le \frac{N_{crit,V}}{\frac{N_{crit,V} \cdot e}{f_{m,V,d} \cdot W_V} + 1} \quad (3)$$

and

$$M_d \le \frac{(N_{crit,V} - N_d) \cdot f_{m,V,d} \cdot W_V}{N_{crit,V}} - N_d \cdot \frac{l}{200} \quad (4)$$

Verification of horizontal force in plane of the wall

Verification of stability against overturning

$$H_d \le \frac{N_d \cdot a_{res}}{h} \quad (5)$$

where

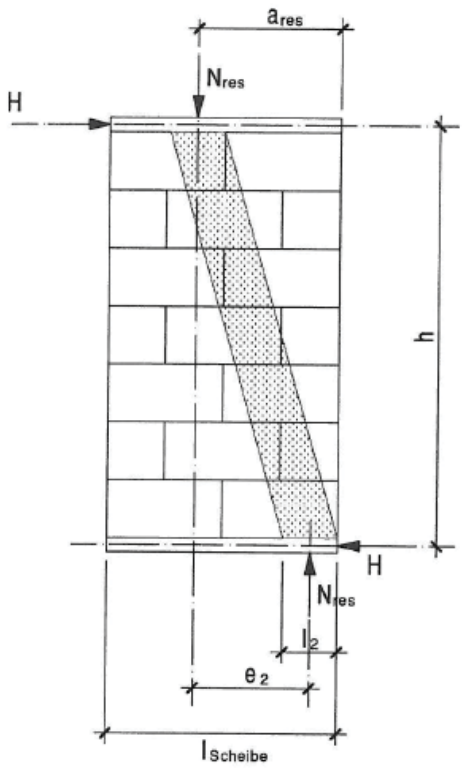
a_{res} … distance of resulting normal force from the end of the wall

H_d … design value of horizontal force

N_d … design value of normal force acting on the wall

h … height of wall element

STEKO – Modular construction system	Annex 4
Design considerations	of European technical approval ETA-13/0645



Verification of lateral pressure in the footing

$$\sigma_{c,90,d} = \frac{N_d}{k_{c,90} \cdot l_2 \cdot 2 \cdot t} \leq f_{c,90,d} \qquad (6)$$

where

l_2 … length of load application on the bottom of the slab; $l_2 = 2\left(a_{res} - \frac{H_d \cdot h}{N_d}\right)$

t … thickness of cover layer of modular construction system

Verification of shear connection in plane of the wall

$$H_d \leq 0{,}1 \cdot N_d + l_{slab} \cdot 4\,\text{kN/m} \qquad (7)$$

where

l_{slab} … length of wall slab

For calculation of deformations, the effective shear modulus G_{eff} may be taken as 100 N/mm² for the cover layers.

STEKO – Modular construction system	Annex 4
Design considerations	of European technical approval ETA-13/0645

Reference documents

CUAP 02.04/11 Common Understanding of Assessment Procedure for a European Technical Approval according to Article 9.2 of the Construction Products Directive “Modular construction system”, Version December 2012

EN 338 (10.2009): Structural timber – Strength classes

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

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

EN 13183-1 (04.2002): Moisture content of a piece of sawn timber – Part 1: Determination by oven dry method

EN 13501-1 (02.2007):Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests

EN 13501-2 (09.2009): Fire classification of construction products and building elements — Part 2: Classification using data from fire resistance tests, excluding ventilation services

EN 13986 (10.2004): Wood-based panels for use in construction – Characteristics, evaluation of conformity and marking

EN 15425 (02.2008), Adhesives — One component polyurethane for load bearing timber structures — Classification and performance requirements

EN ISO 717-1 (10.2004): Wood-based panels – Determination of formaldehyde release – Part 1: Formaldehyde emission by the chamber method

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

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

EN ISO 13788 (12.2012): Hygrothermal performance of building components and building elements – Internal surface temperature to avoid critical surface humidity and interstitial condensation – Calculation methods

STEKO – Modular construction system	Annex 5
Reference documents	of European technical approval ETA-13/0645