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Authorised and notified according to Article 10 of the Council Directive (89/106/EEC) of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products.



European Technical Approval ETA-06/0238

*Fourth issue**

Trade name:

STEICOjoist and STEICOwall

Holder of approval:

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Generic type and use of construction product:

Light composite wood-based beams and columns for structural use

Valid from: to:

18 January 2013
27 October 2016

This version replaces

ETA-06/0238 valid from 27 October 2011 to 27 October 2016

Manufacturing plant:

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Poland

This European Technical Approval contains:

Fourteen pages, including four Annexes, which form an integral part of the document



European Organisation for Technical Approvals

I LEGAL BASES AND GENERAL CONDITIONS

1 This European Technical Approval is issued by the British Board of Agrément in accordance with:

- Council Directive 89/106/EEC of 21 December 1988 [Construction Products Directive (CPD)] on the approximation of laws, regulations and administrative provisions of Member States relating to construction products⁽¹⁾, modified by the Council Directive 93/68/EEC of 22 July 1993⁽²⁾.
- UK implementation of CPD Statutory Instruments 1991, No 1620. The Building and Building Construction Products Regulations 1991 — made 15 July 1991, laid before Parliament 22 July 1991, coming into force 27 December 1991, and amended by the Construction Products (Amendment) Regulations 1994 (Statutory Instruments 1994, No 3051)
- Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex to Commission Decision 94/23/EC⁽³⁾
- EOTA Guideline for European Technical Approval ETAG 011 *Light Composite Wood-based Beams and Columns*, January 2002.

2 The British Board of Agrément is authorised to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European Technical Approval and for their fitness for the intended use remains with the holder of the European Technical Approval.

3 This European Technical Approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European Technical Approval.

4 This European Technical Approval may be withdrawn by the British Board of Agrément, in particular after information by the Commission on the basis of Article 5(1) of Council Directive 89/106/EEC.

5 Reproduction of this European Technical Approval, including transmission by electronic means, shall be in full. However, partial reproduction can be made with the written consent of the British Board of Agrément. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European Technical Approval.

6 The European Technical Approval is issued by the approval body in its official language. This version should correspond to the version circulated within EOTA. Translations into other languages have to be designated as such.

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

Definition of product

STEICOjoist and STEICOwall are I-joists of composite construction with solid timber or LVL flanges and hardboard webs and are available in a range of sizes (see Annex 1, Figure 1 and Tables 1 and 2).

The solid timber flanges are one of strength class L17 or L36 to EN 14081-4 : 2009 and finger jointed to length in accordance with EN 385 : 2001. The LVL flanges are of class 1.6E or class 2.0E comprising laminated veneers bonded with phenol-formaldehyde adhesive, laid with the grain running parallel. The veneers are oriented perpendicular to the web.

The hardboard web is in accordance with EN 622-2 : 2004, type HB.HLA1, and is placed in the beams in sections 1200 mm to 1900 mm long. Web-to-web connections consist of a tongue-and-groove joint.

The web-to-flange connection is made by glueing the web into a groove in the centre of the wide face of the flange. Adhesive in accordance with EN 301 : 2006, type 1, is used in the web-to-web and the web-to-flange joint.

The components are machine-assembled in one pass.

Intended use

The product is intended for use as a loadbearing component in building structures, eg construction members or frame elements for walls, roofs, floors and trusses where Essential Requirements 1, 2, 3 and 6 *Mechanical resistance and stability, Safety in case of fire, Hygiene, health and environment and Energy economy and heat retention respectively* (CPD, Annex 1), apply.

The product is for use in timber structures subject to conditions defined by service classes 1 and 2 of EN 1995-1-1 : 2004 (Eurocode 5) and for members subject to static or quasi-static loading.

The provisions made in this ETA are based on an assumed intended working life for the joist of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be used as a means for selecting the appropriate product in relation to the expected economically reasonable working life of the works.

2 Characteristics of product and methods of verification

The assessment of fitness for the intended use (see part II, section 1) has been made in accordance with ETAG 011.

The product is available in the range given in part II, section 1, and has the characteristics listed in Tables 1, 2, 8 and 9 in Annex 2.

ER1 Mechanical resistance and stability

The mechanical properties, characteristic load-carrying capacities and modification factors for the products are given in Annex 2 which has been derived in accordance with ETAG 011. Details for incorporation of holes in the web and axial loading respectively are given in Annexes 3 and 4. They should be used for designs in accordance with EN 1995-1-1 : 2004 (Eurocode 5). The load-carrying capacities have been derived by calculation and calculation assisted by test.

(1) Official Journal of the European Communities No L40, 11.2.1989, p12.

(2) Official Journal of the European Communities No L220, 30.8.1993, p1.

(3) Official Journal of the European Communities No L17, 20.1.1994, p34

The performance of the product in seismic zones has not been assessed and is outside the scope of this ETA and, therefore, No Performance Determined (NPD). Where cyclic design of the structure is required, the product must be considered as part of the overall structure when designing in accordance with the relevant design codes.

ER2 Safety in case of fire

In relation to reaction to fire, the joist materials are classified as D-s2, d0, in accordance with EN 13501-1 : 2007 by reference to EC Decisions 2000/147/EC and 2003/43/EC. Performance in relation to fire resistance would be determined for the complete structural element with any associated finishes, hence, for this Essential Requirement there are no aspects of performance relevant to a joist and, therefore NPD.

ER3 Hygiene, health and environment

According to the manufacturer's declaration, the product specification has been compared with the dangerous substances detailed in Council Directive 76/769/EEC (as amended) and listed on the database established on the EC construction website to verify that it does not contain such substances above the acceptable limits.

The hardboard web and LVL flange are classified as E1 in accordance with EN 13986 : 2004 and EN 14374 : 2004 respectively with regard to extractable formaldehyde content.

The joists are not preservative-treated nor do they contain pentachlorophenol.

In addition to the specific clauses relating to dangerous substances contained in this European Technical Approval, there may be other requirements applicable to the products falling within its scope (eg transposed European legislation and national laws, regulations and administrative provisions). To meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

ER4 Safety in use

Not relevant to this product.

ER5 Protection against noise

Not relevant to this product.

ER6 Energy economy and heat retention

Hygrothermal properties in accordance with EN 12524 : 2000, are given in Annex 2, Table 6. The natural variation of the materials has been accounted for in these values.

Aspects of durability, serviceability and identification

Untreated joists can be used in service classes 1 and 2 as explained in Eurocode 5 and in Hazard Classes 1 and 2 as specified in EN 335-1 : 2006. The products may be exposed directly to the weather for a short time during installation.

Attack from insects such as house longhorn beetle, dry wood termites and woodworm may reduce the durability of the product.

The ability of the product to resist loads without undue deflection (serviceability) is dealt with in the section headed *ER1 Mechanical resistance and stability*. The

product bears the manufacturer's identification mark, the product type and the CE marking as described in section 3.3.

3 Evaluation of Conformity and CE marking

3.1 Attestation of Conformity system

The system of attestation of conformity applied to this product shall be that laid down in the CPD, Annex III, 2(i) (referred to as System 1).

3.2 Responsibilities

3.2.1 Tasks for the manufacturer — factory production control

The manufacturer continues to operate a factory production control system. All elements, requirements and provisions adopted by the manufacturer are documented to ensure that the product conforms with this ETA.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the prescribed test plan⁽⁴⁾. The raw materials shall be subject to controls and tests by the manufacturer before acceptance. Checks on incoming materials, shall include control of the certificates of conformity presented by suppliers (comparison with nominal values) by verifying dimensions and determining material properties.

The manufactured joists are checked for:

- flange and web material
- dimensional accuracy
- visual quality
- glue spread
- fit of component parts
- strength of completed joist.

The frequency of controls and tests conducted during production and on the assembled joist is laid down in the prescribed test plan, taking account of the manufacturing process of the joist.

The results of factory production control are recorded and evaluated. The records include at least:

- designation of the product, basic material and components
- type of control or testing
- date of manufacture of the product and date of testing of the product or basic material and components
- result of control and testing and, if appropriate, comparison with requirements
- signature of person responsible for factory production control.

The records shall be presented to the inspection body involved in the continuous surveillance.

Details of the extent, nature and frequency of testing and controls to be performed within the factory production control shall correspond to the prescribed test plan included in the technical documentation of this European Technical Approval.

(4) The prescribed test plan is deposited with the British Board of Agrément and is made available to the approved bodies involved in the conformity attestation process.

3.2.2 Declaration of conformity

The manufacturer shall make a declaration in accordance with the requirements of this European Technical Approval.

3.2.3 Tasks for approved bodies

3.2.3.1 Initial type-testing of the product

For initial type-testing (ITT) for other aspects of performance, the results of the tests performed as part of the assessment for the European Technical Approval shall be used unless there are changes in the production line or plant. In such cases the necessary type-testing has to be agreed between the British Board of Agrément and the approved body involved.

3.2.3.2 Initial inspection of factory and of factory production control

The approved body shall ascertain that, in accordance with the prescribed test plan, the factory, in particular the staff and equipment, and the factory production control, are suitable to ensure a continuous and orderly manufacturing of the joist with the specifications given in part II, section 2.

3.2.3.3 Continuous surveillance

The approved body shall visit the factory at least twice per year for routine inspections. It shall be verified that the system of factory production control and the specified manufacturing processes are maintained, taking account of the prescribed test plan. The results of product certification and continuous surveillance shall be made available on demand by the certification body to the British Board of Agrément. Where the provisions of the European Technical Approval and the prescribed test plan are no longer fulfilled, the certificate of conformity shall be withdrawn by the certification body.

3.3 CE Marking

The CE marking⁽⁵⁾ shall be affixed to each joist and/or the accompanying documentation. The CE symbol shall be accompanied by the following information:

- identification number of the certification body
- identification of the product
- name or identification mark of producer and the registered address of the producer
- the last two digits of the year in which the CE marking was affixed (ITT)
- number of the EC certificate of conformity
- number of the European Technical Approval.

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

The product is manufactured in accordance with the provisions of the European Technical Approval using the manufacturing processes as identified in the inspection of the plant by the British Board of Agrément and the approved body and laid down in the technical documentation.

4.2 Installation

A joist is deemed fit for its intended use provided:

- it is designed in accordance with Eurocode 5 or an appropriate national code using the design data given in Annex 2, Tables 1 to 6, 8 and 9. Design and detailing of structures should be carried out by a suitably experienced person in accordance with the manufacturer's instructions and the requirements of this ETA
- verifiable calculation, notes and drawings are prepared taking account of the loads to be resisted
- the minimum end bearing length shall be 45 mm and the minimum intermediate bearing length shall be 75 mm.

4.3 Criteria

The fitness for use of the joist can be assumed if it is installed correctly in accordance with the following requirements:

- installation is carried out by personnel under the direction of supervisors, all of whom are appropriately qualified for this work
- installation is in accordance with the manufacturer's specifications and drawings prepared for that purpose, and the appropriate tools are used
- the flanges must not be drilled, notched or otherwise altered on site
- the joists should be handled and installed in a similar manner to solid timber beams. However, the strength and stiffness of joists about their minor axis is less than that of corresponding solid timber sections. Therefore, care must be exercised to ensure that joists are not damaged during handling due to bending about their minor axis. In accordance with normal good practice for timber they should be protected from wetting during installation
- the characteristic bending moments given in Annex 2, Tables 1 and 2, are based on the assumption that lateral bracing to the compression flange (at a spacing not exceeding ten times the flange width) is in place. Alternative bracing will require separate analysis
- the joists should have a moisture content at the time of installation close to that attained in service
- temporary bracing should be provided to keep the joists in a straight and plumb position during installation
- rigid service pipes can be incorporated within the floor or roof void by passing through site-cut holes in accordance with the manufacturer's literature or software as detailed in Annex 3.

(5) See EU Commission Guidance Paper D *CE Marking under the Construction Products Directive*.

5 Recommendations

5.1 Recommendations on packaging, transport and storage

Delivery and site storage must be carried out in accordance with the manufacturer's instructions. During transportation the joists must be protected from adverse weather. The joists should be stored clear of the ground and stacked vertically (within the plane of the spans). Precautions should be taken to minimise changes in moisture content due to the weather. Full cover should be provided but permit free passage of air.

5.2 Recommendations on use, maintenance and repair

The assessment of the fitness for use is based on the assumption that maintenance is not required during the assumed intended working life.

Should repair prove necessary, an assessment must be made in each case. It is the responsibility of the manufacturer to ensure that the information on the specific conditions given in part II, sections 1, 2, 4.2 and 4.3, is given to those concerned. This information may be made by replicating the respective parts of the European Technical Approval.



On behalf of the British Board of Agrément

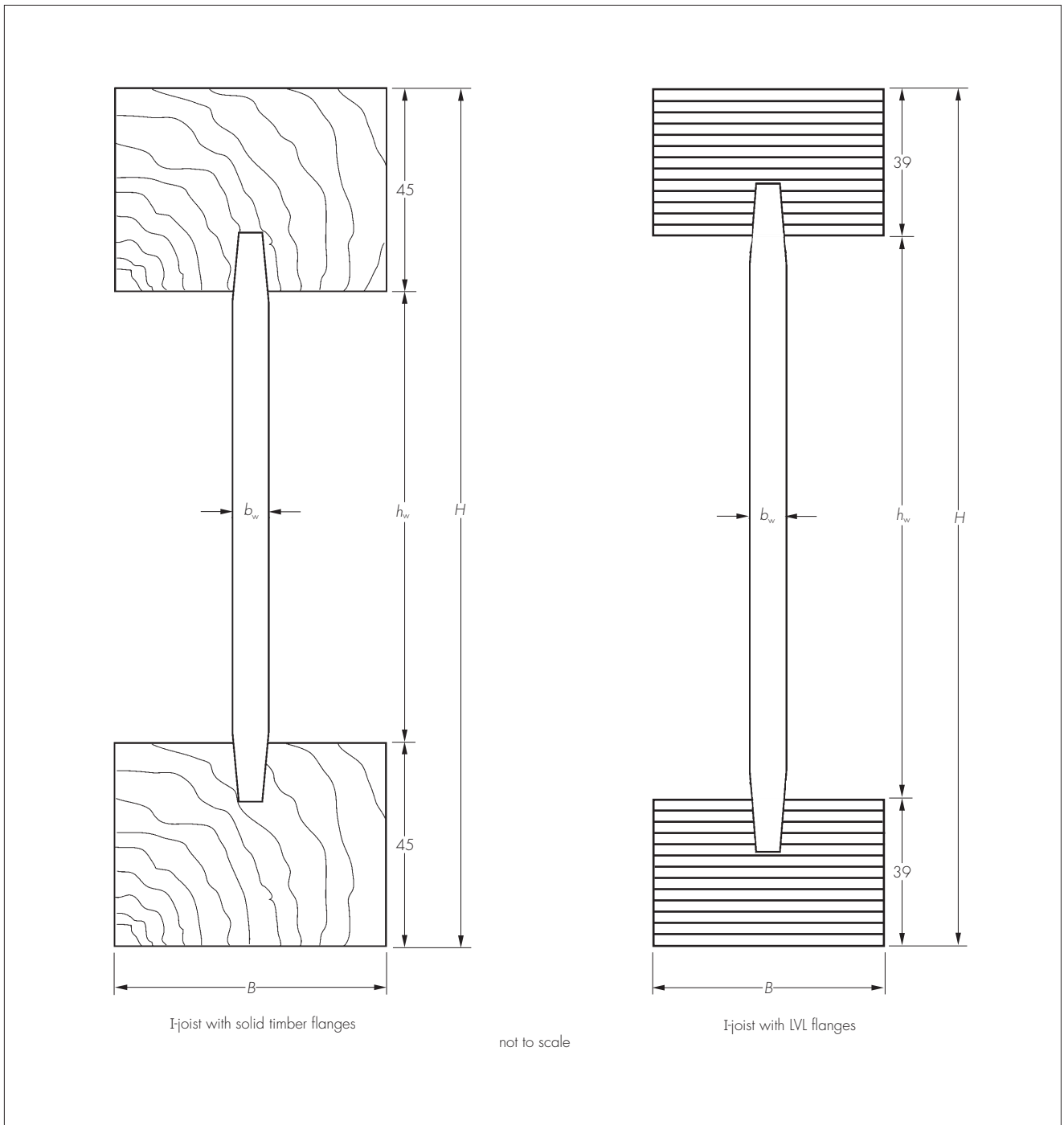
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Date of Fourth issue: 18 January 2013

ANNEX 1 PRODUCTION DETAIL

Figure 1 Sections (dimensions in mm)



ANNEX 1 PRODUCTION DETAIL (continued)*Table 1 Dimensions and information for STEICO I-joist products with solid timber flanges*

Type	Joist depth H (mm)	Flange width B (mm)	Flange depth h_f (mm)	Web thickness b_w (mm)	Flange grade
SJ 45	160 - 400	45	45	8.0	L36
SJ 60	160 - 500	60	45	8.0	L36
SJ 90	160 - 500	90	45	8.0	L36
SW 45	160 - 400	45	45	6.7 or 8.0	L17
SW 60	160 - 500	60	45	6.7 or 8.0	L17
SW 90	160 - 500	90	45	6.7 or 8.0	L17

Table 2 Dimensions and information for STEICO I-joist products with LVL flanges

Type	Joist depth H (mm)	Flange width B (mm)	Flange depth h_f (mm)	Web thickness b_w (mm)	Flange grade
SJ _l 45	160 - 400	45	39	8.0	2.0E LVL
SJ _l 60	160 - 500	60	39	8.0	2.0E LVL
SJ _l 90	160 - 500	90	39	8.0	2.0E LVL
SW _l 45	160 - 400	45	39	6.7 or 8.0	1.6E LVL
SW _l 60	160 - 500	60	39	6.7 or 8.0	1.6E LVL
SW _l 90	160 - 500	90	39	6.7 or 8.0	1.6E LVL

ANNEX 2 PRODUCT CHARACTERISTICS

Table 1 Characteristic design properties — solid timber flanges

Type	Depth (mm)	Moment capacity (kN·m)	Shear capacity (kN)	Bending stiffness EI_{joist} ($\text{N}\cdot\text{mm}^2 \times 10^9$)	Shear stiffness GA_{joist} (MN)
SJ 45	160	4.96	9.64	183	1.42
	200	7.09	11.72	327	2.09
	220	8.00	12.72	416	2.42
	240	8.92	13.69	516	2.76
	250	9.38	14.11	571	2.93
	300	11.74	16.13	888	3.77
	350	13.64	18.02	1281	4.61
	360	14.01	18.39	1369	4.78
	400	15.51	19.82	1753	5.45
SJ 60	160	6.75	10.28	249	1.42
	200	9.45	12.22	436	2.09
	220	10.66	13.25	554	2.42
	240	11.87	14.25	687	2.76
	250	12.48	14.68	759	2.93
	300	15.57	16.72	1177	3.77
	350	18.03	18.63	1693	4.61
	360	18.52	19.00	1808	4.78
	400	20.45	20.43	2310	5.45
	450	22.83	22.15	3030	6.29
	500	25.20	22.82	3855	7.13
SJ 90	160	10.04	10.63	370	1.42
	200	14.13	12.70	651	2.09
	220	15.96	13.76	827	2.42
	240	17.75	14.78	1025	2.76
	250	18.65	15.21	1132	2.93
	300	23.21	17.28	1752	3.77
	350	26.80	19.20	2513	4.61
	360	27.51	19.57	2683	4.78
	400	30.30	21.00	3419	5.45
	450	33.74	22.70	4472	6.29
	500	37.12	23.90	5675	7.13
SW 45	160	2.49	6.57	127	1.12
	200	3.56	8.00	227	1.63
	220	4.01	8.69	289	1.88
	240	4.48	9.35	359	2.13
	250	4.63	9.53	390	2.26
	300	5.90	11.28	618	2.89
	350	6.86	12.81	893	3.52
	360	7.05	12.90	954	3.64
	400	7.81	12.14	1223	4.15
SW 60	160	3.32	6.87	169	1.12
	200	4.74	8.34	302	1.63
	220	5.34	9.04	384	1.88
	240	5.95	9.72	477	2.13
	250	6.18	9.94	520	2.26
	300	7.82	11.68	818	2.89
	350	9.06	13.23	1178	3.52
	360	9.30	13.53	1258	3.64
	400	10.28	14.01	1608	4.15
	450	11.48	13.13	2108	4.78
	500	12.67	12.42	2685	5.41
SW 90	160	4.91	7.05	251	1.12
	200	7.05	8.60	450	1.63
	220	7.99	9.38	574	1.88
	240	8.89	10.08	711	2.13
	250	9.27	10.33	779	2.26
	300	11.64	12.06	1216	2.89
	350	13.44	13.61	1746	3.52
	360	13.80	13.91	1863	3.64
	400	15.21	14.68	2376	4.15
	450	16.93	13.76	3107	4.78
	500	18.64	13.01	3945	5.41

NOTE: The characteristics for beams within the depth range not listed in the table can be calculated by linear interpolation.

ANNEX 2 PRODUCT CHARACTERISTICS (continued)

Type	Depth (mm)	Characteristic bending moment (kN·m)	Characteristic vertical shear (kN)	Bending stiffness EI_{joist} ($\text{N}\cdot\text{mm}^2 \times 10^9$)	Shear stiffness GA_{joist} (MN)
S _l 45	160	5.90	9.64	195	1.83
	200	7.81	11.66	343	2.50
	220	8.79	12.63	433	2.84
	240	9.78	13.57	536	3.18
	250	10.27	13.97	591	3.34
	300	12.82	15.91	912	4.18
	350	15.43	17.74	1308	5.02
	360	15.96	18.09	1397	5.19
400	17.75	19.48	1783	5.86	
S _l 60	160	7.85	10.09	259	1.83
	200	10.36	12.19	455	2.50
	220	11.65	13.18	575	2.84
	240	12.94	14.15	709	3.18
	250	13.60	14.56	782	3.34
	300	16.91	16.53	1203	4.18
	350	20.30	18.37	1721	5.02
	360	20.98	18.73	1836	5.19
	400	23.61	20.12	2337	5.86
	450	26.48	21.78	3056	6.70
500	29.34	22.46	3880	7.54	
S _l 90	160	11.82	10.53	389	1.83
	200	15.47	12.71	679	2.50
	220	17.37	13.73	857	2.84
	240	19.28	14.72	1056	3.18
	250	20.24	15.14	1164	3.34
	300	25.09	17.13	1785	4.18
	350	30.03	18.98	2545	5.02
	360	31.02	19.34	2714	5.19
	400	35.04	20.72	3447	5.86
	450	39.73	22.36	4493	6.70
500	44.13	23.53	5687	7.54	
SW _l 45	160	3.38	6.74	148	1.56
	200	4.47	8.16	260	2.12
	220	5.03	8.84	330	2.41
	240	5.60	9.50	407	2.69
	250	5.89	9.79	450	2.83
	300	7.36	11.16	695	3.53
	350	8.87	12.31	998	4.24
	360	9.18	12.08	1066	4.38
400	10.21	11.29	1362	4.94	
SW _l 60	160	4.49	7.05	197	1.56
	200	5.93	8.52	346	2.12
	220	6.67	9.22	437	2.41
	240	7.41	9.90	539	2.69
	250	7.79	10.19	595	2.83
	300	9.70	11.58	916	3.53
	350	11.65	12.88	1311	4.24
	360	12.04	13.13	1399	4.38
	400	13.56	12.97	1783	4.94
	450	15.23	11.72	2333	5.64
500	16.89	10.81	2964	6.35	
SW _l 90	160	6.72	7.37	294	1.56
	200	8.85	8.88	516	2.12
	220	9.94	9.60	651	2.41
	240	11.03	10.29	802	2.69
	250	11.58	10.59	884	2.83
	300	14.37	11.99	1357	3.53
	350	17.21	13.29	1937	4.24
	360	17.78	13.54	2065	4.38
	400	20.09	14.12	2624	4.94
	450	22.80	12.96	3423	5.64
500	25.34	12.15	4335	6.35	

NOTE: The characteristics for beams within the depth range not listed in the table can be calculated by linear interpolation.

ANNEX 2 PRODUCT CHARACTERISTICS (continued)*Table 3 Values of k_{mod} to be used with Eurocode 5 when designing STEICO I-joist products*

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	0.60	0.60	0.42	0.34	0.60	0.60
Long term	0.70	0.70	0.56	0.45	0.70	0.70
Medium term	0.80	0.80	0.72	0.60	0.80	0.80
Short term	0.90	0.90	0.87	0.73	0.90	0.90
Instantaneous	1.10	1.10	1.10	0.93	1.10	1.10

Table 4 Values of k_{def} to be used with Eurocode 5 when designing STEICO I-joist products

Duration of load	Bending and axial deformation		Shear deformation	
	Service Class 1	Service Class 2	Service Class 1	Service Class 2
Permanent	0.60	0.80	2.25	3.00
Long term	0.50	0.50	1.50	2.00
Medium term	0.25	0.25	0.75	1.00
Short term	0.00	0.00	0.30	0.40

Table 5 Recommended values of Y_m to be used with Eurocode 5 when designing STEICO I-joist products in absence of nationally determined parameters

Combination	Bending and axial resistance	Shear resistance	Bearing resistance
Fundamental	1.2	1.3	1.2
Accidental	1.0	1.0	1.0

Table 6 Hygrothermal properties

Material	Density ⁽¹⁾ (mean) ρ_m ($\text{kg}\cdot\text{m}^{-3}$)	Design thermal conductivity λ ($\text{W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$)	Specific heat capacity c_p ($\text{J}\cdot\text{kg}^{-1}\cdot\text{K}^{-1}$)	Water vapour resistance factor ⁽²⁾ μ	
				dry	wet
LVL flanges	500	0.13	1600	50	20
Solid timber flanges	500	0.13	1600	50	20
Hardboard webs	900	0.14	1700	10	20

(1) The density for timber- and wood-based products is the density in equilibrium with 20°C and 65% relative humidity.

(2) Water vapour resistance factors are given as dry cup and wet cup values (see EN ISO 12572 : 2001).

Table 7 Manufacturing tolerances (mm)

Description ⁽¹⁾	Tolerances (mm)
Joist depth – H	–2 to + 1
Joist width – B	–2 to + 2
Flange depth – h_f	–2 to + 2
Web thickness – b_w	–0.7 + 0.7
Joist length – L	–0

(1) See Figure 1 of Annex 1.

ANNEX 2 PRODUCT CHARACTERISTICS (continued)

Table 8 Characteristic bearing resistance — solid timber

Type (mm)	Joist depth (mm)	End bearing capacity (kN)				Intermediate bearing capacity (kN)			
		45 mm stiffeners		89 mm stiffeners		75 mm stiffeners		89 mm stiffeners	
		without	with	without	with	without	with	without	with
SJ 45	160	8.1	9.1	8.7	10.1	17.8	20.9	20.1	21.2
	200	8.1	9.7	8.7	10.7	17.8	21.5	20.1	21.8
	220	8.1	10.0	8.7	11.0	17.8	21.8	20.1	22.1
	240	8.1	10.3	8.7	11.3	17.8	22.1	20.1	22.4
	250	8.1	10.5	8.7	11.5	17.8	22.2	20.1	22.5
	300	8.1	11.2	8.7	12.2	17.8	23.0	20.1	23.3
	350	8.1	12.0	8.7	13.0	17.8	23.7	20.1	24.0
	360	8.1	12.1	8.7	13.1	17.8	23.9	20.1	24.2
	400	8.1	12.7	8.7	13.7	17.8	24.5	20.1	24.8
	SJ 60	160	12.0	12.1	12.6	13.6	19.9	20.7	21.6
200		12.0	12.7	12.6	14.2	19.9	21.3	21.6	23.0
220		12.0	13.0	12.6	14.5	19.9	21.6	21.6	23.3
240		12.0	13.3	12.6	14.8	19.9	21.9	21.6	23.6
250		12.0	13.5	12.6	15.0	19.9	22.1	21.6	23.8
300		12.0	14.2	12.6	15.7	19.9	22.8	21.6	24.5
350		12.0	15.0	12.6	16.5	19.9	23.6	21.6	25.3
360		12.0	15.1	12.6	16.6	19.9	23.7	21.6	25.4
400		12.0	15.7	12.6	17.2	19.9	24.3	21.6	26.0
450		10.8	16.5	11.4	18.0	18.7	25.1	20.4	26.8
500	9.5	17.2	10.1	18.7	17.4	25.8	19.1	27.5	
SJ 90	160	12.9	13.2	15.3	14.8	27.1	31.0	29.3	35.3
	200	12.9	13.8	15.3	15.4	27.1	31.6	29.3	35.9
	220	12.9	14.1	15.3	15.7	27.1	31.9	29.3	36.2
	240	12.9	14.4	15.3	16.0	27.1	32.2	29.3	36.5
	250	12.9	14.6	15.3	16.2	27.1	32.3	29.3	36.7
	300	12.9	15.3	15.3	16.9	27.1	33.1	29.3	37.4
	350	12.9	16.1	15.3	17.7	27.1	33.8	29.3	38.2
	360	12.9	16.2	15.3	17.8	27.1	34.0	29.3	38.3
	400	12.9	16.8	15.3	18.4	27.1	34.6	29.3	38.9
	450	11.7	17.6	14.1	19.2	25.8	35.3	28.1	39.7
500	10.4	18.3	12.8	19.9	24.6	36.1	26.8	40.4	

NOTE: The characteristics for beams within the depth range not listed in the table can be calculated by linear interpolation.

ANNEX 2 PRODUCT CHARACTERISTICS (continued)*Table 9 Characteristic bearing resistance — LVL flange*

Type (mm)	Joist depth (mm)	End bearing capacity (kN)				Intermediate bearing capacity (kN)			
		45 mm stiffeners		89 mm stiffeners		75 mm stiffeners		89 mm stiffeners	
		without	with	without	with	without	with	without	with
S _J 45	160	9.1	16.0	11.3	17.9	17.9	21.3	21.2	25.2
	200	9.1	16.6	11.3	18.5	17.9	21.9	21.2	25.8
	220	9.1	16.9	11.3	18.8	17.9	22.2	21.2	26.1
	240	9.1	17.2	11.3	19.1	17.9	22.5	21.2	26.4
	250	9.1	17.4	11.3	19.2	17.9	22.7	21.2	26.6
	300	9.1	18.1	11.3	20.0	17.9	23.4	21.2	27.3
	350	9.1	18.9	11.3	20.7	17.9	24.2	21.2	28.1
	360	9.1	19.0	11.3	20.9	17.9	24.3	21.2	28.2
	400	9.1	19.6	11.3	21.5	17.9	24.9	21.2	28.8
S _J 60	160	12.2	17.1	14.3	17.6	22.5	31.0	25.3	34.5
	200	12.2	17.7	14.3	18.2	22.5	31.6	25.3	35.1
	220	12.2	18.0	14.3	18.5	22.5	31.9	25.3	35.4
	240	12.2	18.3	14.3	18.8	22.5	32.2	25.3	35.7
	250	12.2	18.4	14.3	18.9	22.5	32.3	25.3	35.8
	300	12.2	19.2	14.3	19.7	22.5	33.1	25.3	36.6
	350	12.2	19.9	14.3	20.4	22.5	33.8	25.3	37.3
	360	12.2	20.1	14.3	20.6	22.5	34.0	25.3	37.5
	400	12.2	20.7	14.3	21.2	22.5	34.6	25.3	38.1
	450	10.9	21.4	13.0	21.9	21.3	35.3	24.0	38.8
S _J 90	500	9.7	22.2	11.8	22.7	20.0	36.1	22.8	39.6
	160	15.6	23.5	16.5	23.4	27.1	38.2	31.3	42.5
	200	15.6	24.1	16.5	24.0	27.1	38.8	31.3	43.1
	220	15.6	24.4	16.5	24.3	27.1	39.1	31.3	43.4
	240	15.6	24.7	16.5	24.6	27.1	39.4	31.3	43.7
	250	15.6	24.9	16.5	24.7	27.1	39.6	31.3	43.8
	300	15.6	25.6	16.5	25.5	27.1	40.3	31.3	44.6
	350	15.6	26.4	16.5	26.2	27.1	41.1	31.3	45.3
	360	15.6	26.5	16.5	26.4	27.1	41.2	31.3	45.5
	400	15.6	27.1	16.5	27.0	27.1	41.8	31.3	46.1
	450	14.4	27.9	15.3	27.7	25.8	42.6	30.1	46.8
500	13.1	28.6	14.0	28.5	24.6	43.3	28.8	47.6	

NOTE: The characteristics for beams within the depth range not listed in the table can be calculated by linear interpolation.

ANNEX 3 DESIGN RECOMMENDATIONS FOR HOLES CUT IN WEB

The characteristic shear capacity for STEICO I-joist products with holes in the web can be calculated as follows:

$$V_{\text{hole,k}} = V_k \cdot k_{\text{hole}}$$

where:

V_k is the characteristic shear capacity for STEICO I-joist products without holes in the web.

$$k_{\text{hole}} = \frac{H - h_f - 0,9 \cdot D}{H - h_f}$$

where:

- H depth of the joist
- h_f depth of the flange
- D diameter of the hole or largest of A or B

where:

- D diameter. $D \leq H - 2,2 \cdot h_f \leq 200$ mm
- A width of rectangular hole. $A \leq (H - 2 \cdot h_f) \leq 200$ mm
- B height of rectangular hole. $B \leq (H - 2 \cdot h_f) / 2 \leq 110$ mm

This reduction in shear shall not be considered for round holes with diameter ≤ 38 mm or rectangular holes with maximum size of 15 by 40 mm.

Permitted position of the holes:

All holes have to be located in the centre of the web.

Holes up to a maximum diameter of 20 mm or with maximum size of 15 by 40 mm can be positioned anywhere in the beam web if the distance between the holes edge is minimum 40 mm.

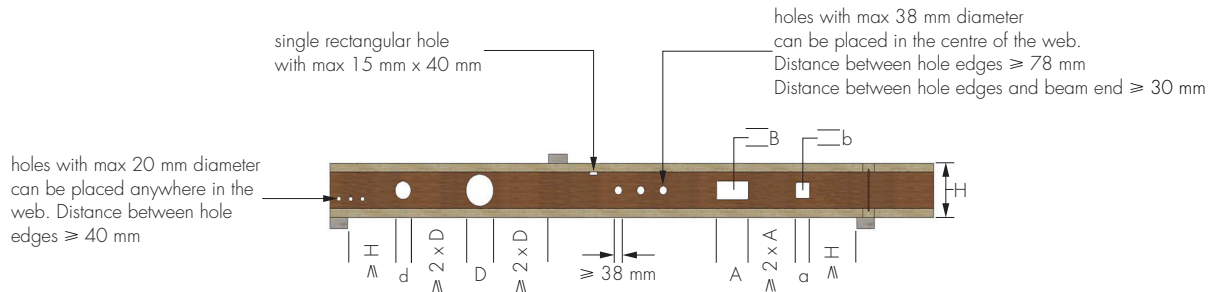


Figure 1: Permitted position of holes

ANNEX 4 AXIALLY LOADED MEMBERS

The axial load-carrying capacity of STEICOwall and STEICOjoist should be calculated in accordance with the procedures given in Eurocode 5. The capacity should be derived from the cross-section of the I-beams as given in Annex 1 and the characteristic values for LVL flange material as given in Table 1. STEICOwall with L 17 solid timber flanges shall be calculated by using the strength values as given in EN 338 for the strength class C 18, STEICOjoist with L 36 solid timber flanges shall be calculated by using the strength values as given in EN 338 for the strength class C 35. In the case of combined actions, eg compression and bending the relevant interaction equations given in Eurocode 5 should be used.

Table 1 Characteristic values LVL flange material in $\text{N}\cdot\text{mm}^{-2}$ and $\text{kg}\cdot\text{m}^{-3}$

Property		LVL 2.0 (STEICOjoist)	LVL 1.6 (STEICOwall)
Bending strength flatwise	$f_{m,k}$	48.0	26.0
Tension strength parallel to grain	$f_{t,0,k}$	36.0	16.0
Compression strength parallel to grain	$f_{c,0,k}$	36.0	22.0
Mean modulus of elasticity parallel to grain	E_{mean}	13800	11000
Characteristic modulus of elasticity parallel to grain	$E_{0,05}$	11600	10000
Characteristic density	ρ_k	480	430

The characteristic values for the HB.HLA1 hardboard for designs in accordance with Eurocode 5 are given in Table 2.

Table 2 Characteristic values for HB.HLA 1 web material $\text{N}\cdot\text{mm}^{-2}$ and $\text{kg}\cdot\text{m}^{-3}$

Property		HB.HLA 1
Bending strength of web edgewise	$f_{m,k}$	31.0
Shear strength of the web edgewise	$f_{v,0,k}$	14.0
Mean modulus of elasticity parallel to grain	E_{mean}	5300
Mean modulus of rigidity	G_{mean}	2100
Characteristic density	ρ_k	900

The characteristic shear strength of the web – flange joint is $f_{v,\text{joint},k} = 2.40 \text{ N}\cdot\text{mm}^{-2}$.