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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 30/06/2018

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 LTD**
Trade name of the construction product	**Finnjoist I-joist, FJI**
Product family to which the construction product belongs	Light composite wood-based beam for structural purposes
Manufacturer	**Metsäliitto Cooperative** **Metsä Wood, Building Products** P.O. Box 50 FI-02020 Metsä Finland 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	ETAG 011, Edition January 2002, used as European Assessment Document (EAD)
This ETA replaces	ETA 02/0026 issued on 11/06/2013

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 are intended to be used as load bearing parts of building constructions. With regard to moisture behaviour of the product, the use is limited in service classes 1 and 2 as defined in Eurocode 5.

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. Thus, Finnjoist I joists can be used in use classes 1 and 2 according to Eurocode 5, and use classes 1 and 2 as specified in EN 335. The product may be exposed to the weather for a short time during installation.

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 the building kit of 50 years for the load-bearing structure and for non-accessible components and materials, as well as 25 years for repairable or replaceable components and materials[1].

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.

[1] This means that it is expected that when this working life has elapsed, the real working life may be, in normal use conditions, considerably longer without major degradation affecting the essential requirements of the works. The indications given as to the working life of a building kit cannot be interpreted as a guarantee given by the producer or the technical assessment body. They should only be regarded as a means for the specifiers to choose the appropriate criteria for building kits in relation to the expected, economically reasonable working life of the works.

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	
Resistance	Clause 3.1
Creep	Clause 3.1
Dimensional stability	Clause 3.1
Seismic evaluation	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 resistance	Clause 3.5
BWR 7. Sustainable use of natural resources	
Sustainable use of natural resources	No performance assessed

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.

Beams and columns covered by this ETA remain elastic under design seismic actions. In case of seismic actions, the ductile behaviour of the final works will be guaranteed, if requested, by joints and connections appropriately designed and realized according to the relevant national rules on design and execution of works.

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 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. The manufacturer has declared that product does not contain pentachlorophenol.

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 Directive, 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.

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[2], 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 Ltd.

Issued in Espoo on June 30, 2018
by Eurofins Expert Services Ltd

Tiina Ala-Outinen
Business Manager

Pertti Jokinen
Product Manager

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

ANNEX 1
DESCRIPTION OF THE JOISTS

1 Cross sections and sizes

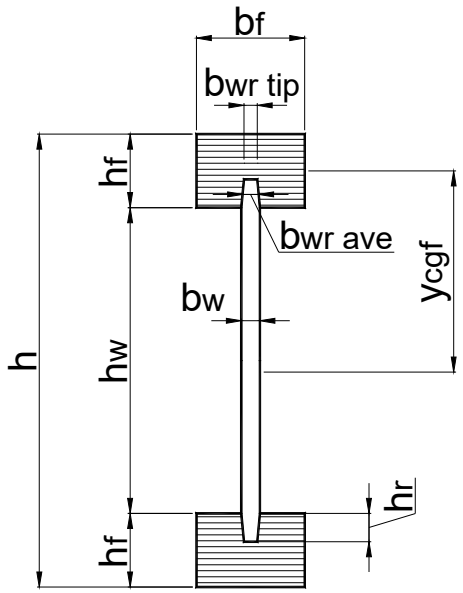

Figure 1-1. Cross-section of Finnjoist I-joist.

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 10 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.

The joists are provided with system holes (knock outs), the diameter of which is 38 mm. The spacing between the hole centres is 300 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	± 0,8 mm

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 needed 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	8000
Mean modulus of elasticity parallel to grain	E_{mean}	13 800	9600

The web is made of OSB board – 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**
Tension strength, bending calculations	$f_{t,90,k}$	7,2	7,0
Compression strength, bending calculations	$f_{c,90,k}$	12,9	12,7
Shear strength, panel shear	$f_{v,k}$	6,8	6,8
Shear strength, planar shear *)	$f_{r,k}$	2,4	2,4
Mean modulus of elasticity, bending calculations	$E_{w,t,0}$	3 000	3 000
Mean shear modulus	G_v	1 080	1 080

*) For FJI stud shear strength, planar shear 1,0 N/mm²

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

4 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 Ltd. For the standard range of Finnjoist I-Joists mechanical properties have been calculated in Table 2-4 using these procedures. The effect of the knock-outs has been taken into account in the shear force resistance value. 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[3]	f_{mk}	38,4	32
Tensile strength of flanges7	f_{t0k}	28	22
Compression strength of flanges7	f_{c0k}	28	22
Bending strength of web edgewise	$f_{mk,w}$	7,2	7,2
Shear strength of web	f_{vsk}	6,8	6.8
Shear strength of web/flange joint	f_{vpk}	2,4	1,0
Characteristic modulus of elasticity of flanges	E_k	11 600	8000
Mean modulus of elasticity of flanges	E_f	13 800	9600
Mean modulus of elasticity of web	E_w	3 000	3 000
Modulus of rigidity of web	G_w	1 080	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

[3] To be used in the calculations only.

for the modulus of rigidity of the web may be used, if the manufacturer of the OSB has a higher value certified.

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 10 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
	kg/m	A_F mm^2	A_W mm^2	M_k kNm	EI_{mean} x10^{12} Nmm^2	V_k kN	GA_{mean} x10^6 N	$GI_{T,mean}$ x10^9 Nmm^2	M_T kNm
FJI 38x160-36	2.01	1266	1084	4.580	0.145	6.076	1.190	0.3272	0.1050
FJI 45x160-36	2.26	1518	1084	5.516	0.173	6.297	1.190	0.3972	0.1249
FJI 53x160-36	2.56	1806	1084	6.581	0.204	6.548	1.190	0.4830	0.1493
FJI 58x160-36	2.74	1986	1084	7.245	0.224	6.706	1.190	0.5363	0.1645
FJI 63x160-36	2.92	2166	1084	7.898	0.244	6.863	1.190	0.5905	0.1799
FJI 69x160-36	3.15	2382	1084	8.670	0.267	6.926	1.190	0.6561	0.1986
FJI 70x160-36	3.18	2418	1084	8.798	0.271	6.926	1.190	0.6672	0.2018
FJI 89x160-36	3.88	3102	1084	11.240	0.346	6.926	1.190	0.8834	0.2633
FJI 96x160-36	4.14	3354	1084	12.140	0.373	6.926	1.190	0.9638	0.2862
FJI 38x200-36	2.27	1266	1484	6.033	0.252	8.902	1.630	0.3402	0.1140
FJI 45x200-36	2.53	1518	1484	7.258	0.300	9.225	1.630	0.4102	0.1340
FJI 53x200-36	2.82	1806	1484	8.650	0.354	9.594	1.630	0.4960	0.1584
FJI 58x200-36	3.01	1986	1484	9.518	0.388	9.825	1.630	0.5493	0.1736
FJI 63x200-36	3.19	2166	1484	10.372	0.422	9.968	1.630	0.6035	0.1890
FJI 69x200-36	3.41	2382	1484	11.380	0.463	9.945	1.630	0.6691	0.2077
FJI 70x200-36	3.45	2418	1484	11.548	0.470	9.942	1.630	0.6802	0.2108
FJI 89x200-36	4.14	3102	1484	14.740	0.599	9.892	1.630	0.8964	0.2724
FJI 96x200-36	4.40	3354	1484	15.916	0.646	9.878	1.630	0.9767	0.2953
FJI 38x220-36	2.40	1266	1684	6.777	0.318	10.315	1.851	0.3467	0.1185
FJI 45x220-36	2.66	1518	1684	8.147	0.377	10.690	1.851	0.4167	0.1385
FJI 53x220-36	2.95	1806	1684	9.704	0.445	11.117	1.851	0.5025	0.1629
FJI 58x220-36	3.14	1986	1684	10.674	0.488	11.205	1.851	0.5558	0.1781
FJI 63x220-36	3.32	2166	1684	11.630	0.531	11.177	1.851	0.6100	0.1935
FJI 69x220-36	3.54	2382	1684	12.757	0.582	11.148	1.851	0.6756	0.2122
FJI 70x220-36	3.58	2418	1684	12.945	0.590	11.144	1.851	0.6867	0.2154
FJI 89x220-36	4.28	3102	1684	16.514	0.752	11.082	1.851	0.9028	0.2769
FJI 96x220-36	4.53	3354	1684	17.829	0.812	11.065	1.851	0.9832	0.2998
FJI 38x240-36	2.53	1266	1884	7.530	0.391	11.503	2.071	0.3531	0.1231
FJI 45x240-36	2.79	1518	1884	9.045	0.464	11.920	2.071	0.4232	0.1430
FJI 53x240-36	3.09	1806	1884	10.768	0.548	12.397	2.071	0.5089	0.1674
FJI 58x240-36	3.27	1986	1884	11.842	0.600	12.430	2.071	0.5623	0.1826
FJI 63x240-36	3.45	2166	1884	12.898	0.652	12.396	2.071	0.6165	0.1981
FJI 69x240-36	3.67	2382	1884	14.145	0.715	12.361	2.071	0.6820	0.2167
FJI 70x240-36	3.71	2418	1884	14.353	0.725	12.356	2.071	0.6932	0.2199
FJI 89x240-36	4.41	3102	1884	18.301	0.924	12.281	2.071	0.9093	0.2814
FJI 96x240-36	4.66	3354	1884	19.755	0.997	12.261	2.071	0.9897	0.3043
FJI 38x300-36	2.93	1266	2484	9.843	0.660	13.818	2.732	0.3726	0.1367
FJI 45x300-36	3.19	1518	2484	11.798	0.782	14.319	2.732	0.4426	0.1566
FJI 53x300-36	3.48	1806	2484	14.018	0.921	14.892	2.732	0.5284	0.1810
FJI 58x300-36	3.67	1986	2484	15.403	1.008	15.250	2.732	0.5817	0.1962
FJI 63x300-36	3.85	2166	2484	16.765	1.095	15.608	2.732	0.6360	0.2116
FJI 69x300-36	4.07	2382	2484	18.371	1.200	15.751	2.732	0.7015	0.2303
FJI 70x300-36	4.11	2418	2484	18.639	1.217	15.751	2.732	0.7126	0.2335
FJI 89x300-36	4.80	3102	2484	23.727	1.548	15.751	2.732	0.9288	0.2950
FJI 96x300-36	5.06	3354	2484	25.602	1.670	15.751	2.732	1.0092	0.3179
FJI 45x360-36	3.58	1518	3084	14.629	1.188	16.108	3.393	0.4621	0.1702
FJI 53x360-36	3.88	1806	3084	17.350	1.398	16.752	3.393	0.5479	0.1946
FJI 58x360-36	4.06	1986	3084	19.046	1.529	17.155	3.393	0.6012	0.2098
FJI 63x360-36	4.24	2166	3084	20.714	1.660	17.557	3.393	0.6554	0.2252
FJI 69x360-36	4.47	2382	3084	22.682	1.817	17.718	3.393	0.7210	0.2439
FJI 70x360-36	4.50	2418	3084	23.010	1.843	17.718	3.393	0.7321	0.2471
FJI 89x360-36	5.20	3102	3084	29.242	2.340	17.718	3.393	0.9483	0.3086
FJI 96x360-36	5.46	3354	3084	31.538	2.524	17.718	3.393	1.0286	0.3315
FJI 45x400-36	3.85	1518	3484	16.559	1.510	18.360	3.834	0.4751	0.1792
FJI 53x400-36	4.14	1806	3484	19.615	1.775	19.095	3.834	0.5608	0.2037
FJI 58x400-36	4.33	1986	3484	21.519	1.940	19.554	3.834	0.6142	0.2188
FJI 63x400-36	4.51	2166	3484	23.392	2.105	20.013	3.834	0.6684	0.2343
FJI 69x400-36	4.73	2382	3484	25.601	2.303	20.196	3.834	0.7339	0.2529
FJI 70x400-36	4.77	2418	3484	25.969	2.336	20.196	3.834	0.7451	0.2561
FJI 89x400-36	5.46	3102	3484	32.964	2.963	20.196	3.834	0.9612	0.3177
FJI 96x400-36	5.72	3354	3484	35.540	3.194	20.196	3.834	1.0416	0.3405
FJI 45x500-36	4.51	1518	4484	21.529	2.501	19.620	4.935	0.5075	0.2019
FJI 53x500-36	4.80	1806	4484	25.422	2.929	20.405	4.935	0.5933	0.2263
FJI 58x500-36	4.99	1986	4484	27.848	3.197	20.895	4.935	0.6466	0.2415
FJI 63x500-36	5.17	2166	4484	30.233	3.465	21.386	4.935	0.7008	0.2569
FJI 69x500-36	5.39	2382	4484	33.045	3.787	21.582	4.935	0.7664	0.2756
FJI 70x500-36	5.43	2418	4484	33.514	3.840	21.582	4.935	0.7775	0.2788
FJI 89x500-36	6.12	3102	4484	42.419	4.859	21.582	4.935	0.9937	0.3403
FJI 96x500-36	6.38	3354	4484	45.700	5.234	21.582	4.935	1.0741	0.3632
FJI 45x600-36	5.17	1518	5484	26.702	3.768	19.637	6.037	0.5400	0.2245
FJI 53x600-36	5.46	1806	5484	31.436	4.401	20.423	6.037	0.6257	0.2489
FJI 58x600-36	5.65	1986	5484	34.384	4.796	20.914	6.037	0.6791	0.2641
FJI 63x600-36	5.83	2166	5484	37.282	5.192	21.405	6.037	0.7333	0.2796
FJI 69x600-36	6.05	2382	5484	40.698	5.667	21.601	6.037	0.7988	0.2982
FJI 70x600-36	6.09	2418	5484	41.268	5.746	21.601	6.037	0.8100	0.3014
FJI 89x600-36	6.78	3102	5484	52.085	7.249	21.601	6.037	1.0261	0.3630
FJI 96x600-36	7.04	3354	5484	56.071	7.803	21.601	6.037	1.1065	0.3858

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	2.09	1355	1075	4.819	0.150	5.864	1.179	0.3848	0.1152
FJI 45x160	2.37	1628	1075	5.816	0.178	6.077	1.179	0.4859	0.1393
FJI 53x160	2.69	1940	1075	6.948	0.211	6.320	1.179	0.5913	0.1670
FJI 58x160	2.89	2135	1075	7.654	0.231	6.472	1.179	0.6608	0.1852
FJI 63x160	3.09	2330	1075	8.349	0.252	6.624	1.179	0.7283	0.2030
FJI 69x160	3.32	2564	1075	9.170	0.276	6.685	1.179	0.8109	0.2247
FJI 70x160	3.36	2603	1075	9.306	0.280	6.685	1.179	0.8247	0.2283
FJI 89x160	4.12	3344	1075	11.904	0.358	6.685	1.179	1.0942	0.2991
FJI 96x160	4.40	3617	1075	12.861	0.386	6.685	1.179	1.1978	0.3264
FJI 38x200	2.36	1355	1475	6.362	0.262	8.690	1.619	0.3977	0.1242
FJI 45x200	2.63	1628	1475	7.668	0.312	9.006	1.619	0.4989	0.1483
FJI 53x200	2.95	1940	1475	9.153	0.368	9.366	1.619	0.6043	0.1760
FJI 58x200	3.15	2135	1475	10.079	0.404	9.591	1.619	0.6738	0.1943
FJI 63x200	3.35	2330	1475	10.991	0.440	9.816	1.619	0.7412	0.2120
FJI 69x200	3.59	2564	1475	12.066	0.482	9.906	1.619	0.8239	0.2338
FJI 70x200	3.63	2603	1475	12.246	0.489	9.906	1.619	0.8377	0.2374
FJI 89x200	4.38	3344	1475	15.652	0.625	9.906	1.619	1.1072	0.3082
FJI 96x200	4.66	3617	1475	16.907	0.674	9.906	1.619	1.2107	0.3354
FJI 38x220	2.49	1355	1675	7.150	0.330	10.103	1.840	0.4042	0.1288
FJI 45x220	2.77	1628	1675	8.614	0.393	10.470	1.840	0.5054	0.1529
FJI 53x220	3.08	1940	1675	10.277	0.465	10.889	1.840	0.6107	0.1806
FJI 58x220	3.28	2135	1675	11.314	0.509	11.150	1.840	0.6802	0.1988
FJI 63x220	3.48	2330	1675	12.334	0.554	11.412	1.840	0.7477	0.2166
FJI 69x220	3.72	2564	1675	13.539	0.608	11.517	1.840	0.8304	0.2383
FJI 70x220	3.76	2603	1675	13.739	0.617	11.517	1.840	0.8442	0.2419
FJI 89x220	4.52	3344	1675	17.553	0.787	11.517	1.840	1.1136	0.3127
FJI 96x220	4.79	3617	1675	18.958	0.850	11.517	1.840	1.2172	0.3400
FJI 38x240	2.62	1355	1875	7.950	0.407	11.295	2.060	0.4107	0.1333
FJI 45x240	2.90	1628	1875	9.570	0.484	11.705	2.060	0.5118	0.1574
FJI 53x240	3.22	1940	1875	11.412	0.572	12.173	2.060	0.6172	0.1851
FJI 58x240	3.41	2135	1875	12.560	0.627	12.466	2.060	0.6867	0.2034
FJI 63x240	3.61	2330	1875	13.690	0.683	12.758	2.060	0.7542	0.2211
FJI 69x240	3.85	2564	1875	15.024	0.749	12.875	2.060	0.8369	0.2428
FJI 70x240	3.89	2603	1875	15.246	0.760	12.875	2.060	0.8507	0.2464
FJI 89x240	4.65	3344	1875	19.469	0.969	12.875	2.060	1.1201	0.3173
FJI 96x240	4.93	3617	1875	21.025	1.046	12.875	2.060	1.2237	0.3445
FJI 38x300	3.02	1355	2475	10.403	0.690	13.635	2.721	0.4302	0.1469
FJI 45x300	3.29	1628	2475	12.498	0.820	14.129	2.721	0.5313	0.1710
FJI 53x300	3.61	1940	2475	14.879	0.967	14.695	2.721	0.6367	0.1987
FJI 58x300	3.81	2135	2475	16.363	1.060	15.048	2.721	0.7062	0.2169
FJI 63x300	4.01	2330	2475	17.823	1.152	15.401	2.721	0.7737	0.2347
FJI 69x300	4.25	2564	2475	19.546	1.263	15.542	2.721	0.8564	0.2564
FJI 70x300	4.29	2603	2475	19.833	1.281	15.542	2.721	0.8701	0.2600
FJI 89x300	5.04	3344	2475	25.289	1.632	15.542	2.721	1.1396	0.3309
FJI 96x300	5.32	3617	2475	27.299	1.762	15.542	2.721	1.2432	0.3581
FJI 45x360	3.69	1628	3075	15.508	1.249	15.939	3.382	0.5508	0.1846
FJI 53x360	4.01	1940	3075	18.430	1.472	16.576	3.382	0.6562	0.2123
FJI 58x360	4.21	2135	3075	20.251	1.611	16.975	3.382	0.7257	0.2305
FJI 63x360	4.41	2330	3075	22.042	1.751	17.373	3.382	0.7931	0.2483
FJI 69x360	4.64	2564	3075	24.156	1.918	17.533	3.382	0.8758	0.2700
FJI 70x360	4.68	2603	3075	24.509	1.946	17.533	3.382	0.8896	0.2736
FJI 89x360	5.44	3344	3075	31.202	2.475	17.533	3.382	1.1591	0.3444
FJI 96x360	5.72	3617	3075	33.668	2.670	17.533	3.382	1.2626	0.3717
FJI 45x400	3.95	1628	3475	17.557	1.589	18.191	3.823	0.5638	0.1936
FJI 53x400	4.27	1940	3475	20.841	1.871	18.919	3.823	0.6691	0.2213
FJI 58x400	4.47	2135	3475	22.887	2.047	19.374	3.823	0.7386	0.2396
FJI 63x400	4.67	2330	3475	24.900	2.223	19.829	3.823	0.8061	0.2573
FJI 69x400	4.91	2564	3475	27.275	2.434	20.011	3.823	0.8888	0.2791
FJI 70x400	4.95	2603	3475	27.671	2.470	20.011	3.823	0.9026	0.2827
FJI 89x400	5.70	3344	3475	35.191	3.139	20.011	3.823	1.1720	0.3535
FJI 96x400	5.98	3617	3475	37.961	3.385	20.011	3.823	1.2756	0.3807
FJI 45x500	4.61	1628	4475	22.827	2.636	19.759	4.924	0.5962	0.2163
FJI 53x500	4.93	1940	4475	27.016	3.095	20.549	4.924	0.7016	0.2440
FJI 58x500	5.13	2135	4475	29.628	3.381	21.043	4.924	0.7711	0.2622
FJI 63x500	5.33	2330	4475	32.195	3.668	21.537	4.924	0.8386	0.2800
FJI 69x500	5.57	2564	4475	35.223	4.012	21.735	4.924	0.9212	0.3017
FJI 70x500	5.61	2603	4475	35.728	4.069	21.735	4.924	0.9350	0.3053
FJI 89x500	6.36	3344	4475	45.317	5.158	21.735	4.924	1.2045	0.3761
FJI 96x500	6.64	3617	4475	48.849	5.560	21.735	4.924	1.3081	0.4034
FJI 45x600	5.27	1628	5475	28.301	3.974	19.750	6.026	0.6286	0.2389
FJI 53x600	5.59	1940	5475	33.400	4.653	20.540	6.026	0.7340	0.2666
FJI 58x600	5.79	2135	5475	36.577	5.077	21.034	6.026	0.8035	0.2849
FJI 63x600	5.99	2330	5475	39.699	5.501	21.527	6.026	0.8710	0.3026
FJI 69x600	6.23	2564	5475	43.382	6.010	21.725	6.026	0.9537	0.3243
FJI 70x600	6.27	2603	5475	43.995	6.095	21.725	6.026	0.9674	0.3280
FJI 89x600	7.02	3344	5475	55.655	7.707	21.725	6.026	1.2369	0.3988
FJI 96x600	7.30	3617	5475	59.951	8.300	21.725	6.026	1.3405	0.4260

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	2.24	1583	955	5.400	0.160	5.440	1.047	0.4503	0.1312
FJI 45x160-45	2.57	1898	955	6.510	0.190	5.638	1.047	0.7051	0.1713
FJI 53x160-45	2.93	2258	955	7.772	0.225	5.863	1.047	0.8580	0.2061
FJI 58x160-45	3.16	2483	955	8.559	0.246	6.004	1.047	0.9584	0.2290
FJI 63x160-45	3.39	2708	955	9.333	0.268	6.145	1.047	1.0625	0.2527
FJI 69x160-45	3.67	2978	955	10.247	0.294	6.201	1.047	1.1900	0.2817
FJI 70x160-45	3.71	3023	955	10.399	0.298	6.201	1.047	1.2106	0.2864
FJI 89x160-45	4.59	3878	955	13.293	0.380	6.201	1.047	1.6147	0.3785
FJI 96x160-45	4.91	4193	955	14.359	0.410	6.201	1.047	1.7667	0.4131
FJI 38x200-45	2.51	1583	1355	7.156	0.284	8.266	1.487	0.4633	0.1403
FJI 45x200-45	2.83	1898	1355	8.619	0.338	8.566	1.487	0.7180	0.1803
FJI 53x200-45	3.20	2258	1355	10.283	0.399	8.909	1.487	0.8709	0.2152
FJI 58x200-45	3.43	2483	1355	11.320	0.437	9.123	1.487	0.9713	0.2380
FJI 63x200-45	3.66	2708	1355	12.341	0.476	9.337	1.487	1.0755	0.2617
FJI 69x200-45	3.93	2978	1355	13.546	0.522	9.423	1.487	1.2030	0.2908
FJI 70x200-45	3.98	3023	1355	13.747	0.529	9.423	1.487	1.2235	0.2955
FJI 89x200-45	4.85	3878	1355	17.562	0.675	9.423	1.487	1.6277	0.3875
FJI 96x200-45	5.17	4193	1355	18.968	0.729	9.423	1.487	1.7797	0.4222
FJI 38x220-45	2.64	1583	1555	8.056	0.360	9.680	1.707	0.4698	0.1448
FJI 45x220-45	2.96	1898	1555	9.699	0.428	10.031	1.707	0.7245	0.1849
FJI 53x220-45	3.33	2258	1555	11.566	0.506	10.432	1.707	0.8774	0.2197
FJI 58x220-45	3.56	2483	1555	12.730	0.555	10.683	1.707	0.9778	0.2426
FJI 63x220-45	3.79	2708	1555	13.876	0.603	10.933	1.707	1.0820	0.2663
FJI 69x220-45	4.06	2978	1555	15.229	0.662	11.034	1.707	1.2095	0.2953
FJI 70x220-45	4.11	3023	1555	15.454	0.671	11.034	1.707	1.2300	0.3000
FJI 89x220-45	4.98	3878	1555	19.736	0.856	11.034	1.707	1.6342	0.3921
FJI 96x220-45	5.30	4193	1555	21.314	0.924	11.034	1.707	1.7862	0.4267
FJI 38x240-45	2.77	1583	1755	8.967	0.446	10.879	1.928	0.4763	0.1493
FJI 45x240-45	3.09	1898	1755	10.791	0.530	11.274	1.928	0.7310	0.1894
FJI 53x240-45	3.46	2258	1755	12.863	0.627	11.725	1.928	0.8839	0.2242
FJI 58x240-45	3.69	2483	1755	14.155	0.687	12.007	1.928	0.9843	0.2471
FJI 63x240-45	3.92	2708	1755	15.427	0.747	12.289	1.928	1.0884	0.2708
FJI 69x240-45	4.20	2978	1755	16.927	0.819	12.401	1.928	1.2160	0.2999
FJI 70x240-45	4.24	3023	1755	17.177	0.831	12.401	1.928	1.2365	0.3045
FJI 89x240-45	5.11	3878	1755	21.929	1.059	12.401	1.928	1.6407	0.3966
FJI 96x240-45	5.43	4193	1755	23.680	1.143	12.401	1.928	1.7927	0.4312
FJI 38x300-45	3.17	1583	2355	11.765	0.763	13.268	2.589	0.4957	0.1629
FJI 45x300-45	3.49	1898	2355	14.134	0.906	13.749	2.589	0.7505	0.2030
FJI 53x300-45	3.86	2258	2355	16.825	1.069	14.299	2.589	0.9034	0.2378
FJI 58x300-45	4.09	2483	2355	18.503	1.171	14.643	2.589	1.0038	0.2607
FJI 63x300-45	4.32	2708	2355	20.153	1.273	14.987	2.589	1.1079	0.2844
FJI 69x300-45	4.59	2978	2355	22.101	1.396	15.124	2.589	1.2354	0.3134
FJI 70x300-45	4.64	3023	2355	22.426	1.416	15.124	2.589	1.2560	0.3181
FJI 89x300-45	5.51	3878	2355	28.595	1.804	15.124	2.589	1.6602	0.4102
FJI 96x300-45	5.83	4193	2355	30.867	1.947	15.124	2.589	1.8121	0.4448
FJI 45x360-45	3.89	1898	2955	17.564	1.389	15.601	3.250	0.7699	0.2166
FJI 53x360-45	4.25	2258	2955	20.877	1.637	16.225	3.250	0.9228	0.2514
FJI 58x360-45	4.48	2483	2955	22.943	1.792	16.615	3.250	1.0232	0.2743
FJI 63x360-45	4.71	2708	2955	24.976	1.947	17.005	3.250	1.1274	0.2980
FJI 69x360-45	4.99	2978	2955	27.374	2.134	17.161	3.250	1.2549	0.3270
FJI 70x360-45	5.03	3023	2955	27.773	2.165	17.161	3.250	1.2755	0.3317
FJI 89x360-45	5.91	3878	2955	35.366	2.754	17.161	3.250	1.6796	0.4238
FJI 96x360-45	6.23	4193	2955	38.164	2.971	17.161	3.250	1.8316	0.4584
FJI 45x400-45	4.15	1898	3355	19.895	1.772	17.854	3.690	0.7829	0.2256
FJI 53x400-45	4.52	2258	3355	23.625	2.087	18.568	3.690	0.9358	0.2604
FJI 58x400-45	4.75	2483	3355	25.951	2.283	19.014	3.690	1.0362	0.2833
FJI 63x400-45	4.98	2708	3355	28.238	2.480	19.460	3.690	1.1404	0.3070
FJI 69x400-45	5.25	2978	3355	30.937	2.716	19.639	3.690	1.2679	0.3361
FJI 70x400-45	5.30	3023	3355	31.386	2.756	19.639	3.690	1.2884	0.3408
FJI 89x400-45	6.17	3878	3355	39.931	3.503	19.639	3.690	1.6926	0.4328
FJI 96x400-45	6.49	4193	3355	43.080	3.778	19.639	3.690	1.8446	0.4674
FJI 45x500-45	4.81	1898	4355	25.874	2.950	20.049	4.792	0.8154	0.2483
FJI 53x500-45	5.18	2258	4355	30.648	3.466	20.851	4.792	0.9683	0.2831
FJI 58x500-45	5.41	2483	4355	33.623	3.788	21.352	4.792	1.0687	0.3060
FJI 63x500-45	5.64	2708	4355	36.549	4.111	21.853	4.792	1.1728	0.3297
FJI 69x500-45	5.91	2978	4355	40.001	4.498	22.054	4.792	1.3003	0.3587
FJI 70x500-45	5.96	3023	4355	40.576	4.562	22.054	4.792	1.3209	0.3634
FJI 89x500-45	6.83	3878	4355	51.506	5.788	22.054	4.792	1.7250	0.4555
FJI 96x500-45	7.15	4193	4355	55.532	6.239	22.054	4.792	1.8770	0.4901
FJI 45x600-45	5.47	1898	5355	32.060	4.455	19.983	5.894	0.8478	0.2709
FJI 53x600-45	5.84	2258	5355	37.881	5.222	20.782	5.894	1.0007	0.3057
FJI 58x600-45	6.07	2483	5355	41.509	5.701	21.282	5.894	1.1011	0.3286
FJI 63x600-45	6.30	2708	5355	45.075	6.180	21.781	5.894	1.2052	0.3523
FJI 69x600-45	6.57	2978	5355	49.280	6.756	21.981	5.894	1.3328	0.3814
FJI 70x600-45	6.62	3023	5355	49.981	6.851	21.981	5.894	1.3533	0.3861
FJI 89x600-45	7.49	3878	5355	63.298	8.673	21.981	5.894	1.7575	0.4781
FJI 96x600-45	7.81	4193	5355	68.205	9.344	21.981	5.894	1.9094	0.5127

Table 2-4d

Finnjoist characteristic values for flange dependant properties

Flange width	End bearing [1]				Intermediate bearing [1]						Secondary direction [2]				Axial [2]	
	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	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	9.46	11.18	15.76	17.48	16.76	18.48	18.77	20.49	25.36	27.08	0.5121	4.15	3.7641	0.9108	42.50	20.9484
53	10.75	12.47	17.91	19.63	19.05	20.77	21.33	23.05	28.82	30.54	0.7109	4.94	6.1550	1.0836	50.57	24.9228
58	11.55	13.27	19.26	20.98	20.48	22.20	22.93	24.65	30.99	32.71	0.8517	5.43	8.0692	1.1916	55.61	27.4068
63	11.95	13.67	19.88	21.64	21.19	22.91	23.72	25.44	32.05	33.77	1.0051	5.92	10.3435	1.2996	60.65	29.8908
69	11.95	13.67	19.88	21.64	21.19	22.91	23.72	25.44	32.05	33.77	1.1987	6.51	13.5918	1.4292	66.70	32.8716
70	11.95	13.67	19.88	21.64	21.19	22.91	23.72	25.44	32.05	33.77	1.2316	6.61	14.1917	1.4508	67.70	33.3684
89	11.95	13.67	19.88	21.64	21.19	22.91	23.72	25.44	32.05	33.77	1.9350	8.48	29.1772	1.8612	86.86	42.8076
96	11.95	13.67	19.88	21.64	21.19	22.91	23.72	25.44	32.05	33.77	2.2311	9.17	36.6196	2.0124	93.91	46.2852
39mm flange depth																
38	8.33	10.05	13.88	15.60	14.76	16.48	16.53	18.25	22.33	24.05	0.3948	3.70	2.4504	0.8127	37.93	18.6921
45	9.46	11.18	15.76	17.48	16.76	18.48	18.77	20.49	25.36	27.08	0.5545	4.45	4.0764	0.9765	45.57	22.4595
53	10.75	12.47	17.91	19.63	19.05	20.77	21.33	23.05	28.82	30.54	0.7700	5.30	6.6665	1.1637	54.31	26.7651
58	11.55	13.27	19.26	20.98	20.48	22.20	22.93	24.65	30.99	32.71	0.9225	5.83	8.7402	1.2807	59.77	29.4561
63	12.36	14.08	20.35	22.32	21.91	23.63	24.53	26.25	33.15	34.87	1.0887	6.37	11.2040	1.3977	65.23	32.1471
69	13.33	15.05	20.35	23.94	23.63	25.35	26.46	28.18	33.87	37.47	1.2985	7.01	14.7230	1.5381	71.78	35.3763
70	13.36	15.21	20.35	24.20	23.91	25.63	26.55	28.50	33.87	37.90	1.3341	7.11	15.3730	1.5615	72.87	35.9145
89	13.36	15.46	20.35	24.63	24.33	26.09	26.55	29.00	33.87	38.58	2.0961	9.14	31.6073	2.0061	93.62	46.1403
96	13.36	15.46	20.35	24.63	24.33	26.09	26.55	29.00	33.87	38.58	2.4169	9.89	39.6698	2.1699	101.26	49.9077
45mm flange depth																
45	10.32	12.04	16.62	18.34	18.48	20.20	20.49	22.21	27.08	28.80	0.6401	5.19	4.7051	1.1385	53.13	26.1855
53	11.72	13.44	18.89	20.61	21.01	22.73	23.29	25.01	30.78	32.50	0.8887	6.17	7.6938	1.3545	63.21	31.1535
58	12.60	14.32	20.31	22.03	22.58	24.30	25.03	26.75	33.09	34.81	1.0646	6.79	10.0865	1.4895	69.51	34.2585
63	13.48	15.20	21.31	23.45	24.16	25.88	26.78	28.50	35.40	37.12	1.2563	7.40	12.9293	1.6245	75.81	37.3635
69	14.31	16.26	21.31	25.15	26.05	27.77	28.46	30.60	35.78	39.89	1.4984	8.14	16.9897	1.7865	83.37	41.0895
70	14.31	16.44	21.31	25.43	26.24	28.09	28.46	30.95	35.78	40.35	1.5395	8.26	17.7397	1.8135	84.63	41.7105
89	14.31	16.71	21.31	25.88	26.24	28.58	28.46	31.50	35.78	41.08	2.4187	10.60	36.4716	2.3265	108.57	53.5095
96	14.31	16.71	21.31	25.88	26.24	28.58	28.46	31.50	35.78	41.08	2.7889	11.46	45.7745	2.5155	117.39	57.8565

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

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	32.89	4.32	0.121	4.91	1.17	4.98	5.88	8.29	8.70	9.88	10.78
160-58	2.44	1986	1084	43.03	5.65	0.157	4.91	1.17	6.08	6.98	10.13	11.75	12.07	12.97
160-70	2.82	2418	1084	52.39	6.84	0.190	4.91	1.17	6.29	7.19	10.48	11.39	12.48	13.39
160-89	3.42	3102	1084	67.21	8.73	0.241	4.91	1.17	6.29	7.19	10.48	11.39	12.48	13.39
200-45	2.29	1518	1484	32.89	5.70	0.211	7.20	1.60	4.98	5.88	8.29	8.70	9.88	10.78
200-58	2.70	1986	1484	43.03	7.44	0.273	7.20	1.60	6.08	6.98	10.13	11.75	12.07	12.97
200-70	3.08	2418	1484	52.39	9.00	0.329	7.20	1.60	6.29	7.19	10.48	11.39	12.48	13.39
200-89	3.68	3102	1484	67.21	11.47	0.419	7.20	1.60	6.29	7.19	10.48	11.39	12.48	13.39
220-45	2.41	1518	1684	32.89	6.41	0.266	8.34	1.82	4.98	5.88	8.29	8.70	9.88	10.78
220-58	2.83	1986	1684	43.03	8.36	0.343	8.34	1.82	6.08	6.98	10.13	11.75	12.07	12.97
220-70	3.21	2418	1684	52.39	10.11	0.414	8.34	1.82	6.29	7.19	10.48	11.39	12.48	13.39
220-89	3.81	3102	1684	67.21	12.87	0.527	8.34	1.82	6.29	7.19	10.48	11.39	12.48	13.39
240-45	2.54	1518	1884	32.89	7.13	0.328	9.48	2.03	4.98	5.88	8.29	8.70	9.88	10.78
240-58	2.95	1986	1884	43.03	9.29	0.422	9.48	2.03	6.08	6.98	10.13	11.75	12.07	12.97
240-70	3.33	2418	1884	52.39	11.22	0.510	9.48	2.03	6.29	7.19	10.48	11.39	12.48	13.39
240-89	3.94	3102	1884	67.21	14.27	0.648	9.48	2.03	6.29	7.19	10.48	11.39	12.48	13.39
300-45	2.93	1518	2484	32.89	9.35	0.556	12.91	2.68	4.98	5.88	8.29	8.70	9.88	10.78
300-58	3.34	1986	2484	43.03	12.14	0.713	12.91	2.68	6.08	6.98	10.13	11.75	12.07	12.97
300-70	3.72	2418	2484	52.39	14.62	0.858	12.91	2.68	6.29	7.19	10.48	11.39	12.48	13.39
300-89	4.32	3102	2484	67.21	18.56	1.089	12.91	2.68	6.29	7.19	10.48	11.39	12.48	13.39
360-45	3.31	1518	3084	32.89	11.66	0.849	16.34	3.33	4.98	5.88	8.29	8.70	9.88	10.78
360-58	3.72	1986	3084	43.03	15.07	1.086	16.34	3.33	6.08	6.98	10.13	11.75	12.07	12.97
360-70	4.10	2418	3084	52.39	18.12	1.304	16.34	3.33	6.29	7.19	10.48	11.39	12.48	13.39
360-89	4.70	3102	3084	67.21	22.94	1.651	16.34	3.33	6.29	7.19	10.48	11.39	12.48	13.39
400-45	3.57	1518	3484	32.89	13.24	1.083	18.50	3.76	4.98	5.88	8.29	8.70	9.88	10.78
400-58	3.98	1986	3484	43.03	17.07	1.382	18.50	3.76	6.08	6.98	10.13	11.75	12.07	12.97
400-70	4.36	2418	3484	52.39	20.49	1.657	18.50	3.76	6.29	7.19	10.48	11.39	12.48	13.39
400-89	4.96	3102	3484	67.21	25.91	2.094	18.50	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

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	35.26	4.55	0.125	4.74	1.16	4.98	5.88	8.29	8.70	9.88	10.78
160-58	2.57	2135	1075	46.25	5.97	0.162	4.74	1.16	6.08	6.98	10.13	11.75	12.07	12.97
160-70	2.98	2603	1075	56.39	7.24	0.196	4.74	1.16	7.10	8.00	11.83	12.74	14.09	14.99
160-89	3.63	3344	1075	72.44	9.25	0.250	4.74	1.16	7.23	8.14	12.05	12.96	14.35	15.26
200-45	2.38	1628	1475	35.26	6.02	0.219	7.03	1.59	4.98	5.88	8.29	8.70	9.88	10.78
200-58	2.82	2135	1475	46.25	7.88	0.284	7.03	1.59	6.08	6.98	10.13	11.75	12.07	12.97
200-70	3.23	2603	1475	56.39	9.54	0.343	7.03	1.59	7.10	8.00	11.83	12.74	14.09	14.99
200-89	3.89	3344	1475	72.44	12.18	0.437	7.03	1.59	7.23	8.14	12.05	12.96	14.35	15.26
220-45	2.50	1628	1675	35.26	6.77	0.277	8.17	1.81	4.98	5.88	8.29	8.70	9.88	10.78
220-58	2.95	2135	1675	46.25	8.86	0.358	8.17	1.81	6.08	6.98	10.13	11.75	12.07	12.97
220-70	3.36	2603	1675	56.39	10.72	0.433	8.17	1.81	7.10	8.00	11.83	12.74	14.09	14.99
220-89	4.01	3344	1675	72.44	13.67	0.551	8.17	1.81	7.23	8.14	12.05	12.96	14.35	15.26
240-45	2.63	1628	1875	35.26	7.54	0.342	9.31	2.03	4.98	5.88	8.29	8.70	9.88	10.78
240-58	3.08	2135	1875	46.25	9.85	0.442	9.31	2.03	6.08	6.98	10.13	11.75	12.07	12.97
240-70	3.49	2603	1875	56.39	11.91	0.533	9.31	2.03	7.10	8.00	11.83	12.74	14.09	14.99
240-89	4.14	3344	1875	72.44	15.18	0.679	9.31	2.03	7.23	8.14	12.05	12.96	14.35	15.26
300-45	3.02	1628	2475	35.26	9.89	0.582	12.74	2.67	4.98	5.88	8.29	8.70	9.88	10.78
300-58	3.46	2135	2475	46.25	12.88	0.749	12.74	2.67	6.08	6.98	10.13	11.75	12.07	12.97
300-70	3.87	2603	2475	56.39	15.55	0.903	12.74	2.67	7.10	8.00	11.83	12.74	14.09	14.99
300-89	4.53	3344	2475	72.44	19.77	1.147	12.74	2.67	7.23	8.14	12.05	12.96	14.35	15.26
360-45	3.40	1628	3075	35.26	12.34	0.891	16.16	3.32	4.98	5.88	8.29	8.70	9.88	10.78
360-58	3.85	2135	3075	46.25	16.00	1.143	16.16	3.32	6.08	6.98	10.13	11.75	12.07	12.97
360-70	4.26	2603	3075	56.39	19.28	1.376	16.16	3.32	7.10	8.00	11.83	12.74	14.09	14.99
360-89	4.91	3344	3075	72.44	24.46	1.744	16.16	3.32	7.23	8.14	12.05	12.96	14.35	15.26
400-45	3.66	1628	3475	35.26	14.02	1.138	18.45	3.75	4.98	5.88	8.29	8.70	9.88	10.78
400-58	4.10	2135	3475	46.25	18.14	1.456	18.45	3.75	6.08	6.98	10.13	11.75	12.07	12.97
400-70	4.51	2603	3475	56.39	21.81	1.750	18.45	3.75	7.10	8.00	11.83	12.74	14.09	14.99
400-89	5.17	3344	3475	72.44	27.63	2.215	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. It is assumed, that the knock-outs do not interfere and that the knock-out considered is a hole. Additional holes may be taken in the joist web for installations according to following rules:

   - The structural effect of all additional holes must be considered separately on a case by case basis.
   - Holes shall be positioned at the centre of the web, except of holes smaller or equal than 20 mm in diameter or rectangular holes with their maximum width or depth being less or equal to 20mm.
   - 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

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

     must be considered.

   - 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
   - For rectangular holes, the corners shall be made carefully and overcutting shall be avoided.
   - For joists with holes, the shear capacity can be calculated as follows:

     $$R_{V,k,hole} = 1{,}1 \cdot k_{hole} \cdot R_{V,k} \le R_{V,k} \quad (1a)$$

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

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

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

$$k_{hole} = \frac{h_w + h_f - k_{shape} * h_{hole} - k * 38}{h_{w,eff} - 38}, \quad 0 \le k_{hole} \le 1 \tag{2}$$

$$h_{w,eff} = \frac{35 b_w}{h_w}\left(h_w + h_f\right) \le h_w + h_f \tag{3}$$

k_{shape} is 1,00 for round holes and 1,23 for rectangular holes. k takes into account the effect of the system hole (open knock-out hole) that may be present near to the considered hole. 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.

When h ≤ 212mm:

$$k = \frac{250 - h - h_{hole}}{76}, \quad 0 \le k \le 1 \tag{4}$$

When h ≥ 212mm:

$$k = \frac{h - h_{hole} - 174}{76}, \quad 0 \le k \le 1 \tag{5}$$