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Joona Siira / MiTek Finland Oy	Posi-Joist floor vibration design (EC 5 + NAD FI)		

FLOOR DETAILS AND LOADING

Floor own weight without slab	g_k =	**1,05**	kN/m^2
Imposed load	qk =	**2**	kN/m^2
Imposed load long term part	Ψ_2 =	**30 %**	
Posi-joist span	L =	**4339**	mm
Above room, max side length perpendicular to joists	B =	**5,2**	m
Above room, max side length	A =	**5,2**	m

POSI-JOISTS

Joist height	PS12N (306 mm)		
Joist width	98 mm		
Chord thickness	48 mm		
Chord grade	C24		
Deflection from 1 kN point load	w =	**1,79**	mm
Spacing	s =	**600**	mm

POINT LOAD DIVIDING STRUCTURES

Screed / concrete slab	No slab
Floor sheet	Chipboard P6 t=22 mm
Strongbacks	1 x C24 48x198
Ceiling battens	Disregarded

FLOOR SHEET FIXING

Fixing dowels	Cor. nail 2,5x50		
Dowel spacing	c =	**150**	mm

COMPOSITELY OPERATING FLOOR SHEETS

Operation	Glued connection
Glueing method	On-site glueing

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MATERIALS AND CROSS SECTION

$E_{mean,beam}$	6003,65669	N/mm^2	*Posi-Joist-beam bending E*
$E_{c,mean}$	2100	N/mm^2	*Sheet compression E in direction of the beams*
$E_{0,mean}$	3500	N/mm^2	*Sheet bending E in direction of the beams*
$E_{90,mean}$	3500	N/mm^2	*Sheet bending E in direction perpendicular to the beams*
H_{beam}	306	mm	*Posi-Joist height*
b_{chord}	98	mm	*Posi-Joist width*
h_{chord}	48	mm	*Posi-Joist chord height*
$I_{y,beam}$	158364864	mm^4	*Posi-Joist moment of Inertia*
A_{beam}	9408	mm^2	*Posi-Joist area of cross section*
b_{ef}	600	mm	*The effective width of floor board*
A_{board}	13200	mm^2	*The effective cross section of floor board in compound structure*
$I_{y,board}$	532400	mm^4	*The board moment of inertia in compound structure*

NEUTRAL AXIS

K_{ser}	0,00	N/mm	*Dowel slip modulus*
γ_{board}	1,00		*Auxiliary factor for board (compound structure)*
γ_{beam}	1,00		*Auxiliary factor for Posi-Joist beam (compound structure)*
a_1	110,01	mm	*Distance from neutral axis to board center of gravity*
a_2	53,99	mm	*Distance from neutral axis to Posi-Joist center of gravity*

FLOOR STIFFNESS IN DIRECTION OF THE BEAMS

$(EI)_{floor}$	2002928856	Nmm^2/mm	*Posi-Joist floor bending stiffness*
I_{slab}	0	mm^4	*Floor slab moment of Inertia*
E_{slab}	0	N/mm^2	*Floor slab E modulus*
$(EI)_{slab}$	0	Nmm^2/mm	*Floor slab bending stiffness*
$\Sigma(EI)_L$	**2002928856**	**Nmm^2/mm**	***Total bending stiffness (floor, slab)***

FLOOR STIFFNESS IN DIRECTION PERPENDICULAR TO THE BEAMS

I_{slab}	0	mm^4	*Floor slab moment of Inertia*
E_{slab}	0	N/mm^2	*Floor slab E modulus*
$(EI)_{slab}$	0	Nmm^2/mm	*Floor slab bending stiffness*
I_{board}	887333,333	mm^4	*Floor board moment of Inertia*
E_{board}	3500	N/mm^2	*Floor board E modulus*
$(EI)_{board}$	3105666,67	Nmm^2/mm	*Floor board bending stiffness*
$I_{strongback}$	31049568	mm^4	*Single strongback moment of inertia*
$E_{strongback}$	11000	N/mm^2	*Single strongback E modulus*
$(EI)_{strongbacks}$	78715198,9	Nmm^2/mm	*Strongbacks' bending stiffness (all strongbacks)*
$I_{ceiling}$	0	mm^4	*Ceiling battens' moment of inertia*
$E_{ceiling}$	0	N/mm^2	*Ceiling battens' E modulus*
$(EI)_{ceiling}$	0	Nmm^2/mm	*Ceiling battens' bending stiffness*
$\Sigma(EI)_B$	**81820865,6**	**Nmm^2/mm**	***Total bending stiffless (floor slab, floor board, strongbacks, ceiling battens)***

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FLOOR DEFLECTION OF 1 kN POINT LOAD

k_L	1,10		*Deflection criteria modifying factor*
$\delta_{sallittu}$	0,5	mm	*Allowed deflection of 1 kN point load*
k_δ	0,45		*Auxiliary factor for stiffness*
δ_{laatta}	0,50	mm	*Deflection of 1 kN point load*
δ_{palkki}	1,79	mm	*Unrestrained deflection of 1 kN:n point load*

FLOOR FREQUENCY

m_1	107,03	kg/m^2	*Floor dead load*
m_2	61,16	kg/m^2	*Long term service load*
$\Sigma(EI)_L$	2002928,86	Nm^2/m	*Bending stiffness in direction of beams*
f_1	9,10	Hz	*Floor characteristic frequency*

DESIGN RESULTS

Point load deflection (F=1 kN)	0,5 mm	**OK!**
Floor characteristic frequency	9 Hz	**OK! High frequency floor**

NOTES

Floor type:	T&G chipboard
Floor board fixing:	Cor. nail 2,5x50
Dowel spacing:	150 mm
Compound structure:	Floor board and beams are considered as compound structure
Liittorakenteen liitostapa:	On-site glueing
Glue type:	1-component polyurethan glue

- Chip board installation: Longer edge perpendicular to joists
- Glueing the boards to joists and glueing the T&G edges together with PU glue is recommended, even if glueing had not been utilized in "compositely operating floor sheets". (Squeking prevention)
- No gaps allowed for floorboard seams as compound floor is utilized

The floor board local deflection between the joists of 1 kN point load shall not exceed 0.5 mm