

European Technical Approval**ETA-10/0019****Trade Name :**

Unilin SW-EPS SW-XPS SW-PUR
Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML SW-ALT-ML
Unilin OPEN PUR OPEN WOOL

Holder of the approval :

Unilin Systems bvba
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8792 Desselgem
Belgium

Website :

www.unilin-systems.com

Generic type and use of construction product :

Prefabricated wood-based load bearing stressed skin panels

Validity from:

30/04/2010

to:

29/04/2015

Manufacturing plant(s):

WAREGEMSTRAAT 112 8792 Waregem (BE)
29 RUE DE L'USINE 82100 Castelsarrasin (FR)

This European Technical Approval contains:

33 pages including 4 annexes which form an integral part of the document

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European Organisation for Technical Approvals
Organisation Européenne pour l'Agrément Technique
Europäische Organisation für Technische Zulassungen

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I LEGAL BASES AND GENERAL CONDITIONS

1. This European Technical Approval is issued by UBAtc in accordance with:
 - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products¹, modified by Council Directive 93/68/EEC² and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council³;
 - Belgian law of 25 March 1996 concerning the adaptation of legislative and administrative provisions of Member States to the Construction Products Directive (89/106/EEC) for construction products⁴ and Belgian Royal Decree of 18 August 1998 concerning construction products⁵
 - Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex to Commission Decision 94/23/EC⁶;
 - Guideline for European Technical Approval for Prefabricated wood-based load bearing Stresses Skin-Panels, ETA-Guideline Nr. 019.
2. The UBAtc is authorized to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant(s). 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 manufacturers other than those indicated on page 1, or manufacturing plants other than those laid down in the context of this European Technical Approval.
4. This European Technical Approval may be withdrawn by UBAtc, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.
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6. Subject to the application introduced, the European Technical Approval is issued by the approval body in its official languages. These versions correspond fully to the English version circulated in EOTA. Translations into other languages have to be designated as such.

¹ Official Journal of the European Communities N° L 40, 11.2.1989, p. 12

² Official Journal of the European Communities N° L 220, 30.8.1993, p. 1

³ Official Journal of the European Union N° L 284, 31.10.2003, p. 1

⁴ Belgian Law Gazette, 21.05.1996

⁵ Belgian Law Gazette, 11.09.1998

⁶ Official Journal of the European Communities N° L 17, 20.1.1994, p. 34

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II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1. Definition of product and intended use

Roof elements type SW-EPS, SW-XPS, SW-PUR, SW-EPS-ML, SW-PUR-ML, SW-WOOL-ML, SW-ALT-ML, OPEN PUR and OPEN WOOL are prefabricated wood based load bearing stressed skin-panels as defined in the ETAG 019 and are intended to be used as load bearing element in inclined roofs.

These elements are fixed in site on the roof substructure consisting of purlins, ridge purlins, and wall plates or directly on trusses and can be covered with tiles, slates or corrugated plates. This ETA does not cover the jointing, the claddings, the rain and snow protection, internal lining and the fixings to the substructure.

These elements shall be subjected to static and quasi static actions only and are intended to be used in classes 1 and 2 according to EN 1995-1-1

The provisions made in this European Technical Approval (ETA) are based on an assumed intended working life for the stressed skin panels of 50 years. The indications given on the working life for the stressed skin panels cannot be interpreted as a guarantee given by the manufacturer or by the Approval Body but are to be regarded only as a reasonable working life of the construction works.

The SW element is a pure sandwich type without wooden ribs. The core consists of a rigid insulation of expanded polystyrene EPS (SW-EPS), polyurethane PUR (SW-PUR) or extruded polystyrene XPS (SW-XPS). The skins are wood based boards (particle board, OSB, plywood) or gypsum boards.

The SW-ML element is a closed box type with intermediate wooden ribs. The core consists of a rigid insulation such as PUR (SW-PUR-ML), EPS (SW-EPS-ML), XPS (SW-XPS-ML) or of flexible insulation such as mineral wool (SW-WOOL-ML) or wood fibre (SW-ALT-ML).

The OPEN PUR element is an open box type consisting of a wood based board or gypsum board, wooden ribs and filled with rigid insulation (PUR).

The OPEN WOOL element is an open box type consisting of a wood based board or gypsum board, wooden ribs and filled with flexible insulation (mineral wool) and covered with a watertight and vapour open layer.

Skins, ribs and core are bonded by means of an adhesive, which can be the foamed PUR itself.

The wooden ribs can be finger jointed and in the rigid insulation core but-joints can occur. The wood based boards and the gypsumfibre boards are scarf jointed. At the junction between the gypsum boards in the SW panels two battens 21x98x600mm are glued on the board.

The material characteristics of the materials and components are given in annex 1. The roof elements correspond to the information and drawings given in annex 2. The performance characteristic data of the roof elements are given in annex 3.

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2 Characteristics of product and the methods of verification

ER 1 Mechanical resistance and stability

Structural performance

The load bearing capacities of the elements type SW can be designed according to the EOTA Technical Report No 019 "Calculation models for prefabricated wood-based load bearing stressed skin panels for use in roofs".

The load bearing capacities of the elements type SW-ML can be designed as a glued thin-flanged I-beam according to EN 1995-1-1. When particleboard type 3 and gypsum board are used, they are not considered as load bearing boards.

The load bearing capacities of the elements types OPEN PUR and OPEN WOOL are designed as a glued thin-flanged U-beam according to EN 1995-1-1 or as consisting of only wooden ribs if the board is considered as not load bearing. This is the case for particleboard type P3, gypsum plasterboard, gypsum fibreboard a calcium-silicate board

It is assumed that the counter battens give no strength.

The characteristic strength values used in the design are given in annex 3

Dimensional stability

The dimensional stability has been assessed under the conditions of clause 4. In normal conditions harmful deformations due to moisture changes are not expected

ER 2 Safety in case of fire

Reaction to fire

No performance determined

Resistance to fire

No performance determined

ER 3 Hygiene, health and the environment

Vapour permeability and moisture resistance

Vapour permeability, moisture resistance and critical surface humidity of the element can be assessed on basis of calculations according to EN ISO 13788. The water vapour resistance factors given in table 1 may be used.

The element shall be separately assessed if it is to be used in a building intended to be refrigerated.

Water tightness

The water tightness of the external envelope has been assessed to fulfil the common requirements against driving rain when the elements are covered with tiles, slates or corrugated plates. Water tightness of the internal surface has not been assessed.

Release of dangerous substances

According to the declaration of the manufacturer the element does not contain harmful or dangerous substances as defined in the EU database with the exception of formaldehyde.

The wood based materials are classified E1 in accordance with EN 13986.

When a glue containing formaldehyde is used the amount of formaldehyde emitting is negligible.

The product used as wood preservative satisfies the requirements of Directive 98/8/EC on biocides.

ER 4 Safety in use

Slipperiness of floor

Not relevant

Impact resistance

The impact resistance was assessed to be adequate for the intended use on basis of the experience.

ER 5 Protection against noise

No performance determined

ER 6 Energy and heat retention

Thermal resistance

The thermal resistance R was determined in accordance with EN ISO 6946 with the 8 values see table 1.

Air permeability

The elements including the joints provide adequate air tightness in relation to the intended use

Thermal inertia

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The density, the specific heat capacity and the thermal resistance of the relevant materials are given in table 1 according to EN 12524.

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Table 1: Density, specific heat capacity and thermal resistance of the relevant materials according to EN 12524

Material	Technical specification	λ (W/m.K)	μ (-)	C_p (J/kg.K)	ρ (kg/m³)
<i>Solid wood</i>	EN 338 EN 14081-1	0,13	50	1600	500
<i>Particleboard</i>	EN 13986	0,14	50	1700	600
<i>OSB</i>	EN 13986	0,13	50	1700	650
<i>Plywood</i>	EN 13986	0,13	200	1600	500
<i>Gypsum plasterboard</i>	EN 520	0,25	10	1000	900
<i>Gypsum fibreboard</i>	ETA 03/0050	0,25	10	1000	900
<i>Polyurethane PUR</i>	EN 13165	e < 80mm $\lambda = 0,029$ 80 mm \leq e < 120mm $\lambda = 0,028$ e \geq 120mm $\lambda = 0,027$	60	1400	30
<i>Expanded polystyrene EPS</i>	EN 13163	0,038	60	1450	15
<i>Extruded polystyrene XPS</i>	EN 13164	0,038	150	1450	30
<i>Mineral wool MW</i>	EN 13162	0,037	1	1030	16 35 95
<i>Wood fibres</i>	EN 13171	0,038	5	2100	40

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Aspects of durability, serviceability and identification

Durability

The elements can be used in service classes 1 and 2 as defined in Eurocode 5. During the erection of the building, the elements resist temporary exposure to water without decay, provided that they are allowed to dry afterwards.

Durability may be reduced by attack from insects.

When necessary and required by the local authorities at the building site, elements may be treated against biological attack according to the rules valid on the place. Any adverse effects of the treatment on other properties shall be taken into account. This ETA does not cover these kinds of treatments.

Serviceability

Serviceability of the elements is understood as their ability to resist loads without unacceptable deformation or vibrations. This characteristic is treated under ER 1.

Identification

The elements are delivered in packages suitable to protect them during transportation and storage. Each delivery package is labelled with an ID number of the element and the delivery address or order number. The product label also bears the CE-marking.

3 Evaluation of conformity and CE marking

3.1 Attestation of conformity system

The system of attestation of conformity, specified by the European Commission in decision 2000/447/EC- Official Journal L 180, 19.07.2000 is system 1, according to Council Directive 89/106/EEC Annex III.2.(i), and provides for:

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

- a Tasks for the manufacturer
 - Factory production control.
 - Further testing for samples taken at the factory by the manufacturer in accordance with a prescribed test plan.
- b Tasks for the approved body
 - Initial type testing.
 - Initial inspection of the factory and of factory production control.
 - Continuous surveillance, assessment and approval of production control.

3.2 Responsibilities

3.2.1 Tasks for the manufacturer

3.2.1.1 Factory production control (FPC)

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 elements are in conformity with the European Technical Approval.

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The factory production control shall address at least:

- Type and quality of all materials and components incorporated in the closed box wood-based load bearing stressed skin panels.
- Positions of structural members.
- Overall dimensions of the roof elements
- Installation of thermal insulation material.
- Tolerances of geometry, square ness and flatness.
- Markings for correct position and installation in the works and special handling.
- Packaging and transport protection.
- 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.
- 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 and shall be presented to the approved surveillance.

3.2.1.2 Testing of samples taken at the factory

Testing of samples by the manufacturer according to a prescribed test plan is part of the factory production control.

3.2.1.3 Declaration of conformity

When all the criteria of the Conformity Attestation are satisfied, the manufacturer shall make a Declaration of conformity, stating that the product is in conformity with the provisions of this European Technical Approval

3.2.2 Tasks of approved bodies

3.2.2.1 Initial type testing of the product

Approval tests have been conducted by the approval body or under its responsibility in accordance with section 5 of ETAG 019. The results have been assessed in accordance with section 6 of the ETA Guideline.

3.2.2.2 Initial inspection of factory and of factory production control

An approved body shall conduct initial inspection of each manufacturing line in order to ensure that the premises and technical equipment are acceptable, personnel is qualified and a factory production control system which is in accordance with the provisions in the ETA Guideline and this ETA is followed.

3.2.2.3 Continuous surveillance, assessment and approval of factory production control

The approved body shall visit the factories at least twice a year for surveillance of the manufacturer.

It shall be verified that the factory production control is performed according to this ETA, including tests of samples according to the prescribed test plan.

3.3.2.4 Certification

When all criteria for conformity attestation are fulfilled the approved body shall issue certification of conformity of the product.

In cases where the provisions of the European Technical Approval and the control plans are no longer fulfilled, the certificate of conformity shall be withdrawn.

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3.3 CE marking

The letters "CE" shall correspond to the Council Directive 93/68/EC.

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:

- Identification number of the notified certification body.
- Name or identification mark and address of 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 (trade name, intended use).
- Project number and element number for identification of the characteristics.
- Information, regarding the performances of any thermal insulation contained (reaction to fire class, thermal resistance, R of the element).

A simplified CE marking shall be affixed on the product itself.

The simplified CE marking affixed on the product shall be accompanied by the following information:

- Identification number of the notified certification body.
- Name and address or identifying mark of the producer.
- Number of the European Technical Approval.

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

4.1 Manufacturing

The elements are 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 approval body.

4.2 Design

The European Technical Approval only applies to the manufacture and use of the elements. 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 elements is carried under the responsibility of an engineer experienced in such product.
- Design of the work shall account for the protection of the elements.
- In service, elements are not exposed to detrimental moisture. The definitions of service classes 1 and 2 according to EN 1995-1-1 apply.
- The elements are installed correctly.

Design of the products can be according to EN 1995-1-1 and EOTA technical report 019, taking into account of ER 1 of the European Technical Approval. Standards and regulations in force at the place of use shall be considered.

4.3 Installation

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.

Installation according an installation plan shall be carried out by appropriately qualified personnel under the supervision of the person responsibility for technical matters on site.

Damaged products or products with swollen boards shall not be installed.

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The roof elements are installed perpendicularly on the direction of the support and in case of a purlin roof from the ridge to the wallboard.

The panels are connected alongside with a spring and sealed at the upper groove with PUR.

Corbels in the length of the panel until 300 mm as well as corbels across until 150 mm do not require any additional provisions. Contact the manufacturer about larger corbels.

Holes with a maximum side of $\frac{1}{4}$ of the board width may be installed in the elements provided that any ribs are not damaged, contact the manufacturer for larger holes.

After assembling the roof elements, the roof has to be fitted, as soon as possible, with a roof covering. In any case, measures have to be taken to protect the element against rainfall by sealing the upper grooves as soon as possible. The sealing of the side seams is carried out in accordance with the panel type, by means of a spring and by filling the upper core with PUR. The cross seams have to be avoided for as far as possible. If there are cross seams anyway, then these have to be supported and installed as close as possible to the ridge. They need to be sealed with PUR foam and aluminium tape.

After assembling the roof elements, the space situated under the roof elements has to be ventilated sufficiently during the rest of the construction process. Especially if construction activities take place during the building process (e.g. installing flooring, etc.) that can cause an indoor climate that is more humid than is usual for the occupied state.

The space between the upper side of the roof element and the cladding is well ventilated.

5 Recommendations

For elements longer than 3 m, the manipulation of the element has to be transported in such a way that damage is avoided especially elements have to be sufficiently supported to avoid breakage. The assembly on the work has to take place in dry conditions

The elements shall be protected against harmful wetting during transport and storage and stored only temporarily on the building site.

Elements shall be stored on a plane underlay using a sufficient number of supports according to manufacturer's instructions so that the elements do not have contact with water on the ground.

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6 Supporting documents

See annex 4

The drawings are given to clarify the ETA and are not intended to reflect any particular detail

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ANNEX1

Characteristics of materials and components

Material / Component	Reference to European or relevant product specification
Boards	
Particleboard	EN 13986, E1, Type P5 EN 312-5 or Type P3 EN 312-3 Thickness: 3 mm up to 22 mm
OSB	EN 13986 E1, Type 3 EN 300 Thickness: 12 mm up to 18 mm
Plywood	EN 13986 E1, Class 2 EN 636-2 Min. 5 layers, characteristic strength values see annex 3 Thickness: 9 mm up to 18 mm Conifer plywood ; combi plywood (conifer, birch)
Gypsum plasterboard	EN 520, Type H2 Thickness: 9,5 mm up to 15 mm
Gypsum fibreboard	ETA 03/0050 Thickness 12 mm up to 15 mm
Calcium silicate board	ETA 06/0219 Thickness 15mm

Material / Component	Reference to European or relevant product specification
Core	
Polyurethane PUR	EN 13165 <ul style="list-style-type: none"> - Type SW: CS (10\Y)120, DS(TH) 8, T2, thickness 50 up to 160 mm - Type SW-ML: CS (10\Y)120, DS(TH) 8, T2, thickness 50 up to 160 mm - Type Open PUR: CS(10\Y)100, DS(TH) 8, thickness 50 up to 200 mm
Expanded polystyrene EPS	EN 13163; T1 L1 W1 S1 P4 DS(70-)3, CS(10)60 BS 100 DS(N)5 Thickness 60 up to 160 mm
Extruded polystyrene XPS	EN 13164; DS(TH), CS(10\Y) 300 Thickness 80 up to 100 mm
Mineral wool	EN 13162; Thickness 60 up to 215 mm <ul style="list-style-type: none"> - Type SW-WOOL-ML: with aluminium vapour barrier; density 35kg/m³ - Type OPEN WOOL: two possibilities <ul style="list-style-type: none"> - Density 16 kg/m³ T2 - Density 95 kg/m³ T5 DS(TH) CS(10\Y)20 TR7,5 PL5(300) WL(P) MU1
Wood fibres	EN 13171-T3-TR2,5-MU5-AF5; TYPE SW-ALT-ML Thickness 80 up to 200 mm

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Material / Component	Reference to European or relevant product specification
Wood	
Ribs	Softwood EN 338; C16, C18, C24 Max moisture content 18% Dimensions: 21 x 58 to 160 mm; 24 x 98 to 170 mm; 30 x 98 to 215 mm
Counter battens	Softwood Dimensions : min 13 x 20 mm, max 40 x 40 mm Quality: only sound intergrown knots are admitted with a maximal diameter equal to the width of the counter batten; wane: maximum 30% of the height of the side on which it appears

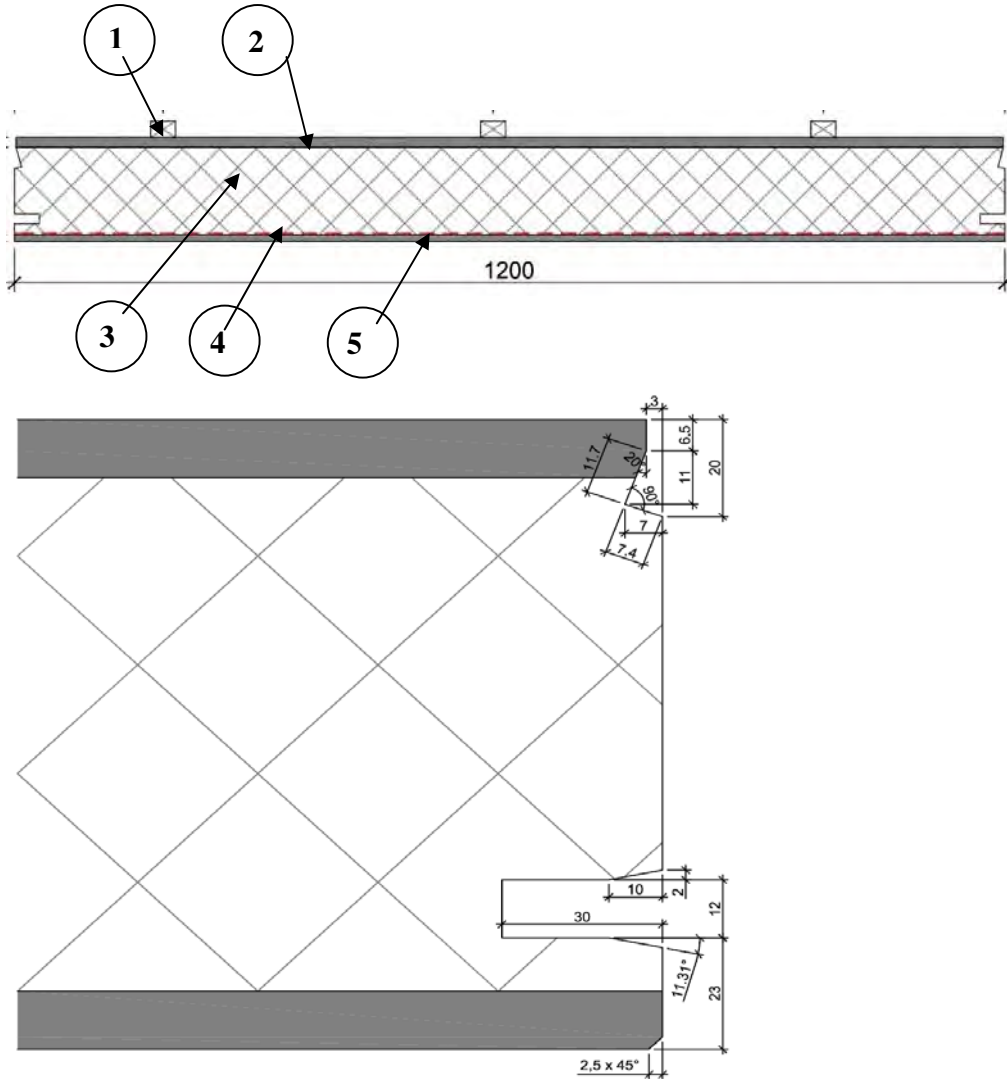
Material / Component	Reference to European or relevant product specification
Vapour barrier	
HDPE 20	Paper + MPET (metal + polyethylene) 159 g/m ² / thickness 181 µm / s _d = 67 m
Standard	Paper 90 g/m ² /thickness 112 µm / tensile strength 70 N/15 mm
Water tight vapour open barrier	
Delta Vent	EN 13859-1 s _d < 0,03m
Glue	
One component polyurethane glue	Type I, EN 15425 gluing: board-ribs, counter batten-board, board-core, finger joints in ribs
MUF glue	Type I, EN 301 Gluing: Scarf joints in the boards

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ANNEX 2

DESCRIPTION OF THE ROOF ELEMENTS

1 Type SW-EPS SW-PUR 1200mm



- ① - Counter battens :- dimensions on demand min 20 × 30 mm max 40 × 40 mm
 - distance between counter batten: min: 120 mm; max 400 mm
- ② - Upper skin (see table 1)
- ③- Core (see table 1)
- ④- Vapour barrier (only if the core is made out of PUR and the inner board is different from a 3 mm thick particleboard): standard paper; on demand HPDE 20
- ⑤- Inner skin (see table 1)

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Table 1

Composition of elements type SW, width 1200 mm

	Upper skin (mm)									
	Particle board type P5					Plywood		OSB		
Inner skin (mm)		3	8	12	18	12	18	12	15	18
Particle board type P5	3	1-3						1		
	8	1	1-3	1	1	1	1	1		1
	12	1	1-3	1	1	1	1	1		1
	18		1-3	1	1	1	1	1		1
Plywood	12	1	1	1	1	1	1	1	1	1
	18			1	1	1	1	1	1	1
OSB	12	1	1-3	1	1	1	1	1		1
	18		1	1	1	1	1	1	1	1
Gypsum fibreboard	12		1-3	1	1	1	1	1	1	1
Gypsum Plasterboard	9,5	1	1-3	1	1	1	1	1		1
	13	1	1-3	1	1	1	1	1	1	1
	18	1	1-3	1	1	1	1	1	1	1

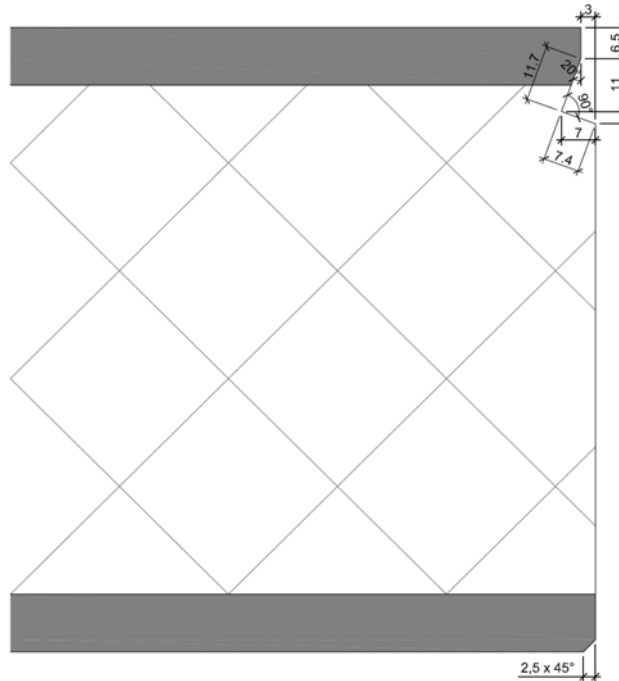
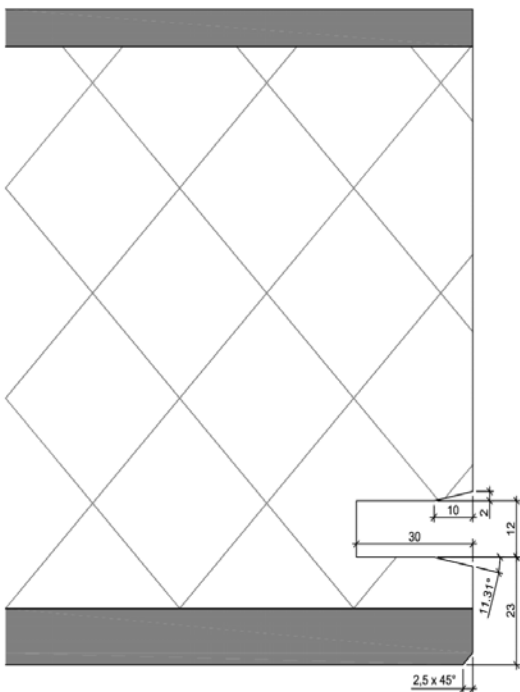
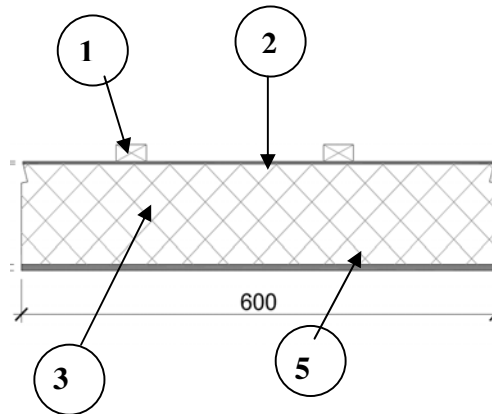
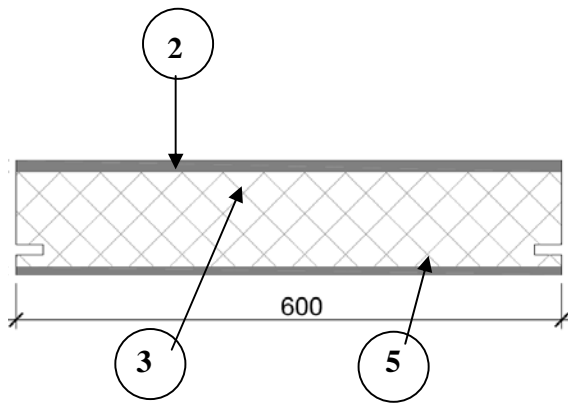
Maximum thickness of the boards \leq thickness of the core divided by 8

1 core is PUR with a thickness from 50 mm up to 160 mm

3 core is EPS with a thickness from 60 mm up to 160 mm

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2 Type SW-EPS SW-PUR SW-XPS 600mm



① - counter battens: dimensions on demand: min. 20 × 30 mm max 40 × 40 mm

distance between counter battens min. 120 mm; max 300 mm

② - Upper skin (see table 2)

③ - Core (see table 2)

④ - Vapour barrier (only if the core is made out of PUR and the inner board is different from a 3 mm thick particleboard): standard paper, on demand HPDE 20.

⑤ - Inner skin (see table 2).

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Table 2

Composition of elements type SW, width 600 mm.

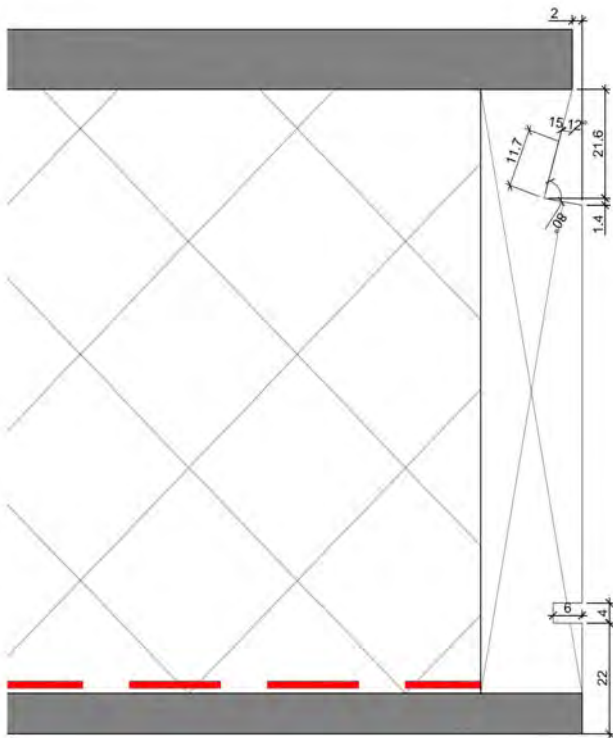
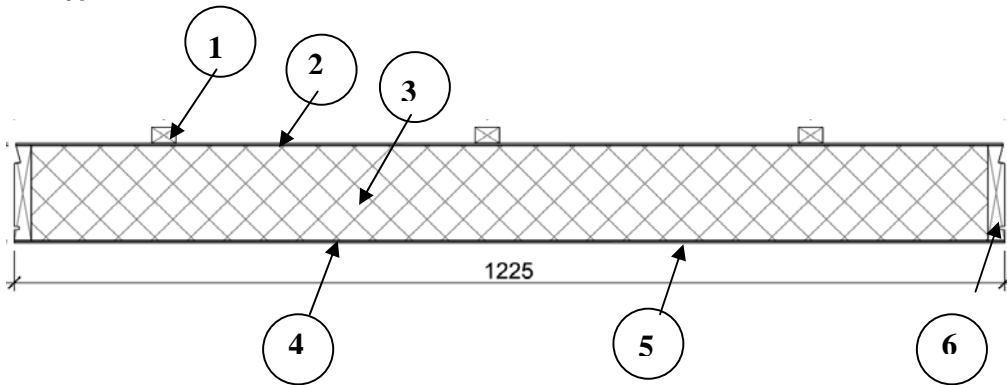
Inner skin (mm)		Upper skin (mm)									
		Particle board type P5					Plywood		OSB		
		3	8	10	12	18	12	18	12	15	18
Particle board type P5	3	1-3							1		
	8	1	1-3		1	1	1	1	1		1
	12	1	1-3	4	1	1	1	1	1		1
	18		1-3	4	1	1	1	1	1		1
Plywood	12	1	1	4	1	1	1	1	1	1	1
	18				1	1	1	1	1	1	1
OSB	12	1	1-3	4	1	1	1	1	1		1
	18		1		1	1	1	1	1		1
Gypsum fibreboard	12		1-3	4	1	1	1	1	1		1
Gypsum Plasterboard	9,5	1	1-3	4	1	1	1	1	1		1
	13	1	1-3	4	1	1	1	1	1		1
	18	1	1-3	4	1	1	1	1	1		1

Maximum thickness of the board ≤ thickness of the core divided by 8

- ① core is PUR thickness from 50 mm up to 160 mm
- ③ core is EPS thickness from 60 mm up to 160 mm
- ④ core is XPS thickness from 80 mm up to 100 mm

**ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
SW-ALT-ML, Unilin OPEN PUR OPEN WOOL**

3 Type SW-PUR-ML SW-EPS-ML 1225mm



- ① - Counter battens: dimensions min 20 × 30 mm max 40 × 40 mm distance min. 120 mm: max. 400 mm
- ② - Upper skin (see table 3)
- ③ - Core (see table 3)
- ④ - Standard paper on demand HPDE 20 vapour barrier (only if core is PUR and inner board different from a 3 mm particleboard)
- ⑤ - Inner skin (see table 3)
- ⑥ - Wooden ribs (dimensions 21 × 50 -160 mm or 24 × 50 -160 mm)

Table 3

**ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
SW-ALT-ML, Unilin OPEN PUR OPEN WOOL**

Composition of elements type SW-ML, width 1225 mm, two ribs

Inner skin		Upper skin (mm)								
		Particle board				Plywood		OSB		
		3	8	12	18	12	18	12	15	18
Particle board type 5 or 3	3	1-3						1-3		
	8	1	1-3	1	1	1		1		1
	12	1	1	1	1	1		1		1
	18		1	1	1	1		1		1
	12	1-3	1	1	1	1	1	1	1	1
	18									
OSB	12	1-3	1	1	1	1		1		1
	15									
	18		1	1	1	1		1		1
Gypsum fibreboard	12		1	1	1	1		1		1

Thickness of the board \leq thickness of the core divided by X with:

X = 9 thickness core 160mm

X = 4 thickness core 50mm

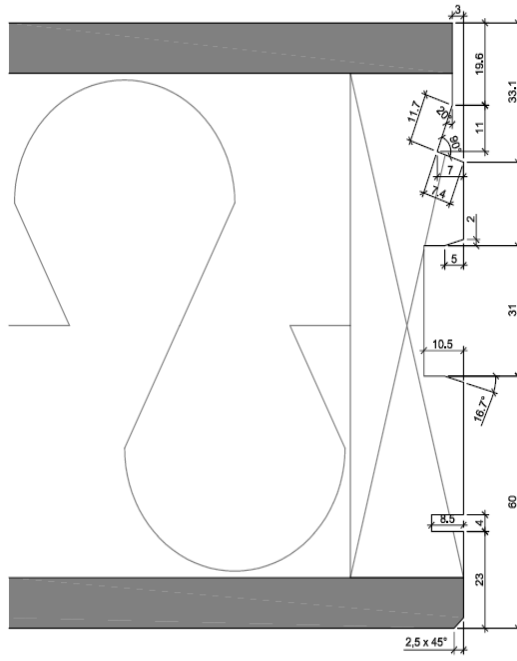
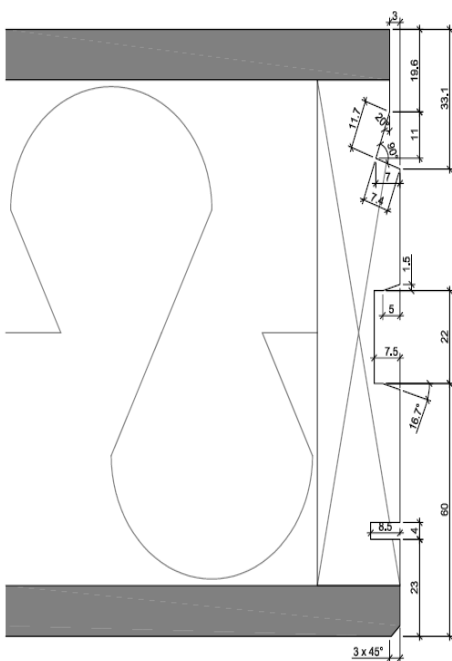
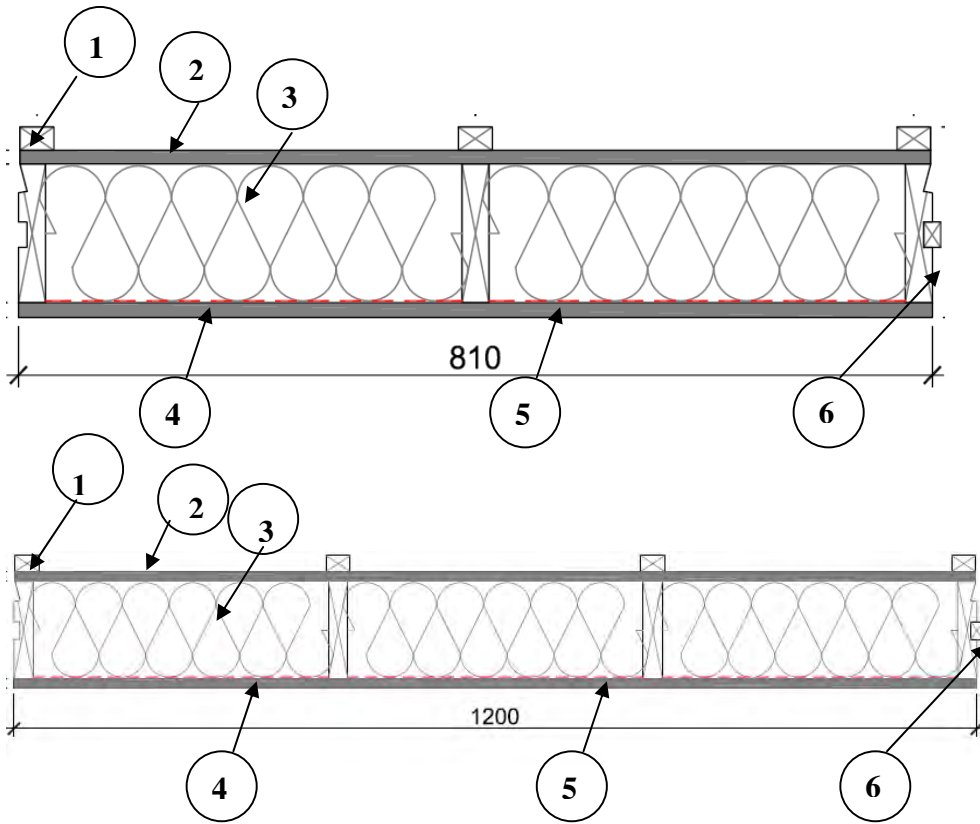
X linear interpolation between thickness core 160 mm and 50 mm

① core is PUR thickness from 50 mm up to 160 mm

③ core is EPS thickness from 60 mm up to 160 mm

ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
 SW-ALT-ML, Unilin OPEN PUR OPEN WOOL

4 Type SW-WOOL-ML & SW-ALT-ML 810 mm & 1200mm



**ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
SW-ALT-ML, Unilin OPEN PUR OPEN WOOL**

- ① - Counter battens (dimensions on demand min 20 × 30 mm max 40 × 40 mm)
- ② - Upper board (see table 4)
- ③ - Core mineral wool with aluminium film
- ④ - Vapour barrier aluminium film incorporated in the mineral wool
- ⑤ - Inner board (see table 4)
- ⑥ - Wooden ribs
Dimensions of the rib 21 × 85 -160 mm or 24 × 98 -170 mm 30 × 98 – 215 mm

Table 4

Composition of elements type SW-WOOL-ML, SW-ALT-ML

Inner board (mm)		Upper board (mm)						
		Particle board		Plywood		OSB		
		12	18	12	18	12	15	18
Particle board	8	2	2	2	2	2	2	2
	12	2	2	2	2	2	2	2
	18	2	2	2	2	2	2	2
Plywood	9	2	2	2	2	2	2	2
	12	2	2	2	2	2	2	2
	18	2	2	2	2	2	2	2
OSB	12	2	2	2	2	2	2	2
	15	2	2	2	2	2	2	2
	18	2	2	2	2	2	2	2
Gypsum Fibreboard	12	2	2	2	2	2	2	2

Maximum thickness of the boards = thickness of the core divided by x with:

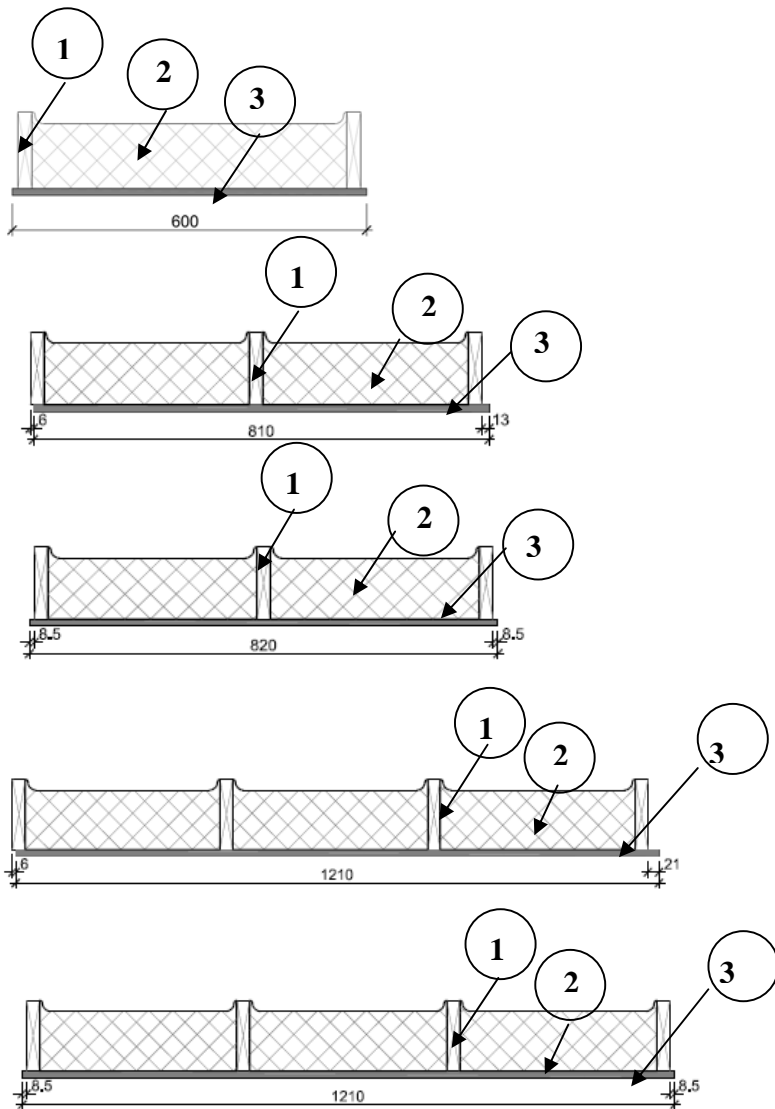
X = 12; thickness core 210 mm

X = 7; thickness core 85 mm

X linear interpolation between thickness core 210 mm and 85 mm

ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
 SW-ALT-ML, Unilin OPEN PUR OPEN WOOL

5 Type OPEN PUR



- ① - Wooden ribs dimension see table 5
- ② - Core PUR
- ③ - Inner skin (see table 5)

Composition

Number of ribs : width 600 two ribs;
 width 810, 820 mm three ribs
 width 1210mm four ribs

**ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
SW-ALT-ML, Unilin OPEN PUR OPEN WOOL**

Table 5

Composition of elements type OPEN-PUR

Rafter height (mm)		Thickness (mm)	85			100		120		130		145			170		195	215
Rafter thickness (mm)			21	24	30	24	30	24	30	21	24	30	24	30	30	30		
Inner board	Particle board	12	1-2-3	1-2-3-7	1-2-3			1-2-3-7	1-2-3	1-2-3	1-2-3-7	1-2-3	1-2-3-7	1-2-3	1-2-3	1-2-3		
	Particle board	16	1-2-3	1-3	1-3			1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3	1-3		
	Particle board	22			2-3		2-3		2-3		2-3		2-3		2-3	2-3		
	Plywood	12	3	3	3			3	3	3	3	3	3	3	3	3		
	OSB	12	3	3-7	3			3-7	3	3	3-7	3	3-7	3	3	3		
	Gypsum fibreboard	12,5	2	2	2			2	2	2	2	2	2	2	2	2		
	Gypsum plasterboard	13		2-7				2-7			2-7		2-7		2	2		
	Calcium silicate board	15		3	3			3	3	3	3	3	3	3	3	3		
Particleboard + T&G	18		7		7		7			7		7						

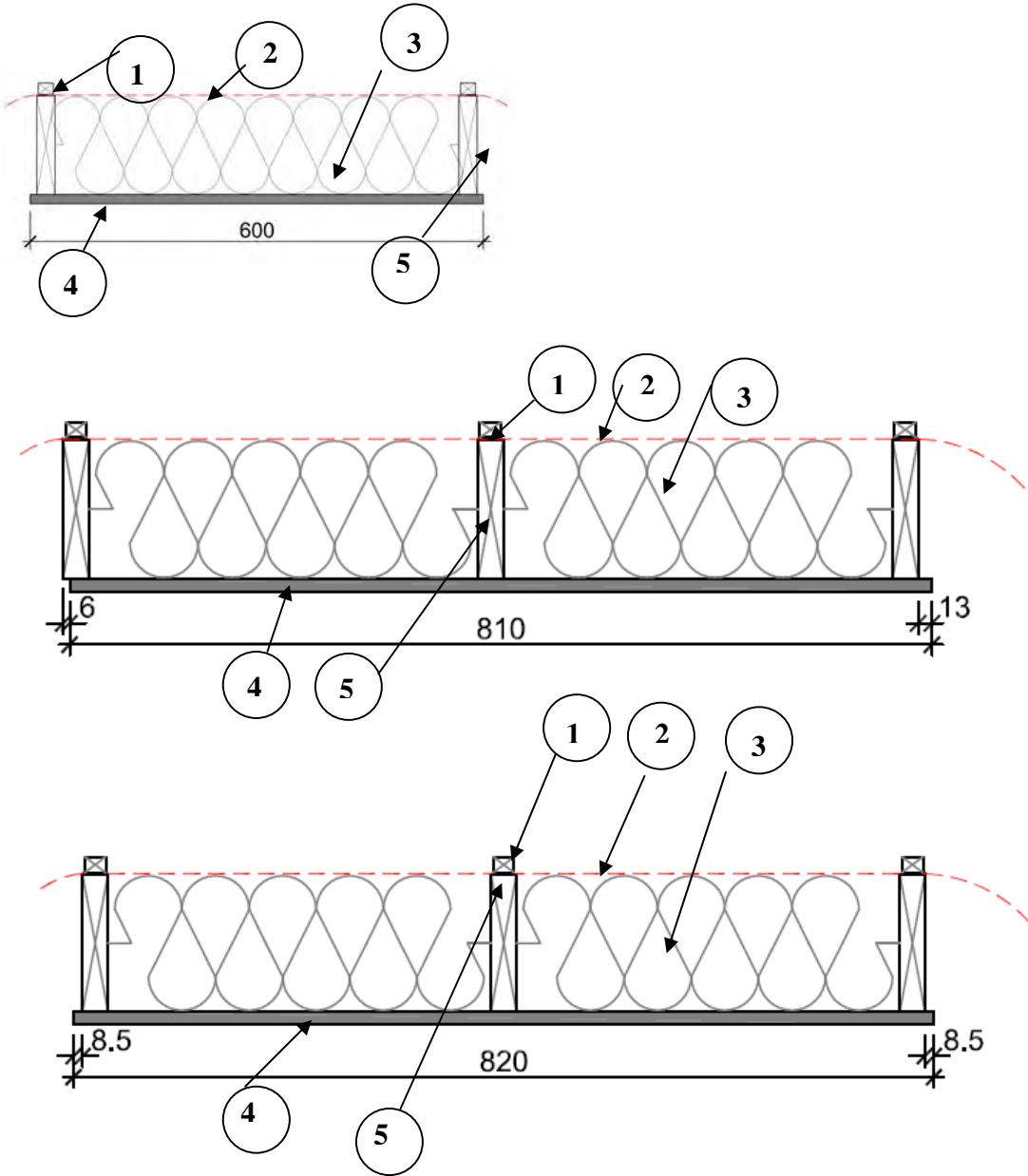
	Insulation	Width (mm)	Thickness insulation (mm)
1	PUR	810	; 65 – 195
2	PUR	820	; 65 – 195
3	PUR	1210	; 65 - 195
7	PUR	600	. 50-150

*

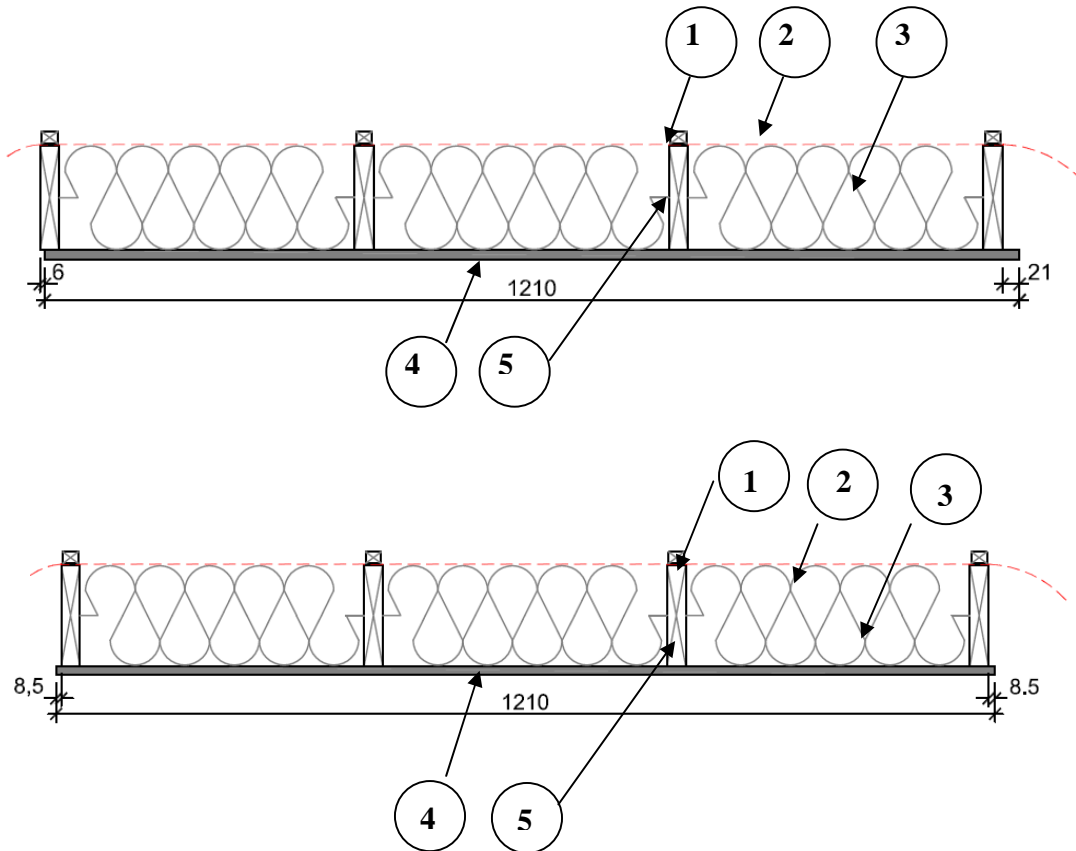
ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
SW-ALT-ML, Unilin OPEN PUR OPEN WOOL

6 Type OPEN WOOL

With watertight vapour open barrier



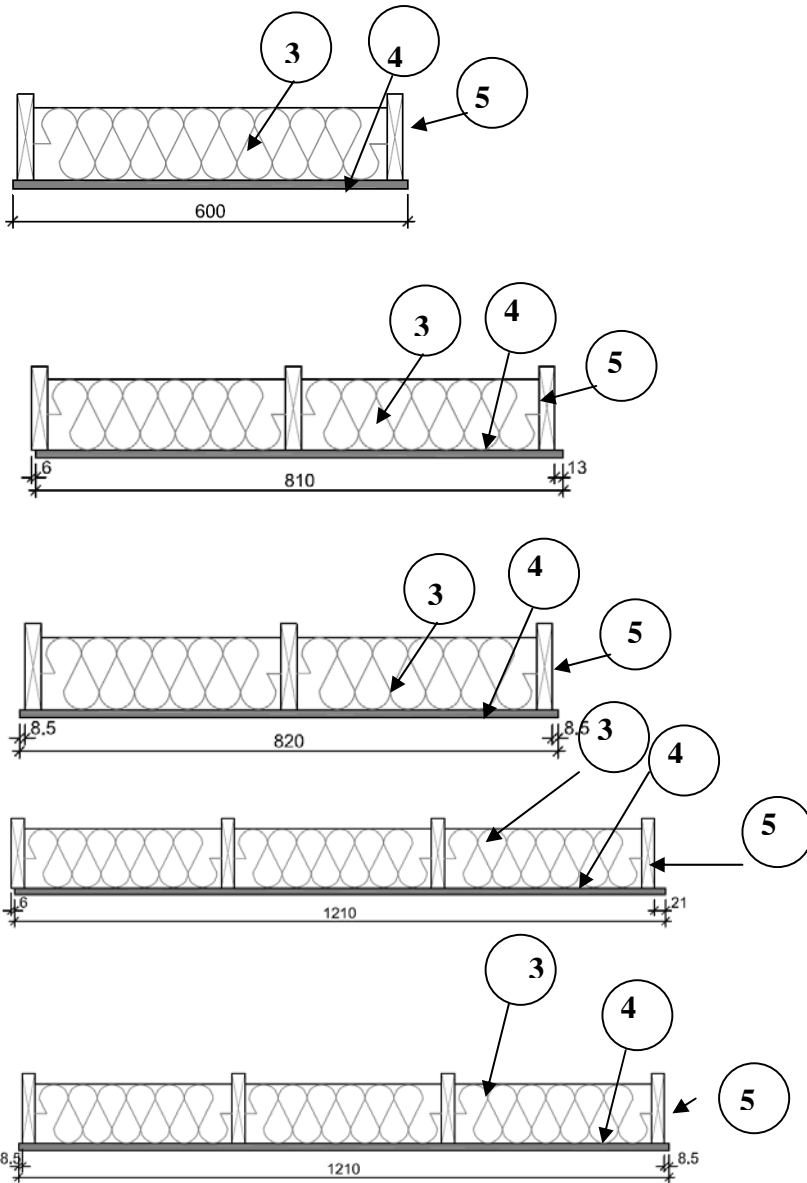
ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
 SW-ALT-ML, Unilin OPEN PUR OPEN WOOL



- ① - Counter battens: min 13 mm × 20 mm, max 20 mm × 40 mm
- ② - Waternight vapour open barrier
- ③ - Core mineral wool: density is 16 kg/m³
- ④ - Inner skin: see table 6
- ⑤ - Wooden ribs: dimensions see table 6

**ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
SW-ALT-ML, Unilin OPEN PUR OPEN WOOL**

Without watertight vapour open barrier



- ① - Counter battens: min 13 mm × 20 mm, max 20 mm × 40 mm
- ② - Watertight vapour open barrier
- ③ - Core mineral wool: density 95 kg/m³.
- ④ - Inner skin: see table 6
- ⑤ - Wooden ribs: dimensions see table 6

table 6
Composition of elements type OPEN-WOOL

**ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
SW-ALT-ML, Unilin OPEN PUR OPEN WOOL**

	Rafter height (mm)	Thickness (mm)	85		100		120		145			170		195	215
	Rafter thickness (mm)		21	24	30	24	30	21	24	30	24	30	30	30	
Innerboard	Particle board	12		4-5-6-7	4-5-6	4-5-6-7	4-5-6	4-5-6	4-5-6-7	4-5-6	4-5-6-7	4-5-6	4-5-6	4-5-6	
	Particle board	16		4-6	4-6		4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	
	Plywood	12		6	6	6	6	6	6	6	6	6	6	6	
	OSB	12		6-7	6	6-7	6	6	6-7	6	6-7	6	6	6	
	Gypsum fiber board	12,5		5	5	5	5	5	5	5	5	5	5	5	
			Insulation		Width (mm)				Insulation thickness (mm)						
		4	Mineral wool		810				100 - 215						
		5	Mineral wool		820				100 - 215						
		6	Mineral wool		1210				100 - 215						
		7	Mineral wool		600				100 - 215						

7 Length and tolerances

Maximum length 8 m

Tolerances on

- nominal length ± 15 mm
- width ± 3 mm;
- height: ± 5 mm
- insulation thickness for the open PUR element: thickness PUR ≤ 100 mm ± 5 mm; thickness > 100 mm ± 5 %

**ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
SW-ALT-ML, Unilin OPEN PUR OPEN WOOL**

ANNEX 3

CHARACTERISTIC STRENGTH VALUE

The characteristics strength values used in the design for the boards are:

	Wooden ribs	OSB Particle boards	Gypsum fibreboard	Gypsum plasterboard	Plywood
Strength values	EN 338	EN 12369 *	ETA 03/0050	EN 250	EN 13986
Stiffness values				Table 1	Table 1
k_{mod} k_{def} γ_m	EN 1995-1-1	EN 1995-1-1	ETA 03/0050	ETA 03/0050	EN 1995-1-1

*Remark: In order to take the strength reduction due to the scarf joint in the boards into account the strength values for bending, tension and compression have to be divided by 2

table 1 : Characteristic strength values for plywood, gypsum plasterboard and fibreboard

Characteristic Strength values (N/ mm ²)	Plywood conifer 12mm/18mm long grained	Plywood conifer 12mm cross grained	Plywood combi 9mm cross grained	Gypsum fibreboard 12 mm	Gypsum plasterboard 9,5/15 mm
$E_{t,c,mean}$	6000	5000	6000	3800	2800
$f_{m,k}^*$	10	5,7	10	2,8	1,2
$f_{t,k}^*$	5	3,5	6,4	1,2	1,2
$f_{c,k}^*$	7	6,3	8,2	4,2	3,8
$F_{v,k}$	3,5	3,5	7	1,7	0,9
$F_{r,k}$	0,6	0,6	1,7	1,7	0,9

* In order to take the strength reduction of the scarf joint into account the values were multiplied by 0,5 for the plywood and by 0,7 for the gypsum, plasterboard and fibreboard.

The characteristics strength values used in the design for the core are:

EPS, XPS: see Strength class EPS60 EOTA Technical Report No 019

EPS $G_{mean}= 1,8$ N/mm² $E_{mean} = 4$ N/mm² $f_{v,k} = 0,05$ N/mm²

XPS $G_{mean}= 1,8$ N/mm² $E_{mean} = 4$ N/mm² $f_{v,k} = 0,05$ N/mm²

PUR $G_{mean}= 2,5$ N/mm² $E_{mean} = 4$ N/mm² $f_{v,k} = 0,05$ N/mm²

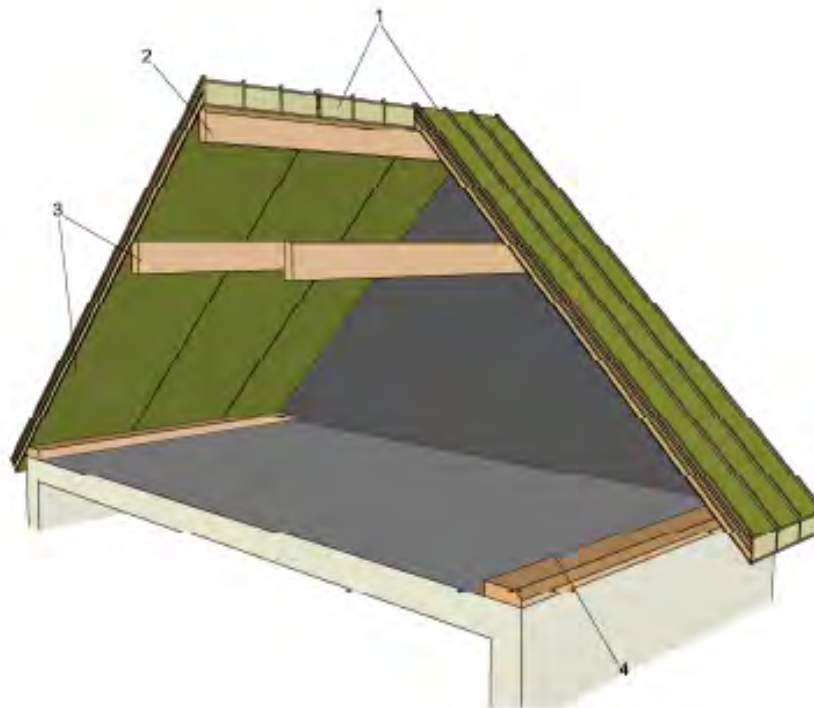
The k_{mod} , k_{def} and γ_m see EOTA Technical Report No 019 $k_{def}=7$

ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
SW-ALT-ML, Unilin OPEN PUR OPEN WOOL

ANNEX 4

Construction principle roof elements

1. Roof element
2. Ridge Purlin
3. Purlin
4. Wall plate

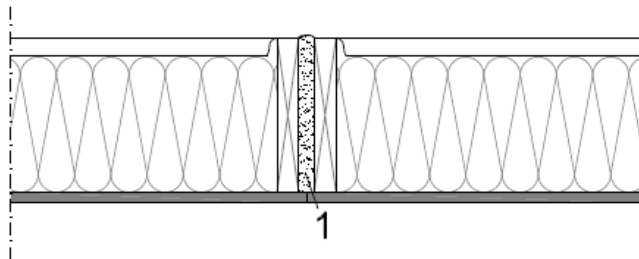


**ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
SW-ALT-ML, Unilin OPEN PUR OPEN WOOL**

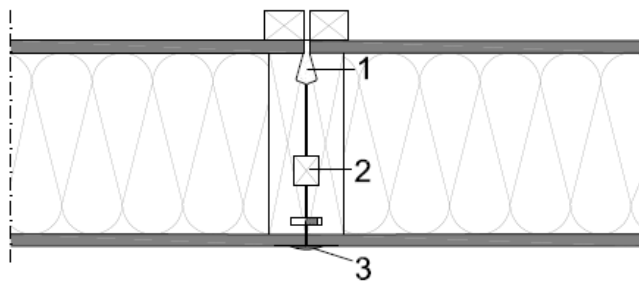
Joints between elements

1. PUR foam
2. Timber fillet
3. Finishing: PVC profile

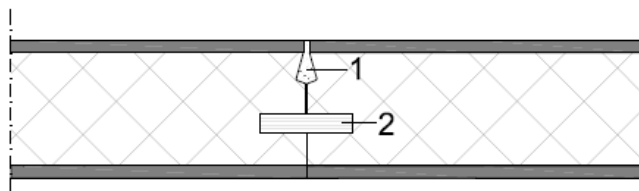
OPEN PUR
OPEN WOOL



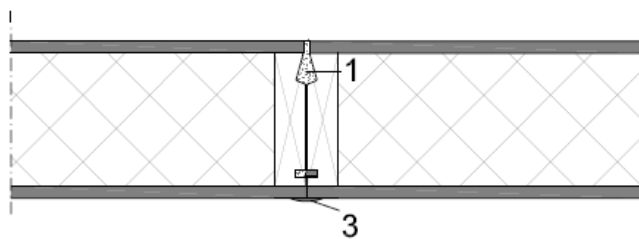
SW-WOOL-ML
SW-ALT-ML



SW-PUR
SW-EPS
SW-XPS



SW-PUR-ML
SW-EPS-ML

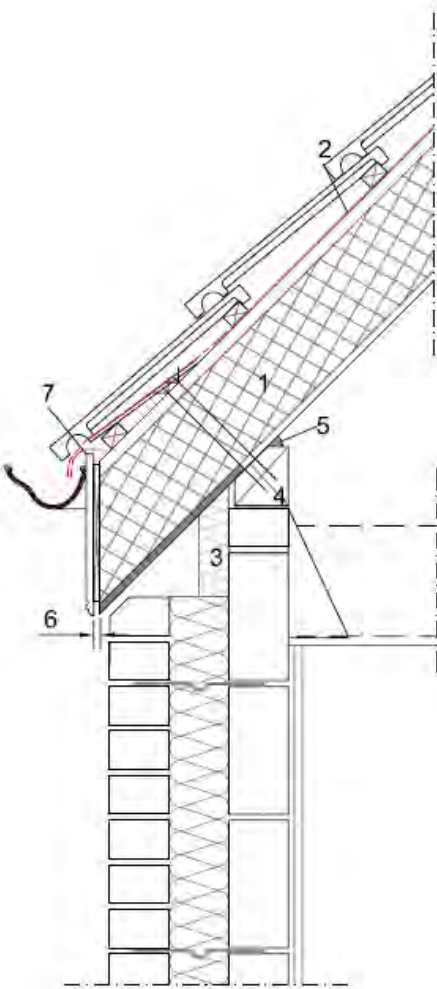


ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
SW-ALT-ML, Unilin OPEN PUR OPEN WOOL

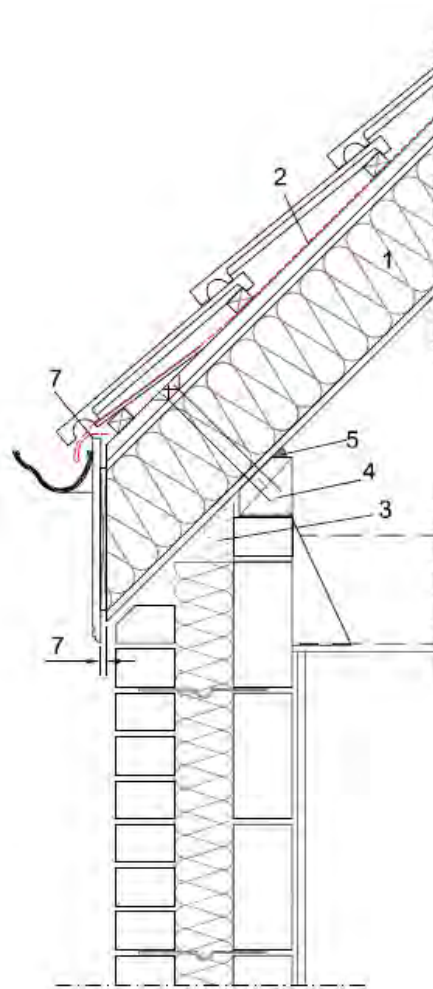
Eaves

1. Roof element
2. Optional breathable felt
3. Rigid insulation board
4. Min. 75mm chamfered wall plate
5. Air tight silicone seal
6. Air gap (+/- 10mm)
7. Optional over fascia vent

Open



SW

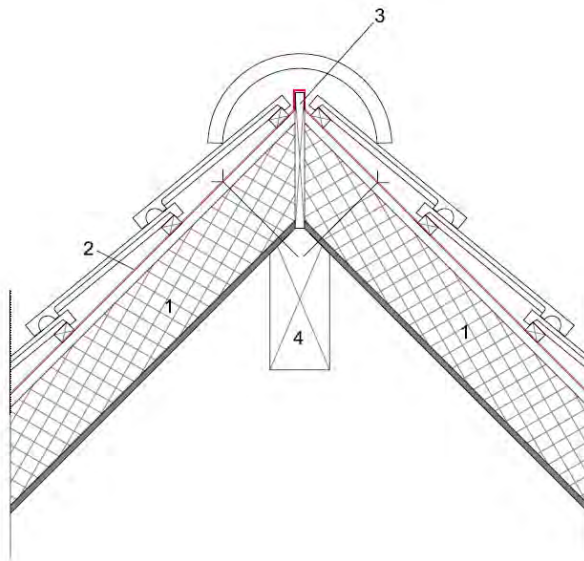


ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
SW-ALT-ML, Unilin OPEN PUR OPEN WOOL

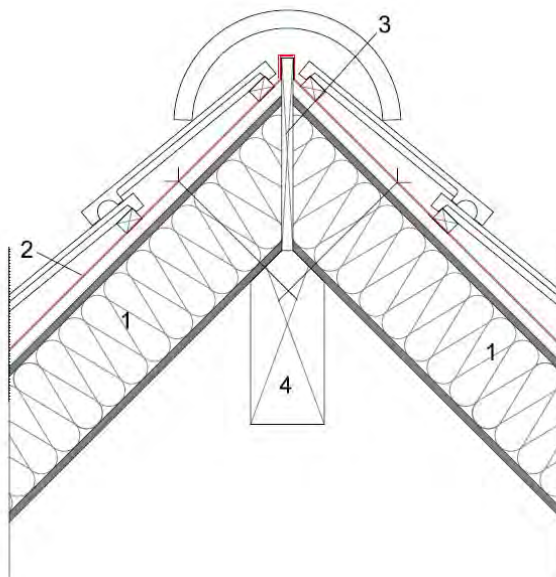
Ridge

1. Roof element
2. Optional breathable felt
3. Optional ridge board or fill with foam
4. Ridge beam

Open



SW

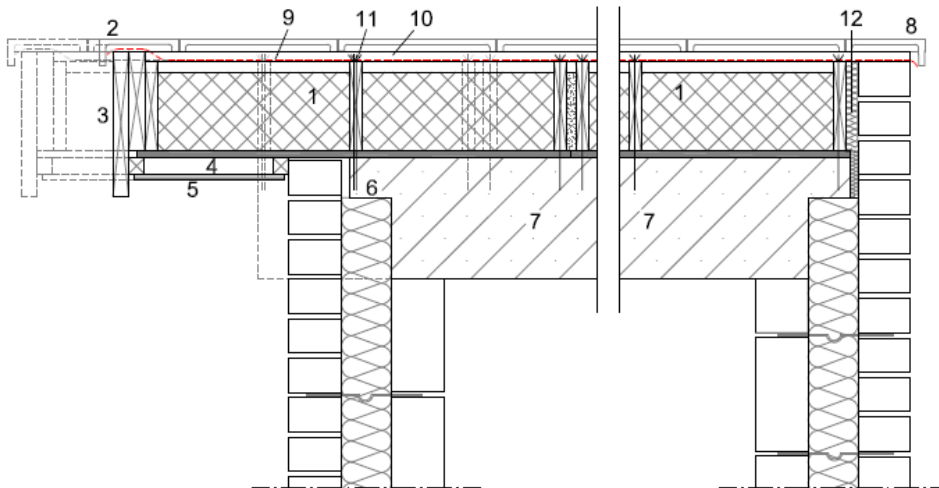


**ETA Unilin SW-EPS SW-XPS SW-PUR, Unilin SW-EPS-ML SW-PUR-ML SW-WOOL-ML
SW-ALT-ML, Unilin OPEN PUR OPEN WOOL**

Verge

1. Roof element
2. Left verge tile
3. Bargeboard to architects design
4. Air space
5. Soffit to architects design
6. Chamfered edge
7. Purlin (fixed to internal wall)
8. Right verge tie
9. Optional breathable felt
10. Tiling batten
11. Double fixing necessary at verge
12. Compressible insulation

Open



SW

