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Designated according to Article 29 of Regulation (EU) No 305/2011

Member of EOTA
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European Technical Assessment

ETA 02/0026
of 16/03/2021

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011:	**Eurofins Expert Services OY**
Trade name of the construction product	**Finnjoist I-joist, FJI**
Product family to which the construction product belongs	Composite wood-based beams and columns
Manufacturer	**Metsäliitto Cooperative** **Metsä Wood UK Ltd** Old Golf Course, Fishtoft Road Boston, PE21 0BJ United Kingdom www.metsawood.com
Manufacturing plant	UK Kings Lynn Cross Bank Road Kings Lynn, Norfolk PE30 2HD
This European Technical Assessment contains	17 pages including 3 Annexes which form an integral part of this assessment.
This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of	EAD 130367-00-0304
This ETA replaces	ETA 02/0026 issued on 30/06/2018

II Specific Part

1 Technical description of the product

Finnjoist I-joists are wood-based composite joists and columns the cross section of which is I shaped. The flanges are made of LVL and the web of OSB and they are glued together. The materials, dimensions and tolerances are given in Annex 1. The standard cross sections are given in Annex 2.

2 Specification of the intended uses in accordance with the applicable European Assessment Document, EAD

2.1 Intended uses

Finnjoist I-joists and studs are intended to be used as structural elements for load-bearing applications in buildings and civil engineering structures, for example: construction members or frame elements for walls, roofs, floors.

The products are intended to be used in service class 1 and 2 according to EN 1995-1-1. The product may be exposed to the weather for a short time during installation.

The product is only intended to be used subject to static or quasi-static actions. In seismic areas the behaviour factor of composite wood-based beams and columns used for the design is limited to non-dissipative or low-dissipative structures (q ≤1,5), defined according to Eurocode 8 (EN 1998-1:2004 clauses 1.5.2 and 8.1.3 b).

Instructions for use are given in Annex 3

2.2 Working life and durability

The provisions made in this European Technical Assessment are based on an assumed intended working life of Finnjoist I-joist of 50 years, when installed in the works, provided that the composite wood-based beams and columns are subject to appropriate installation, use and maintenance, see 2.1. These provisions are based upon the current state of the art and the available knowledge and experience. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works[2].

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

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[2] The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product can also be shorter than the assumed working life.

3 Performance of the product and references to the methods used for its assessment

Table 1. Basic requirements for construction works and essential characteristics

Basic requirement and essential characteristics	Performance
BWR 1. Mechanical resistance and stability	
Bending strength and/or bending moment capacity (edgewise and flatwise) and size effect parameter (edgewise and flatwise)	Clause 3.1, Annex 2
Tension strength and/or tension capacity parallel to the product and size effect parameter	Clause 3.1, Annex 2
Tension strength and/or capacity perpendicular to the product	No performance assessed
Compression strength and/or capacity parallel to the product	Clause 3.1, Annex 2
Compression strength perpendicular to the product (edgewise and flatwise) and/or bearing capacity	Clause 3.1, Annex 2
Shear strength and/or capacity (edgewise and flatwise) and size effect parameter (flatwise)	Clause 3.1, Annex 2
Modulus of elasticity parallel to the grain	Clause 3.1, Annex 2
Shear modulus (edgewise and flatwise)	Clause 3.1, Annex 2
Torsional shear capacity and rigidity	Clause 3.1, Annex 2
Density	Clause 3.1, Annex 2
Creep	Clause 3.1, Annex 2
Dimensional stability	Annex 1
Corrosion resistance of metal fasteners and other connectors	No performance assessed
Bonding quality and durability of bonding strength	Clause 3.1
BWR 2. Safety in case of fire	
Reaction to fire of materials and components	Clause 3.2
Resistance to fire	No performance assessed
BWR 3. Hygiene, health and the environment	
Content, emission and/or release of dangerous substances	Clause 3.3
BWR 6. Energy economy and heat retention	
Thermal conductivity	Clause 3.4
Thermal inertia	No performance assessed
Aspects of durability	
Natural Durability	Clause 3.5

3.1 Mechanical resistance and stability, BWR 1

Characteristic value or mean values of the mechanical properties inclusive stiffness values of the standard joist sections are given in Annex 2. The manufacturer provides on its website software, Finnwood, for the design of the joists, where these values are included.

Actions at joist supports shall not exceed the bearing resistance given in Annex 2. Holes in the joists to provide openings for ducts, pipes etc. must only be made in the web, after the resistance has been checked. The rules for web holes given in Annex 3 shall be followed.

The adhesive is of type I (full exposure to the weather) as defined in EN 301. The bonding quality and durability of bonding strength have been assessed according to the shear test method described in EN 13377, D.4. to be suitable for use class 1 and 2 conditions.

3.2 Safety in case of fire, BWR 2

3.2.1 Reaction to fire

The joists consist of materials classified to have reaction to fire class D s2,d0 or better.

3.3 Hygiene, health and environment, BWR 3

3.3.1 Content, emission and/or release of dangerous substances

The release of dangerous substances is determined according to EAD 130067-00-0304, “Composite Wood-base beams and columns”. The manufacturer has not declared that the joists would have other harmful or dangerous substances as defined in the EU database than formaldehyde. The formaldehyde potential of the LVL is classified to be E1 in accordance with EN 14374. The formaldehyde potential class of the web board is classified to be E1 in accordance with EN 13986.In addition to the specific clauses relating to dangerous substances contained in this European Technical Assessment, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

3.4 Energy economy and heat retention, BWR 6

3.4.1 Thermal resistance

The thermal conductivity λ for both web and flange material is 0,13 W/(m K) according to EN 12524. The natural density variation of the materials is taken into account in this value.

3.5 Aspects of durability

3.5.1 Natural durability

The adhesive of type I also can be used in service class 3, but the untreated flange and web materials do not withstand attacks from fungi. The biological durability is DC5 (not durable) based on spruce sapwood classification according to EN 350. Therefore Finnjoist I joists can be used in service classes 1 and 2 as defined in Eurocode 5, which correspond to the use classes 1 and 2 as defined in EN 335. The product may be exposed to the weather for a short time during installation.

Durability may be reduced by attack from insects such as long horn beetle, dry wood termites and anobium in regions where these may be found.

4 Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

According to the Decision 99/92/EC of the European Commission[3], the system of assessment and verification of constancy of performance (see Annex V to the regulation (EU) No 305/2011) is System 1.

4.1 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Eurofins Expert Services Oy.

Issued in Espoo on March 3, 2021
by Eurofins Expert Services Oy

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[3] Official Journal of the European Communities L 29 of 03.02.1999

ANNEX 1
DESCRIPTION OF THE JOISTS

1 Cross sections and sizes

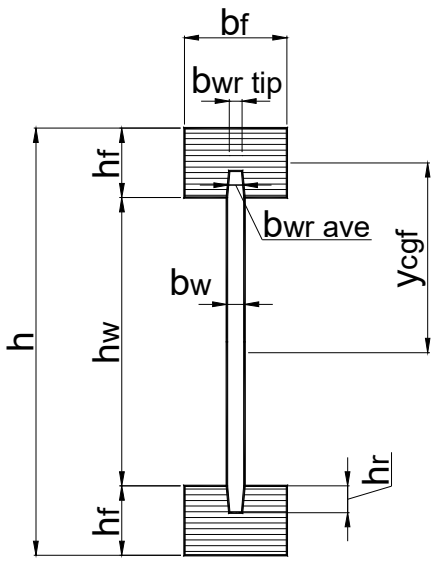

Figure 1-1. Cross-section of Finnjoist I-joist.

The shape of the joists is shown in Figure 1-1. The angle of the web flange joint is 6° (nominal). In the tip of the web flange joint a small space is left for the overflow glue. The depth of Finnjoist I joist is from 160 mm to 600 mm. The thickness of the web is 9 to 12 mm. The width of the flange is from 38 to 96 mm and the depth from 36 to 45 mm. Tolerances measured in equivalent conditions when RH is 65 % and temperature 20 °C are given in Table 1 1. Standard cross sections are given in Annex 2 Table 2-4.

The type of cross section is given by a code, e.g. FJI 58/250, where the first figure indicates the width of the flange and the second one the depth of the joist.

The main direction of the flakes of the web board is perpendicular to the flanges. The joints of the web board are made as a V shaped joint by gluing and they are allowed to be spaced deliberately. The nominal root depth of the joint is 10 mm.

Table 1-1. Tolerances of the Finnjoist I-joists.

Overall joist depth	h	± 1,5 mm
Overall joist length	l	- 0 / + 10 mm
Flange width	b_f	± 1,5 mm
Flange depth	h_f	± 2 mm
Web thickness	b_w	- 0,4 / + 1,6 mm

Note: Comma in decimal numbers represents the decimal point in the English number definition.

2 Specifications of components

The flanges are made of KERTO LVL (laminated veneer lumber) produced by Metsä Wood Lohja Mill or Punkaharju Mill or corresponding LVL. The LVL flanges are orientated such that their veneers are perpendicular to the plane of the of the web. The material properties of the flanges comply with EN 14374. The characteristic strength values of the LVL shall be at least as given in Table 1-2 and they shall be certified by an approved body.

Table 1-2. Characteristic strength values of the LVL used for flanges of Finnjoist I-joists required in design of Finnjoist.

Property (N/mm²)		**Joist**	**Stud**
Bending strength	$f_{m,k}$	48	32
Tension strength parallel to grain	$f_{t,0,k}$	35	22
Compression strength parallel to grain	$f_{c,0,k}$	35	22
5th percentile modulus of elasticity parallel to grain	$E_{0,k}$	11 600	8 000
Mean modulus of elasticity parallel to grain	$E_{0,mean}$	13 800	9 600

The web is made of OSB board which corresponds with at least grade 3 in accordance with EN 300 and EN 12369-1. The characteristic strength values of the OSB shall be at least as given in Table 1-3.

Table 1-3. Characteristic strength values of the OSB used for web of Finnjoist I-joists.

Property / **Thickness**		**<10 mm** **N/mm²**	**> 10 mm** **N/mm²**	**Stud** **N/mm²**
Tension strength, bending calculations	$f_{t,90,k}$	7,2	7,0	7,0
Compression strength, bending calculations	$f_{c,90,k}$	12,9	12,7	12,7
Shear strength, panel shear	$f_{v,k}$	7,6	7,6	6,8
Shear strength, planar shear	$f_{r,k}$	2,4	2,4	1,0
Mean modulus of elasticity, bending calculations	$E_{0,mean}$	3 000	3 000	3 000
Mean shear modulus	$G_{v,mean}$	1 800	1 800	1 080

The adhesive is of type I (full exposure to the weather) as defined in EN 301.

3 Moisture content

When manufactured, the moisture content of the flanges and the web are below the equilibrium value in use conditions. Due to changing temperature and relative humidity of the surrounding air the moisture content of the joists will continuously change.

ANNEX 2
MECHANICAL PROPERTIES OF THE JOISTS

Cross sections and sizes

The product is intended to be used in service classes 1 and 2 as defined in Eurocode 5. Characteristic resistances for the standard joist cross sections are based on characteristic strength values given in Table 2-1, which also may be used to calculate the properties for non-standard cross sections. The evaluation methods have been calculation or design assisted by testing. The structural properties of Finnjoist I-joists within the ranges for joist depth and flange specification given in Annex 1 may be calculated using Metsä Wood's design procedures approved by Eurofins Expert Services Oy. For the standard range of Finnjoist I-joists mechanical properties have been calculated in Table 2-4 using these procedures. For sizes other than given in the tables, mechanical properties may be calculated by interpolation.

Table 2-1. Characteristic strength and modulus of elasticity and rigidity values to be used in calculations.

Property	Symbol	Value N/mm2	
		Joist	Stud
Bending strength of flanges[4]	$f_{F,m,k}$	38,4	32
Tensile strength of flanges[4]	$f_{F,t,0,k}$	28	22
Compression strength of flanges[4]	$f_{F,c,0,k}$	28	22
Bending strength of web edgewise	$f_{W,m,k}$	7,0	7,0
Shear strength of web	$f_{v,s,k}$	7,6	6,8
Shear strength of web/flange joint	$f_{v,p,k}$	2,4	1,0
Characteristic modulus of elasticity of flanges	$E_{F,0,k}$	11 600	8000
Mean modulus of elasticity of flanges	$E_{F,0,mean}$	13 800	9 600
Mean modulus of elasticity of web	$E_{W,mean}$	3 000	3 000
Modulus of rigidity of web	$G_{W,mean}$	1 800	1 080

Serviceability of the joists is understood as their ability to resist loads without unacceptable deformation. Both bending deformation and shear deformation will cause deflection of the joist. Table 2-4 gives the mean stiffness values for the joists. These values are based on mean values of modulus of elasticity *E* and modulus of rigidity *G* given in Table 2-1, which also may be used to calculate the properties for non-standard cross sections. A higher value for the modulus of rigidity of the web may be used, if the manufacturer of the OSB has a higher value certified.

[4] To be used in the calculations only.

The modification factors for the joists, k_{mod} and k_{def} as defined in Eurocode 5, are given in Tables 2-2 and 2-3.

Table 2-2. Values of k_{mod} for the Finnjoist I-joists.

Duration of load	Bending and axial resistance		Shear resistance		Bearing resistance	
	Service class 1	Service class 2	Service class 1	Service class 2	Service class 1	Service class 2
Permanent	0,6	0,6	0,40	0,30	0,6	0,6
Long term	0,7	0,7	0,50	0,40	0,7	0,7
Medium term	0,8	0,8	0,70	0,55	0,8	0,8
Short term	0,9	0,9	0,90	0,70	0,9	0,9
Instantaneous	1,10	1,10	1,10	0,90	1,10	1,10

Table 2-3. Values of k_{def} for the Finnjoist I-joists.

Bending and axial deformation		Shear deformation	
Service class 1	Service class 2	Service class 1	Service class 2
0,60	0,80	1,50	2,25

The structural performance of the product relies on adequate restraint to the compression flange. The effect of the restraint on the load-bearing capacity of the joist has to be taken into account as specified in Eurocode 5. The bending resistance values given in Tables 2-4 a-f are based on spacing of lateral constraints 300 mm. If the lateral bracing is spaced more sparsely the values shall be reduced according to the instructions given by the manufacturer.

The values to be used in design are given on the following page in Tables 2-4 a-f. The values refer to flange depths: Joist 36, 39 and 45 mm, Stud 36 and 39 mm and web thickness 9 mm. Linear interpolation shall be used for sizes in between.

Bearing resistance values are given without restriction for shear resistance. When relevant, the limiting effect of shear resistance shall be taken into account.

When the Finnjoist I-joists are used as columns, the characteristic resistance values shall be calculated according to Eurocode 5 and the values in Tables 2-1 to 2-4 a-f shall be used, as relevant.

Table 2-4a

Characterisitc Values - 36mm flange

Joist type	Weight	Flange Area	Web Area	Bending Moment	Flexural Rigidity (mean value)	Shear Capacity	Shear Rigidity (mean value)	Torsional Rigidity (mean value)	Torsional Capacity
		A_F	A_W	M_k	EI_{mean}	V_k	GA_{mean}	$GI_{T,mean}$	M_T
	kg/m	mm^2	mm^2	kNm	$x10^{12}$ Nmm^2	kN	$x10^6$ N	$x10^9$ Nmm^2	kNm
FJI 38x160-36	1,95	1266	996	4,574	0,145	7,694	2,592	0,3313	0,1031
FJI 45x160-36	2,21	1518	996	5,511	0,173	7,651	2,592	0,4014	0,1230
FJI 53x160-36	2,50	1806	996	6,576	0,204	7,616	2,592	0,4871	0,1474
FJI 58x160-36	2,68	1986	996	7,240	0,224	7,599	2,592	0,5405	0,1626
FJI 63x160-36	2,87	2166	996	7,893	0,243	7,585	2,592	0,5947	0,1781
FJI 69x160-36	3,09	2382	996	8,664	0,267	7,571	2,592	0,6602	0,1967
FJI 70x160-36	3,12	2418	996	8,793	0,271	7,569	2,592	0,6714	0,1999
FJI 89x160-36	3,82	3102	996	11,234	0,345	7,539	2,592	0,8875	0,2614
FJI 96x160-36	4,08	3354	996	12,134	0,373	7,531	2,592	0,9679	0,2843
FJI 38x200-36	2,19	1266	1356	6,021	0,252	10,127	3,240	0,3462	0,1113
FJI 45x200-36	2,44	1518	1356	7,246	0,299	10,059	3,240	0,4162	0,1312
FJI 53x200-36	2,74	1806	1356	8,638	0,354	10,004	3,240	0,5020	0,1556
FJI 58x200-36	2,92	1986	1356	9,506	0,388	9,978	3,240	0,5553	0,1708
FJI 63x200-36	3,10	2166	1356	10,360	0,422	9,956	3,240	0,6095	0,1863
FJI 69x200-36	3,32	2382	1356	11,367	0,462	9,934	3,240	0,6751	0,2049
FJI 70x200-36	3,36	2418	1356	11,535	0,469	9,931	3,240	0,6862	0,2081
FJI 89x200-36	4,06	3102	1356	14,727	0,598	9,883	3,240	0,9024	0,2696
FJI 96x200-36	4,32	3354	1356	15,903	0,646	9,870	3,240	0,9828	0,2925
FJI 38x220-36	2,31	1266	1536	6,759	0,317	11,369	3,564	0,3536	0,1154
FJI 45x220-36	2,56	1518	1536	8,129	0,376	11,286	3,564	0,4236	0,1353
FJI 53x220-36	2,86	1806	1536	9,686	0,445	11,219	3,564	0,5094	0,1597
FJI 58x220-36	3,04	1986	1536	10,657	0,487	11,186	3,564	0,5627	0,1749
FJI 63x220-36	3,22	2166	1536	11,612	0,530	11,160	3,564	0,6170	0,1904
FJI 69x220-36	3,44	2382	1536	12,739	0,581	11,133	3,564	0,6825	0,2090
FJI 70x220-36	3,48	2418	1536	12,927	0,589	11,129	3,564	0,6936	0,2122
FJI 89x220-36	4,18	3102	1536	16,496	0,751	11,070	3,564	0,9098	0,2737
FJI 96x220-36	4,43	3354	1536	17,811	0,811	11,054	3,564	0,9902	0,2966
FJI 38x240-36	2,42	1266	1716	7,507	0,390	12,626	3,888	0,3610	0,1195
FJI 45x240-36	2,68	1518	1716	9,022	0,463	12,525	3,888	0,4311	0,1394
FJI 53x240-36	2,97	1806	1716	10,744	0,546	12,444	3,888	0,5168	0,1638
FJI 58x240-36	3,16	1986	1716	11,818	0,599	12,406	3,888	0,5702	0,1790
FJI 63x240-36	3,34	2166	1716	12,875	0,651	12,373	3,888	0,6244	0,1945
FJI 69x240-36	3,56	2382	1716	14,121	0,713	12,341	3,888	0,6899	0,2131
FJI 70x240-36	3,60	2418	1716	14,329	0,724	12,336	3,888	0,7011	0,2163
FJI 89x240-36	4,30	3102	1716	18,277	0,922	12,265	3,888	0,9172	0,2778
FJI 96x240-36	4,55	3354	1716	19,732	0,995	12,246	3,888	0,9976	0,3007
FJI 38x300-36	2,78	1266	2256	9,799	0,657	16,467	4,860	0,3833	0,1318
FJI 45x300-36	3,04	1518	2256	11,753	0,779	16,316	4,860	0,4534	0,1517
FJI 53x300-36	3,33	1806	2256	13,973	0,918	16,184	4,860	0,5391	0,1761
FJI 58x300-36	3,51	1986	2256	15,358	1,005	16,121	4,860	0,5925	0,1913
FJI 63x300-36	3,70	2166	2256	16,719	1,092	16,068	4,860	0,6467	0,2068
FJI 69x300-36	3,92	2382	2256	18,326	1,197	16,015	4,860	0,7122	0,2254
FJI 70x300-36	3,96	2418	2256	18,594	1,214	16,007	4,860	0,7234	0,2286
FJI 89x300-36	4,65	3102	2256	23,682	1,545	15,892	4,860	0,9395	0,2901
FJI 96x300-36	4,91	3354	2256	25,556	1,667	15,861	4,860	1,0199	0,3130
FJI 45x360-36	3,39	1518	2796	14,556	1,182	18,616	5,832	0,4756	0,1640
FJI 53x360-36	3,69	1806	2796	17,276	1,392	19,360	5,832	0,5614	0,1884
FJI 58x360-36	3,87	1986	2796	18,972	1,523	19,826	5,832	0,6147	0,2036
FJI 63x360-36	4,05	2166	2796	20,640	1,654	19,836	5,832	0,6690	0,2191
FJI 69x360-36	4,28	2382	2796	22,608	1,811	19,757	5,832	0,7345	0,2377
FJI 70x360-36	4,31	2418	2796	22,936	1,837	19,745	5,832	0,7456	0,2409
FJI 89x360-36	5,01	3102	2796	29,167	2,334	19,573	5,832	0,9618	0,3024
FJI 96x360-36	5,27	3354	2796	31,463	2,518	19,527	5,832	1,0422	0,3253
FJI 45x400-36	3,63	1518	3156	16,462	1,502	20,085	6,480	0,4905	0,1722
FJI 53x400-36	3,93	1806	3156	19,517	1,766	20,888	6,480	0,5763	0,1966
FJI 58x400-36	4,11	1986	3156	21,421	1,931	21,391	6,480	0,6296	0,2118
FJI 63x400-36	4,29	2166	3156	23,294	2,096	21,893	6,480	0,6838	0,2273
FJI 69x400-36	4,51	2382	3156	25,502	2,294	22,094	6,480	0,7494	0,2459
FJI 70x400-36	4,55	2418	3156	25,871	2,327	22,094	6,480	0,7605	0,2491
FJI 89x400-36	5,25	3102	3156	32,865	2,954	22,055	6,480	0,9767	0,3106
FJI 96x400-36	5,50	3354	3156	35,442	3,186	21,997	6,480	1,0570	0,3335

Table 2-4b

Characterisitc Values - 39mm flange

Joist type	Weight	Flange Area	Web Area	Bending Moment	Flexural Rigidity (mean value)	Shear Capacity	Shear Rigidity (mean value)	Torsional Rigidity (mean value)	Torsional Capacity
		A_F	A_W	M_k	EI_{mean}	V_k	GA_{mean}	$GI_{T,mean}$	M_T
	kg/m	mm^2	mm^2	kNm	$x10^{12}$ Nmm^2	kN	$x10^6$ N	$x10^9$ Nmm^2	kNm
FJI 38x160	2,04	1355	993	4,815	0,150	8,722	2,592	0,3886	0,1134
FJI 45x160	2,32	1628	993	5,811	0,178	9,038	2,592	0,4897	0,1375
FJI 53x160	2,63	1940	993	6,943	0,211	9,361	2,592	0,5951	0,1652
FJI 58x160	2,83	2135	993	7,650	0,231	9,339	2,592	0,6646	0,1835
FJI 63x160	3,03	2330	993	8,345	0,252	9,321	2,592	0,7321	0,2012
FJI 69x160	3,27	2564	993	9,165	0,276	9,303	2,592	0,8148	0,2230
FJI 70x160	3,31	2603	993	9,302	0,280	9,300	2,592	0,8286	0,2266
FJI 89x160	4,07	3344	993	11,900	0,358	9,261	2,592	1,0980	0,2974
FJI 96x160	4,34	3617	993	12,857	0,386	9,250	2,592	1,2016	0,3246
FJI 38x200	2,27	1355	1353	6,351	0,261	11,605	3,240	0,4035	0,1216
FJI 45x200	2,55	1628	1353	7,657	0,311	12,026	3,240	0,5046	0,1457
FJI 53x200	2,87	1940	1353	9,142	0,368	12,324	3,240	0,6100	0,1734
FJI 58x200	3,07	2135	1353	10,068	0,404	12,291	3,240	0,6795	0,1917
FJI 63x200	3,27	2330	1353	10,979	0,439	12,264	3,240	0,7470	0,2094
FJI 69x200	3,51	2564	1353	12,055	0,482	12,236	3,240	0,8297	0,2312
FJI 70x200	3,55	2603	1353	12,234	0,489	12,232	3,240	0,8434	0,2348
FJI 89x200	4,30	3344	1353	15,640	0,624	12,172	3,240	1,1129	0,3056
FJI 96x200	4,58	3617	1353	16,895	0,674	12,156	3,240	1,2165	0,3328
FJI 38x220	2,39	1355	1533	7,135	0,330	13,046	3,564	0,4109	0,1257
FJI 45x220	2,67	1628	1533	8,598	0,392	13,519	3,564	0,5120	0,1498
FJI 53x220	2,99	1940	1533	10,261	0,464	13,833	3,564	0,6174	0,1775
FJI 58x220	3,19	2135	1533	11,298	0,509	13,793	3,564	0,6869	0,1958
FJI 63x220	3,39	2330	1533	12,318	0,553	13,759	3,564	0,7544	0,2135
FJI 69x220	3,63	2564	1533	13,523	0,607	13,726	3,564	0,8371	0,2353
FJI 70x220	3,67	2603	1533	13,723	0,616	13,721	3,564	0,8508	0,2389
FJI 89x220	4,42	3344	1533	17,537	0,786	13,648	3,564	1,1203	0,3097
FJI 96x220	4,70	3617	1533	18,942	0,849	13,629	3,564	1,2239	0,3369
FJI 38x240	2,51	1355	1713	7,929	0,406	14,209	3,888	0,4183	0,1298
FJI 45x240	2,79	1628	1713	9,549	0,483	14,725	3,888	0,5195	0,1539
FJI 53x240	3,11	1940	1713	11,391	0,571	15,314	3,888	0,6248	0,1816
FJI 58x240	3,31	2135	1713	12,539	0,626	15,308	3,888	0,6944	0,1999
FJI 63x240	3,51	2330	1713	13,669	0,681	15,268	3,888	0,7618	0,2176
FJI 69x240	3,75	2564	1713	15,003	0,748	15,228	3,888	0,8445	0,2394
FJI 70x240	3,79	2603	1713	15,225	0,759	15,222	3,888	0,8583	0,2430
FJI 89x240	4,54	3344	1713	19,448	0,968	15,135	3,888	1,1277	0,3138
FJI 96x240	4,82	3617	1713	21,004	1,045	15,112	3,888	1,2313	0,3410
FJI 38x300	2,87	1355	2253	10,362	0,688	16,280	4,860	0,4406	0,1421
FJI 45x300	3,15	1628	2253	12,457	0,817	16,871	4,860	0,5417	0,1662
FJI 53x300	3,47	1940	2253	14,837	0,965	17,545	4,860	0,6471	0,1939
FJI 58x300	3,66	2135	2253	16,321	1,057	17,967	4,860	0,7166	0,2122
FJI 63x300	3,86	2330	2253	17,781	1,149	18,389	4,860	0,7841	0,2299
FJI 69x300	4,10	2564	2253	19,504	1,260	18,558	4,860	0,8668	0,2517
FJI 70x300	4,14	2603	2253	19,791	1,279	18,558	4,860	0,8806	0,2553
FJI 89x300	4,90	3344	2253	25,247	1,630	18,558	4,860	1,1500	0,3261
FJI 96x300	5,18	3617	2253	27,257	1,759	18,558	4,860	1,2536	0,3533
FJI 45x360	3,50	1628	2793	15,438	1,244	18,443	5,832	0,5640	0,1785
FJI 53x360	3,82	1940	2793	18,359	1,467	19,181	5,832	0,6694	0,2062
FJI 58x360	4,02	2135	2793	20,180	1,606	19,642	5,832	0,7389	0,2245
FJI 63x360	4,22	2330	2793	21,972	1,745	20,103	5,832	0,8064	0,2422
FJI 69x360	4,46	2564	2793	24,086	1,912	20,288	5,832	0,8891	0,2640
FJI 70x360	4,50	2603	2793	24,438	1,940	20,288	5,832	0,9028	0,2676
FJI 89x360	5,25	3344	2793	31,132	2,470	20,288	5,832	1,1723	0,3384
FJI 96x360	5,53	3617	2793	33,598	2,665	20,288	5,832	1,2759	0,3656
FJI 45x400	3,74	1628	3153	17,465	1,581	20,291	6,480	0,5789	0,1867
FJI 53x400	4,06	1940	3153	20,748	1,863	21,102	6,480	0,6843	0,2144
FJI 58x400	4,26	2135	3153	22,794	2,039	21,610	6,480	0,7538	0,2327
FJI 63x400	4,46	2330	3153	24,807	2,215	22,117	6,480	0,8213	0,2504
FJI 69x400	4,70	2564	3153	27,181	2,426	22,320	6,480	0,9039	0,2722
FJI 70x400	4,74	2603	3153	27,577	2,461	22,320	6,480	0,9177	0,2758
FJI 89x400	5,49	3344	3153	35,097	3,130	22,320	6,480	1,1872	0,3466
FJI 96x400	5,77	3617	3153	37,868	3,377	22,320	6,480	1,2908	0,3738

Table 2-4c

Characterisitc Values - 45mm flange

Joist type	Weight	Flange Area	Web Area	Bending Moment	Flexural Rigidity (mean value)	Shear Capacity	Shear Rigidity (mean value)	Torsional Rigidity (mean value)	Torsional Capacity
		A_F	A_W	M_k	EI_{mean}	V_k	GA_{mean}	$GI_{T,mean}$	M_T
	kg/m	mm^2	mm^2	kNm	$x10^{12}$ Nmm^2	kN	$x10^6$ N	$x10^9$ Nmm^2	kNm
FJI 38x160-45	2,20	1583	885	5,397	0,160	8,289	2,592	0,4536	0,1297
FJI 45x160-45	2,52	1898	885	6,507	0,190	8,590	2,592	0,7083	0,1698
FJI 53x160-45	2,89	2258	885	7,769	0,224	8,933	2,592	0,8612	0,2046
FJI 58x160-45	3,12	2483	885	8,556	0,246	8,981	2,592	0,9617	0,2275
FJI 63x160-45	3,35	2708	885	9,330	0,268	8,966	2,592	1,0658	0,2512
FJI 69x160-45	3,62	2978	885	10,244	0,294	8,952	2,592	1,1933	0,2802
FJI 70x160-45	3,67	3023	885	10,396	0,298	8,950	2,592	1,2139	0,2849
FJI 89x160-45	4,54	3878	885	13,290	0,380	8,919	2,592	1,6180	0,3770
FJI 96x160-45	4,86	4193	885	14,356	0,410	8,910	2,592	1,7700	0,4116
FJI 38x200-45	2,44	1583	1245	7,147	0,284	11,172	3,240	0,4685	0,1379
FJI 45x200-45	2,76	1898	1245	8,611	0,337	11,577	3,240	0,7232	0,1780
FJI 53x200-45	3,12	2258	1245	10,274	0,399	11,900	3,240	0,8761	0,2128
FJI 58x200-45	3,35	2483	1245	11,312	0,437	11,874	3,240	0,9765	0,2357
FJI 63x200-45	3,58	2708	1245	12,333	0,475	11,852	3,240	1,0806	0,2594
FJI 69x200-45	3,86	2978	1245	13,538	0,521	11,830	3,240	1,2082	0,2884
FJI 70x200-45	3,90	3023	1245	13,738	0,529	11,827	3,240	1,2287	0,2931
FJI 89x200-45	4,78	3878	1245	17,554	0,675	11,780	3,240	1,6329	0,3852
FJI 96x200-45	5,10	4193	1245	18,959	0,728	11,767	3,240	1,7849	0,4198
FJI 38x220-45	2,55	1583	1425	8,043	0,360	12,614	3,564	0,4759	0,1420
FJI 45x220-45	2,88	1898	1425	9,686	0,428	13,071	3,564	0,7306	0,1821
FJI 53x220-45	3,24	2258	1425	11,553	0,506	13,381	3,564	0,8835	0,2169
FJI 58x220-45	3,47	2483	1425	12,718	0,554	13,350	3,564	0,9839	0,2398
FJI 63x220-45	3,70	2708	1425	13,864	0,603	13,324	3,564	1,0881	0,2635
FJI 69x220-45	3,98	2978	1425	15,216	0,661	13,297	3,564	1,2156	0,2925
FJI 70x220-45	4,02	3023	1425	15,441	0,671	13,293	3,564	1,2361	0,2972
FJI 89x220-45	4,90	3878	1425	19,724	0,855	13,236	3,564	1,6403	0,3893
FJI 96x220-45	5,22	4193	1425	21,301	0,923	13,220	3,564	1,7923	0,4239
FJI 38x240-45	2,67	1583	1605	8,950	0,445	13,785	3,888	0,4833	0,1461
FJI 45x240-45	2,99	1898	1605	10,774	0,530	14,285	3,888	0,7381	0,1862
FJI 53x240-45	3,36	2258	1605	12,846	0,626	14,856	3,888	0,8910	0,2210
FJI 58x240-45	3,59	2483	1605	14,138	0,686	14,840	3,888	0,9914	0,2439
FJI 63x240-45	3,82	2708	1605	15,409	0,746	14,809	3,888	1,0955	0,2676
FJI 69x240-45	4,10	2978	1605	16,910	0,818	14,777	3,888	1,2230	0,2966
FJI 70x240-45	4,14	3023	1605	17,160	0,830	14,773	3,888	1,2436	0,3013
FJI 89x240-45	5,01	3878	1605	21,912	1,058	14,704	3,888	1,6477	0,3934
FJI 96x240-45	5,34	4193	1605	23,662	1,142	14,686	3,888	1,7997	0,4280
FJI 38x300-45	3,03	1583	2145	11,729	0,761	15,906	4,860	0,5056	0,1584
FJI 45x300-45	3,35	1898	2145	14,097	0,904	16,483	4,860	0,7603	0,1985
FJI 53x300-45	3,72	2258	2145	16,788	1,067	17,142	4,860	0,9132	0,2333
FJI 58x300-45	3,95	2483	2145	18,466	1,169	17,554	4,860	1,0137	0,2562
FJI 63x300-45	4,18	2708	2145	20,117	1,271	17,966	4,860	1,1178	0,2799
FJI 69x300-45	4,45	2978	2145	22,065	1,394	18,131	4,860	1,2453	0,3089
FJI 70x300-45	4,50	3023	2145	22,389	1,414	18,131	4,860	1,2659	0,3136
FJI 89x300-45	5,37	3878	2145	28,558	1,802	18,131	4,860	1,6700	0,4057
FJI 96x300-45	5,69	4193	2145	30,831	1,944	18,131	4,860	1,8220	0,4403
FJI 45x360-45	3,71	1898	2685	17,502	1,384	18,099	5,832	0,7826	0,2108
FJI 53x360-45	4,07	2258	2685	20,815	1,632	18,823	5,832	0,9355	0,2456
FJI 58x360-45	4,30	2483	2685	22,880	1,787	19,275	5,832	1,0359	0,2685
FJI 63x360-45	4,53	2708	2685	24,912	1,943	19,728	5,832	1,1401	0,2922
FJI 69x360-45	4,81	2978	2685	27,310	2,129	19,909	5,832	1,2676	0,3212
FJI 70x360-45	4,86	3023	2685	27,710	2,160	19,909	5,832	1,2881	0,3259
FJI 89x360-45	5,73	3878	2685	35,303	2,749	19,909	5,832	1,6923	0,4180
FJI 96x360-45	6,05	4193	2685	38,101	2,966	19,909	5,832	1,8443	0,4526
FJI 45x400-45	3,95	1898	3045	19,812	1,765	20,397	6,480	0,7975	0,2190
FJI 53x400-45	4,31	2258	3045	23,541	2,079	21,213	6,480	0,9504	0,2538
FJI 58x400-45	4,54	2483	3045	25,866	2,276	21,723	6,480	1,0508	0,2767
FJI 63x400-45	4,77	2708	3045	28,153	2,473	22,233	6,480	1,1549	0,3004
FJI 69x400-45	5,05	2978	3045	30,852	2,709	22,437	6,480	1,2825	0,3294
FJI 70x400-45	5,09	3023	3045	31,301	2,748	22,437	6,480	1,3030	0,3341
FJI 89x400-45	5,96	3878	3045	39,847	3,496	22,437	6,480	1,7072	0,4262
FJI 96x400-45	6,29	4193	3045	42,995	3,771	22,437	6,480	1,8591	0,4608

Table 2-4d

Finnjoist characteristic values for flange dependant properties

		End bearing [1]				Intermediate bearing [1]						Secondary direction [2]				Axial [2]	
Flange width	Flange depth	45mm		89mm		75mm		89mm		135mm		Moment Capacity	Shear Capacity	Flexural Rigidity	Shear Rigidity	Axial Capacity [3]	Axial Rigidity [2]
		NS	S	NS	S	NS	S	NS	S	NS	S	$M_{f,k,y}$	$V_{f,k,z}$	EI_y	$EA_{Q,mean,z}$	$F_{c,k,x}$	$EA_{mean,x}$
mm	mm	kN	kN	kN	kN	kN	kN	kN	kN	kN	kN	kNm	kN	$x10^9 Nmm^2$	$x10^6 N$	kN	$x10^6 N$
36mm flange depth																	
45	36	9,46	11,18	15,76	17,48	16,76	18,48	18,77	20,49	25,36	27,08	0,512	4,149	3,764	0,911	42,50	20,948
53	36	10,75	12,47	17,33	19,63	19,05	20,77	21,33	23,05	28,69	30,54	0,711	4,936	6,155	1,084	50,57	24,923
58	36	11,23	13,27	17,33	20,98	20,37	22,20	22,31	24,65	28,69	32,71	0,852	5,428	8,069	1,192	55,61	27,407
63	36	11,23	13,37	17,33	21,14	20,37	22,38	22,31	24,85	28,69	32,97	1,005	5,920	10,343	1,300	60,65	29,891
69	36	11,23	13,37	17,33	21,14	20,37	22,38	22,31	24,85	28,69	32,97	1,199	6,511	13,592	1,429	66,70	32,872
70	36	11,23	13,37	17,33	21,14	20,37	22,38	22,31	24,85	28,69	32,97	1,232	6,609	14,192	1,451	67,70	33,368
89	36	11,23	13,37	17,33	21,14	20,37	22,38	22,31	24,85	28,69	32,97	1,935	8,479	29,177	1,861	86,86	42,808
96	36	11,23	13,37	17,33	21,14	20,37	22,38	22,31	24,85	28,69	32,97	2,231	9,168	36,620	2,012	93,91	46,285
39mm flange depth																	
38	39	8,33	10,05	13,88	15,60	14,76	16,48	16,53	18,25	22,33	24,05	0,395	3,702	2,450	0,813	37,93	18,692
45	39	9,46	11,18	15,76	17,48	16,76	18,48	18,77	20,49	25,36	27,08	0,555	4,449	4,076	0,977	45,57	22,460
53	39	10,75	12,47	17,74	19,63	19,05	20,77	21,33	23,05	28,82	30,54	0,770	5,301	6,667	1,164	54,31	26,765
58	39	11,55	13,27	17,74	20,98	20,48	22,20	22,93	24,65	29,52	32,71	0,923	5,834	8,740	1,281	59,77	29,456
63	39	11,64	14,08	17,74	22,32	21,21	23,63	23,15	26,25	29,52	34,87	1,089	6,367	11,204	1,398	65,23	32,147
69	39	11,64	15,05	17,74	23,59	21,21	25,35	23,15	28,18	29,52	35,37	1,298	7,007	14,723	1,538	71,78	35,376
70	39	11,64	15,17	17,74	23,59	21,21	25,56	23,15	28,41	29,52	35,37	1,334	7,114	15,373	1,562	72,87	35,915
89	39	11,64	15,17	17,74	23,59	21,21	25,56	23,15	28,41	29,52	35,37	2,096	9,139	31,607	2,006	93,62	46,140
96	39	11,64	15,17	17,74	23,59	21,21	25,56	23,15	28,41	29,52	35,37	2,417	9,885	39,670	2,170	101,26	49,908
45mm flange depth																	
45	45	10,32	12,04	16,62	18,34	18,48	20,20	20,49	22,21	27,08	28,80	0,640	5,187	4,705	1,139	53,13	26,186
53	45	11,72	13,44	18,57	20,61	21,01	22,73	23,29	25,01	30,78	32,50	0,889	6,171	7,694	1,355	63,21	31,154
58	45	12,47	14,32	18,57	22,03	22,58	24,30	24,81	26,75	31,19	34,81	1,065	6,786	10,086	1,490	69,51	34,259
63	45	12,47	15,20	18,57	23,45	22,87	25,88	24,81	28,50	31,19	37,04	1,256	7,401	12,929	1,625	75,81	37,364
69	45	12,47	16,26	18,57	24,42	22,87	27,77	24,81	30,60	31,19	37,04	1,498	8,139	16,990	1,787	83,37	41,090
70	45	12,47	16,39	18,57	24,42	22,87	28,00	24,81	30,66	31,19	37,04	1,540	8,262	17,740	1,814	84,63	41,711
89	45	12,47	16,39	18,57	24,42	22,87	28,00	24,81	30,66	31,19	37,04	2,419	10,599	36,472	2,327	108,57	53,510
96	45	12,47	16,39	18,57	24,42	22,87	28,00	24,81	30,66	31,19	37,04	2,789	11,460	45,774	2,516	117,39	57,857

Notes:

1) For bearing capacities NS indicates no web stiffener at the support, S indicates web stiffeneer at the support

2) Moment capacity, shear capacity, flexural rigidity, axial capacity and axial rigidity in the weak direction per flange

3) Axial capacity does not include stability factors

Table 2-4e

Finnstud characteristic values - 36mm flange

Joist Type	Weight	Af	Aw	Axial Capacity per flange [3]	Bending Moment Capacity	Flexural Rigidity [2]	Shear Capacity	Shear Rigidity [2]	End Bearing				Intermediate Bearing	
									45 mm		89 mm		89 mm	
									NS	S	NS	S	NS	S
	kg/m	mm^2	mm^2	kN	kNm	$Nmm^2 \times 10^{12}$	kN	$N \times 10^6$	kN	kN	kN	kN	kN	kN
160-45	2,03	1518	1084	39,47	4,82	0,126	4,91	1,17	4,98	5,88	8,29	8,70	9,88	10,78
160-58	2,44	1986	1084	51,64	6,25	0,163	4,91	1,17	6,08	6,98	10,13	11,75	12,07	12,97
160-70	2,82	2418	1084	62,87	7,58	0,197	4,91	1,17	6,29	7,19	10,48	11,39	12,48	13,39
160-89	3,42	3102	1084	80,65	9,67	0,251	4,91	1,17	6,29	7,19	10,48	11,39	12,48	13,39
200-45	2,29	1518	1484	39,47	6,36	0,220	7,20	1,60	4,98	5,88	8,29	8,70	9,88	10,78
200-58	2,70	1986	1484	51,64	8,24	0,284	7,20	1,60	6,08	6,98	10,13	11,75	12,07	12,97
200-70	3,08	2418	1484	62,87	9,96	0,343	7,20	1,60	6,29	7,19	10,48	11,39	12,48	13,39
200-89	3,68	3102	1484	80,65	12,70	0,436	7,20	1,60	6,29	7,19	10,48	11,39	12,48	13,39
220-45	2,41	1518	1684	39,47	7,16	0,277	8,34	1,82	4,98	5,88	8,29	8,70	9,88	10,78
220-58	2,83	1986	1684	51,64	9,25	0,357	8,34	1,82	6,08	6,98	10,13	11,75	12,07	12,97
220-70	3,21	2418	1684	62,87	11,18	0,431	8,34	1,82	6,29	7,19	10,48	11,39	12,48	13,39
220-89	3,81	3102	1684	80,65	14,24	0,548	8,34	1,82	6,29	7,19	10,48	11,39	12,48	13,39
240-45	2,54	1518	1884	39,47	7,96	0,341	9,48	2,03	4,98	5,88	8,29	8,70	9,88	10,78
240-58	2,95	1986	1884	51,64	10,27	0,439	9,48	2,03	6,08	6,98	10,13	11,75	12,07	12,97
240-70	3,33	2418	1884	62,87	12,41	0,530	9,48	2,03	6,29	7,19	10,48	11,39	12,48	13,39
240-89	3,94	3102	1884	80,65	15,79	0,674	9,48	2,03	6,29	7,19	10,48	11,39	12,48	13,39
300-45	2,93	1518	2484	39,47	10,43	0,577	12,91	2,68	4,98	5,88	8,29	8,70	9,88	10,78
300-58	3,34	1986	2484	51,64	13,41	0,741	12,91	2,68	6,08	6,98	10,13	11,75	12,07	12,97
300-70	3,72	2418	2484	62,87	16,17	0,893	12,91	2,68	6,29	7,19	10,48	11,39	12,48	13,39
300-89	4,32	3102	2484	80,65	20,53	1,133	12,91	2,68	6,29	7,19	10,48	11,39	12,48	13,39
360-45	3,31	1518	3084	39,47	12,99	0,881	16,34	3,33	4,98	5,88	8,29	8,70	9,88	10,78
360-58	3,72	1986	3084	51,64	16,65	1,128	16,34	3,33	6,08	6,98	10,13	11,75	12,07	12,97
360-70	4,10	2418	3084	62,87	20,02	1,356	16,34	3,33	6,29	7,19	10,48	11,39	12,48	13,39
360-89	4,70	3102	3084	80,65	25,36	1,716	16,34	3,33	6,29	7,19	10,48	11,39	12,48	13,39
400-45	3,57	1518	3484	39,47	14,75	1,124	18,46	3,76	4,98	5,88	8,29	8,70	9,88	10,78
400-58	3,98	1986	3484	51,64	18,86	1,435	18,46	3,76	6,08	6,98	10,13	11,75	12,07	12,97
400-70	4,36	2418	3484	62,87	22,64	1,722	18,46	3,76	6,29	7,19	10,48	11,39	12,48	13,39
400-89	4,96	3102	3484	80,65	28,64	2,176	18,46	3,76	6,29	7,19	10,48	11,39	12,48	13,39

Notes:
1) For Bearing Capacities NS indicates no web stiffener at the support, S indicates web stiffener at the support
2) Flexural Rigidity (EI) and Shear Rigidity (GA) are mean values
3) Axial Capacity does not include any stability factors

Table 2-4f

Finnstud characteristic values - 39mm flange

Joist Type	Weight	Af	Aw	Axial Capacity per flange [3]	Bending Moment Capacity	Flexural Rigidity [2]	Shear Capacity	Shear Rigidity [2]	End Bearing				Intermediate Bearing	
									45 mm		89 mm		89 mm	
									NS	S	NS	S	NS	S
	kg/m	mm^2	mm^2	kN	kNm	$Nmm^2 \times 10^{12}$	kN	$N \times 10^6$	kN	kN	kN	kN	kN	kN
160-45	2,12	1628	1075	42,32	5,08	0,130	4,74	1,16	4,98	5,88	8,29	8,70	9,88	10,78
160-58	2,57	2135	1075	55,50	6,60	0,168	4,74	1,16	6,08	6,98	10,13	11,75	12,07	12,97
160-70	2,98	2603	1075	67,67	8,01	0,204	4,74	1,16	7,10	8,00	11,83	12,74	14,09	14,99
160-89	3,63	3344	1075	86,93	10,24	0,260	4,74	1,16	7,23	8,14	12,05	12,96	14,35	15,26
200-45	2,38	1628	1475	42,32	6,72	0,228	7,03	1,59	4,98	5,88	8,29	8,70	9,88	10,78
200-58	2,82	2135	1475	55,50	8,72	0,295	7,03	1,59	6,08	6,98	10,13	11,75	12,07	12,97
200-70	3,23	2603	1475	67,67	10,56	0,357	7,03	1,59	7,10	8,00	11,83	12,74	14,09	14,99
200-89	3,89	3344	1475	86,93	13,48	0,455	7,03	1,59	7,23	8,14	12,05	12,96	14,35	15,26
220-45	2,50	1628	1675	39,47	7,56	0,288	8,17	1,81	4,98	5,88	8,29	8,70	9,88	10,78
220-58	2,95	2135	1675	51,64	9,80	0,372	8,17	1,81	6,08	6,98	10,13	11,75	12,07	12,97
220-70	3,36	2603	1675	62,87	11,86	0,450	8,17	1,81	7,10	8,00	11,83	12,74	14,09	14,99
220-89	4,01	3344	1675	80,65	15,13	0,573	8,17	1,81	7,23	8,14	12,05	12,96	14,35	15,26
240-45	2,63	1628	1875	39,47	8,41	0,356	9,31	2,03	4,98	5,88	8,29	8,70	9,88	10,78
240-58	3,08	2135	1875	51,64	10,89	0,459	9,31	2,03	6,08	6,98	10,13	11,75	12,07	12,97
240-70	3,49	2603	1875	62,87	13,18	0,555	9,31	2,03	7,10	8,00	11,83	12,74	14,09	14,99
240-89	4,14	3344	1875	80,65	16,80	0,707	9,31	2,03	7,23	8,14	12,05	12,96	14,35	15,26
300-45	3,02	1628	2475	39,47	11,04	0,604	12,74	2,67	4,98	5,88	8,29	8,70	9,88	10,78
300-58	3,46	2135	2475	51,64	14,24	0,778	12,74	2,67	6,08	6,98	10,13	11,75	12,07	12,97
300-70	3,87	2603	2475	62,87	17,19	0,939	12,74	2,67	7,10	8,00	11,83	12,74	14,09	14,99
300-89	4,53	3344	2475	80,65	21,87	1,193	12,74	2,67	7,23	8,14	12,05	12,96	14,35	15,26
360-45	3,40	1628	3075	39,47	13,76	0,925	16,16	3,32	4,98	5,88	8,29	8,70	9,88	10,78
360-58	3,85	2135	3075	51,64	17,68	1,188	16,16	3,32	6,08	6,98	10,13	11,75	12,07	12,97
360-70	4,26	2603	3075	62,87	21,31	1,430	16,16	3,32	7,10	8,00	11,83	12,74	14,09	14,99
360-89	4,91	3344	3075	80,65	27,04	1,814	16,16	3,32	7,23	8,14	12,05	12,96	14,35	15,26
400-45	3,66	1628	3475	39,47	15,62	1,181	18,45	3,75	4,98	5,88	8,29	8,70	9,88	10,78
400-58	4,10	2135	3475	51,64	20,03	1,512	18,45	3,75	6,08	6,98	10,13	11,75	12,07	12,97
400-70	4,51	2603	3475	62,87	24,10	1,819	18,45	3,75	7,10	8,00	11,83	12,74	14,09	14,99
400-89	5,17	3344	3475	80,65	30,55	2,303	18,45	3,75	7,23	8,14	12,05	12,96	14,35	15,26

Notes:

1) For Bearing Capacities NS indicates no web stiffener at the support, S indicates web stiffener at the support

2) Flexural Rigidity (EI) and Shear Rigidity (GA) are mean values

3) Axial Capacity does not include any stability factors

ANNEX 3
INSTALLATION GUIDE AND ADDITIONAL CALCULATION RULES FOR FINNJOISTS AND FINNSTUDS WITH WEBHOLES

The installation guide of the manufacturer shall be followed. Especially the following points shall be noticed:

1. The instructions of the manufacturer regarding the restraint of the compression flange and temporary bracing shall be followed.
2. The bearing length to be used shall be 45 mm or greater. If the bearing length is more than 135 mm, the bearing resistance values given for 135 mm shall be used.
3. Web stiffeners may be used according to the instructions of the manufacturer. The characteristic bearing resistance with web stiffeners is given in Table 2-4.
4. During installation, the finished product may be exposed for conditions corresponding to service class 3 during a short time before immediate protection against rain.
5. Holes may be made to the joist web for installations according to the following rules:

   5.1. The structural effect of all additional holes must be considered separately on a case by case basis.

   5.2. Holes shall be positioned at the centre of the web, except of holes smaller or equal to 20 mm in diameter or rectangular holes with their maximum width or depth being less or equal to 20mm, see Figure 3-1.

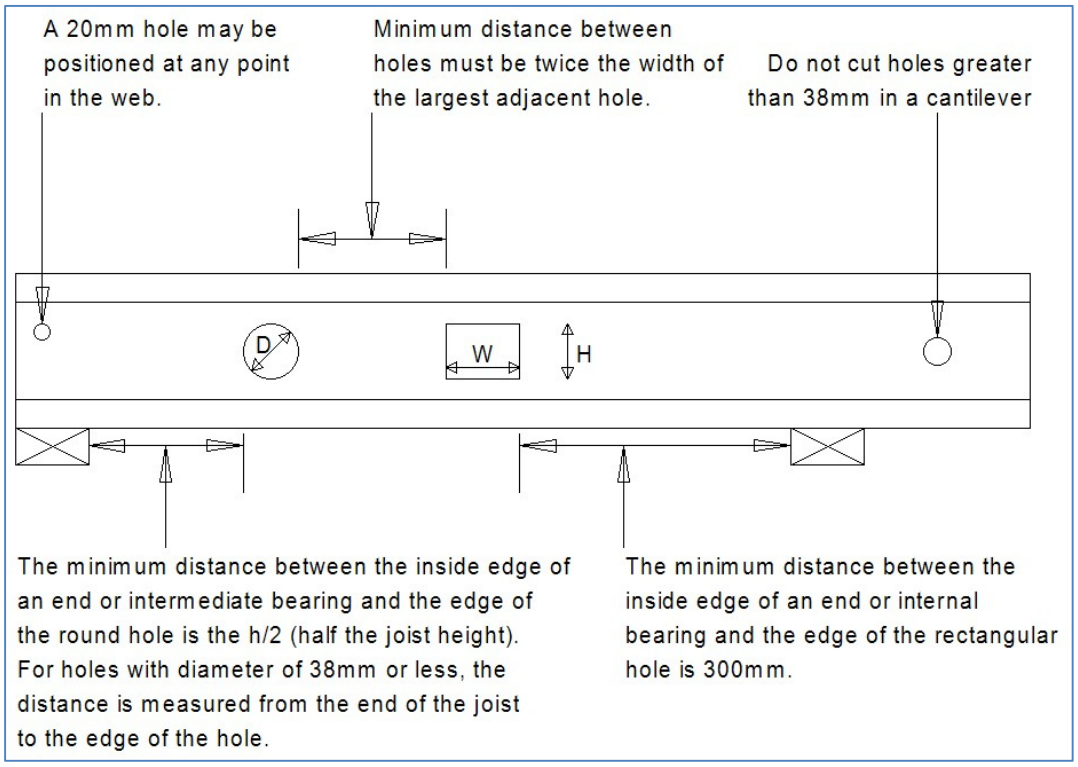

Figure 3-1: Possible locations of web holes

   5.3. The spacing of the holes shall be such, that the length of the unbroken web between the holes is at least two times the diameter of the larger hole. Else, the group of holes shall be considered as one elongated hole. Groups of holes are considered as one theoretical hole with an inscribing circle or rectangle that envelopes the group of holes, see Figure 3-2.

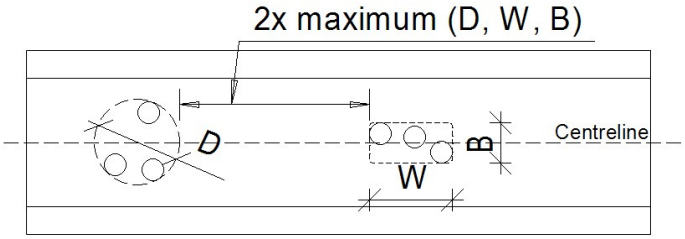

Figure 3-2: Theoretical hole sizes which must be considered for groups of holes.

5.4. Where holes are not positioned at the centre of the web, but with an eccentricity of e_{hole} to the centreline, a theoretical hole with a diameter of $h_{hole,\ theoretical}$ must be considered, see equation (1) and Figure 3-3.

$$h_{\text{ hole, theoretical}} = h_{\text{ hole}} + 2\ e_{\text{ hole}} \tag{1}$$

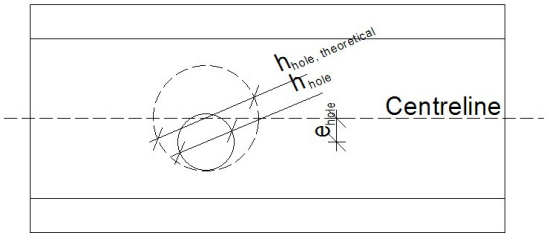

Figure 3-3: Theoretical hole $h_{hole,theoretical}$ which must be considered for eccentric holes.

5.5. For rectangular holes, the corners shall be made carefully and over cutting is not allowed.

5.6. For joists with holes, the shear capacity can be calculated as follows:

$$R_{V,k,hole} = 1{,}1 \cdot k_{hole} \cdot R_{V,k} \le R_{V,k} \tag{2a}$$

when the width of a rectangular hole is smaller than min (*h*; 240mm):

$$R_{V,k,hole} = \max \begin{cases} 1{,}1 \cdot k_{hole} \cdot R_{V,k} \\ 1{,}23 \dfrac{N}{mm^2} \cdot b_f \cdot h_f \end{cases} \le R_{V,k} \tag{2b}$$

where factor k_{hole} takes into account the effect of the hole.

$$k_{hole} = \frac{h_w + h_f - k_{shape} \cdot h_{hole}}{h_{w,eff}}, 0 \le k_{hole} \le 1 \tag{3}$$

$$h_{w,eff} = \frac{35 b_w}{h_w}\left(h_w + h_f\right) \le h_w + h_f \tag{4}$$

k_{shape} is 1,00 for round holes and 1,23 for rectangular holes h_{hole} is the diameter of the round hole. For rectangular holes, h_{hole} is the larger of either length or height of the hole.