1. input data

1.1. general settings

vibration analysis in accordance with the design and dimensioning rules from the research project Winter/Hamm/Richter: "Schwingungs- und Dämpfungsverhalten von Holz- und Holz-Beton-Verbunddecken" TU München 2010
ceiling between different utilisation units ⇒ **f_{grenz} = 8 Hz, w_{grenz} = 0.5 mm, a_{grenz} = 0.70 m/s²**
modal damping ratio ξ = 0.01
continuous effect is not taken into account in the stiffness criterion
calculation using approximation formulas acc. to DIN EN 1995-1-1, 7.3.3

1.2. dimensions

ceiling width b = 3.500 m, 3 span(s), all outer edges are hinged

span	l m
1	4.600
2	3.450
3	4.500

continuous effect is not taken into account in the stiffness criterion
all intermediate support axles are rigidly mounted

1.3. permanent action effects

Nr.	action eff	g kN/m²
1	permanent loads	0.838
Σ		0.838

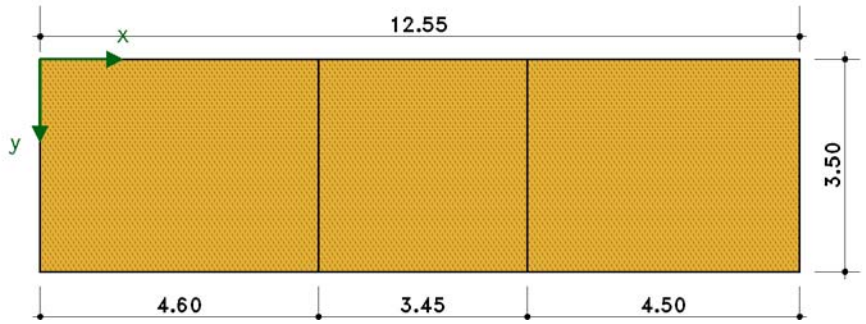
1.4. screed

60 mm cement screed, E = 25000 N/mm², g = 1.320 kN/m², I_{screed} = 18000000 mm⁴/m
⇒ EI_{screed} = 450.000000 Mm²/m
with consideration of rigidity in the transverse direction as well

1.5. cross laminated timber ceiling panel

Merkle X-Lam 180/5s, structure **40.0**-30.0-**40.0**-30.0-**40.0** solid coniferous timber C24
top layers in x-direction, d = 180.0 mm
without consideration of shear deformations in x-direction
without consideration of shear deformations in y-direction
lateral contraction number ν = 0.00, drill stiffness = 50.0
plate is clamped with 2- axis

1.6. plan view scale 1:125



2. results

2.1. natural frequency

Attention! All stiffnesses are user-defined!
$EI_{lengthwise}$ = 3.038000 MNm²/m, EI_{cross} = 0.871000 MNm²/m
k_f = 1.175, b_{ef} = 3.060, α = 1.040 ⇒ f(α) = 1.362, m = 220.0 kG/m²
f_e = 13.966 Hz ≥ f_e = 8 Hz ⇒ **criterion fulfilled!**

2.2. stiffness criterion

b_{ef} = 3.060 m
w(2kN) = 0.23 mm ≤ w_{grenz} = 0.5 mm ⇒ **criterion fulfilled!**

2.3. constructive requirements

floating storage of the screed is absolutely necessary!
acc. to [Winter/Hamm/Richter], TU München 2010 gilt:
Due to their higher mass and greater rigidity, wet screeds are better
than dry screeds in terms of the vibration behaviour of the ceilings.
A (preferably heavy) fill improves the vibration behaviour.
The heavier the fill, the greater the improvement in the subjective assessment.
Heavy fills are fills with a surface weight of at least 60 kg/m².

verification fulfilled!