

PRE-STRUCTURAL DESIGN TABLES

INFORMATION:

The following pre-structural design tables for the cross-laminated timber product XWORKS from Holzwerke van Roje were created based on the theory of flexible bonded bending beams (γ method).

The most important assumptions are as follows:

- Usage class 1
- Permanent load g_k without cross-laminated timber; this has already been taken into account in the calculation
- Load capacity: cat. A (residential) and B (offices) with $\psi_0 = 0.7$ [-], $\psi_1 = 0.5$ [-] and $\psi_2 = 0.3$ [-]
- Fire rating according to DIN EN 1995-1-2/NA and a burn rate of $\beta_0 = 0.65$ mm/min
- Verification of vibration according to Hamm/Richter with
 - Lehr's damping ratio of 4 %
 - $b = 1.2 \cdot l$
 - cement screed with 6.0 cm and an E_{module} of 25,000 N/mm²
 - structural requirements must be considered
- Deflection analysis with k_{def} of 0.8 [-] and the following limits
 - $w_{\text{inst}} = l/300$
 - $w_{\text{net,fin}} = l/300$
 - $w_{\text{fin}} = l/200$
- The pre-structural design table does not replace a static calculation

PRE-STRUCTURAL DESIGN TABLE

SINGLE-SPAN BEAMS

CEILING CLASS 1

Permanent load (kN/m ²)	Load capacity (kN/m ²)	Span widths – single-span beams with ceiling class 1								
		3,0 m	3,5 m	4,0 m	4,5 m	5,0 m	5,5 m	6,0 m	6,5 m	7,0 m
2,0	2,0	120-3S	140-5S	140-5S	160-5S	200-5S	220-7S	240-7S	260-7S	280-7S*
	3,0	120-3S	140-5S	140-5S	160-5S	200-5S	220-7S	240-7S	260-7S	280-7S*
	5,0	120-3S	140-5S	140-5S	160-5S	200-5S	220-7S	240-7S	260-7S	280-7S*
2,5	2,0	120-3S	140-5S	140-5S	180-5S	200-5S	220-7S	240-7S	260-7S	280-7.2S*
	3,0	120-3S	140-5S	140-5S	180-5S	200-5S	220-7S	240-7S	260-7S	280-7.2S*
	5,0	120-3S	140-5S	140-5S	180-5S	200-5S	220-7S	240-7S	260-7S	280-7.2S*
3,0	2,0	120-3S	140-5S	160-5S	180-5S	200-5S	220-7S	240-7S	260-7S	280-7.2S*
	3,0	120-3S	140-5S	160-5S	180-5S	200-5S	220-7S	240-7S	260-7S	280-7.2S*
	5,0	120-3S	140-5S	160-5S	180-5S	200-5S	220-7S	240-7S	280-7.2S*	280-7.2S*

*Cover layers with two layers positioned longitudinally

CEILING CLASS 2

Permanent load (kN/m ²)	Load capacity (kN/m ²)	Span widths – single-span beams with ceiling class 2								
		3,0 m	3,5 m	4,0 m	4,5 m	5,0 m	5,5 m	6,0 m	6,5 m	7,0 m
2,0	2,0	90-3S	120-3S	140-5S	140-5S	160-5S	180-5S	220-7S	240-7S	240-7S
	3,0	100-3S	120-3S	140-5S	160-5S	180-5S	200-5S	220-7S	240-7S	260-7.2S*
	5,0	100-3S	120-3S	140-5S	160-5S	180-5S	200-5S	220-7S	240-7S	260-7.2S*
2,5	2,0	100-3S	120-3S	140-5S	160-5S	180-5S	200-5S	220-7S	240-7S	260-7.2S*
	3,0	100-3S	120-3S	140-5S	160-5S	180-5S	200-5S	220-7S	240-7S	260-7.2S*
	5,0	120-3S	140-5S	140-5S	160-5S	200-5S	220-7S	240-7S	260-7S	260-7.2S*
3,0	2,0	100-3S	120-3S	140-5S	160-5S	180-5S	200-5S	220-7S	240-7S	260-7.2S*
	3,0	100-3S	140-5S	140-5S	160-5S	200-5S	220-7S	220-7S	260-7.2S*	280-7.2S*
	5,0	120-3S	140-5S	160-5S	180-5S	200-5S	220-7S	240-7S	260-7.2S*	280-7.2S*

*Cover layers with two layers positioned longitudinally

Fire safety
requirement:

R90

R60

$\beta_0 = 0,65 \text{ mm/min}$

$k_{\text{def}} = 0,8$

PRE-STRUCTURAL DESIGN TABLE

DOUBLE-SPAN BEAMS

CEILING CLASS 1

Permanent load (kN/m ²)	Load capacity (kN/m ²)	Span widths – double-span beams with ceiling class 1								
		3,0 m	3,5 m	4,0 m	4,5 m	5,0 m	5,5 m	6,0 m	6,5 m	7,0 m
2,0	2,0	100-3S	120-3S	140-5S	160-5S	160-5S	180-5S	200-5S	200-5S	220-7S
	3,0	100-3S	120-3S	140-5S	160-5S	160-5S	180-5S	200-5S	200-5S	220-7S
	5,0	100-3S	120-3S	140-5S	160-5S	160-5S	180-5S	200-5S	200-5S	220-7S
2,5	2,0	100-3S	120-3S	140-5S	160-5S	160-5S	180-5S	200-5S	200-5S	220-7S
	3,0	100-3S	120-3S	140-5S	160-5S	160-5S	180-5S	200-5S	200-5S	220-7S
	5,0	100-3S	120-3S	140-5S	160-5S	160-5S	180-5S	200-5S	220-7S	220-7S
3,0	2,0	100-3S	120-3S	140-5S	160-5S	180-5S	180-5S	200-5S	200-5S	220-7S
	3,0	100-3S	120-3S	140-5S	160-5S	180-5S	180-5S	200-5S	200-5S	220-7S
	5,0	100-3S	120-3S	140-5S	160-5S	180-5S	180-5S	200-5S	220-7S	220-7S

CEILING CLASS 2

Permanent load (kN/m ²)	Load capacity (kN/m ²)	Span widths – double-span beams with ceiling class 2								
		3,0 m	3,5 m	4,0 m	4,5 m	5,0 m	5,5 m	6,0 m	6,5 m	7,0 m
2,0	2,0	90-3S	90-3S	100-3S	120-3S	140-5S	140-5S	180-5S	180-5S	200-5S
	3,0	90-3S	100-3S	100-3S	120-3S	140-5S	140-5S	180-5S	180-5S	200-5S
	5,0	90-3S	100-3S	120-3S	140-5S	160-5S	160-5S	180-5S	200-5S	220-7S
2,5	2,0	90-3S	100-3S	120-3S	120-3S	140-5S	140-5S	180-5S	200-5S	220-7S
	3,0	90-3S	100-3S	120-3S	120-3S	140-5S	160-5S	180-5S	200-5S	220-7S
	5,0	100-3S	100-3S	120-3S	140-5S	160-5S	180-5S	200-5S	220-7S	220-7S
3,0	2,0	90-3S	100-3S	120-3S	120-3S	140-5S	160-5S	180-5S	200-5S	220-7S
	3,0	90-3S	100-3S	120-3S	120-3S	140-5S	160-5S	180-5S	200-5S	220-7S
	5,0	100-3S	100-3S	120-3S	140-5S	160-5S	180-5S	200-5S	220-7S	220-7S

Fire safety requirement:

R90

R60

R30

$\beta_0 = 0,65 \text{ mm/min}$

$k_{\text{def}} = 0,8$

Fire safety
 requirement

R90

R60

R30

 $\beta_0 = 0.65 \text{ mm/min}$
 $k_{\text{def}} = 0.8$

 Load capacity
 for cat. A and B

 $\psi_0 = 0.7; \psi_1 = 0.5; \psi_2 = 0.3$
 (according to DIN EN 1990/NA)

CEILING CLASS 1

Ceilings between different usage units.

Apartment-separating ceilings in apartment buildings.

Ceilings in offices with PC usage or meeting rooms.

CEILING CLASS 2

Ceilings within a single usage unit.

Ceilings in normal single-family houses.

 Verification of vibration with $\zeta = 4 \%$, $b = 1.2^* \text{ l}$

XWORKS description	Panel structure in mm							Strength class
	30	30	30	-	-	-	-	
90-3S	30	30	30	-	-	-	-	C24
100-3S	40	20	40	-	-	-	-	C24
120-3S	40	40	40	-	-	-	-	C24
140-5S	40	20	20	20	40	-	-	C24
160-5S	40	20	40	20	40	-	-	C24
180-5S	40	30	40	30	40	-	-	C24
200-5S	40	40	40	40	40	-	-	C24
220-7S	40	20	40	20	40	20	40	C24
240-7S	40	20	40	40	40	20	40	C24
260-7.2S*	40	40	30	40	30	40	40	C24
280-7.2S*	40	40	40	40	40	40	40	C24

The layer structure in the outer layer may differ between visuals in industrial (ISI) and residential quality (WSI).

*Cover layers with two layers positioned longitudinally