European Technical Assessment	ETA 17/0004 of 29/03/2017

General Part

Technical Assessment Body issuing the ETA	Technický a zkušební ústav stavební Praha, s.p.
Trade name of the construction product	NOVATOP solid
Product family to which the construction product belongs	Solid wood slab elements to be used as structural elements in buildings
Manufacturer	AGROP NOVA a.s. Ptenský Dvorek 99 CZ-798 43 Ptení Czech Republic www.agrop.cz
Manufacturing plant	AGROP NOVA a.s. Ptenský Dvorek 99 CZ-798 43 Ptení Czech Republic
This European Technical Assessment contains	14 pages including 6 Annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of	European Assessment Document EAD 130005-00-0304, edition March 2015
This ETA replaces	ETA-12/0079, version 2, issued on 23/11/2012

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full (excepted the confidential Annex(es) referred to above). However, partial reproduction may be made, with the written consent of the issuing Technical Assessment Body. Any partial reproduction has to be identified as such.

Specific part

1. Technical description of the product

This European Technical Assessment (ETA) applies to the cross laminated timber "NOVATOP solid".

NOVATOP solid are cross laminated timber elements made of softwood boards which are bonded together to form solid wood slab elements with a minimum of three layers up to a maximum of 13 layers. Adjacent layers are generally arranged with the grain direction perpendicular (angle 90°) to each other. In NOVATOP cross laminated timber elements with at least five layers, up to two adjacent layers may be oriented with parallel grain direction. The lay-up of the solid wood slab shall be symetrical about its center plane.

Thickness of NOVATOP solid is up to 0.4 m, width is up tp 2.5 m and length is up to 6.0 m in case of continuous longitudinal layers or up to 12.0 m in case of layers connected by finger joints.

The principle of structure of the solid wood slab is shown in Annex 1.

The species used is European spruce or an equivalent softwood.

The application of chemical substances (wood preservatives and flame retardants) is not subject of this European Technical Assessment.

Boards
The specification of the boards is given in Annex 2. Boards are visualy or machine strength graded.

Adhesive
The adhesive for bonding of the solid wood slab and the finger joints of the individual boards shall conform to EN 301 or EN 15425.

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

NOVATOP solid are intended to be used as structural or non-structural elements in buildings and timber structures, e.g. as walls, floors and roofs. NOVATOP solid may only 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 solid wood slab element in service.

The intended use shall be evaluated in each individual case depending on the climatic boundary conditions, e.g. heavy rain with extreme wind conditions in high mountains or coastal areas. These areas represent a limited use of the kits.

The verifications and assessment methods on which this European Technical Assessment are based lead to the assumption of a working life of the NOVATOP solid elements at least 50 years, when installed in the works, provided that the solid wood slab elements are subject to appropriate instalation, use and maintenance. These provisions are based upon the current state of art and the available knowledge and experience (the real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, and the particular conditions of the design, execution, use and maintenance of that works may be outside this ETA. Therefore, it cannot be excluded that in these cases the real working life of the product may also be shorter than the assumed working life).

The indications given on the working life of the construction product cannot be interpreted as a guarantee neither given by the producer (or his representative) nor by EOTA nor by TAB, but are regarded only as a mean for choosing the right products in relation to the expected oconomically reasonable working life of the works.

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

The assessment of the fitness for use of the NOVATOP solid elements according to the basic requirements for construction works were performed in accordance with EAD 130005-00-0304.

The European Technical Assessment is issued for the product on the basis of agreed data and information, deposited at Technický a zkušební ústav stavební Praha, s.p., which identifies product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data and 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 alternations to the ETA shall be necessary.

3.1 Mechanical resistance and stability (BWR 1)

3.1.1 General

The mechanical properties of the NOVATOP solid and the boards for its manufacturing correspond to the specifications given in the Annexes 2 and 3. Details about the elements are deposited at Technický a zkušební ústav stavební Praha, s.p.

Specification of the boards is given in Annex 2. Boards are visually or machine strength graded. Only technically dried wood shall be used.

Only boards which are planned on both sides shall be used. The boards can be connected by finger joints according to EN 14080 in longitudinal direction. Butt joints in longitudinal layers are not permissible.

Resistance and stiffness values shall be calculated according to EN 1995-1-1, 9.1.2 "Glued thin-flanged beams". In addition the joint design and embedding strength values given in EN 1995-1-1 for solid timber 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.

Additional national provisions shall be taken into account.

Dimensional stability
In normal condition, harmful deformations due to moisture changes of the NOVATOP solid are not expected.

Tolerances of the NOVATOP solid are given in the specified moisture content of (10 ± 2) %, see Table 1.

Table 1: Tolerances of the NOVATOP solid

thickness, h	± 1 mm
length, l	± 2 mm
width, b	± 2 mm

3.2 Safety in case of fire (BWR 2)

3.2.1 Reaction to fire

NOVATOP solid is classified to have reaction to fire class D-s2, d0 without further testing in accordance with the Commission Decision 2005/610/EC. The boundry conditions stated in the Commission Decision have to be met.

3.2.2 Resistance to fire

No performance assessed.

3.3 Hygiene, health and environment (BWR 3)

3.3.1 Content emission and/or release of dangerous substances

The release of dangerous substances is determined according to EAD 130005-00-0304. No dangerous substances is the performance of the NOVATOP solid in this respect. A manufacturer's declaration to this effect has been submitted.

In addition to the specific clauses relating to dangerous substances contained in this ETA, there may be other requirements applicable to the products falling within its scope, e.g. transposed national laws and administrative provisions. In order to meet the provisions of the Regulation (EU) No. 305/2011 of the European Parliament and of the Council, these requirements need also to be complied with, when and where they apply.

3.3.2 Water vapor permeability - Water vapor transmission

No performance assessed.

If requirements concerning the water vapor permeability of the elements are made, the calculation shall be performed in accordance with EN ISO 13788 using the design vapor permeability of the softwood from EN ISO 10456.

3.4 Safety and accessibility in use (BWR 4)

3.4.1 Impact resistance

No performance assessed.

3.5 Protection against noise (BWR 5)

3.5.1 Airborne sound insulation

No performance assessed.

3.5.2 Impact sound insulation

No performance assessed.

3.5.3 Sound absorption

No performance assessed.

3.6 Energy economy and heat retention (BWR 6)

3.6.1 Thermal conductivity

No performance assessed.

Thermal resistance of the elements shall be calculated e.g. according to EN ISO 6946 using the design thermal conductivity of the softwood from EN ISO 10456.

3.6.2 Air permeability

No performance assessed.

3.6.3 Thermal inertia

No performance assessed.

Thermal inertia (design specific heat capacity c_p) can be takem from EN ISO 10456 for the softwood.

3.7 Durability, serviceability and identification

3.7.1 Durability

NOVATOP solid can be used in service classes 1 and 2 as definied in EN 1995-1-1. This 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.

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.

3.7.2 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.

3.7.3 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

According to the decision 1997/176/EC[1] of the European Commission as amended by the decision 2001/596/EC[2] the system of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011 and Commission delegated Regulation (EU) No 568/2014) given in the following table applies:

Product(s)	Intended use(s)	Level(s) or class(es)	System(s)
Structural glued laminated products and other glued timber products	Bridges and buildings	Any	1

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

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

Issued in Prague on 29/03/2017

By
Ing. Mária Schaan
Head of the TAB

Annexes:

---

[1] 1997/176/EC - Commission Decision of 17 February 1997, published in the Official Journal of the European Union (OJEU), L 73 of 14/03/1997

[2] 2001/596/EC - Commission Decision of 8 January 2001, published in the Official Journal of the European Union (OJEU), L 209/33 of 02/08/2001
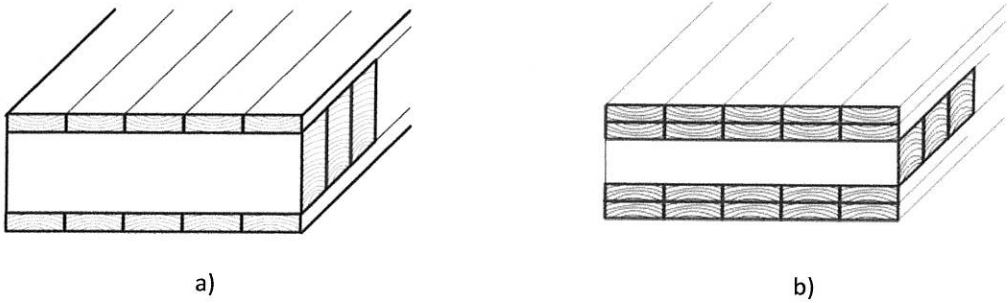
Figure 1: Principle of the solid wood slab elements
a) Cross laminated timber structure with three layers
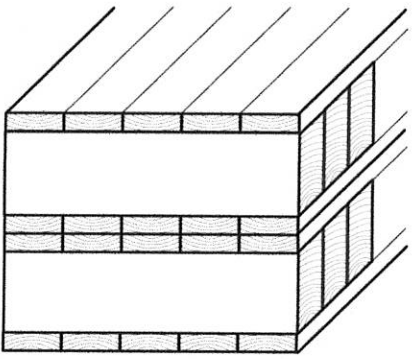b) Cross laminated timber structure with five layers

Figure 2: Principle of the cross laminated timber structure with six layers
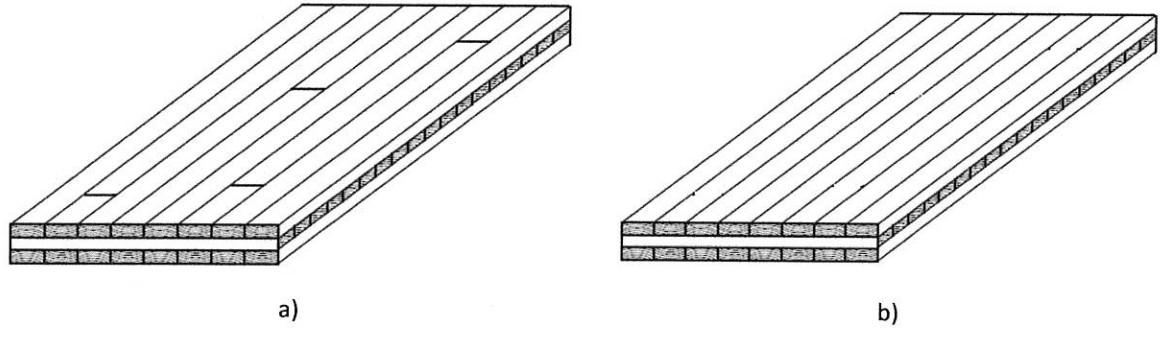

Figure 3: Principle of the cross laminated timber structure with three layers
a) Cross laminated timber with finger joints
b) Cross laminated timber with continuous longitudinal layers

Cross laminated timber		
Thickness	mm	14 to 400
Width	m	≤ 3.0
Length	m	≤ 12.0
Number of layers	-	3 to 13
Boards		
Surface	-	Planed and/or grinded
Gaps between adjacent boards	-	max. 6 mm
Thickness	mm	4 to 44
Boards shall be strength graded with suitable visual and/or machine procedures to be able to assign them to the strength class according to EN 338. Boards in cross layers containing butt joints have no tensile, compression or bending strength parallel to the grain.	-	Within one member of the CLT only one of the specified combinations of strength classes shall be applied: Cover layers: C 24 Inner layer: C 16 C 24 (≥ 90 %)
Moisture of wood according to EN 13183-2	% by mass	10 ± 2 Within one solid wood slab element only one of the specified moisture ranges shall be applied.
Finger-joints	-	EN 14080

NOVATOP solid	Annex 3
Mechanical requirements	

BWR 1

Essential characteristics	Assessment method	Class / Level / Desription	
Strength class of the boards	EN 338	C 16	C 24
Mechanical actions perpendicular to the plane of the CLT			
Property		in N/mm^2	
Bending strength $f_{m,k}$	EAD, cl. 2.2.1.1	18.5	24.0
Tensile strength $f_{t,90,k}$	EN 14080	0.4	0.5
Compression strength $f_{c,90,k}$	EN 14080	2.2	2.5
Shear strength $f_{v,9090,k}$ perpendicular to the grain of the boards	EAD, cl. 2.2.1.3	0.8	0.8
Shear strength $f_{v,090,k}$ parellel to the grain of the boards (reduced)	EN 14080	2.1	2.7
Modulus of elasticity parallel to the grain of the boards $E_{0,mean}$	EAD, cl. 2.2.1.1	8400	11500
Modulus of elasticity perpendicular to the grain of the boards $E_{90,mean}$	EN 14080	280	300
Shear modulus parallel to the grain of the boards $G_{090,mean}$	EN 14080	520	650
Shear modulus perpendicular to the grain of the boards $G_{9090,mean}$	EAD, cl. 2.2.1.1	50	50
Mechanical actions in the plane of the CLT			
Bending strength $f_{m,k}$	EAD, cl. 2.2.1.1	18.5	24.0
Tensile strength parallel to the grain of the boards $f_{t,0,k}$	EN 14080	13.0	19.2
Compression strength $f_{c,0,k}$	EN 14080	17.0	24.0
Modulus of elasticity parallel to the grain of the boards $E_{0,mean}$	EAD, cl. 2.2.1.1	8400	11500
Shear strength parallel to the grain of the boards $f_{v,090,k}$ calculated with the gross cross section	EAD, cl. 2.2.1.3	1.7	1.7
Shear modulus parallel to the grain of the boards $G_{090,mean}$	EAD, cl. 2.2.1.3	520	720
Creep and duration of load	k_{mod} and k_{def} according to EN 1995-1-1, table 3.1 and 3.2 shall be used		
Dimensional stability	Moisture content during service shall not change to such an extend that adverse deformation will occur.		
In-service stability	The service class 1 and 2 according to EN 1995-1-1		
Bond integrity	EAD, cl. 2.2.1.8	Pass	

Essential characteristic	Assessment method	Class / Level / Desription
BWR 2		
Reaction to fire		
Glue laminated timber products	Commission Decision 2005/610/EC	D-s2, d0
Resistance to fire		
Charring rate	EN 13501-2	No performance assessed
BWR 3		
Content, emission and/or release of dangerous substances		
Formaldehyde	EN 13986+A1 (EN 717-1)	E1 (emission class)
Water vapor permeability - Water vapor transmission		
Vapor permeability	EN ISO 10456	No performance assessed ($\mu = 50$ (dry) / $\mu = 20$ (wet))
BWR 4		
Impact resistance		
Impact resistance - Soft body resistance is assumed to be fulfilled for walls with a minimum of 3 layers and minimum thickness 60 mm.		
BWR 5		
Airborne sound insulation		
Weighted sound reduction index R_w	EN ISO 10140-2	No performance assessed
Impact sound insulation		
Weighted impact sound pressure level $L_{n,w}$	EN ISO 10140-3	No performance assessed
Sound absorption		
Sound absorption	EN ISO 354	No performance assessed
BWR 6		
Thermal conductivity	EN ISO 10456	No performance assessed ($\lambda = 0.13$ W/(m·K)
Air permeability	EN 12114	No performance assessed
Thermal inertia	EN ISO 10456	No performance assessed ($c_p = 1600$ J/(kg·K)

General

Design, calculation and realization can be done according to EN 1995-1-1 taking into account the following provisions. For the calculation according to EN 1995-1-1 national regulations may have to be followed.

Layers covering the surface in addition to the symmetric structure may not be taken into account for the calculation.

The determination of the distribution of stresses and internal forces must consider the influence of shear deformations.

Characteristic strength and stiffness values can be taken from the Annex 3.

Mechanical actions perpendicular to the solid wood slab

1) Bending

Taking into account the slip within the cross layers due to rolling shear and a shear modulus of $G = 50$ N/mm² might be used.

For NOVATOP solid with three layers (two longitudinal layers and one cross layer) fulfilling the conditions in EN 1995-1-1, Annex B.1.2 the stress distribution might be calculated according to EN 1995-1-1, Annex B, as mechanically jointed beams with the following assumption:

$$\frac{s_i}{K_i} = \frac{\overline{d_i}}{G_{9090} \cdot b}$$

(1)

where

d_i	is	thickness of the cross layer i, in mm;
G_{9090}	-	rolling shear modulus of cross layer, $G_{9090} = 50$ N/mm²;
b	-	width of the cross layer, in mm.

For NOVATOP solid with five layers (three longitudinal layers and two cross layer) fulfilling the conditions in EN 1995-1-1, Annex B.1.2 the stress distribution might be calculated according to EN 1995-1-1, Annex B, as mechanically jointed beams with the following assumption:

1) Equation (1);

2) The longitudinal stiffness of the cross layers shall be disregarded.

3) For the determination of the distances a_i the interspaces between the longitudinal layers shall be taken into account.

For the design of the solid wood slabs a bending strength of 24 N/mm² (maximum stress in the outermost fiber) might be assumed. Additionally, the factor k_{sys} according to EN 1995-1-1 might be taken into account depending on the number of parallel boards in the outer layer. The resulting value for 8 and more boards in the outer layer corresponds to a characteristic bending strength value of 28.8 N/mm². Consistently a modulus of elasticity of 11500 N/mm²

for the strength class GL 24h according to EN 14080 might be assumed parallel to the grain of the layers.

2) Tension and compression

Load bearing capacity and stiffness compression might be calculated according to EN 1995-1-1 using the strength class GL 24h according to EN 14080. Tension perpendicular to the solid wood slab shall be avoided.

3) Shear

For the design of the solid wood slabs according to EN 1995-1-1 or according to the shear analogy method a shear strength perpendicular to the grain of the boards (rolling shear strength) of 0.8 N/mm² (maximum shear stress within the cross layers) might be assumed. A shear modulus parallel to the grain of the boards of 650 N/mm² and perpendicular to the grain of the boards (rolling shear) of 50 N/mm² might be assumed.

Mechanical action in plane of the solid wood slab

Stress distribution within the solid wood slab has to be calculated by taking into account only the boards which are oriented in the direction of the actions.

1) Bending

For the design of the solid wood slabs according to EN 1995-1-1 a bending strength of 24 N/mm² (maximum stress in the outermost fiber) might be assumed. Additionally, the factor k_{sys} according to EN 1995-1-1 might be taken into account depending on the number of layers parallel to the span. Consistently a modulus of elasticity of 11500 N/mm² might be assumed.

2) Tension and compression

Load bearing capacity and stiffness for tension and compression can be calculated according to EN 1995-1-1 using the strength class values according to EN 14080. The net cross section is calculated by only taking into account the layers with grain direction parallel to the force.

3) Shear

For the design of the solid wood slabs according to EN 1995-1-1 a shear strength of 1.70 N/mm² (shear stress based on the gross cross section) and a shear modulus of 720 N/mm² might be assumed.

EAD 130005-00-0304, European Assessment Document for Solid wood slab element to be used as a structural element in buildings, edition March 2015

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

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

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

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

EN 301 Adhesives, phenolic and aminoplastic, for load-bearing timber structures - Classification and performance requirements

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 408+A1 Timber structures - Structural timber and glued laminated timber - Determination of some physical and mechanical properties

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

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 (ISO 10456:2007)

Commission Decision 2005/610/EEC of 9 August 2005 establishing the classes of reaction-to-fire performance for certain construction products

Report No. 076147 regarding testing the Cross Laminated Timber from 26 March 2008, University of Karlsruhe, Germany

H.J. Blaß: Expert Report No. 563 from 29 June 2009, Karlsruhe, Germany

H.J. Blaß: Expert Report No. 982 from 2 August 2012, Karlsruhe, Germany

Report No. 2376/2010-RH regarding testing the Cross Laminated Timber from 29 June 2011, Holzforschung, Austria

Test Report No. B956/2008 from 17 March 2008 regarding the determination of formaldehyde release, Fraunhofer Institute for Wood Research Wilhelm-Klauditz-Institut WKI, Germany

Test Report No. B957/2008 from 17 March 2008 regarding the determination of formaldehyde release, Fraunhofer Institute for Wood Research Wilhelm-Klauditz-Institut WKI, Germany

European Technical Approval ETA-12/0079 valid from 23.11.2012 and issued by Technický a zkušební ústav stavební Praha, s.p.