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FIRE PROTECTION WITH CLTPLUS? IT WORKS.

For users in the timber construction, architecture and engineering sectors



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01 **CLTPLUS IS A SAFE** CONSTRUCTION MATERIAL

Wooden buildings are still not given enough credit in terms of fire resistance. Ensuring stability in the event of a fire is not just a question of material, but also of quality planning and execution. The moisture content of CLTPLUS of around 12% means that water must first evaporate before the

wood begins to burn. This results in a charred surface, but not a loss of static properties. CLTPLUS is a stable and safe building material with predictable fire behaviour tested for fire resistance by Holzforschung Austria and TU Munich.

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INFO

- CLTPLUS can achieve fire resistance of over 90 minutes if properly dimensioned.
- By forming a pyrolysis layer, the wood protects itself in the event of a fire.
- The fire resistance of CLTPLUS solid wood elements has been verified using static calculation based on the European Technical Assessment ETA-20/0843 and the provisions of EN 1995-1-2.



PROPERTIES

Fire behaviour: D-s2, d0

Ceilings:

- _ B0 = 0.65 mm/min initial burn, without fire protection cladding
- $B1a = 2 \cdot B0 = 1.30$ mm/min for the first 25 mm when exceeding _ an adhesive joint
- B1b = 0.65 mm/min for the additional thickness of a layer -

Walls

- _ B0 = 0.65 mm/min initial burn, without fire protection cladding
- β 1 = 0.86 mm/min for the first 25 mm when exceeding an adhesive joint and for additional thickness of an inner layer

Source: https://www.bemessung.at/article/20



Scan the QR code or click here for the declaration of performance and ETA



SAFE BUILDING MATERIAL / IDEA CONSTRUCTION

FAQ



IS CLTPLUS FLAMMABLE?

THEURL's CLTPLUS elements are classified as D-s2, d0 and therefore as normally combustible with limited smoke development and are non-drip. The flash point of wooden components is 270 to 300 °C.

FAQ



WHAT HAPPENS TO CLTPLUS IF IT IS EXPOSED TO FIRE?

If CLTPLUS is exposed to fire, the stored water molecules begin to evaporate at around 100 °C. At temperatures of 200 to 300 °C, the long-chain molecules in the cell walls are broken down and come to the surface of the wood in gas form, where they react with the oxygen contained in the air and burn.

02 FIRE BEHAVIOUR OF CLTPLUS

THEURL subjects all CLTPLUS elements to a fire test to prove their fire resistance. THEURL'S CLTPLUS elements are classified as D-s2, d0 according to EN 13501-1. The fire class corresponds, among other things,

to fire protection panels or fire protection glass and is characterised by limited flame spread, low smoke development and no formation of flammable droplets.

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FIRE BEHAVIOUR
D = Normally combustible

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SMOKE DEVELOPMENT

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s2 = Limited smoke development





FAQ



IS THE FIRE BEHAVIOUR OF CLTPLUS PREDICTABLE?

Yes, the fire behaviour of wood as a material can be calculated precisely. Wood smokes only slightly and remains non-drip during burning. The load-bearing function of the wooden components remains intact for a very long time, even in the event of a fire.



03 FIRE RESISTANCE OF UNCLADDED CONSTRUCTION ELEMENTS

When planning and building with bare CLTPLUS elements it is possible to achieve highly effective fire protection by increasing the thickness of the CLTPLUS solid wood panel to optimise the fire protection properties of the building material. Thanks to the complete lateral bonding of all layers, an airtight and smoke-tight seal is achieved from a panel thickness of 60 mm. The characteristic performance properties and the fire resistance period are defined according to the classification standard EN 13501-2:

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PERFORMANCE CRITERION R

The performance criterion R indicates that the load-bearing function of a component is maintained under mechanical influence during the required period of fire exposure.



PERFORMANCE CRITERION E

Performance criterion E describes the ability of a room-dividing component to prevent the passage of flames or hot gases to the side facing away from the fire.

PERFORMANCE CRITERION I Performance criterion I defines a limit of the

temperature increase to a specific level on the side facing away from the fire.



Carrying capacity R



Room closure E



Thermal insulation I

EXAMPLE OF TYPICAL CLASSIFICATIONS

Designation	Requirement	Component example
R 30, R 60, R 90	Load-bearing components	Columns, walls, beams, ceilings
EI 30, EI 60, EI 90	Space-enclosing thermally insulating components	Non-load-bearing partition components, shaft walls, partitions, suspended ceilings
REI 30, REI 60, REI 90	Load-bearing and room-enclosing thermally insulating components	Load-bearing separating components



WHAT ARE THE DIFFERENCES BETWEEN BUILDINGS CLASS 1 – 6, AND HOW DOES FIRE PROTECTION WORK IN A HIGH-RISE BUILDING?

The higher the building class, the higher the fire protection requirements for the building. The five building classes result from the type of building, its height, area and number of usage units.

Building class 1 (detached buildings), building class 2 (non-detached buildings/terraced houses), building class 3 (other buildings), building class 4 (buildings higher than class 4)

FAQ



04 FIRE RESISTANCE OF CLADDED CONSTRUCTION ELEMENTS

In order to further optimise the fire resistance of unclad CLTPLUS elements, special fire protection cladding such as planking, coverings or casings are available. Then the wooden components can be described as being "encapsulated" with non-combustible building materials. This allows load-bearing and reinforcing walls, ceilings and supports made of wood even though they are flammable - to retain highly fire-retardant properties.

ROSS-LAMINATED TIMBER ELEMENTS, WALL CONSTRUCTIONS												
		Alternative			side	Installation level insulated						
Application examples from the manufacturer Knauf	Construction	Fire resistance class	Class F, Class FI	Diamond	Vidiwall	Covering thickness in mm on the in of the wall (= fire-side)	Glass wool according to ÖNORM EN 13162 insulation layer in the compartment, minimum thickness in mm / minimum raw density in kg/m ³	Cellulose density ≥ 50 kg/m³ 🛱 ଋ	Hemp blication and kg/m³ Hemp	Sheep wool g m ³ [−] g m ³ [−] g m ³ [−] g m ³ [−] g m ³ g m ³ [−] g m ³	Cross-laminated timber 4-layer minimum thickness in mm	Max. load in kN/m
FIRE-SIDE	W511.at	REI 60	•	•	•	12.5	-	-	-	-	78	35
FIRE-SIDE	W512.at	REI 90	•	•	•	2x12.5	-	-	-	-	97	35
FIRE-SIDE	W521.at	REI 90	•	•	•	12.5	40/11	٠	•	•	97	35

• Max. wall height: 3000 mm

Additional façade construction layers on the side facing away from fire have no influence on fire resistance.

CROSS-LAMINATED TIMBER ELEMENTS, CEILING CONSTRUCTIONS

			Alternative application of						Installation level insulated			
Application examples from the manufacturer Knauf	Construction	Fire resistance class	Class F, Class Fl	Diamond	Vidiwall	Covering thickness in mm on the inside of the wall (= fire-side)	Cross-laminated timber element 5-layer, thickness in mm	Max. load in kN/m²	Glass wool according to ÖNORM EN 13162 insulation layer in the compartment, minimum thickness in mm / minimum raw density in kg/m ³	Cellulose density ≥ 50 kg/m³	Hemp density ≥ 30 kg/m³	Sheep wool density ≥ 16 kg/m ³
FIRE-SIDE	D150.at	REI 90	•	•	•	12.5	150	7	_	-	-	-
	D150.at	REI 90	•	•	•	12.5	150	6	40/11	•	•	•

• Max. span: 5000 mm

At least the same fire resistance when using additional floor or ceiling structures.

FIRE PROTECTION WITH CLTPLUS? IT WORKS.



05 THE BURN RATE

The burn rate defines the layer thickness per minute with which the wood on the fire-side of a CLT component burns in the event of a fire. This rate is measured in mm per minute and depends on various factors, the type of wood, the moisture of the wood and the fire protection measures. For THEURL's CLTPLUS elements, the fire test at IBS Linz demonstrated that during fire simulation using flames, according to the standard fire curve at a temperature of over 900 °C, the top only becomes lukewarm after 90 minutes and remains smoke-tight. The test was carried out on a 120 mm thick 5-layer CLTPLUS panel.



Scan the QR code or click <u>here</u> for the test report



EXAMPLE WALL ELEMENT

Example burn rate wall element CLTPLUS 100 L5s The calculated burn rate is 0.86 mm/min from the second layer affected by the fire.

EXAMPLE CEILING ELEMENT

Example burn rate ceiling element CLTPLUS 180 L5s The calculated burning rate is 1.3 mm/min. A thickness of 25 mm can be expected for each additional layer affected by the fire until the coal layer forms again.





06 CATALOGUE OF TESTED AND APPROVED COMPONENTS

dataholz.eu

The online catalogue includes approved wood materials and component structures that have been tested in terms of building physics and ecology. The characteristic values can be used as a basis for providing evidence to building authorities. An overview of some frequently used components:



Scan the QR code or click here and learn about all the structures on dataholz.eu.

OUTSIDE WALL WITH CROSS-LAMINATED TIMBER



Exterior wall solid wood construction, rear-ventilation/ventilation, with installation level, formwork

AWMHHI01A

(REI brand inside 90, outside 60)





Exterior wall solid wood construction, no rear-ventilation, with installation level, plastered

AWMOPI03A (REI brand inside 90, outside 90)





Exterior wall solid wood construction, rear-ventilation/ventilation, with installation level, formwork

AWMHHI02A (REI brand inside 90, outside 60)





Exterior wall solid wood construction, no rear-ventilation, with installation level, plastered

AWMOPI05A (REI brand inside 90, outside 60)









Exterior wall solid wood construction, rear-ventilation/ventilation, without installation level, formwork

AWMOH003A

(REI brand inside 60, outside 60)





Exterior wall solid wood construction, no rear-ventilation, without installation level, plastered

AWM0P001A (REI brand inside 90, outside 60)





Exterior wall solid wood construction, no rear-ventilation, with installation level, plastered

AWMOPI01A (REI brand inside 90, outside 90)





Exterior wall solid wood construction, no rear-ventilation, without installation level, plastered

AWM0P004A (REI brand inside 30, outside 60)





INSIDE WALL WITH CROSS-LAMINATED TIMBER





Interior wall solid wood construction, with installation level, other surface

IWMXXI03A (Fire REI 60)



Interior wall solid wood construction, without installation level, other surface

> IWMXX001B (Fire REI 90)



Partition wall solid wood construction, without installation

level, single-shell, other surface

PARTITION WALL WITH

CROSS-LAMINATED TIMBER

TWMXX004A (Fire REI 90)





Partition wall solid wood construction, without installation level, double-shell, other surface

TWMXX006A-01 (Fire REI 90)



CEILING WITH CROSS-LAMINATED TIMBER

			1	T	1	1
	-	-	-	-	1	-
2000	v Ø		2000	ŴŴ	ХW	ŴŴ

Ceiling solid wood construction, with suspension, wet, with fill

GDMNXA01A (Fire REI 60)





Ceiling solid wood construction, direct, wet, with fill

GDMNXN01A

(Fire REI 60)





Ceiling solid wood construction, without, wet, with fill

GDMNXN02 (Fire REI 60)



Ceiling solid wood construction, without, dry, with fill

GDMTXN01

(Fire REI 60)



07 FIRE PROTECTION FOR SPECIAL CLTPLUS SOLUTIONS

LARGE COLUMN GRIDS AND FLEXIBLE FLOOR SLABS WITH TS3

The TS3 connection comes into play for large wooden structures and column grids of up to 8 x 8 m. A two-component polyurethane casting resin (adhesive), partly made from renewable raw materials, connects the wooden components at the front, creating panels of any size. The results of a small fire test show that casting resin burns less quickly than wood and therefore withstands the calculated fire duration. From a panel thickness of 200 mm, TS3 connections achieve the REI 60 classification. Test reports can be provided upon request!

Scan the QR code or click <u>here</u> to find out more about TS3

ETA technical assessment



LARGE FIRE TEST IN THE EMPA DÜBENDORF TEST FURNACE

4 panels glued to 5.3 x 2.8 m Surface (20 cm thick) loaded with 3.2 tons Breakage after 69 minutes

i.e. 20 cm BSP ceiling thickness with TS3 meets REI60 fire resistance!



OVERVIEW

Main features	Performance	Harmonised technical specification
Fire behaviour	D-s2, d= (connection same as CLT)	EN 13501-1
Fire behaviour group	RF3	-
Fire resistance	According to the combustion calculation with $d_{0,TS3} = 25 \text{ mm}$	EN 13501-2





X-FIX: CONNECTOR FOR CLTPLUS CEILING ELEMENTS



X-fix is a wood-to-wood component connection that does not require metal. It has a point-like, self-tensioning effect and, thanks to the dovetail shape, joins cross-laminated timber ceilings and walls together with shear and tensile strength. The fire behaviour of X-fix, like CLTPLUS from THEURL, is listed as D-s2, d0 according to the European Technical Assessment ETA-18/0254.

X-fix basics for static design



MOISTURE PROTECTION FOR CLTPLUS CEILING ELEMENTS



In order to ensure the longevity and reliability of CLTPLUS ceiling elements, appropriate moisture protection is required during the construction phase. For this purpose, THEURL applies a specially designed, self-adhesive membrane to the entire surface of the components at the factory in order to ensure effective protection against moisture on the construction site. The fleece with anti-slip coating and full-surface adhesive application is classified as fire class E according to the EN 13501-1 standard. The film can be freely exposed to the weather for 4 weeks.

The SIGA Wetguard 200 SA was tested for airtightness at the IFT in Rosenheim. Confirmation of airtightness ensures that no smoke can flow through component joints between two floors in glued (wooden) ceiling elements (with Wetguard 200 SA). In addition to being airtight, Wetguard 200 SA also performs the function of being smoke-tight up to a surface temperature of +80 °C.

Connections to rising components, such as walls and stairwells, can also be connected to Wetguard 200 SA in a smoke-tight manner using the associated system products Wigluv or Rissan.

Special solution on our website and for moisture protection



日國建設

08 FIRE PROTECTION DETAILED DESIGN OF SOLID WOOD COMPONENTS AND THEIR CONNECTIONS

Important aspects of the detailed fire protection design for CLTPLUS include special fire protection cladding made of fire-resistant materials and intumescent fire barriers that swell in the event of a fire. If the space-enclosing function is completely effective, it can be assumed that the fire resistance of the flat components will be maintained for the required fire resistance period despite the joining of elements or components. When planning wires and cable routes through a component forming a fire compartment, due consideration must be given to the dimensions of professional installation of El insulation.



A + B = COMPONENT JOINTS

Joints resulting from connections to elements (e.g. wall-to-wall, wall-to-ceiling)

C = INSTALLATION JOINTS

Joints and openings resulting from recesses for building services installations

COMPONENT JOINTS

Connections for component joints with shiplap, connection to cover board and butt connection.







CEILING WITH SHIPLAP

Connection with shiplap with a minimum ideal thickness of the remaining wood cross section of 20 mm up to the shiplap. Green line: Compressive tape

CEILING WITH DECK BOARD

Connection with a cover board arranged on both sides with a minimum ideal thickness of the remaining wood cross section of 20 mm up to the cover board. Blue line: airtight sealing

CEILING WITH BUTT CONNECTION Blunt impact on ceilings Blue line: airtight sealing



SOLUTIONS FOR ISOLATION VARIANTS

Officially tested and innovative solutions in cross-laminated timber are possible without complex fire protection cladding in open reveals. Irrespective of whether as a combination bulkhead or individual implementation.

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NO FORMWORK







EXAMPLE

To seal off flammable waste water pipes, a CFS-C EL endless sleeve is installed on the underside of the ceiling. In the event of a fire, the intumescent sleeve foams up and closes the ceiling opening. The CFS-S ACR fire protection sealant is used in the annular gap between the sewage pipe and the CLTPLUS ceiling to ensure a smoke-tight seal.



EXAMPLE

To seal off flammable waste water pipes, a CFS-C EL endless sleeve is installed on both sides of the wall element. In the event of a fire, the intumescent sleeve foams up and closes the ceiling opening. The CFS-S ACR fire protection sealant is used in the annular gap between the sewage pipe and the CLTPLUS wall element to ensure a smoke-tight seal.





Brochure fire protection in timber construction with detailed information

09 WE PROVIDE YOU FIRE-SAFE SOLUTIONS - FROM PRELIMINARY DESIGN AIDS TO WALLNER MILD AND DC-STATIC **DESIGN SOFTWARE**

ARE YOU TRYING TO FIND US IN A STRUCTURAL ANALYSIS SOFTWARE FOR TIMBER CONSTRUCTION?

The most important components can be measured quickly and easily. We also feature as a manufacturer in the wood construction software Wallner Mild and DC-Static.

CLTPLUS PRE-SIZING FOR R30, R60 AND R 90 MADE EASY

The design and execution is carried out in accordance with Eurocode 5 (EN 1995-1-1 and EN 1995-1-2), taking into account the national specifications in ÖNORM B 1995-1-1 and ÖNORM B 1995-1-2 as well as the current version of European Technical Assessment ETA-20/0843.

CROSS-LAMINATED TIMBER DESIGN VOLUME II

As an innovative structural element, cross-laminated timber opens up new possibilities in structural timber construction. This guide is intended to help you properly exploit and implement the possibilities in planning and execution.

Dietrich's WM WALLNER MILD









NOTE ON CONTENT



Edition 12.2023

- Make sure you have the latest edition.
- This publication is aimed at trained specialists. The images included do not constitute work instructions and are not to scale.
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