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ETA and designated according to Article
29 of the Regulation (EU) No 305/2011**

Technický a zkušební ústav stavební
Praha, s.p.

Trade name of the construction product

NOVATOP element

**Product family to which the construction
product belongs**

Product area: 14
Wood-based panels and elements

Manufacturer

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Manufacturing plant

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**This European technical assessment
contains**

29 pages including 6 annexes, which form
an integral part of this European technical
assessment

**This European technical assessment is
issued in accordance with Regulation
(EU) No 305/2011, on the basis of**

ETAG 019, edition February 2004, used
as European Assessment Document (EAD)

This ETA replaces

ETA-11/0310 issued on 12/12/2012

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1 TECHNICAL DESCRIPTION OF THE PRODUCT

NOVATOP elements (called “element” or “elements” in the further text) are glued stressed skin panels (or thin-flanged beams) consisting of an upper and lower flange made of three and/or five layer solid wood panels (SWP) and webs (SWP, BSH, LVL) in longitudinal direction of the intended span of the elements at a distance app. 340 mm (see example on the figure 1). Perpendicular to the longitudinal webs additional cross webs are arranged with a distance of app. 600-1000 mm. These cross webs are connected to the longitudinal webs by tenon and mortise connection without gluing or are they a butt jointed and fixed with nails. Flanges are glued to the webs with adhesives complying with the requirements of EN 301 and EN 15425.

Standard depths of the elements are 160 mm and 240 mm. Other depths up to 400 mm are possible.

Standard widths of the elements are 0.69 m, 1.03 m, 2.09 m and 2.45 m. The length of the elements is up to 12 m. Due to the limited lengths of the constituting solid wood panels, jointing of the webs and flanges is required. The tension flanges (SWP of 27 mm) are finger jointed. Additionally, they are reinforced with SWP of 42 mm with a length of 1000 mm glued on the flange. The butt jointed longitudinal webs are lap jointed by nailed SWPs from both sides. They are glued to the upper and lower flange. Drawings of the element joints are provided by the manufacturer (see figures 16 and 17).

The application of chemical substances is not subjected by this ETA.

The void of the elements can be empty or a thermal and/or acoustic insulation (see Annex 1) can be used.

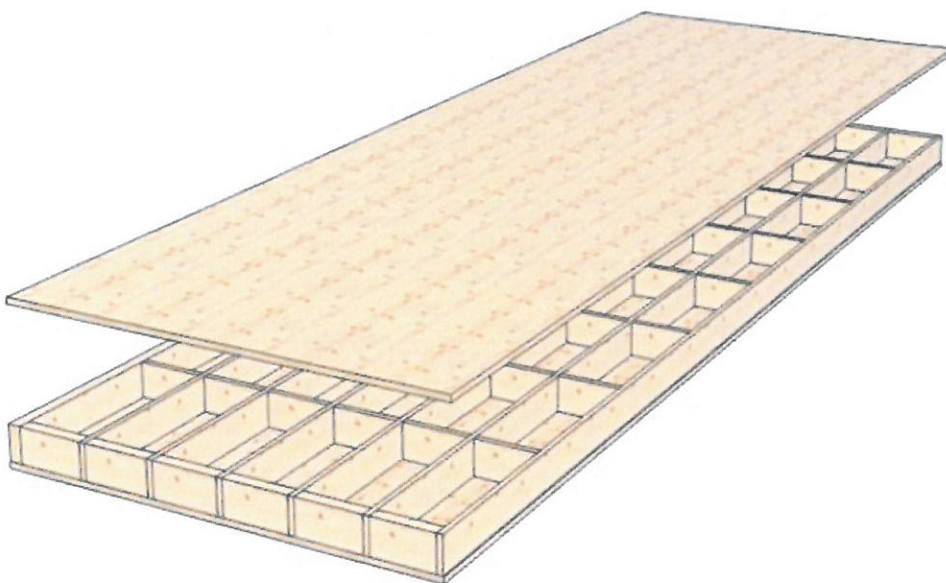
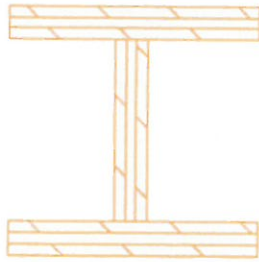
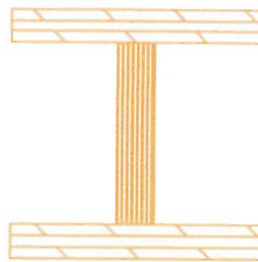


Figure 1: NOVATOP element (example)

SWP



LVL



BSH

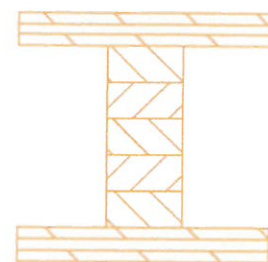


Figure 2: Type of SWP beam

Figure 3: Type of LVL beam

Figure 4: Type of BSH beam

1.1 Components

The parameters and data of product specification for material identification and structural parts of which are the elements composed are given in Annexes 1 and 2.

2 SPECIFICATION OF THE INTENDED USE(S) IN ACCORDANCE WITH THE APPLICABLE EUROPEAN ASSESSMENT DOCUMENT (HEREINAFTER EAD)

The elements are intended to be used as structural elements in buildings and timber structures, e.g. as wall, floor and roof elements. The elements may only be used in service classes 1 and 2 according to EN 1995-1-1/A1.

2.1 Intended working life

The provisions made in this ETA are based on an assumed intended working life of the elements of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

2.2 Manufacturing

The European technical assessment is issued for the product on the basis of agreed data/information, deposited with Technický a zkušební ústav stavební Praha, s.p., which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to Technický a zkušební ústav stavební Praha, s.p. before the changes are introduced.

Technický a zkušební ústav stavební Praha, s.p. will decide whether or not such changes affect the ETA and consequently the validity of the CE marking on the basis of the ETA and if so whether further assessment or alterations to the ETA, shall be necessary.

2.3 Installation

The elements must be installed by appropriately qualified professional personnel according to an assembly plan or project. An assembly plan shall be prepared for each structure, which contains the sequence in which the individual panels shall be installed and their designation. The assembly plan shall be available at the construction site.

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 Technický a zkušební ústav stavební Praha, s.p.

2.4 Design

For every individual project, a precisely formulated construction design must be produced by an authorized person according to the instructions of the ETA holder. This design must also deal with the assemblance of the elements, for instance temporal anchoring, bracing and support. Whenever this is important, other characteristics concerning BWR1 should be documented in the design also.

Products can be designed in accordance with EN 1995-1-1/A1 and EN 1995-1-2/AC with reference to article 3.1 of this ETA. Norms and regulations effective at the place of use should be taken into account.

2.5 Packaging, transport and storage

The elements must be stored in closed and dry spaces and positioned horizontally; after the removal of the protective casing they must be carefully covered, preferably with a different sheet material. The elements must be protected from adverse weather effects even on the construction site, and stored there for the necessary time only. It is necessary to avoid exposing the components to rain and flowing water; for the protection against rain, impurities and excessive solar radiation it is recommended using waterproof tarpaulins or canvases.

The manufacturer's instruction for packaging, transport and storage shall be observed.

2.6 Use, maintenance and repair

Before use, the elements must be checked, whether they were not damaged during transport or storage. Damaged elements must be replaced with new elements.

During the assembly, the elements may be exposed to the weather for a short period of time. Elements, which have become damp, must be dried and checked for damage before they are used and assembled. Only faultless elements may be used.

The manufacturer must assure that information about the relevant measures will be presented to the responsible persons.

3 PERFORMANCE OF THE PRODUCT AND REFERENCES TO THE METHODS USED FOR ITS ASSESSMENT

3.1 Mechanical resistance and stability (BWR 1)

The mechanical properties of the flanges and webs of the elements are given in Annex 2.

Resistance and stiffness values shall be calculated according to EN 1995-1-1/A1, 9.1.2 "Glued thin-flanged beams". In addition the design principles given in Annex 5 shall be taken into account.

Resistance against seismic actions is NPD. Local design regulations shall be taken into account in areas where the elements might support seismic action.

Duration of load shall be taken into account in accordance with EN 1995-1-1/A1; k_{mod} values for solid timber may be applied. Creep shall be taken into account in accordance with EN 1995-1-1/A1.

Additional national provisions shall be taken into account.

3.1.1 Dimensional stability

In normal condition, harmful deformations due to moisture changes of the elements are not expected.

3.2 Safety in case of fire (BWR 2)

3.2.1 Reaction to fire

The elements are classified to have reaction to fire D-s2, d0 and D_f-s1 without further testing (CWFT), as far as the boundary conditions given in EN 13986 will have been met. Elements treated against fire are not covered by this ETA.

Additional outer linings and insulation in connection with the timber units shall be tested according to the relevant test methods with regard to the concrete end use and classified according to EN 13501-1+A1.

3.2.2 Resistance to fire

No performance determined.

3.2.3 External fire performance of roof coverings

Not relevant. The elements do not contain any roofing.

3.3 Hygiene, health and environment (BWR 3)

3.3.1 Water vapor permeability and moisture resistance

No performance determined.

The elements may contain thermal and/or sound insulation in the cavities.

If requirements concerning the water vapor permeability of the elements are made, the calculation shall be performed in accordance with EN ISO 13788.

3.3.2 Watertightness

No performance determined.

3.3.3 Dangerous substances

Based on the declaration of the manufacturer, the elements do not contain harmful or dangerous substances as defined in the EU database, with exception of formaldehyde. The formaldehyde release of the boards is classified to be E1 in accordance with EN 13986. The elements do not contain pentachlorophenol.

In addition to the specific clauses relating to dangerous substances contained in this european technical assessment, 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 EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

3.4 Safety and accessibility in use (BWR 4)

3.4.1 Slipperiness of floors

Not relevant. The elements do not have finished floor covering. Possible floor covering shall fulfill the requirements for slipperiness performance.

3.4.2 Impact resistance

The elements are not assessed to impact resistance. In case of declaration, the value based on the test according to EN 596 and EN 1195 shall be declared, then requirements given in EN 12871 shall be fulfilled.

3.5 Protection against noise (BWR 5)

3.5.1 Airborne sound insulation and impact sound insulation

Exemplary performance and measured value for weighted sound reduction index R_w and weighted impact sound pressure level $L_{n,w}$ of the elements are given in Annex 3.

3.5.2 Sound absorption

No performance determined.

3.6 Energy economy and heat (BWR 6)

3.6.1 Thermal resistance

No performance determined.

Based on individual design of the elements may have energy economy related function. The thermal resistance R (R -value) or thermal transmittance U (U -value) of the product varies according to the design.

Thermal resistance of the elements shall be calculated e.g. according to EN ISO 6946, using the design thermal conductivity of the SWP boards and, concerning insulating materials, of the thermal conductivity values according to relevant norm of insulating material.

3.6.2 Air permeability

No performance determined.

3.6.3 Thermal inertia

No performance determined.

3.7 Sustainable use of natural resources (BWR 7)

For the sustainable use of natural resources no performance was determined for this product.

3.8 Aspects of durability, serviceability and identification

3.8.1 Durability

The elements can be used in service classes 1 and 2 as defined in the Eurocode 5 (EN 1995-1-1/A1). These classes correspond to the hazard classes 1 and 2 according to EN 335-1. The elements shall not be used in service class 3 / hazard class 3 without additional protective treatment.

Notice: Attack from insects may have severe detrimental effects to the performance of the elements. Standards, regulations and recommendations in force at the place of use should be observed.

If the elements are intended to be covered by timber flooring, it is recommended that the moisture content is checked by a moisture meter calibrated for each type of used wood.

The designer shall pay attention to the details of the construction and to ensure that no water pockets will be formed. If the elements are intended to be a part of the external envelope of the building, they shall be protected adequately, e.g. by a roofing or a cladding.

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

The moisture content of the timber and glulam and elements shall at manufacturing generally not exceed 15 % for timber members and 12 % for board members.

3.8.2 Serviceability

Serviceability of the elements is understood as their ability to resist loads without unacceptable deformations and vibrations. This characteristic is treated under BWR 1.

3.8.3 Identification

The elements are provided with a protective foil. Each delivery package is labelled with relevant data, e.g. type mark of elements, address and other customer data. The product label also bears the CE marking.

4 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE (HEREINAFTER AVCP) SYSTEM APPLIED, WITH REFERENCE TO ITS LEGAL BASE

4.1 AVCP system

According to the Decision 2000/447/EC¹ of the European Commission, as amended, the system of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 1:

Product	Intended use	Level or class	System
Prefabricated load bearing sandwich panels based on wood	For uses, which contributing to the load-carrying capacity of construction	---	1

5 TECHNICAL DETAILS NECESSARY FOR THE IMPLEMENTATION OF THE AVCP SYSTEM, AS PROVIDED FOR IN THE APPLICABLE EAD

5.1 Tasks of the manufacturer

5.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this european technical assessment.

The manufacturer may only use initial materials and components stated in the technical documentation² of this european technical assessment.

Within the factory production control, the manufacturer performs the control in accordance with the "Control plan"³ which are fixed with this european technical assessment. Details of the extent, nature and frequency of controls, which has to be performed within the factory production control, correspond to the control plan which is a part of technical documentation of this european technical assessment.

The results of factory production control are recorded in checklist signed by the person responsible and are evaluated. The records shall be presented to the notified product

¹ Official Journal of the European Communities N° L 180, 19.07.2000, s. 0040-0045

² The technical documentation of this European technical assessment has been deposited at the Technický a zkušební ústav stavební Praha, s.p. and, as far as relevant for the tasks of the notified product certification body involved in the assessment and verification of constancy of performance, is handed over to the notified product certification body

³ The control plan has been deposited at Technický a zkušební ústav stavební Praha, s.p. and is handed over only to the notified product certification body involved in the assessment and verification of constancy of performance.

certification body involved in continuous surveillance. On request the records must be presented to the Technický a zkušební ústav stavební Praha, s.p.

5.1.2 Further testing of samples taken at the factory

Tests must be conducted on samples which represent the final product.

Testing is only required considering to the bonded load-bearing structures. Test methods must comply with the methods set out in the harmonized product standards and their details are given in the control plan.

5.2 Tasks of notified product certification body

5.2.1 Assessment of the performance of a construction product made on the basis of test (including sampling), calculation, tabulated values or descriptive documentation of the product

Notified product certification 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 product certification bodies shall therefore not undertake the tasks referred to in point 1.2 (b)(i), in Annex V of Regulation (EU) No 305/2011, unless there are changes in the manufacture or manufacturing plant. In such cases the necessary initial type-testing has to be agreed between the Technický a zkušební ústav stavební Praha, s.p. and notified product certification body involved.

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

The notified product certification body shall ascertain that, in accordance with the control plan, the manufacturing plant, in particular personnel and equipment, and the factory production control are suitable to ensure a continuous and orderly manufacturing of the NOVATOP elements according to the specifications given in clause 2 and in the Annexes of the European technical assessment.

5.2.3 Continuous surveillance, assessment and evaluation of factory production control

The notified product certification body shall visit the factory at least twice a year for surveillance of the manufacturer.

It has to be verified that the system of factory production control and the specified manufacturing process are maintained taking into account the control plan.

Continuous surveillance and assessment of factory production control have to be performed according to the control plan.

The results of continuous surveillance shall be made available on demand by the notified product certification body or the Technický a zkušební ústav stavební Praha. In cases where the provisions of the European technical assessment and the control plan are no longer fulfilled, the certificate of constancy of performance shall be withdrawn.

5.3 CE marking

The CE marking shall be affixed on each packing of elements. The letters CE shall be accompanied by the following information:

- identification number of the technical assessment body
- the name or identifying mark of the manufacturer and of the manufacturing plant
- last two digits of the year in which the marking was affixed

- the number of the certificate of constancy of performance of the product
- number of the European technical assessment

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited by the Technický a zkušební ústav stavební Praha, s.p.

Issued in Prague on 25/03/2015

by 

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Head of the Technical Assessment Body (TAB)

Annexes:

- Annex 1: Characteristics of components
- Annex 2: Product characteristics of the SWP boards
- Annex 3: Performance characteristic
- Annex 4: Examples - figures
- Annex 5: Design principles of the NOVATOP elements
- Annex 6: Reference documents

ANNEX 1

CHARACTERISTICS OF COMPONENTS

Covering

Solid wood panels have to fulfill the requirements of EN 13353+A1 and EN 13986 for structural performance as SWP/2S and SWP/2SD.

Nominal thickness of the SWPs is 27 mm to 60 mm.

Factor of vapor resistance μ of SWP boards is 70/200 according to EN ISO 10456.

The thermal conductivity λ (λ -value) of SWP boards used in manufacture of the elements is 0.13 W/m·K according to EN ISO 10456.

For design of NOVATOP elements utilizing the strength and stiffness values of SWP boards, listed in Annex 1 and 2 must be satisfied the requirements of properties, composition and production on the SWP boards listed in document called "AGROP STAT".

Taking into account the reduction factor, the following tensile strengths (maximum stress in the centre of the finger jointed SWP flange) may be assumed for SWP flanges with finger joints:

- SWP 27 mm (9/9/9): $f_{t,k} = 11.5 \text{ N/mm}^2$
- SWP 33 mm (9/15/9): $f_{t,k} = 9.30 \text{ N/mm}^2$

For other SWP flanges the tensile strength in plane of board has to be derived from the tensile strength of C24 by taking into account only the boards in direction of the load.

The load-bearing joints at the tension flanges must be executed as finger joints. Butt jointed tension flanges must be executed as non-load-bearing layers. Butt jointed compression flanges must be executed with close contact over the whole contact area. A gap in the butt jointed compression flange in a T-cross-section must be regarded as non-loadbearing.

The effective transverse bending stiffness $EI_{ef,trans}$ of NOVATOP elements may be calculated with the method of mechanically jointed beams. The webs may be considered as a flexible layer with a shear modulus of $G_{web,ef} = 150 \text{ N/mm}^2$. Boards of the flanges transverse to the main load-bearing direction must be continuous and should not have any joints.

Ribs

Solid wood panels must meet the requirements of EN 13353+A1 and EN 13986 for technical classes SWP/2S and SWP/2SD.

Adhesive

Flanges are glued to the webs with polyurethane adhesive which have to comply with the requirements of EN 301 and EN 15425.

Insulation materials

The thermal insulation materials, such as mineral wool (WW) according to EN 13162 ed.2 and factory made wood fiber (WF) according to EN 13171 ed.2, can be used. The minimal

thickness of used thermal insulation is 60 mm (partial filling), the maximal thickness is up to the depth of void.

Factor of vapor resistance μ of mineral wool (MW) is 1/1 and of wood fiber (WF) is 5/3 according to EN ISO 10456 or on the basis of testing of insulation material producer.

The thermal conductivity λ (λ -value) of mineral wool (MW) and wood fiber (WF) shall be taken from declared values (CE marking).

The class of reaction to fire of mineral wool (MW) is at least A1, of wood fiber (WF) is at least E.

As the sound insulation a lime shatter with the maximal volume mass of 2800 kg/m³, mass per square meter of 80 kg/m² and of granulometry 6/7 mm or insulation materials mentioned above can be used.

The used insulation material does not contribute to the loadbearing characteristics of the element.

NOVATOP element

ANNEX 2**Product characteristics of the SWP boards**

Basic work requirement 1 (BWR 1)

Performance characteristic	---	Verification procedure	Class / Use category / Numeric value ¹⁾			
Nominal thickness	mm	EN 325	27 - 60			
Nominal density	kg/m ³	EN 323	≥ 410			
Boards with continuous lamellas in inner layers						
Mechanical actions in plane of the SWP						
Composition of boards			6/15/6	9/9/9	9/15/9	9/42/9
Bending strength $f_{m,0}$	N/mm ²	EN 789	13.9	20.3	16.8	9.7
Bending strength $f_{m,90}$			17.1	10.7	14.2	21.3
Tensile strength $f_{t,0}$			9.3	13.6	11.2	6.5
Tensile strength $f_{t,90}$			11.4	7.1	9.5	14.2
Compression strength $f_{c,0}$			13.9	20.3	16.8	9.7
Compression strength $f_{c,90}$			17.1	10.7	14.2	21.3
Shear strength f_v			3.0	3.0	3.0	3.0
Modulus of elasticity $E_{m,0}$			5300	7800	6400	3700
Modulus of elasticity $E_{m,90}$			6600	4100	5400	8200
Shear modulus G			600	600	600	600
Mechanical actions perpendicular to the plane of the SWP						
Bending strength $f_{m,0}$	N/mm ²	EN 789	25.0	28.9	27.3	20.1
Bending strength $f_{m,90}$			10.8	6.2	8.2	15.6
Modulus of elasticity $E_{m,0}$			9600	11100	10500	7700
Modulus of elasticity $E_{m,90}$			2300	800	1400	4200
Shear modulus G			90	90	90	90
Shear strength f_v			1.1	1.1	1.1	1.1
Glued connection between web and flange						
Shear strength $f_{v,k,glue, SWP}$	N/mm ²	ETAG 019	4.00			
Shear strength $f_{v,k,glue, LVL}$			4.40			
Shear strength $f_{v,k,glue, BSH}$			3.50			

1) Thickness is given as nominal value. Density and strengths values are 5-% fractiles according to ETAG 019.

2) Subscripts 0 and 90 denote the grain direction of the outer layers of the SWP

NOVATOP element

ANNEX 2**Product characteristics of the SWP boards**

Basic work requirement 1 (BWR 1)

Performance characteristic	---	Verification procedure	Class / Use category / Numeric value ¹⁾					
Boards with butt joints in the inner layer								
Mechanical actions in plane of the SWP								
Composition of boards			6/15/6	9/9/9	9/15/9	9/42/9		
Bending strength $f_{m,0}$	N/mm ²	EN 789	13.9	20.3	16.8	9.7		
Bending strength $f_{m,90}$			8.6	5.3	7.1	10.7		
Tensile strength $f_{t,0}$			9.3	13.6	11.2	6.5		
Tensile strength $f_{t,90}$			5.7	3.6	4.7	7.1		
Compression strength $f_{c,0}$			13.9	20.3	16.8	9.7		
Compression strength $f_{c,90}$			8.6	5.3	7.1	10.7		
Shear strength f_v			3.0	3.0	3.0	3.0		
Modulus of elasticity $E_{m,0}$			5300	7800	6400	3700		
Modulus of elasticity $E_{m,90}$			3300	2050	2700	4100		
Shear modulus G			600	600	600	600		
Mechanical actions perpendicular to the plane of the SWP								
Bending strength $f_{m,0}$			N/mm ²	EN 789	25.0	28.9	27.3	20.1
Bending strength $f_{m,90}$	5.4	3.1			4.1	7.8		
Modulus of elasticity $E_{m,0}$	9600	11100			10500	7700		
Modulus of elasticity $E_{m,90}$	1150	400			710	2100		
Shear modulus G	90	90			90	90		
Shear strength f_v	1.1	1.1			1.1	1.1		
Glued connection between web and flange								
Shear strength $f_{v,k,glue, SWP}$	N/mm ²	ETAG 019	4.00					
Shear strength $f_{v,k,glue, LVL}$			4.40					
Shear strength $f_{v,k,glue, BSH}$			3.50					

1) Thickness is given as nominal value. Density and strengths values are 5-% fractiles according to ETAG 019.

2) Subscripts 0 and 90 denote the grain direction of the outer layers of the SWP

NOVATOP element

ANNEX 3**Performance characteristic**

Basic work requirement 2 (BWR 2)

Performance characteristic	Verification procedure	Class / Use category / Numeric value
Reaction to fire Walls, floors, roofs	EN 13501-1+A1	D-s2, d0
End use applications of NOVATOP elements		
Overall thickness of element ≥ 160 mm		
Skins	Solid wood panel (SWP) Thickness ≥ 27 mm Density ≥ 410 kg/m ³	
Rib	Solid wood panel (SWP)	
Void	Empty and/or thermal insulation (see Annex 1)	
Joints	Ribs and boards are joined only by glueing and cold pressing	
Walls, floors, roofs	2003/43/ES	D-s2, d0 D _{fl} -s1
Solid wood panels (SWP) according to Commission Decision 2003/43/EEC		
Floorings	F _{fl} The product does not include floorings.	
Resistance to fire	EN 13501-2+A1	No performance determined
External fire performance of roof covering	No performance determined The product does not include roofing	
Basic work requirement 3 (BWR 3)		
Water vapor permeability and moisture resistance		
Solid wood panels (SWP)	EN ISO 10456	$\mu = 70/200$
Mineral wool (MW)	EN ISO 10456	$\mu = 1/1$
Wood fiber (WF)	EN ISO 10456	$\mu = 5/3$
Watertightness		
Not performance determined	---	---
Dangerous substances		
Formaldehyde	EN 13986	E1 (emission class)
Other dangerous substances	ETAG 019, clause 5.3.3	No other dangerous substances.

NOVATOP element		ANNEX 3	
Performance characteristic			
Basic work requirement 4 (BWR 4)			
Performance characteristic	Verification procedure	Class / Use category / Numeric value	
Slipperiness of floors			
Not performance determined	---	The product does not include floorings	
Impact resistance			
In case of declaration	ETAG 019, clause 5.4.2	Acceptable value	
Basic work requirement 5 (BWR 5)			
Protection against noise			
Airborne sound insulation and impact sound insulation	EN ISO 10140-2 EN ISO 10140-3	Airborne sound insulation R_w (C; C_{tr}) (dB)	Impact sound insulation $L_{n,w}$ (dB)
- Fermacell board, 20 mm - Steico Standard board, 8 mm - concrete paver, 38 mm, 90 kg/m ² - element 1		52 (-3; -7)	66
- OSB board, 22 mm - Steico Standard, 8 mm - concrete paver, 38 mm, 90 kg/m ² - element 1		50 (-3; -7)	65
- Fermacell board, 20 mm - Steico Therm board, 40 mm - Fermacell subbase, 30 mm, 45 kg/m ² - element 2		62 (-1; -7)	54
- OSB board, 22 mm - Steico Therm board, 40 mm - Fermacell subbase, 30 mm, 45 kg/m ² - element 2		62 (-1; -7)	56
- concrete board, 50 mm - ORSIL N board, 40 mm - element 2		58 (-2; -5)	67
- Fermacell board, 20 mm - Steico Therm board, 40 mm - element 3		60 (-2; -5)	62
- Fermacell board, 20 mm - Steico Standard board, 8 mm - Fermacell subbase, 60 mm, 90 kg/m ² - element 1		59 (-2; -7)	60
- 2 x OSB board, 15 mm - Steprock HD board, 30 mm - element 2		55 (-3; -11)	58
Element with three types of floor coverings: - element 2			
- textile flooring, thickness 3,5 mm		-	73
- textile flooring, thickness 10 mm		-	62
- PVC flooring with bearing, thickness 3 mm		-	75

NOVATOP element	ANNEX 3	
Performance characteristic		
Basic work requirement 5 (BWR 5)		
Element 1	27 (-1; -3)	93
Element 2	36 (-0; -1)	88
Element 1	Element 2	Element 3
three-layer board, 27 mm wooden grid, 186 mm three layer, 27 mm	three-layer board, 27 mm wooden grip, 186 mm lime shatter, 37,5 kg/m ² three-layer board, 27 mm	three-layer board, 27 mm wooden grip, 186 mm lime shatter, 75 kg/m ² three-layer board, 27 mm
Sound absorption		
Not performance determined	---	---
Basic work requirement 6 (BWR 6)		
Thermal resistance		
Solid wood panels (SWP)	EN ISO 10456	$\lambda = 0.13 \text{ W/m}\cdot\text{K}$
Mineral wool (MW)	EN 12667	According to CE marking
Wood fiber (WF)	EN 12667	According to CE marking
Air permeability		
Not performance determined	---	---
Thermal inertia		
Not performance determined	---	---

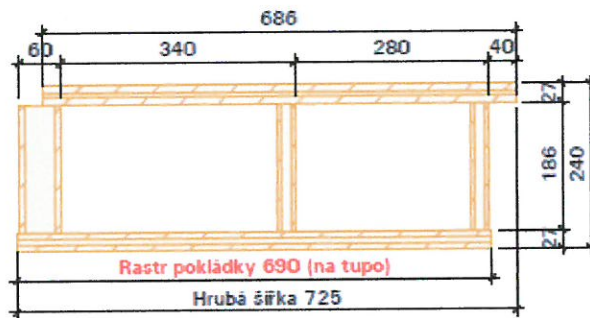


Figure 5: NOVATOP element (standard width 0.69 m)

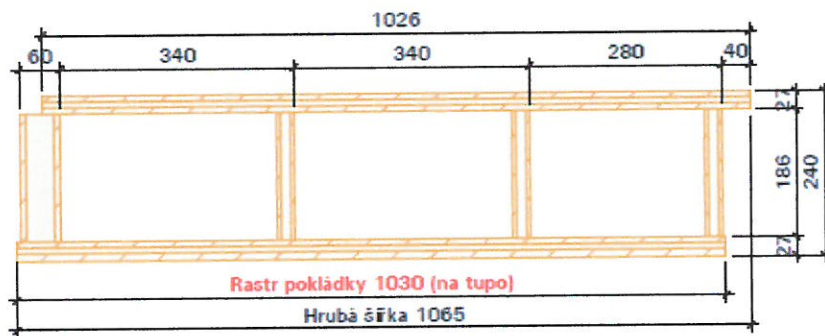


Figure 6: NOVATOP element (standard width 1.03 m)

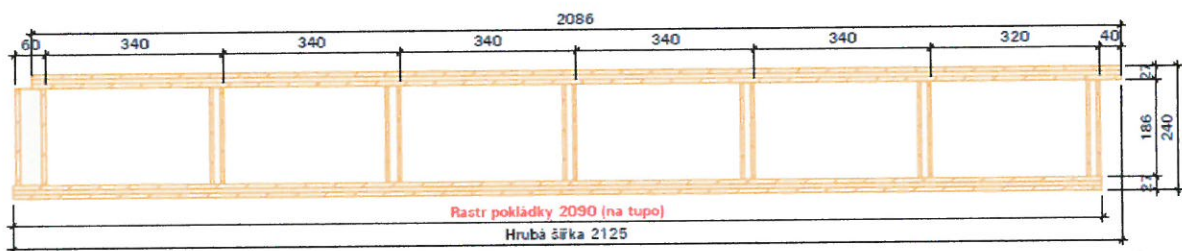


Figure 7: NOVATOP element (standard width 2.09 m)

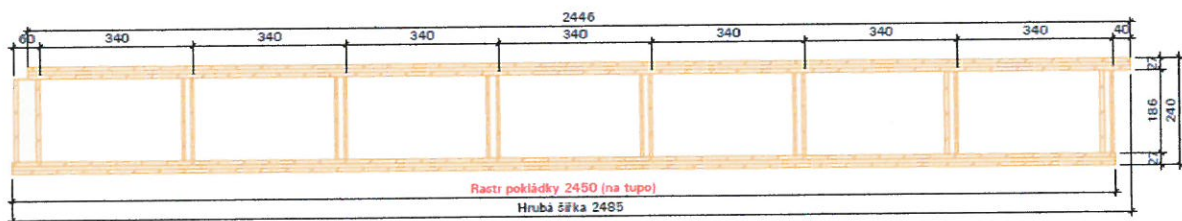


Figure 8: NOVATOP element (standard width 2.45 m)

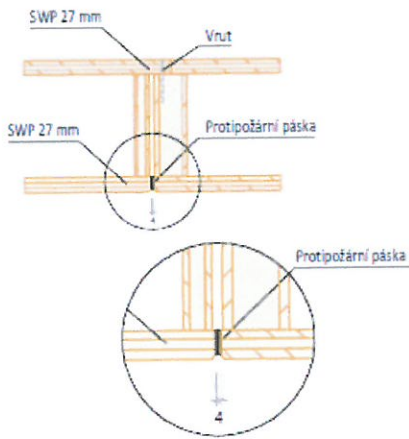


Figure 9: Performing with a gap

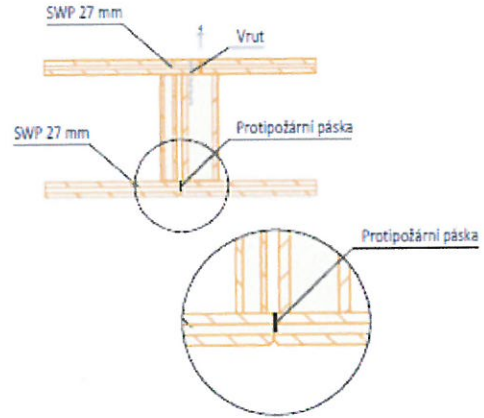


Figure 10: Performing without a gap

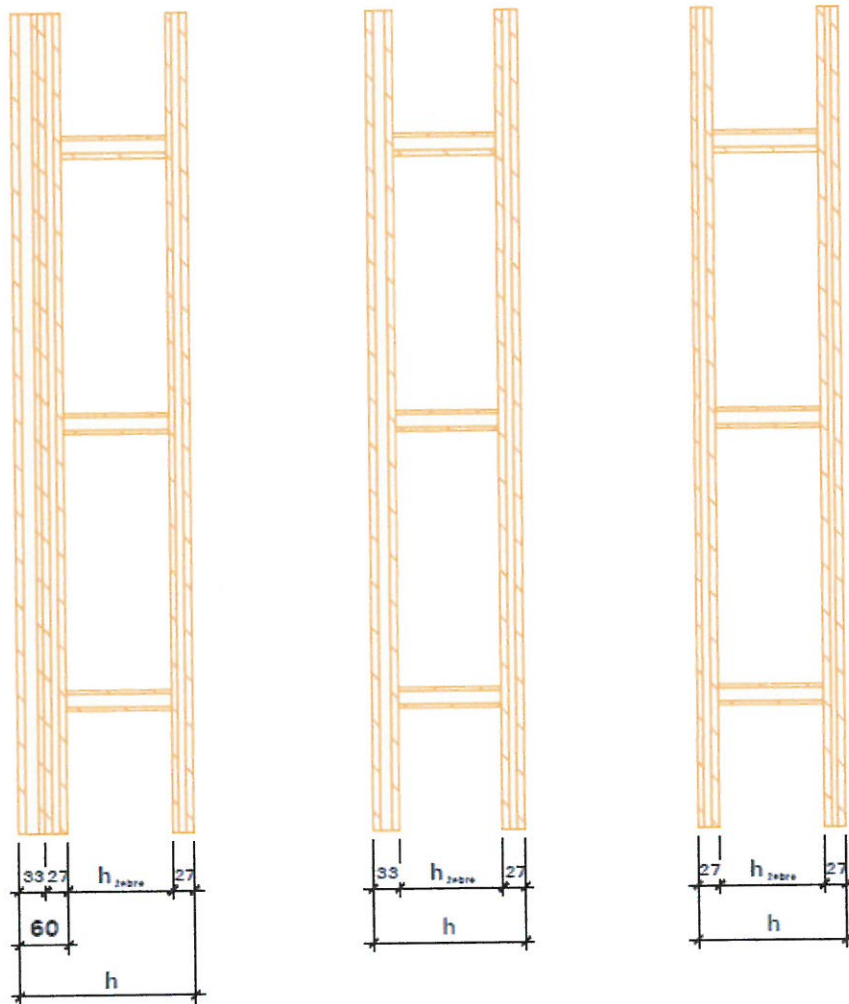


Figure 11: Composition of the element (example)

NOVATOP element	ANNEX 5
Design principles of the NOVATOP elements	

The elements may be calculated assuming a linear variation of strain over the depth. No rolling shear in the flanges has to be taken into account. Only the boards which are oriented in the direction of the actions (in the direction of the span) are taken into account.

For the calculation according to EC 5 as a "glued thin-flanged beam" the SWPs may be considered as a homogenous material using the modulus of elasticity and the shear modulus for in plane actions of the panels.

The effective flange width may be calculated according to EC 5 using the values in Table 9.1 of EC 5 for SWP.

For the design of finger-jointed solid wood panels the following tensile strength values may be used:

SWP 27 mm (9/9/9): $f_{t,k} = 11.50 \text{ N/mm}^2$

SWP 33 mm (9/15/9): $f_{t,k} = 9.30 \text{ N/mm}^2$

The load-bearing joints at the tension flanges must be executed as finger joints. Butt jointed tension flanges must be executed as non-load-bearing layers. Butt jointed compression flanges must be executed with close contact over the whole contact area. A gap in the butt jointed compression flange in a T-cross-section must be regarded as non-loadbearing.

For the design of the glue line between the flanges and the webs of SWP boards the characteristic shear strength value according to EN 338:2010 may be used for a strength class C 24 $f_{v,k,glue, SWP} = 4.00 \text{ N/mm}^2$.

For the design of the glue line between the flanges and the webs of LVL boards the characteristic shear strength value may be used $f_{v,k,glue, LVL} = 4.40 \text{ N/mm}^2$.

For the design of the glue line between the flanges and the webs of BSH boards the characteristic shear strength value may be used $f_{v,k,glue, BSH} = 3.50 \text{ N/mm}^2$.

Both failure modes as a shear failure in layer of SWP (mode 1) and shear failure between the web and flange (mode 2) should be taken into account. The shear lines are given in figures 12 and 14 (SWP), respectively figures 13 and 15 (BSH, LVL). For outer webs the shear line in the SWP of the flange next to the end of the element is disregarded.

The transverse bending stiffness shall be calculated with the method of mechanically jointed beams with a shear modulus of the webs of $G_{web,ef} = 150 \text{ N/mm}^2$. Boards of SWP flanges transverse to the main load-bearing direction must be continuous and should not have any joints.

Jointing of the NOVATOP elements may be carried out according to the figure 16 and 17.

Taking into account the reduction, a characteristic tensile strength of 11.5 N/mm^2 (maximum stress in the center of the finger jointed SWP flange with three 9 mm layers) may be assumed. For other SWP flanges the tensile strength in plane has to be derived from the tensile strength of C 24 by taking into account only the boards in direction of the load.

NOVATOP element	ANNEX 5
Design principles of the NOVATOP elements	

The load-bearing joints at the tension flanges must be executed as finger joints. Butt jointed tension flanges must be regarded as non-load-bearing layers. Butt jointed compression flanges must be executed with close contact over the whole contact area. A gap in the butt jointed compression flange must be regarded as non-load-bearing resulting in NOVATOP elements consisting of a series of T-cross-sections.

The jointing of the webs needs no further consideration in design.

For the design of the stresses in SWP flanges and webs the strength values from Annex 1 apply.

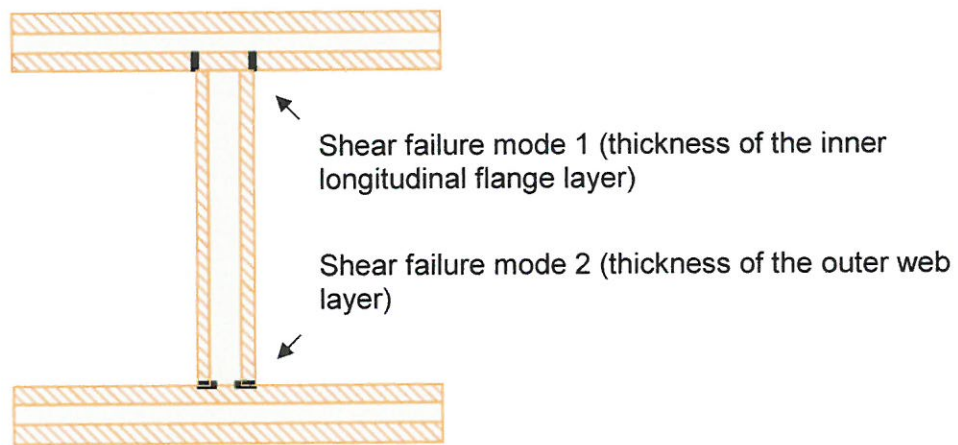


Figure 12: Assumed shear lines for the design of the glued connection for webs of SWP

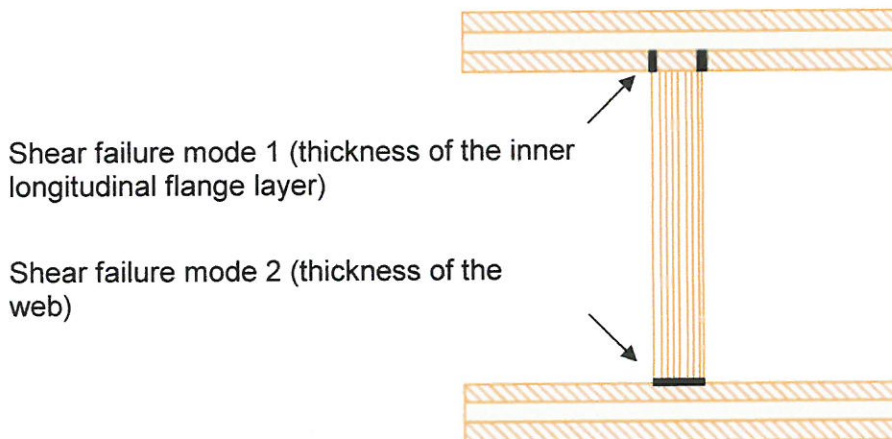


Figure 13: Assumed shear lines for the design of the glued connection for webs of BSH, LVL

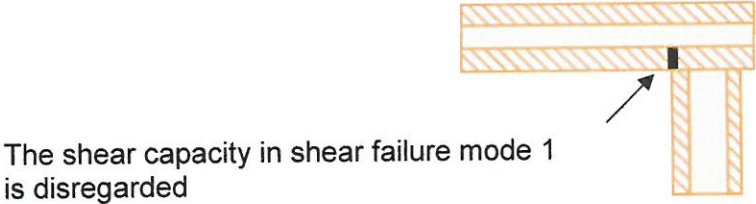


Figure 14: For outer webs the shear capacity in shear failure mode 1 next to the end of the element is disregarded (SWP)

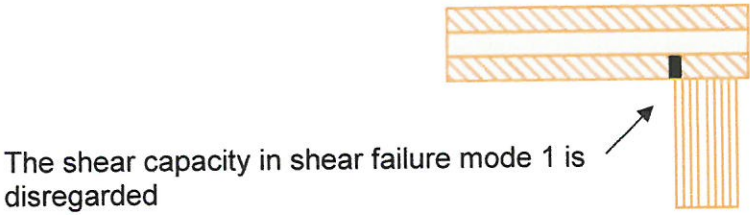


Figure 15: For outer webs the shear capacity in shear failure mode 1 next to the end of the element is disregarded (BSH, LVL)

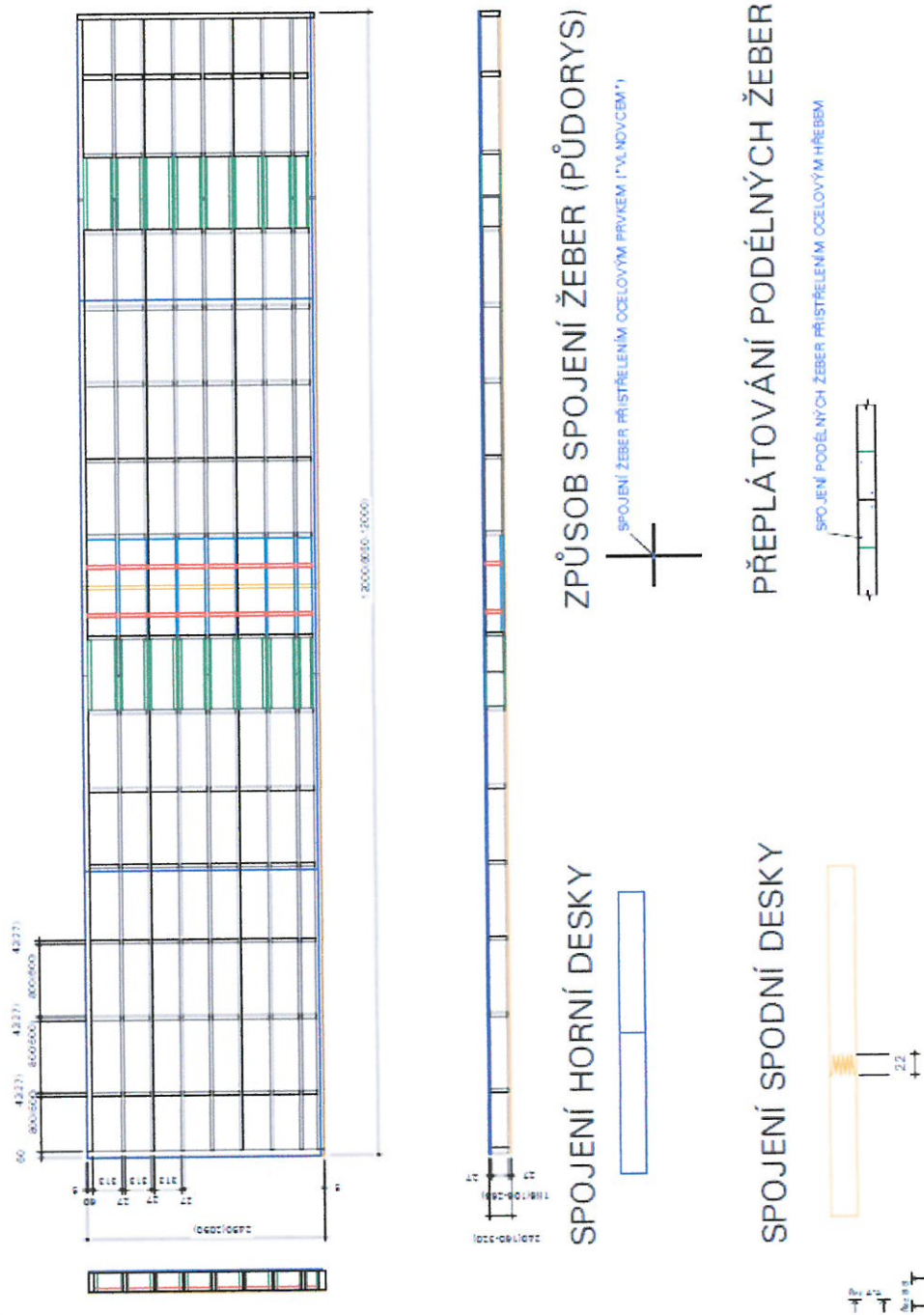


Figure 17: Jointing of the NOVATOP elements

NOVATOP element	ANNEX 6
Reference documents	

Guideline for european technical assessment ETAG 019 for Prefabricated wood-based loadbearing stressed skin panels, edition November 2004

EN 1995-1-1/A1 Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings

EN 1995-1-2/AC Eurocode 5: Design of timber structures - Part 1-2: General - Structural fire design

EN 12086 Thermal insulating products for building applications - Determination of water vapour transmission properties

EN 12667 Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance

EN 12871 Wood-based panels - Determination of performance characteristics for load bearing panels for use in floors, roofs and walls

EN 13162 ed.2 Thermal insulation products for buildings - Factory made mineral wool (MW) products - Specification

EN 13171 ed. 2 Thermal insulation products for buildings - Factory made wood fibre (WF) products - Specification

EN 13501-1+A1 Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests

EN 13501-2+A1 Fire classification of construction products and building elements - Part 2: Classification using test data from resistance fire tests, excluding ventilation services

EN 13986 Wood-based panels for use in construction - Characteristics, evaluation of conformity and marking

EN 13353+A1 Solid wood panels (SWP) - Requirements

EN 14358 Timber structures - Calculation of characteristic 5-percentile values and acceptance criteria for a sample

EN 789 Timber structures - Test methods - Determination of mechanical properties of wood based panels

EN 323 Wood-based panels. Determination of density

EN 325 Wood-based panels - Determination of dimensions of test pieces

EN 338 Structural timber- Strength classes

EN 14080 Timber structures - Glued laminated timber and glued solid timber - Requirements

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

EN ISO 10140-3 Acoustics - Laboratory measurement of sound insulation of building elements - Part 3: Measurement of impact sound insulation

EN ISO 6946 Building components and building elements - Thermal resistance and thermal transmittance - Calculation method

EN ISO 10456 Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values

EN ISO 13788 Hygrothermal performance of building components and building elements - Internal surface temperature to avoid critical surface humidity and interstitial condensation - Calculation methods

Commission Decision 2003/43/EEC of 17 January 2003 establishing the classes of reaction-to-fire performance for certain construction products

Expert's report of 06.06.2014, prof. H.J. Blaß, Karlsruher Institut für Technologie, Versuchsanstalt für Stahl, Holz und Steine, Germany

NOVATOP element	ANNEX 6
Reference documents	

Expert's report of 16.01.2015 – expert's report amendment of 06.06.2014, prof. H.J. Blaß, Karlsruher Institut für Technologie, Versuchsanstalt für Stahl, Holz und Steine, Germany
 Test report No. 146117 of 22. 05. 2014 refer to determination of shear strength between rib and flange for NOVATOP element, Karlsruher Institut für Technologie, Versuchsanstalt für Stahl, Holz und Steine, Germany

Test report No. 146101 of 12.03.2014 refer to determination of load-bearing capacity and behavior during deformations for ceiling NOVATOP elements, Karlsruher Institut für Technologie, Versuchsanstalt für Stahl, Holz und Steine, Germany

H.J. Blass, P. Aune, B.S. Choo, R. Goerlacher, D.R. Griffiths, B.O. Hilson, P. Racher, G. Steck [Ed.] "Timber engineering STEP 1", Centrum Hout, Netherlands, 1995

Report No. 142/08 regarding laboratory measurement of airborne and impact sound insulation, Center of Building Construction (Centrum stavebního inženýrství), Czech Republic, from 30.04.2008

Report No. 143/08 regarding laboratory measurement of airborne and impact sound insulation, Center of Building Construction (Centrum stavebního inženýrství), Czech Republic, from 30.04.2008

Report No. 144/08 regarding laboratory measurement of airborne and impact sound insulation, Center of Building Construction (Centrum stavebního inženýrství), Czech Republic, from 29.04.2008

Report No. 145/08 regarding laboratory measurement of airborne and impact sound insulation, Center of Building Construction (Centrum stavebního inženýrství), Czech Republic, from 29.04.2008

Report No. 146/08 regarding laboratory measurement of airborne and impact sound insulation, Center of Building Construction (Centrum stavebního inženýrství), Czech Republic, from 29.04.2008

Report No. 316/07 regarding laboratory measurement of airborne sound insulation, Center of Building Construction (Centrum stavebního inženýrství), Czech Republic, from 12.11.2007

Report No. 317/07 regarding laboratory measurement of airborne and impact sound insulation, Center of Building Construction (Centrum stavebního inženýrství), Czech Republic, from 20.11.2007

Report No. 318/07 regarding laboratory measurement of airborne and impact sound insulation, Center of Building Construction (Centrum stavebního inženýrství), Czech Republic, from 20.11.2007

Report No. 319/07 regarding laboratory measurement of airborne and impact sound insulation, Center of Building Construction (Centrum stavebního inženýrství), Czech Republic, from 29.11.2007

Report No. 350/07 regarding laboratory measurement of impact sound insulation, Center of Building Construction (Centrum stavebního inženýrství), Czech Republic, from 30.11.2007

Test Report No. QA-2010-1621 from 15.06.2010 regarding the determination of formaldehyde release, Fraunhofer Institute for Wood Research Wilhelm-Klauditz-Institut WKI, Germany

Certificate No. 1393-CPD-0019 from 29.08.2005 of 3-layer boards SWP/2, VVÚD Praha, Czech Republic

Data sheet of multilayer SWPs, AGROP NOVA a.s.

Certificate No. 254-2/222/§5/2009 from 30.11.2009 Laminated wood-DUO, TRIO, VVÚD Praha, Czech Republic

NOVATOP element	ANNEX 6
Reference documents	

Declaration of performance No. DOP-MO-BH-001 Strength graded structural timber with rectangular cross section in accordance with EN 14081-1:2005+A1, of 01.07.2013, Mosser Holzindustrie Gesellschaft mbH, Austria

Declaration of performance No. DOP-MO-BSH-001 Glued laminated timber in accordance with EN 14080:2005, of 01.07.2013, Mosser Leimholz Gesellschaft mbH, Austria

Declaration of performance No. 04-0001-01 Light wood beams and columns for load-bearing structures in accordance with ETA-06/0238, of 27.06.2013, Materialprüfungsanstalt der Universität Stuttgart MPA Stuttgart – Otto-Graf-Institut (FMPA), Germany

Technical documentation of NOVATOP element, AGROP NOVA a.s., Ptení, Czech Republic

Data sheet of AGROP STAT 3 layers solid wood panels with declared values in accordance with EN 13986, AGROP NOVA a.s.

Declaration of performance No. 1402 of multilayer solid wood panel AGROP STAT SWP/1 SD, SWP/2 SD, SWP/3 SD

Safety data sheet of 18.07.2010, Glue PURBOND® HB S309, issued by Purbond AG company, Switzerland

Declaration of performance No. 03-0001-04 Glued laminated timber for load-bearing structures, of 26.11.2013, Materialprüfungsanstalt der Universität Stuttgart MPA Stuttgart – Otto-Graf-Institut (FMPA), Germany

Technical directive of PURBOND® HB S309, one-component polyurethane adhesive to produce load-bearing timber building elements