



CLTPLUS PRELIMINARY DIMENSIONING

CLT_{PLUS}

CROSS LAMINATED TIMBER
BY THEURL

PRELIMINARY DIMENSIONING

Basis: ÖNORM EN 1995-1-1:2015 / B 1995-1-1:2019, ÖNORM EN 1995-1-2:2011 / B 1995-1-2:2011

Preliminary dimensioning of KPZT

These tables serve only for preliminary dimensioning and are not a substitute for static dimensioning.

CALCULATION PARAMETERS

1. MATERIAL DATA

The calculations are based on the material parameters according to ETA-20-0843 of 16.11.2020, Theurl Timber Structures, the following manufacturer-specific values are used.

$$E_{0,\text{mean}} = 11\,600 \text{ MPa} \quad G_{090,\text{mean}} = 690 \text{ MPa (panel plane)}$$

$$f_{c,0,k} = 21 \text{ MPa} \quad f_{m,k} = 24 \text{ MPa} \quad k_{\text{def}} = 0.8$$

2. VERIFICATION

CLTPLUS net weight with $\rho = 550 \text{ kg/m}^3$ assumed and taken into account in the tables

Loads category A ($\Psi_0 = 0.7$, $\Psi_1 = 0.5$, $\Psi_2 = 0.3$), $k_{\text{mod}}=0.8$)

Verification in the limit state of serviceability,

Applied limit values of deflection:

Characteristic design situation $w_{\text{inst}} = l/300$

Quasi-constant design situation $w_{\text{net, fin}} = l/250$
 $w_{\text{fin}} = l/250$

Vibration verification

Requirements for ceiling class 1:

Constructive requirement - 6 cm wet screed floating on the fill

Frequency criterion $f_1 \geq f_{\text{gr}} = 8 \text{ Hz}$ or $f_{1,\text{min}} \geq 4.5 \text{ Hz}$

Stiffness criterion $w_{\text{stat}} \leq w_{\text{gr}} = 0.25 \text{ mm}$

Vibration acceleration $a_{\text{rms}} \leq a_{\text{agr}} = 0.05 \text{ m/s}^2$

Dimensioning with degree of damping $\zeta = 0.04$ (wet coat)

Verification in the limit state of load-bearing capacity:

Verification of bending stresses

Verification of shear stresses

Verification of fire resistance

One-sided burn-off (ceiling and outer wall)

Applied charring rates (according to the standard):

$$\beta_0 = 0.65 \text{ mm/min} \quad \beta_{1a} = 1.30 \text{ mm/min} \quad \beta_{1b} = 0.65 \text{ mm/min}$$

You can also choose us as a manufacturer in WALLNER MILD or Dietrichs.

Information on various construction details can be found at www.dataholz.eu.

TABLE: THEURL CLTPLUS AS A CEILING - SINGLE-SPAN BEAM

Slab thicknesses with maximum spans

Ceiling verification

Residential construction - heavy ceiling structures:

6.5 cm coat; 10 cm grit (200 kg/m²) etc.; Total load: 4.0 kN/m²; Load 3.2 kN/m²

Span [m]							
Vibration	3.7	4	4.5	5.0	5.6	6.2	7.1
DK I	140 L5	160 L5	180 L5	200 L5	220 L7	240 L7	280 L7 · 2

Span [m]							
Vibration	3.9	4.3	4.7	5.5	6.1	6.7	7.5
DK II	140 L5	160 L5	180 L5	200 L7 · 2	220 L7 · 2	240 L7 · 2	280 L7 · 2

Single-family houses - very light ceiling structures

6.5 cm coat; 10 cm light fill (20 kg/m²) construction 2.5 kN/m²; Load 2.8 kN/m²

Span [m]							
Vibration	3.1	3.7	4.3	4.8	5.3	6.1	6.8
DK II	100 L3	120 L3	140 L5	160 L5	180 L5	200 L7 · 2	220 L7 · 2

Roof verification (DK III)

Construction 2.0 kN/m² variable load 2.5 kN/m²;

Span [m]							
SLS	4.5	5.1	5.6	6.5	7.1	7.7	8.3
DK III	140 L5	160 L5	180 L5	200 L7 · 2	220 L7 · 2	240 L7 · 2	260 L7 · 2

Fire

R0

R30

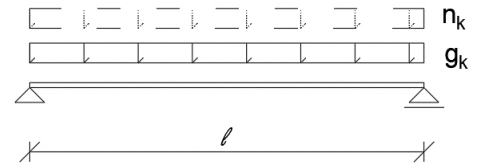
R60

R90

TABLE: THEURL CLTPLUS AS A CEILING - SINGLE-SPAN BEAM

Vibration verification for ceiling class 1 (DKL I.)
with wet coat

Calculation: ETA 20/0843 of 16.11.2020
ÖNORM EN 1995-1-1:2015 / B 1995-1-1:2019
ÖNORM EN 1995-1-2:2011 / B 1995-1-2:2011



Minimum panel thickness for the specified spans

Perma- nent load ¹⁾	Load ²⁾		Span l						
	g_k [kN/ m ²]	n_k [kN/m ²]	3.0 m	3.5 m	4.0 m	4.5 m	5.0 m	6.0 m	7.0 m
1.5	2.0				140 L5				
	2.8								
	3.0		120 L3	140 L5	140 L5	160 L5	180 L5	220 L7	280 L7 · 2
	4.0								
	5.0								
2.0	2.0								
	2.8								
	3.0		120 L3	140 L5	140 L5	160 L5	200 L5	240 L7	280 L7 · 2
	4.0								
	5.0			140 L5					
2.5	2.0								
	2.8								
	3.0		120 L3	140 L5	140 L5	160 L5	200 L5	240 L7	280 L7 · 2
	4.0								
	5.0				160 L5	180 L5			
3.0	2.0								
	2.8								
	3.0		120 L3	140 L5	160 L5	180 L5	200 L5	240 L7	280 L7 · 2
	4.0								
	5.0								
4.0	2.0								
	2.8		120 L3						
	3.0			140 L5	160 L5	180 L5	200 L5	240 L7	280 L7 · 2
	4.0		120 L3						
	5.0					200 L5	220 L7	260 L7 · 2	

¹⁾ The CLTPLUS net weight with $\rho = 550 \text{ kg/m}^3$ is assumed and has already been taken into account in the table

²⁾ Load category A ($\Psi_0 = 0.7$; $\Psi_1 = 0.5$; $\Psi_2 = 0.3$) $k_{mod} = 0.8$

$k_{def} = 0.8$

Verification:

Load-bearing capacity: Bending stress [M]
Shear stress [Q]

Usability:

QS $w_{fin} = l/250$
CH $w_{inst} = l/300$
 $w_{net,fin} = l/250$

Fire

R0

R30

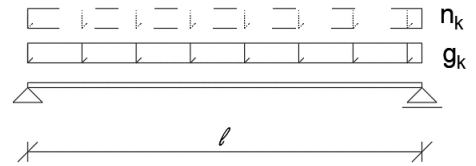
R60

R90

TABLE: THEURL CLTPLUS AS A CEILING - SINGLE-SPAN BEAM

No vibration specifications

Calculation: ETA 20/0843 of 16.11.2020
 ÖNORM EN 1995-1-1:2015 / B 1995-1-1:2019
 ÖNORM EN 1995-1-2:2011 / B 1995-1-2:2011



Minimum panel thickness for the specified spans

Permanent load 1)	Load 2)	Span l						
		3.0 m	3.5 m	4.0 m	4.5 m	5.0 m	6.0 m	7.0 m
g_k [kN/m ²]	n_k [kN/m ²]							
1	1	80 L3	90 L3	100 L3	120 L3	120 L3	160 L5	200 L5
	2	80 L3	100 L3	120 L3	120 L3	140 L5	180 L5	220 L7
	3	90 L3	100 L3	120 L3	140 L5	160 L5	200 L5	240 L7
	4	100 L3	120 L3	140 L5	160 L5	180 L5	220 L7	240 L7
	5	100 L3	120 L3	140 L5	160 L5	180 L5	220 L7	240 L7
2	1	90 L3	100 L3	120 L3	140 L5	140 L5	180 L5	220 L7
	2	90 L3	120 L3	120 L3	140 L5	160 L5	200 L5	220 L7 · 2
	3	100 L3	120 L3	140 L5	160 L5	180 L5	220 L7	240 L7 · 2
	4	100 L3	120 L3	140 L5	160 L5	180 L5	220 L7	240 L7 · 2
	5	120 L3	140 L5	140 L5	160 L5	180 L5	220 L7	240 L7 · 2
3	1	100 L3	120 L3	140 L5	140 L5	160 L5	200 L5	220 L7 · 2
	2	100 L3	120 L3	140 L5	160 L5	180 L5	220 L7	240 L7 · 2
	3	100 L3	120 L3	140 L5	160 L5	180 L5	220 L7	240 L7 · 2
	4	120 L3	140 L5	160 L5	180 L5	200 L5	220 L7 · 2	260 L7 · 2
	5	120 L3	140 L5	160 L5	180 L5	200 L5	220 L7 · 2	260 L7 · 2
4	1	100 L3	120 L3	140 L5	160 L5	180 L5	220 L7	240 L7 · 2
	2	100 L3	120 L3	140 L5	160 L5	180 L5	220 L7	240 L7 · 2
	3	120 L3	140 L5	160 L5	180 L5	200 L5	220 L7 · 2	260 L7 · 2
	4	120 L3	140 L5	160 L5	180 L5	200 L5	220 L7 · 2	260 L7 · 2
	5	120 L3	140 L5	160 L5	180 L5	220 L7	240 L7 · 2	280 L7 · 2

¹⁾ The CLTPLUS net weight with $\rho = 550 \text{ kg/m}^3$ is assumed and has already been taken into account in the table

²⁾ Load category A ($\Psi_0 = 0.7; \Psi_1 = 0.5, \Psi_2 = 0.3$) $k_{mod} = 0.8$

$k_{def} = 0.8$

Verification:

Load-bearing capacity: Bending stress [M]

Shear stress [Q]

Usability:

QS $w_{fin} = l/250$

CH $w_{inst} = l/300$

$w_{net,fin} = l/250$

Fire

R0

R30

R60

R90

TABLE: THEURL CLTPLUS AS EXTERIOR WALL

Calculation: ETA 20/0843 of 16.11.2020
 ÖNORM EN 1995-1-1:2015 / B 1995-1-1:2019
 ÖNORM EN 1995-1-2:2011 / B 1995-1-2:2011

Wind pressure: $w_k = 1.0 \text{ kN/m}^2$

¹⁾ The CLTPLUS net weight with $\rho = 550 \text{ kg/m}^3$ is assumed and has already been taken into account in the table

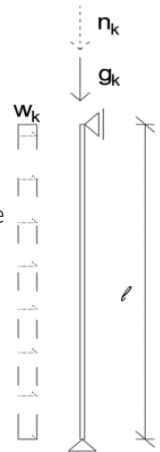
²⁾ Load category A $k_{mod} = 0.8$

Verification:

Load-bearing capacity: Verification as a buckling bar (pressure according to the substitute bar method)

Fire: Unilateral fire attack

Minimum panel thicknesses for various buckling lengths and fire resistance (R0 to R90)



Perma- nent load ¹⁾	Load ²⁾	Buckling length l							
		2.75 m				2.95 m			
g_k [kN/ m ²]	n_k [kN/m ²]	R0	R30	R60	R90	R0	R30	R60	R90
10	10			90 C3				90 C3	
	20					60 C3			
	30	60 C3	80 C3	120 C3	120 C3	60 C3	80 C3	120 C3	120 C3
	40					80 C3			
	50								
20	20	60 C3		120 C3	120 C3	60 C3	80 C3	120 C3	120 C3
	40		80 C3						
	60					80 C3	90 C3	140 C5	160 C5
	80	80 C3	90 C3	140 C5	160 C5		100 C3		
	100		100 C3						
40	20	60 C3	80 C3				90 C3		
	40		90 C3			80 C3	100 C3	140 C5	160 C5
	60	80 C3	100 C3	140 C5	160 C5				
	80					90 C3	120 C3		
	100		120 C3						
60	20		100 C3				100 C3		
	40					80 C3			
	60	80 C3		140 C5	160 C5		120 C3	140 C5	160 C5
	80		120 C3			90 C3			
	100	90 C3							
80	20					80 C3			
	40	80 C3							
	60		120 C3	140 C5	160 C5		120 C3	140 C5	160 C5
	80					90 C3			
	100	90 C3							
100	20					80 C3			
	40	80 C3							
	60		120 C3	140 C5	160 C5	90 C3	120 C3	140 C5	160 C5
	80	90 C3							
	100					100 C3			

