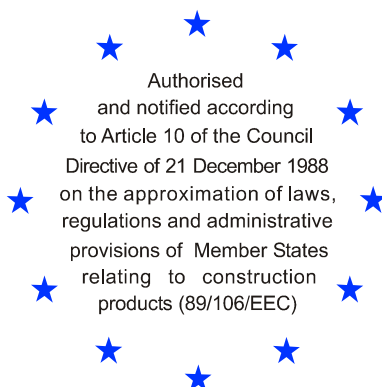# Deutsches Institut für Bautechnik

Anstalt des öffentlichen Rechts

Kolonnenstr. 30 L
10829 Berlin
Germany

Tel.:   +49(0)30 787 30 0
Fax: +49(0)30 787 30 320
E-mail: dibt@dibt.de
Internet: www.dibt.de

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

DIBt

Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-08/0184

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*	BB-Balkenschuhe BB08 *BB-Balkenschuhe BB08*
Zulassungsinhaber *Holder of approval*	BB Stanz- und Umformtechnik GmbH Nordhäuser Straße 42 06536 Berga DEUTSCHLAND
Zulassungsgegenstand und Verwendungszweck *Generic type and use* *of construction product*	Blechformteile (Balkenschuhe für Holz-Holz-Verbindungen und Verbindungen Holz an Beton oder Stahl) *Three-dimensional nailing plates (Joist hangers for wood to wood connections and wood to concrete or steel connections)*
Geltungsdauer: vom *Validity: from* **bis** *to*	23. August 2010 31. August 2013
Herstellwerk *Manufacturing plant*	BB Stanz- und Umformtechnik GmbH, 06536 Berga

Diese Zulassung umfasst *This Approval contains*	52 Seiten einschließlich 4 Anhänge *52 pages including 4 annexes*
Diese Zulassung ersetzt *This Approval replaces*	ETA-08/0184 mit Geltungsdauer vom 01.09.2008 bis 31.08.2013 *ETA-08/0184 with validity from 01.09.2008 to 31.08.2013*

EOTA

Europäische Organisation für Technische Zulassungen
European Organisation for Technical Approvals

I LEGAL BASES AND GENERAL CONDITIONS

1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:

- 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[1], modified by Council Directive 93/68/EEC[2] and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council[3];

- Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauprodukten-gesetz - BauPG) vom 28. April 1998[4], as amended by law of 31 October 2006[5];

- Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC[6];

- Guideline for European technical approval of "Three-dimensional nailing plates", ETAG 015.

2 Deutsches Institut für Bautechnik is authorized 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 Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to 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 Deutsches Institut für Bautechnik. 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 corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

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1   Official Journal of the European Communities L 40, 11 February 1989, p. 12
2   Official Journal of the European Communities L 220, 30 August 1993, p. 1
3   Official Journal of the European Union L 284, 31 October 2003, p. 25
4   *Bundesgesetzblatt Teil I 1998*, p. 812
5   *Bundesgesetzblatt Teil I 2006,* p. 2407, 2416
6   Official Journal of the European Communities L 17, 20 January 1994, p. 34

II   SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1   Definition of the product and intended

1.1   Definition of the product

BB-Balkenschuhe BB08 are one-piece non-welded, face-fixed joist hangers to be used in timber to timber connections as well as in connections between a timber joist and a concrete structure or a steel member.

The joist hangers are made from pre-galvanized steel Grade S250GD+Z (min Z275) according to EN 10346:2009. Design, dimensions, hole positions, steel grade and typical installations are shown in Annex A and in Annex D.

1.2   Intended use

The joist hangers are intended for use in making joist-header-connections in load bearing timber structures, where the requirements for "Mechanical resistance and stability" in the sense of the Essential Requirement 1 of Council Directive 89/106/EEC shall be fulfilled. They are also intended for use in making an end-grain connection between a timber joist and a concrete structure or a steel member.

BB-Balkenschuhe may be installed as connections between wood based members such as:

- Structural solid timber C14-C40 according to EN 338 / EN 14081,

- Glulam GL24-GL36 according to EN 1194 / EN 14080,

- Laminated veneer lumber LVL according to EN 14374 (connection only perpendicular to the plane of the veneer),

- Parallel strand lumber Parallam PSL (connection only perpendicular to the plane of the veneer),

- Laminated strand lumber Intrallam LSL (connection only perpendicular to the plane of the veneer),

- Duo- and Triobalken,

- Solid wood panels according to EN 13353 / EN 13986,

- Plywood according to EN 636 / EN 13986, (thickness t ≥ 25 mm).

However, the calculation methods are only allowed for a characteristic wood density of up to 460 kg/m^3. Even though the wood based material may have a larger density, this must not be used when calculating the load-carrying capacities of the fasteners.

Annex B states the equations for the load-carrying capacities of *BB-Balkenschuhe* connections. The design and construction of the connections shall be carried out according to national provisions that apply at the installation site of the certified object in line with the partial safety factor format, e.g. in accordance with Eurocode 5.

The forces acting on the joist hanger connection are $F_{Z,Ed,up}$, $F_{Z,Ed,down}$ and $F_{Y,Ed}$ as shown in the figure below. The forces $F_{Z,Ed,up}$ and $F_{Z,Ed,down}$ shall act in the plane of symmetry of the joist hanger. The force $F_{Y,Ed}$ shall act with the distance $e_{J,90}$ above the centre of gravity of the nail connection. It is assumed that the forces are acting right at the end of the joist.
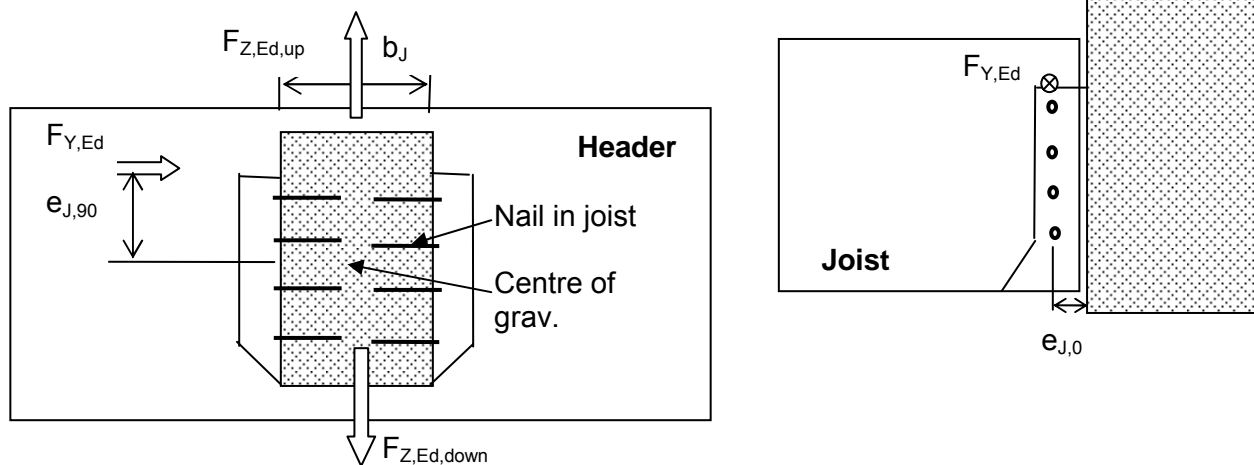
Figure B1: Definition of $e_{J,90}$ and $e_{J,0}$

It is assumed that the header is prevented from rotating. Similar it is assumed that the concrete structure or the steel member, to which the joist hanger is connected, does not rotate.

It is a condition for a force $F_{Y,Ed}$ perpendicular to the vertical symmetry line that the joist hanger is connected with nails or screws in all holes.

The joist hangers are intended for use for connections subject to static or quasi static loading.

The zinc-coated joist hangers are for use in the service classes 1 and 2 of EN 1995-1-1, (Eurocode 5).

The provisions made in this European technical approval are based on an assumed working life of the joist hangers of 50 years, provided that they are subject to appropriate use and maintenance. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to regarded as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

2 Characteristics of product and methods of verification

2.1 Characteristics

ETAG para.	Characteristic	Assessment of characteristic
6.1	**Mechanical resistance and stability**[*]	
6.1.1	Load-carrying capacity	See Annex B
6.1.2	Stiffness	No performance determined
6.1.3	Ductility in cyclic testing	No performance determined
6.2	**Safety in case of fire**	
	Reaction to fire	The joist hangers are made from steel classified as **Euroclass A1** in accordance with EC decision 96/603/EC, amended by EC Decision 2000/605/EC.
	Resistance to fire	The resistance to fire is determined for the complete structural element with any associated finishes, however not for a single connector. Therefore no performance is determined to this Essential Requirement.
6.3	**Hygiene, health and the environment**	
6.3.1	Release of dangerous substances	No dangerous substances[**]
6.4	**Safety in use**	Not relevant
6.5	**Protection against noise**	Not relevant
6.6	**Energy economy and heat retention**	Not relevant
6.7	**Aspects of serviceability**[***]	
6.7.1	Durability	The joist hangers have been assessed as having satisfactory durability and serviceability when used in timber structures using the timber species described in Eurocode 5 and subject to the conditions defined by service class 1 and 2.
6.7.2	Serviceability	
6.7.3	Identification	See Annex A

[*]   See section 2.2 of this ETA
[**]   In accordance with http://europa.eu.int-/comm/enterprise/construction/internal/dangsub/dangmain.htm 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 (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.
[***]   see section 2.3 of this ETA

2.2 Mechanical resistance and stability

Annex B contains the equations for the calculation of the load-carrying capacities of the joist hangers.

The values of capacity of the *BB-Balkenschuhe* are determined by calculation assisted by testing as described in the EOTA Guideline 015 clause 5.1.2. The design and construction of the connections shall be carried out according to national provisions that apply at the installation site of the certified object in line with the partial safety factor format, e.g. in accordance with Eurocode 5.

The design models allow the use of fasteners described in the Tables on page 14 in Annex A.

Threaded nails or screws in accordance to EN 14592

In the equations in Annex B the lateral load-carrying capacities for threaded nails and screws were used. Therefore the appropriate equations of Eurocode 5 for steel plate to timber connections may be used assuming a thick steel plate.

Further, the joist hangers can be fastened to a concrete structure or steel member by bolts with a diameter of 10 mm in holes with a diameter of 11 mm.

No performance has been determined in relation to ductility of a joint under cyclic testing. Therefore the structural behaviour under seismic loading has not been assessed.

No performance has been determined in relation to the joint's stiffness properties to be used for the analysis of the serviceability limit state.

2.3 Aspects of serviceability

2.3.1 Corrosion protection in service classes 1 and 2.

In accordance with ETAG 015 the joist hangers are made up of pre-galvanized steel Grade S250GD+Z (min Z275) according to EN 10346.

2.3.2 In relation to the required corrosion protection for the nails and screws to be used with the joist hangers national provisions that apply at the installation site of the certified object shall be considered e.g. Eurocode 5. In accordance with Eurocode 5 - Table 4.1 - the nails and screws to be used may be of uncoated steel for service class 1 and require corrosion protection Fe/Zn 12c or Z275 for service class 2.

2.3.3 If preservative treatment of timber is used national regulations will apply.

3 Attestation of conformity and CE marking

3.1 Attestation of conformity system

According to the decision 97/638/EC of the European Commission[7] system 2+ of the attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 2+: Declaration of conformity of the product by the manufacturer on the basis of:

a)   Tasks for the manufacturer:

   (1)   initial type-testing of the product,

   (2)   factory production control,

   (3)   testing of samples taken at the factory in accordance with a prescribed test plan.

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7   Official Journal of the European Communities L 268/36 of 01.10.1997

b) Tasks for the notified body:

(4) certification of factory production control on the basis of:

- initial inspection of the factory and the factory production control,

- continuous surveillance, assessment and approval of factory production control.

Note: Approved bodies are also referred to as "notified bodies".

3.2 Responsibilities

3.2.1 Tasks for the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. The factory production control shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use raw materials stated in the technical documentation of this European technical approval.

The factory production control shall be in accordance with the "Control plan of relating to the European technical approval ETA-08/0184 issued on 23 August 2010" which is part of the technical documentation of the European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited with *Deutsches Institut für Bautechnik*[8.]

The incoming raw materials shall be subject to controls and tests by the manufacturer before acceptance. Check of materials, such as sheet metal, shall include control of the inspection documents presented by suppliers (comparison with nominal values) by verifying dimension and determining material properties, e.g. chemical composition, mechanical properties and zinc coating thickness.

The manufactured components shall be checked visually and for dimension accuracy. The control plan includes details of the extent, nature and frequency of testing and controls to be performed within the factory production control.

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan. The records include at least the following information:

- 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 approved body involved in the continuous surveillance and shall be presented to *Deutsches Institut für Bautechnik* on request.

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[8] The control plan has been deposited at *Deutsches Institut für Bautechnik* and is only made available to the approved bodies involved in the conformity attestation procedure.

3.2.1.2 Other tasks for the manufacturer

The manufacturer shall, on the basis of a contract, involve a body which is approved for the tasks referred to in section 3.1 in the field of joist hangers in order to undertake the actions laid down in section 3.2.2. For this purpose, the control plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body involved.

For initial type-testing of the product the results of the tests performed as part of the assessment for the European technical approval may be used unless there are changes in the production line or plant. In such cases the necessary initial type testing has to be agreed between *Deutsches Institut für Bautechnik* and the notified body.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of the European technical approval ETA-08/0184 issued on 23 August 2010.

3.2.2 Tasks for the notified bodies

The approved body shall perform the following tasks in accordance with the provisions of the control plan:

- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control.

3.2.2.1 Initial inspection of the factory and of factory production control

The approved body shall ascertain that, in accordance with the prescribed control plan, the factory, particularly the staff and equipment, and the factory production control, are suitable to ensure continuous and orderly manufacturing of the joist hangers in compliance with the specifications of this European technical approval.

3.2.2.2 Continuous surveillance

The approved body shall visit the factory at least twice a year for routine inspections. It shall be verified that the factory production control system and the specified manufacturing processes are maintained in accordance with the control plan.

3.2.2.3 Other tasks for the approved body

The approved body shall retain the essential points of its actions referred to above and document the results obtained and conclusions drawn in a written report.

The certification body shall make the results of the continuous surveillance available to *Deutsches Institut für Bautechnik* upon demand.

The certification body appointed by the manufacturer shall issue an EC certificate of conformity confirming compliance of the factory production control with the provisions of this European technical approval.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform *Deutsches Institut für Bautechnik* without delay.

3.3 CE marking

The CE marking shall be affixed on each packaging of the joist hangers. The initials "CE" shall be followed by the identification number of the approved certification body and be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacture),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate for the factory production control,
- the number of the European technical approval,
- the number of the guideline for European technical approval (ETAG 015),
- the name and the size of the product.

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

4.1 Manufacturing

BB-Balkenschuhe shall be 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 notified inspection body and laid down in the technical documentation.

This European technical approval is issued for the product on the basis of agreed data/information, deposited with the *Deutsches Institut für Bautechnik,* which identifies the product that has been assessed and judged. Changes to the product or production process, which could resulting this deposited data/information being incorrect, should be notified to *Deutsches Institut für Bautechnik* before the changes are introduced. *Deutsches Institut für Bautechnik* will decide whether or not such changes affect the approval and consequently the validity of the CE marking on the basis of the approval and if so whether further assessment or alterations to the approval shall be necessary.

4.2 Installation

4.2.1 *BB-Balkenschuhe* connections

A joist hanger connection is deemed fit for its intended use provided:

Header – support conditions

- The header shall be restrained against rotation and be free from wane under the joist hanger.

- If the header carries a joist only on one side, the eccentricity moment from the joist $M_v = F_d$ $(B_H / 2 + 30 \text{ mm})$ shall be considered at the strength verification of the header.

  Where $\quad\quad\quad\quad\quad$ F_d $\quad$ Reaction force from the joists $F_{Z,Ed,up}$ or $F_{Z,Ed,down}$
  $\quad\quad\quad\quad\quad\quad\quad\quad\quad$ B_H $\quad$ Width of the header

  For a header with joists from both sides but with different reaction forces exceeding 20 % a similar consideration applies.

Wood to wood connections

BB-Balkenschuhe may be fastened to wood or wood-based members by nails or screws.

- There shall be nails or screws in all holes or a partial nailing pattern as prescribed in Annex B and C may be used (see drawings in Annex A).

- The design of the connections shall be carried out according to national provisions that apply at the installation site of the certified object in line with the partial safety factor format, e.g. in accordance with Eurocode 5.

- The gap between the end of the joist and the surface of the header, where contact stresses can occur during loading shall not exceed 3 mm.

- For *BB-Balkenschuhe* with overlapping nails or screws in the header (confer Figure 8.5 in EN 1995-1-1:2004+A1:2008) its width shall be at least l+4d, where l is the length and d is the diameter of the nail or the screw in the header (see figure in Annex D). For joist hangers with staggered nails in the joist the width shall be at least the penetration length of the nails or screws.

- The cross section of the joist at the joist hanger shall have sharp edges at the lower side against the bottom plate, i.e. it shall be without wane.

- The header shall have a plane surface against the whole joist hanger.

- The width B_J of the joist shall correspond to that of the joist hanger. B_J shall not be smaller than B – 3 mm, where B is the inner width of the joist hanger.

- The height of the joist shall be so large that the top of the joist is at least 20 mm above the upper fastener in the joist.

- Nails or screws to be used shall have a diameter, which fit the holes of the joist hangers. Nails shall have a diameter which is not smaller than the diameter of the hole minus 1 mm.

- To guarantee fitting accuracy of the nails at the joist hanger an appropriate nail shall be used (e.g. with a truncated cone directly under the head of the nail).

Wood to concrete or steel connections

The above mentioned rules for wood to wood connections are applicable also for the connection between the joist and the joist hanger.

- The joist hanger shall be in close contact with the concrete or steel over the whole face. There shall be no intermediate layers in between.
- The gap between the end of the joist and the surface, where contact stress can occur during loading shall not exceed 3 mm.
- The bolt shall have a diameter not less than the hole diameter minus 1 mm.
- The bolts shall be placed symmetrically. There shall always be bolts in the 2 upper holes.
- The upper bolts shall have washers according to EN ISO 7094.

4.2.2   Responsibility of the manufacturer

It is the responsibility of the manufacturer to ensure that the information on the specific conditions given in part II, sections 1, 2, 4, and 5, of this ETA, is given to those concerned.

This information may be made replicating the respective parts of this European technical approval.

5   Recommendations

5.1   Packaging, transport and storage

BB-Balkenschuhe are packed in boxes bearing the manufacturer's name, product type, dimensions, quantity, data of fabrication and batch reference details.

In relation to transportation and storage, *BB-Balkenschuhe* should be treated as conventional metallic building products.

5.2   Use, maintenance, 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, it is normal to replace the joist hanger.

Georg Feistel   *beglaubigt:*
Head of Department   Niebur

Annex A
Product details and definitions

BB-Balkenschuh BB08
Joist hanger with external flanges
1.5 mm thick pre-galvanised steel S250GD+Z (min Z275) according to EN 10346:2009 with
tolerances according to EN 10143:2006
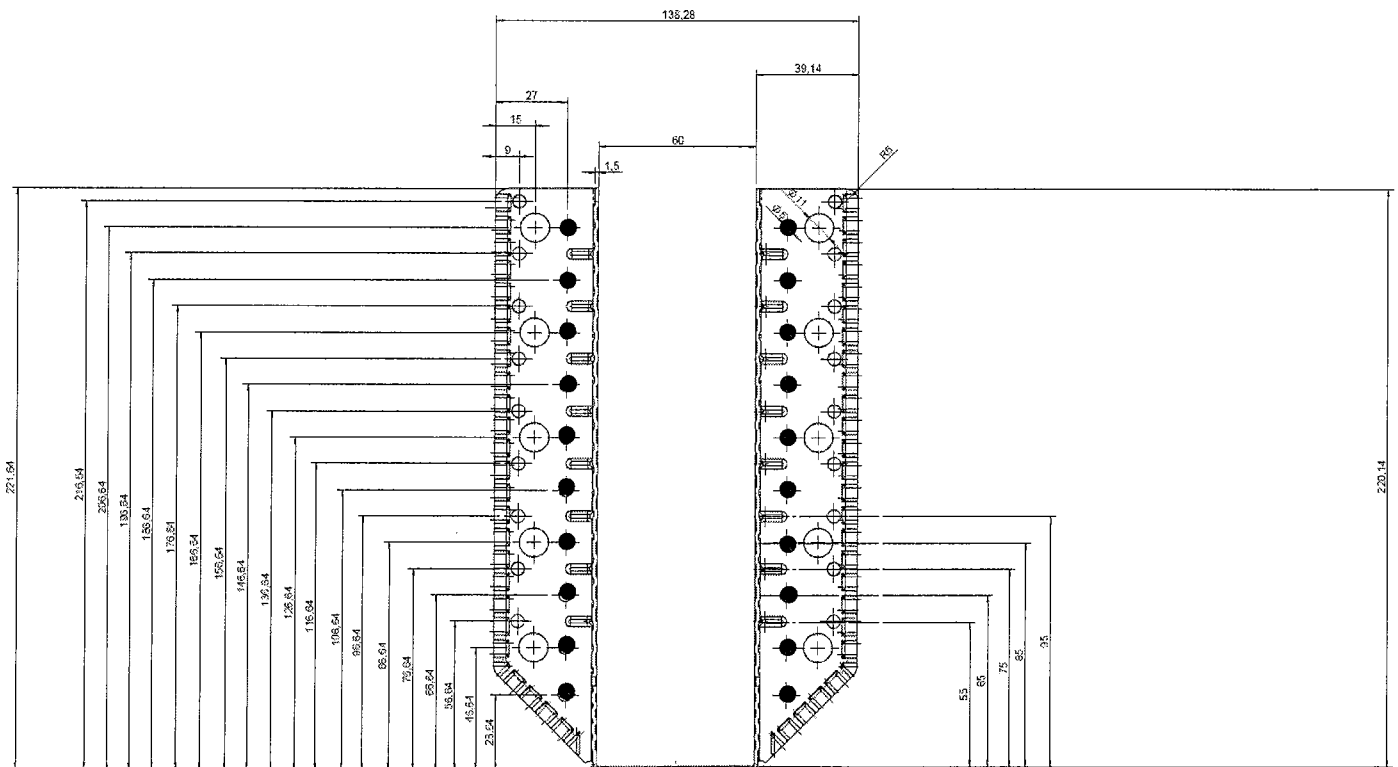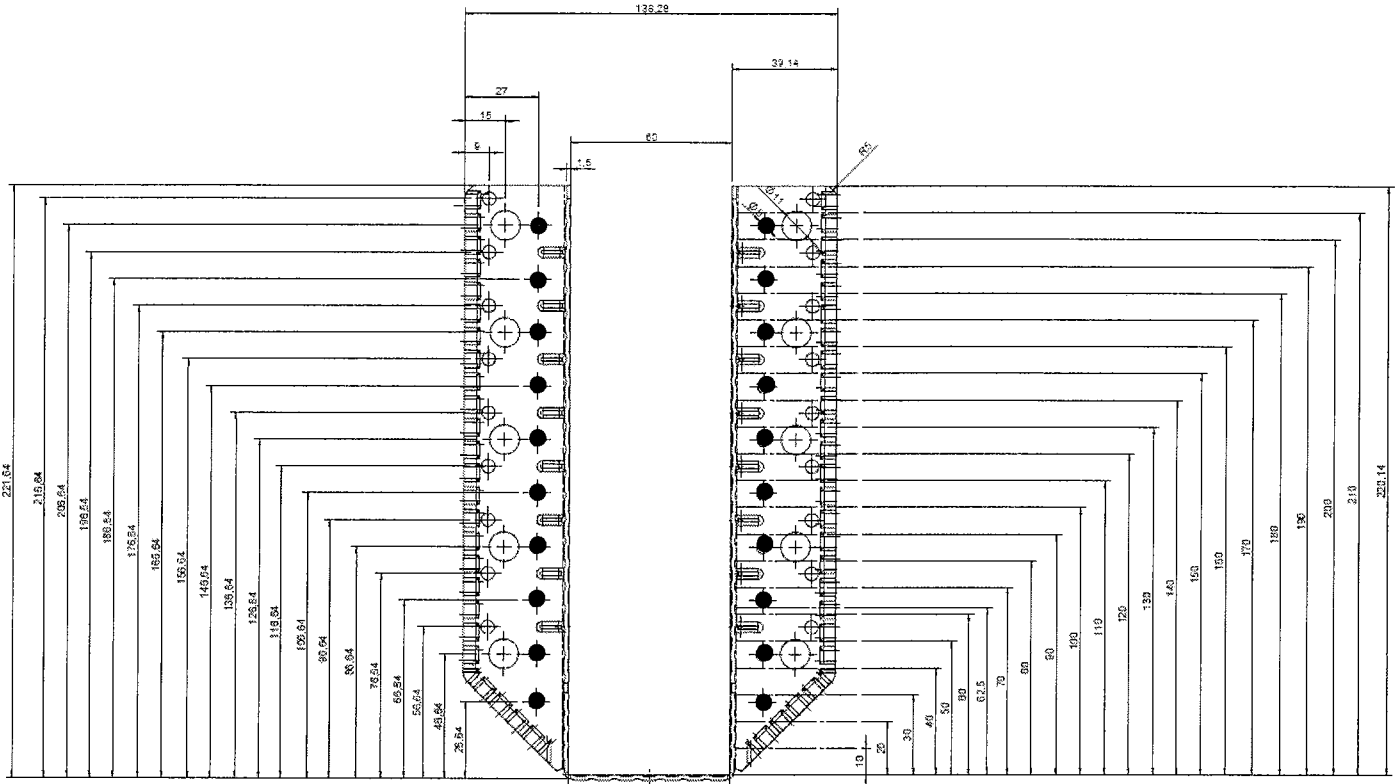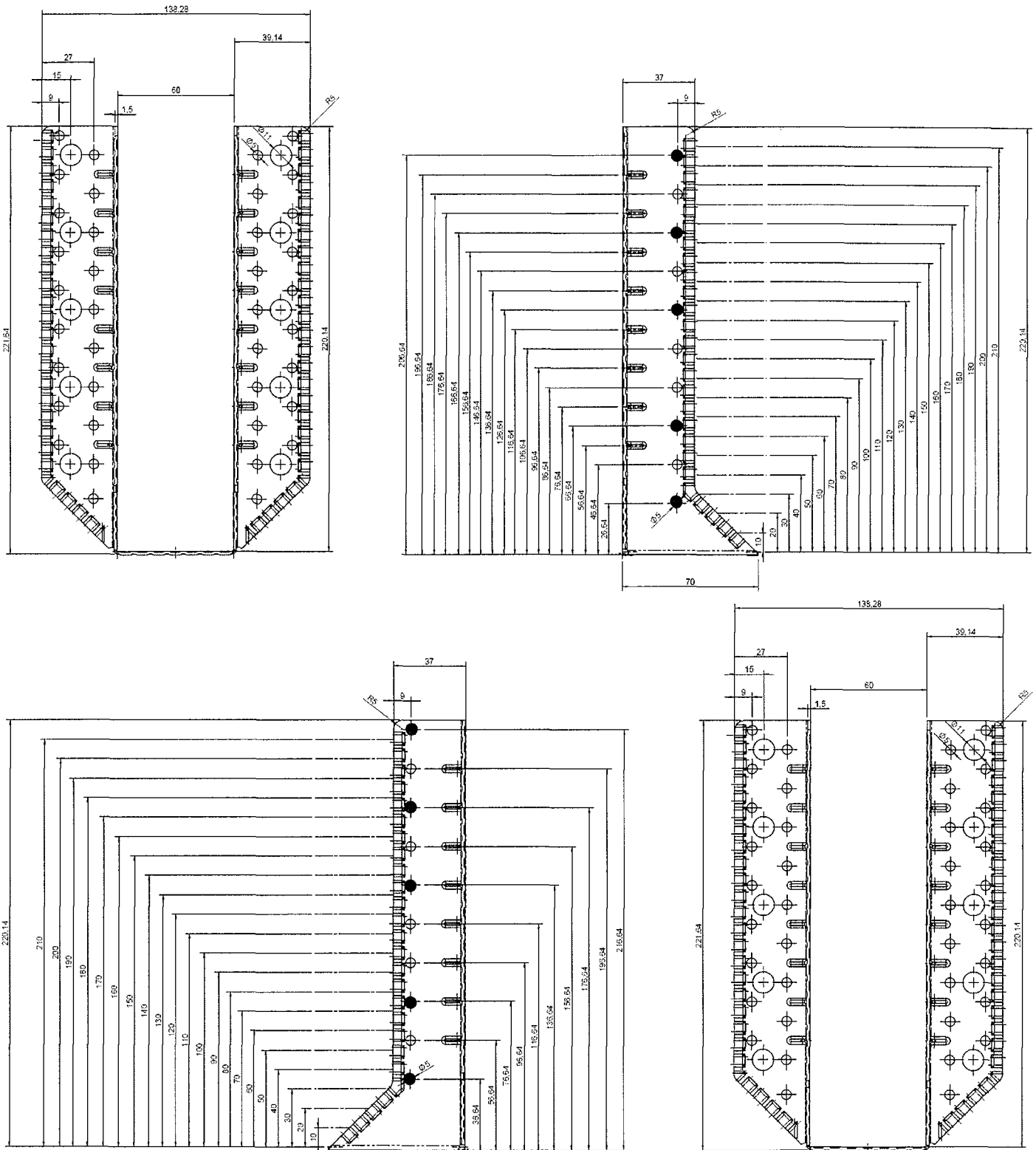
- Partial Nailing; Drawing: width 60 mm; 1.5 mm steel; holes to be nailed are marked in black

BB-Balkenschuhe BB08

Width (mm)	Height (joist flap) (mm)	Total n° of nail holes		Width interval		Height interval		Bolt holes	
		n_H	n_J	min	max	min	max	n°	Diameter (mm)
60	55	4	3	25	64	53	73	2	11
60	62.5	6	4	25	64	61	80	2	11
60	70	8	5	25	64	68	88	2	11
60	75	8	5	25	64	73	93	2	11
60	80	10	6	25	64	78	98	2	11
60	85	10	6	25	64	83	103	2	11
60	90	12	7	25	64	88	108	2	11
60	95	12	7	25	64	93	113	2	11
60	100	14	8	25	64	98	118	4	11
60	110	16	9	25	62	109	128	4	11
60	120	18	10	25	62	119	138	4	11
60	130	20	11	25	62	129	148	4	11
60	140	22	12	25	62	139	158	6	11
60	150	24	13	25	62	149	168	6	11
60	160	26	14	25	62	159	178	6	11
60	170	28	15	25	62	169	188	6	11
60	180	30	16	25	62	179	198	8	11
60	190	32	17	25	62	189	208	8	11
60	200	34	18	25	62	199	218	8	11
60	210	36	19	25	62	209	228	8	11
60	220	38	20	25	62	219	238	10	11
80	60	6	4	66	80	60	67	2	11
80	65	6	4	66	80	65	72	2	11
80	70	8	5	66	80	70	77	2	11
80	75	8	5	66	80	75	82	2	11
80	80	10	6	66	80	80	87	2	11
80	85	10	6	66	80	85	92	2	11
80	90	12	7	66	80	90	97	2	11
80	100	14	8	64	80	100	108	4	11
80	110	16	9	64	80	110	118	4	11
80	120	18	10	64	80	120	128	4	11
80	130	20	11	64	80	130	138	4	11
80	140	22	12	64	80	140	148	6	11
80	150	24	13	64	80	150	158	6	11
80	160	26	14	64	80	160	168	6	11
80	170	28	15	64	80	170	178	6	11
80	180	30	16	64	80	180	188	8	11
80	190	32	17	64	80	190	198	8	11
80	200	34	18	64	80	200	208	8	11
80	210	36	19	64	80	210	218	8	11
100	75	8	5	82	100	75	84	2	11
100	80	10	6	82	100	80	89	2	11
100	90	12	7	82	100	90	99	2	11
100	100	14	8	82	100	100	109	4	11
100	110	16	9	82	100	110	119	4	11
100	120	18	10	82	100	120	129	4	11
100	130	20	11	82	100	130	139	4	11
100	140	22	12	82	100	140	149	6	11

Width (mm)	Height (joist flap) (mm)	Total n° of nail holes		Width interval		Height interval		Bolt holes	
		n_H	n_J	min	max	min	max	n°	Diameter (mm)
100	150	24	13	82	100	150	159	6	11
100	160	26	14	82	100	160	169	6	11
100	170	28	15	82	100	170	179	6	11
100	180	30	16	82	100	180	189	8	11
100	190	32	17	82	100	190	199	8	11
100	200	34	18	82	100	200	209	8	11
120	70	8	5	102	120	70	79	2	11
120	90	12	7	102	120	90	99	2	11
120	100	14	8	102	120	100	109	4	11
120	110	16	9	102	120	110	119	4	11
120	120	18	10	102	120	120	129	4	11
120	130	20	11	102	120	130	139	4	11
120	140	22	12	102	120	140	149	6	11
120	150	24	13	102	120	150	159	6	11
120	160	26	14	102	120	160	169	6	11
120	170	28	15	102	120	170	179	6	11
120	180	30	16	102	120	180	189	8	11
120	190	32	17	102	120	190	199	8	11
140	90	12	7	122	140	90	99	2	11
140	100	14	8	122	140	100	109	4	11
140	110	16	9	122	140	110	119	4	11
140	120	18	10	122	140	120	129	4	11
140	130	20	11	122	140	130	139	4	11
140	140	22	12	122	140	140	149	6	11
140	150	24	13	122	140	150	159	6	11
140	160	26	14	122	140	160	169	6	11
140	170	28	15	122	140	170	179	6	11
140	180	30	16	122	140	180	189	8	11

Fastener types and sizes

NAIL diameter	Length Min - max	Nail type
4.0	25 - 100	Threaded nails according to EN 14592:2009 with a truncated cone under the head

The characteristic withdrawal strength $f_{ax,k}$ for profiled nails shall fulfil the requirement:

$$f_{ax,k} \geq 50 \times 10^{-6} \times \rho_k^2 \text{ (N/mm}^2)$$
Where:
ρ_k characteristic density of the timber in kg/m³

SCREW diameter	Length Min – max	Screw type
5.0	25 - 50	Screws according to EN 14592:2008

BOLT diameter	Corresponding hole diameter	Bolt type
10.0	11.0	See specification of the manufacturer

Annex B
Values of load-carrying capacities

Values of load-carrying capacities of the connections with nails or screws

The downward and the upward directed forces act in the middle of the joist. The lateral force acts at a distance $e_{J,90}$ above the centre of gravity of the nails in the joist (see Figure B1 next page)

Two fastener patterns are specified. A full nailing pattern, where there are nails or screws in all the holes, and a partial nailing pattern, where the number of fasteners in the joist and the header are at least half the numbers specified for full nailing. The nails or screws in the joist may be staggered and there shall always be a fastener in the upper and the lower holes. The other nails or screws are distributed evenly over the height. The fasteners in the header shall be put in the holes closest to the bend line.

For joist hangers with overlapping nails or screws in the header (confer Figure 8.5 in EN 1995-1-1:2004+A1:2008) the width of the header shall be at least l + 4d, where l is the length of the fastener and d is the diameter (see figure in annex D). If there are staggered nails or screws in the joist the width of the joist hanger shall be at least the penetration length of the connectors.

B.1 Joist hangers fastened with threaded nails or screws

B.1.1 Force downward toward the bottom plate

$$F_{Z,Rd} = \min \begin{cases} (n_J + 2) \cdot F_{v,J,Rd} \\ \dfrac{1}{\sqrt{\left(\dfrac{1}{n_H \cdot F_{v,H,Rd}}\right)^2 + \left(\dfrac{1}{k_{H,1} \cdot F_{ax,H,Rd}}\right)^2}} \end{cases}$$

(B.1.1.1)

B.1.2 Force upward away from the bottom plate

$$F_{Z,Rd} = \min \begin{cases} n_J \cdot F_{v,J,Rd} \\ \dfrac{1}{\sqrt{\left(\dfrac{1}{n_H \cdot F_{v,H,Rd}}\right)^2 + \left(\dfrac{1}{k_{H,2} \cdot F_{ax,H,Rd}}\right)^2}} \end{cases}$$

(B.1.1.2)

B.1.3 Lateral force

$$F_{Y,Rd} = \min \begin{cases} \dfrac{n_J \cdot F_{v,J,Rd}}{\sqrt{\left(\dfrac{2 \cdot \sqrt{e_{J,0}^2 + e_{J,90}^2}}{b_J}\right)^2 + \left(\dfrac{F_{v,J,Rd}}{F_{ax,J,Rd}}\right)^2}} \\ \dfrac{F_{v,H,Rd}}{\sqrt{\left(\dfrac{1}{n_H} + \dfrac{e_H}{e_1}\right)^2 + \left(\dfrac{e_H}{e_2}\right)^2}} \end{cases}$$

(B.1.1.3)

n_J total number of fasteners in both sides of the joist

n_H total number of fasteners in the header

$F_{v,Rd}$ design value of lateral load-carrying capacity of the fasteners in the joist (index J) or in the header (index H)

$F_{ax,Rd}$ design value of axial load-carrying capacity of the fasteners in the joist (index J) or in the header (indexH)

b_J width of the joist hanger, see Figure B1

$e_{J,90}$ distance of the lateral force above the centre of gravity of the fasteners in the joist, see Figure B1

$e_{J,0}$ distance from the fasteners in the joist to the surface of the header, see Figure B1

e_H distance of the lateral force above the centre of gravity of the fasteners in the header

e_1 joist hanger dimension, see Annex C

e_2 joist hanger dimension, see Annex C

$k_{H,1}$ form factor, see Annex C

$k_{H,2}$ form factor, see Annex C
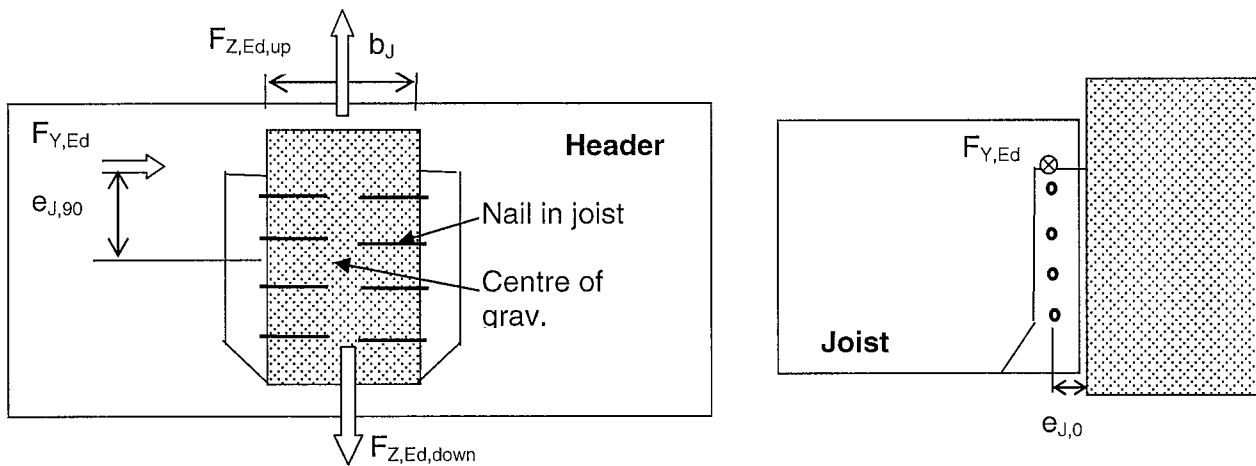
Figure B1: Definition of $e_{J,90}$ and $e_{J,0}$

B.1.4 Combined forces

In case of combined forces the following inequality shall be fulfilled:

$$\left(\frac{F_{Y,Ed}}{F_{Y,Rd}}\right)^2 + \left(\frac{F_{Z,Ed}}{F_{Z,Rd}}\right)^2 \leq 1 \qquad\qquad\text{(B.1.2.1)}$$

B.2 Characteristic load-carrying capacities of the joist hanger connections with bolts

For joist hangers connected to a wall of concrete, lightweight concrete or to a steel member the assumptions for the calculation of the load-carrying capacity of the connection are:

- The force transfer from the joist to the joist hanger is as for a wood to wood connection, see clause B.1.

- The bolts shall always be positioned symmetrically about the vertical axis of the joist hanger.

- Washers according to EN ISO 7094 shall be installed under the upper 2 bolt nuts or heads, see Figure B2.

Description of the static model

For a downward directed force toward the bottom plate the static behaviour is basically the same as for a wood to wood connection with nails or screws.
The fasteners in the joist are subjected to a lateral force, which is equally distributed over the nails or screws in the joist.
Since the concrete and steel have a larger compressive strength than timber subjected perpendicular to the grain the rotation point may be assumed positioned at the top of the bottom plate.
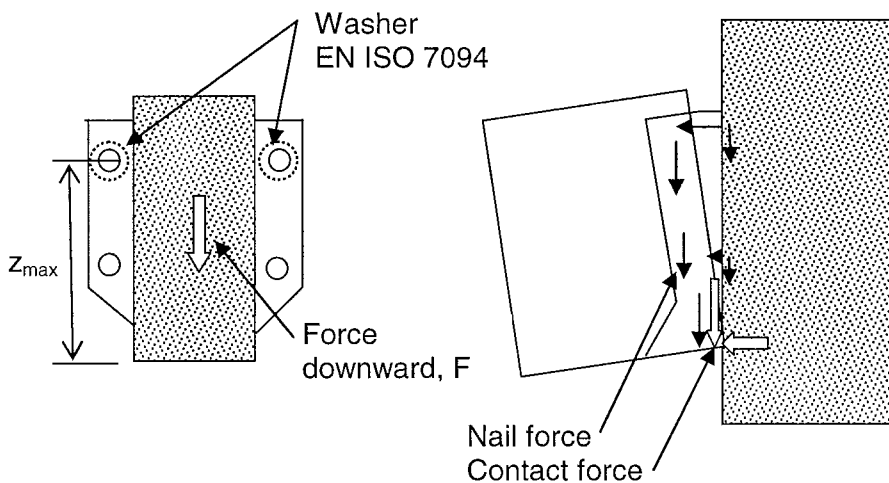
Figure B2 Left: Cross section in joist   **Right**: The joist will deflect and rotate, at the bottom a contact force will occur at the bottom plate, and the withdrawal forces in the bolts in the header will vary linearly.

The forces in the bolts will be lateral forces and withdrawal forces at the same time. The lateral forces are distributed evenly over all bolts. The withdrawal forces are on the safe side assumed to be taken by the 2 upper bolts with. The maximum withdrawal force in an upper bolt can be calculated from:

$$F_{ax,bolt} = \frac{F \cdot e_{J,0}}{2 \cdot z_{max}}$$ (B.2.1)

Where

F   downward directed force toward the bottom plate

$e_{J,0}$ eccentricity = distance from the nail column in the joist to the surface of the header.

z_{max} distance from upper bolt to the bottom plate (rotation point)

The upper 2 bolts are critical. They are subjected to a lateral force and a withdrawal force at the same time. The lateral force is determined assuming an even distribution of the downward force F:

$$F_{lat,bolt} = F / n_{bolt}$$

(B.2.2)

Characteristic load-carrying capacities of a bolted joist hanger connection

The characteristic capacity between the joist and the joist hanger is the same as for a wood to wood connection:

$$F_{Z,Rk} = (n_J + 2) \cdot F_{v,J,Rk}$$

(B.2.3)

The upper 2 bolts are critical. They are subjected to a lateral force calculated from equation (B.2.2). The withdrawal force is calculated from (B.2.1).

Where

F   downward directed force toward the bottom plate

n_{bolt} total number of bolts in the joist hanger

$e_{J,0}$ eccentricity = distance from the nail column in the joist to the surface of the header

z_{max} distance from the upper bolt to the bottom plate (rotation point)

It shall be verified by the design of the bolted connection that the upper bolts have sufficient load-carrying design capacity to carry the combined lateral and axial forces.

From the characteristic capacity of the bearing resistance between the bolt and the plate of the joist hanger the following maximum characteristic capacity of the joist hanger connection can be determined:

$$R_{bear,k} = n_{bolt} \cdot f_{u,k} \cdot d \cdot t$$

(B.2.4)

Where

n_{bolt} total number of bolts in the 2 flaps

$f_{u,k}$ characteristic ultimate tensile strength of the steel, 330 MPa

d   diameter of the bolt (mm)

t   thickness of the joist hanger (mm)

The characteristic load-carrying capacity of the joist hanger connections is the minimum of:

—   the capacity determined from (B.2.3) from the joist and the joist hanger

—   the capacity determined from (B.2.4) from the embedding strength of the steel plate

—   the capacity controlled by the bolt forces given by (B.2.1) and (B.2.2).

Annex C
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2 and $e_{J,0}$

Table C1:   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0}$ = 28 mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
170	55	25	73	4	3	5.37	1.29	306	112	4	2	5.37	1,29	306	112
170	55	26	72	4	3	5.30	1.29	317	113	4	2	5,30	1,29	317	113
170	55	27	72	4	3	5.24	1.29	328	115	4	2	5.24	1,29	328	115
170	55	28	71	4	3	5.17	1.29	340	117	4	2	5.17	1,29	340	117
170	55	29	71	4	3	5.10	1.29	351	119	4	2	5.10	1,29	351	119
170	55	30	70	4	3	5.03	1.29	363	120	4	2	5.03	1,29	363	120
170	55	31	70	4	3	4.97	1.29	376	122	4	2	4.97	1,29	376	122
170	55	32	69	4	3	4.90	1.29	388	124	4	2	4.90	1,29	388	124
170	55	33	69	4	3	4.83	1.29	401	126	4	2	4.83	1,29	401	126
170	55	34	68	4	3	4.77	1.29	413	128	4	2	4.77	1,29	413	128
170	55	35	68	4	3	4.70	1.29	426	129	4	2	4.70	1,29	426	129
170	55	36	67	4	3	4.64	1.29	440	131	4	2	4.64	1,29	440	131
170	55	37	67	4	3	4.57	1.29	453	133	4	2	4.57	1,29	453	133
170	55	38	66	4	3	4.50	1.29	467	135	4	2	4.50	1,29	467	135
170	55	39	66	4	3	4.44	1.29	481	137	4	2	4.44	1,29	481	137
170	55	40	65	4	3	4.37	1.29	495	139	4	2	4.37	1,29	495	139
170	55	41	65	4	3	4.31	1.29	509	140	4	2	4.31	1,29	509	140
170	55	42	64	4	3	4.24	1.29	524	142	4	2	4.24	1,29	524	142
170	55	43	64	4	3	4.17	1.29	539	144	4	2	4.17	1,29	539	144
170	55	44	63	4	3	4.11	1.29	554	146	4	2	4.11	1,29	554	146
170	55	45	63	4	3	4.04	1.29	569	148	4	2	4.04	1,29	569	148
170	55	46	62	4	3	3.98	1.29	585	150	4	2	3.98	1,29	585	150
170	55	47	62	4	3	3.91	1.29	601	152	4	2	3.91	1,29	601	152
170	55	48	61	4	3	3.85	1.29	616	154	4	2	3.85	1,29	616	154
170	55	49	61	4	3	3.79	1.29	633	155	4	2	3.79	1,29	633	155
170	55	50	60	4	3	3.72	1.29	649	157	4	2	3.72	1,29	649	157
170	55	51	60	4	3	3.66	1.29	666	159	4	2	3.66	1,29	666	159
170	55	52	59	4	3	3.59	1.29	683	161	4	2	3.59	1,29	683	161
170	55	53	59	4	3	3.53	1.29	700	163	4	2	3.53	1,29	700	163
170	55	54	58	4	3	3.47	1.29	717	165	4	2	3.47	1,29	717	165
170	55	55	58	4	3	3.40	1.29	734	167	4	2	3.40	1,29	734	167
170	55	56	57	4	3	3.34	1.29	752	169	4	2	3.34	1,29	752	169
170	55	57	57	4	3	3.28	1.29	770	171	4	2	3.28	1,29	770	171
170	55	58	56	4	3	3.21	1.29	788	172	4	2	3.21	1,29	788	172
170	55	59	56	4	3	3.15	1.29	807	174	4	2	3.15	1,29	807	174
170	55	60	55	4	3	3.09	1.29	825	176	4	2	3.09	1,29	825	176
170	55	61	55	4	3	3.03	1.29	844	178	4	2	3.03	1,29	844	178
170	55	62	54	4	3	2.97	1.29	863	180	4	2	2.97	1,29	863	180
170	55	63	54	4	3	2.91	1.29	882	182	4	2	2.91	1,29	882	182
170	55	64	53	4	3	2.84	1.29	902	184	4	2	2.84	1,29	902	184
200	60	66	67	6	4	6.93	2.26	1209	268	4	2	3.98	1,29	942	188
200	60	68	66	6	4	6.74	2.26	1253	274	4	2	3.85	1,29	982	192
200	60	70	65	6	4	6.55	2.26	1299	279	4	2	3.72	1,29	1024	195
200	60	72	64	6	4	6.36	2.26	1345	285	4	2	3.59	1,29	1066	199
200	60	74	63	6	4	6.17	2.26	1391	290	4	2	3.47	1,29	1109	203
200	60	76	62	6	4	5.99	2.26	1439	296	4	2	3.34	1,29	1153	207
200	60	78	61	6	4	5.80	2.26	1488	301	4	2	3.21	1,29	1198	211
200	60	80	60	6	4	5.62	2.26	1537	307	4	2	3.09	1,29	1244	215

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
185	62.5	25	80	6	4	8.97	2.26	491	161	4	2	5.37	1.29	306	112
185	62.5	26	80	6	4	8.88	2.26	504	164	4	2	5.30	1.29	317	113
185	62.5	27	79	6	4	8.78	2.26	517	166	4	2	5.24	1.29	328	115
185	62.5	28	79	6	4	8.68	2.26	531	168	4	2	5.17	1.29	340	117
185	62.5	29	78	6	4	8.58	2.26	545	171	4	2	5.10	1.29	351	119
185	62.5	30	78	6	4	8.48	2.26	559	173	4	2	5.03	1.29	363	120
185	62.5	31	77	6	4	8.38	2.26	573	176	4	2	4.97	1.29	376	122
185	62.5	32	77	6	4	8.28	2.26	588	178	4	2	4.90	1.29	388	124
185	62.5	33	76	6	4	8.19	2.26	603	181	4	2	4.83	1.29	401	126
185	62.5	34	76	6	4	8.09	2.26	618	183	4	2	4.77	1.29	413	128
185	62.5	35	75	6	4	7.99	2.26	633	186	4	2	4.70	1.29	426	129
185	62.5	36	75	6	4	7.89	2.26	648	188	4	2	4.64	1.29	440	131
185	62.5	37	74	6	4	7.80	2.26	664	191	4	2	4.57	1.29	453	133
185	62.5	38	74	6	4	7.70	2.26	680	194	4	2	4.50	1.29	467	135
185	62.5	39	73	6	4	7.60	2.26	696	196	4	2	4.44	1.29	481	137
185	62.5	40	73	6	4	7.51	2.26	712	199	4	2	4.37	1.29	495	139
185	62.5	41	72	6	4	7.41	2.26	728	201	4	2	4.31	1.29	509	140
185	62.5	42	72	6	4	7.31	2.26	745	204	4	2	4.24	1.29	524	142
185	62.5	43	71	6	4	7.22	2.26	762	207	4	2	4.17	1.29	539	144
185	62.5	44	71	6	4	7.12	2.26	779	209	4	2	4.11	1.29	554	146
185	62.5	45	70	6	4	7.02	2.26	796	212	4	2	4.04	1.29	569	148
185	62.5	46	70	6	4	6.93	2.26	814	214	4	2	3.98	1.29	585	150
185	62.5	47	69	6	4	6.83	2.26	831	217	4	2	3.91	1.29	601	152
185	62.5	48	69	6	4	6.74	2.26	849	220	4	2	3.85	1.29	616	154
185	62.5	49	68	6	4	6.64	2.26	868	222	4	2	3.79	1.29	633	155
185	62.5	50	68	6	4	6.55	2.26	886	225	4	2	3.72	1.29	649	157
185	62.5	51	67	6	4	6.45	2.26	905	228	4	2	3.66	1.29	666	159
185	62.5	52	67	6	4	6.36	2.26	923	230	4	2	3.59	1.29	683	161
185	62.5	53	66	6	4	6.27	2.26	942	233	4	2	3.53	1.29	700	163
185	62.5	54	66	6	4	6.17	2.26	962	236	4	2	3.47	1.29	717	165
185	62.5	55	65	6	4	6.08	2.26	981	238	4	2	3.40	1.29	734	167
185	62.5	56	65	6	4	5.99	2.26	1001	241	4	2	3.34	1.29	752	169
185	62.5	57	64	6	4	5.89	2.26	1021	244	4	2	3.28	1.29	770	171
185	62.5	58	64	6	4	5.80	2.26	1041	246	4	2	3.21	1.29	788	172
185	62.5	59	63	6	4	5.71	2.26	1061	249	4	2	3.15	1.29	807	174
185	62.5	60	63	6	4	5.62	2.26	1082	252	4	2	3.09	1.29	825	176
185	62.5	61	62	6	4	5.53	2.26	1102	254	4	2	3.03	1.29	844	178
185	62.5	62	62	6	4	5.44	2.26	1123	257	4	2	2.97	1.29	863	180
185	62.5	63	61	6	4	5.34	2.26	1144	260	4	2	2.91	1.29	882	182
185	62.5	64	61	6	4	5.25	2.26	1166	263	4	2	2.84	1.29	902	184

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
210	65	66	72	6	4	6.93	2.26	1209	268	4	2	3.98	1.29	942	188
210	65	68	71	6	4	6.74	2.26	1253	274	4	2	3.85	1.29	982	192
210	65	70	70	6	4	6.55	2.26	1299	279	4	2	3.72	1.29	1024	195
210	65	72	69	6	4	6.36	2.26	1345	285	4	2	3.59	1.29	1066	199
210	65	74	68	6	4	6.17	2.26	1391	290	4	2	3.47	1.29	1109	203
210	65	76	67	6	4	5.99	2.26	1439	296	4	2	3.34	1.29	1153	207
210	65	78	66	6	4	5.80	2.26	1488	301	4	2	3.21	1.29	1198	211
210	65	80	65	6	4	5.62	2.26	1537	307	4	2	3.09	1.29	1244	215
200	70	25	88	8	5	12.9	3.65	466	208	6	3	9.07	3.47	268	206
200	70	26	87	8	5	12.8	3.65	478	211	6	3	8.97	3.47	276	208
200	70	27	87	8	5	12.7	3.65	491	214	6	3	8.88	3.47	284	210
200	70	28	86	8	5	12.5	3.65	504	217	6	3	8.78	3.47	292	212
200	70	29	86	8	5	12.4	3.65	517	220	6	3	8.69	3.47	300	214
200	70	30	85	8	5	12.3	3.65	530	223	6	3	8.60	3.47	309	216
200	70	31	85	8	5	12.1	3.65	543	226	6	3	8.50	3.47	317	218
200	70	32	84	8	5	12.0	3.65	557	229	6	3	8.41	3.47	326	220
200	70	33	84	8	5	11.9	3.65	571	233	6	3	8.32	3.47	335	222
200	70	34	83	8	5	11.8	3.65	585	236	6	3	8.22	3.47	344	224
200	70	35	83	8	5	11.6	3.65	599	239	6	3	8.13	3.47	354	227
200	70	36	82	8	5	11.5	3.65	614	242	6	3	8.04	3.47	363	229
200	70	37	82	8	5	11.4	3.65	628	245	6	3	7.94	3.47	373	231
200	70	38	81	8	5	11.2	3.65	643	249	6	3	7.85	3.47	382	233
200	70	39	81	8	5	11.1	3.65	658	252	6	3	7.76	3.47	392	236
200	70	40	80	8	5	11.0	3.65	674	255	6	3	7.67	3.47	402	238
200	70	41	80	8	5	10.9	3.65	689	259	6	3	7.58	3.47	413	240
200	70	42	79	8	5	10.7	3.65	705	262	6	3	7.49	3.47	423	242
200	70	43	79	8	5	10.6	3.65	721	265	6	3	7.40	3.47	433	245
200	70	44	78	8	5	10.5	3.65	737	269	6	3	7.30	3.47	444	247
200	70	45	78	8	5	10.4	3.65	754	272	6	3	7.21	3.47	455	250
200	70	46	77	8	5	10.2	3.65	770	275	6	3	7.12	3.47	466	252
200	70	47	77	8	5	10.1	3.65	787	279	6	3	7.03	3.47	477	254
200	70	48	76	8	5	9.99	3.65	804	282	6	3	6.94	3.47	489	257
200	70	49	76	8	5	9.87	3.65	821	286	6	3	6.86	3.47	500	259
200	70	50	75	8	5	9.74	3.65	839	289	6	3	6.77	3.47	512	262
200	70	51	75	8	5	9.62	3.65	856	292	6	3	6.68	3.47	523	264
200	70	52	74	8	5	9.50	3.65	874	296	6	3	6.59	3.47	535	267
200	70	53	74	8	5	9.37	3.65	892	299	6	3	6.50	3.47	548	269
200	70	54	73	8	5	9.25	3.65	910	303	6	3	6.41	3.47	560	272
200	70	55	73	8	5	9.13	3.65	929	306	6	3	6.33	3.47	572	274
200	70	56	72	8	5	9.01	3.65	948	310	6	3	6.24	3.47	585	277
200	70	57	72	8	5	8.89	3.65	966	313	6	3	6.15	3.47	598	279
200	70	58	71	8	5	8.77	3.65	986	317	6	3	6.07	3.47	611	282
200	70	59	71	8	5	8.64	3.65	1005	320	6	3	5.98	3.47	624	285
200	70	60	70	8	5	8.52	3.65	1024	324	6	3	5.89	3.47	637	287
200	70	61	70	8	5	8.40	3.65	1044	327	6	3	5.81	3.47	650	290
200	70	62	69	8	5	8.29	3.65	1064	331	6	3	5.72	3.47	664	292
200	70	63	69	8	5	8.17	3.65	1084	334	6	3	5.64	3.47	677	295
200	70	64	68	8	5	8.05	3.65	1105	338	6	3	5.56	3.47	691	298

Table C1 (contd.): Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0}$ = 28 mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
220	70	66	77	8	5	10.2	3.65	1146	345	6	3	7.12	3.47	720	303
220	70	68	76	8	5	9.99	3.65	1188	352	6	3	6.94	3.47	748	308
220	70	70	75	8	5	9.74	3.65	1231	359	6	3	6.77	3.47	778	314
220	70	72	74	8	5	9.50	3.65	1275	366	6	3	6.59	3.47	808	319
220	70	74	73	8	5	9.25	3.65	1320	374	6	3	6.41	3.47	839	324
220	70	76	72	8	5	9.01	3.65	1366	381	6	3	6.24	3.47	870	330
220	70	78	71	8	5	8.77	3.65	1412	388	6	3	6.07	3.47	902	335
220	70	80	70	8	5	8.52	3.65	1459	395	6	3	5.89	3.47	935	341
260	70	102	79	8	5	10.7	3.65	2035	477	6	3	7.49	3.47	1335	402
260	70	104	78	8	5	10.5	3.65	2092	484	6	3	7.30	3.47	1375	407
260	70	106	77	8	5	10.2	3.65	2151	491	6	3	7.12	3.47	1416	413
260	70	108	76	8	5	9.99	3.65	2210	499	6	3	6.94	3.47	1457	419
260	70	110	75	8	5	9.74	3.65	2269	506	6	3	6.77	3.47	1500	424
260	70	112	74	8	5	9.50	3.65	2330	514	6	3	6.59	3.47	1542	430
260	70	114	73	8	5	9.25	3.65	2392	522	6	3	6.41	3.47	1586	436
260	70	116	72	8	5	9.01	3.65	2454	529	6	3	6.24	3.47	1630	441
260	70	118	71	8	5	8.77	3.65	2518	537	6	3	6.07	3.47	1674	447
260	70	120	70	8	5	8.52	3.65	2582	544	6	3	5.89	3.47	1719	453
220	70	66	77	8	5	10.2	3.65	1146	345	6	3	7.12	3.47	720	303
220	70	68	76	8	5	9.99	3.65	1188	352	6	3	6.94	3.47	748	308
220	70	70	75	8	5	9.74	3.65	1231	359	6	3	6.77	3.47	778	314
220	70	72	74	8	5	9.50	3.65	1275	366	6	3	6.59	3.47	808	319
220	70	74	73	8	5	9.25	3.65	1320	374	6	3	6.41	3.47	839	324
220	70	76	72	8	5	9.01	3.65	1366	381	6	3	6.24	3.47	870	330
220	70	78	71	8	5	8.77	3.65	1412	388	6	3	6.07	3.47	902	335
220	70	80	70	8	5	8.52	3.65	1459	395	6	3	5.89	3.47	935	341
260	70	102	79	8	5	10.7	3.65	2035	477	6	3	7.49	3.47	1335	402
260	70	104	78	8	5	10.5	3.65	2092	484	6	3	7.30	3.47	1375	407
260	70	106	77	8	5	10.2	3.65	2151	491	6	3	7.12	3.47	1416	413
260	70	108	76	8	5	9.99	3.65	2210	499	6	3	6.94	3.47	1457	419
260	70	110	75	8	5	9.74	3.65	2269	506	6	3	6.77	3.47	1500	424
260	70	112	74	8	5	9.50	3.65	2330	514	6	3	6.59	3.47	1542	430
260	70	114	73	8	5	9.25	3.65	2392	522	6	3	6.41	3.47	1586	436
260	70	116	72	8	5	9.01	3.65	2454	529	6	3	6.24	3.47	1630	441
260	70	118	71	8	5	8.77	3.65	2518	537	6	3	6.07	3.47	1674	447
260	70	120	70	8	5	8.52	3.65	2582	544	6	3	5.89	3.47	1719	453

Table C1 (contd.): Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
210	75	25	93	8	5	12.9	3.65	466	208	6	3	9.07	3.47	268	206
210	75	26	92	8	5	12.8	3.65	478	211	6	3	8.97	3.47	276	208
210	75	27	92	8	5	12.7	3.65	491	214	6	3	8.88	3.47	284	210
210	75	28	91	8	5	12.5	3.65	504	217	6	3	8.78	3.47	292	212
210	75	29	91	8	5	12.4	3.65	517	220	6	3	8.69	3.47	300	214
210	75	30	90	8	5	12.3	3.65	530	223	6	3	8.60	3.47	309	216
210	75	31	90	8	5	12.1	3.65	543	226	6	3	8.50	3.47	317	218
210	75	32	89	8	5	12.0	3.65	557	229	6	3	8.41	3.47	326	220
210	75	33	89	8	5	11.9	3.65	571	233	6	3	8.32	3.47	335	222
210	75	34	88	8	5	11.8	3.65	585	236	6	3	8.22	3.47	344	224
210	75	35	88	8	5	11.6	3.65	599	239	6	3	8.13	3.47	354	227
210	75	36	87	8	5	11.5	3.65	614	242	6	3	8.04	3.47	363	229
210	75	37	87	8	5	11.4	3.65	628	245	6	3	7.94	3.47	373	231
210	75	38	86	8	5	11.2	3.65	643	249	6	3	7.85	3.47	382	233
210	75	39	86	8	5	11.1	3.65	658	252	6	3	7.76	3.47	392	236
210	75	40	85	8	5	11.0	3.65	674	255	6	3	7.67	3.47	402	238
210	75	41	85	8	5	10.9	3.65	689	259	6	3	7.58	3.47	413	240
210	75	42	84	8	5	10.7	3.65	705	262	6	3	7.49	3.47	423	242
210	75	43	84	8	5	10.6	3.65	721	265	6	3	7.40	3.47	433	245
210	75	44	83	8	5	10.5	3.65	737	269	6	3	7.30	3.47	444	247
210	75	45	83	8	5	10.4	3.65	754	272	6	3	7.21	3.47	455	250
210	75	46	82	8	5	10.2	3.65	770	275	6	3	7.12	3.47	466	252
210	75	47	82	8	5	10.1	3.65	787	279	6	3	7.03	3.47	477	254
210	75	48	81	8	5	9.99	3.65	804	282	6	3	6.94	3.47	489	257
210	75	49	81	8	5	9.87	3.65	821	286	6	3	6.86	3.47	500	259
210	75	50	80	8	5	9.74	3.65	839	289	6	3	6.77	3.47	512	262
210	75	51	80	8	5	9.62	3.65	856	292	6	3	6.68	3.47	523	264
210	75	52	79	8	5	9.50	3.65	874	296	6	3	6.59	3.47	535	267
210	75	53	79	8	5	9.37	3.65	892	299	6	3	6.50	3.47	548	269
210	75	54	78	8	5	9.25	3.65	910	303	6	3	6.41	3.47	560	272
210	75	55	78	8	5	9.13	3.65	929	306	6	3	6.33	3.47	572	274
210	75	56	77	8	5	9.01	3.65	948	310	6	3	6.24	3.47	585	277
210	75	57	77	8	5	8.89	3.65	966	313	6	3	6.15	3.47	598	279
210	75	58	76	8	5	8.77	3.65	986	317	6	3	6.07	3.47	611	282
210	75	59	76	8	5	8.64	3.65	1005	320	6	3	5.98	3.47	624	285
210	75	60	75	8	5	8.52	3.65	1024	324	6	3	5.89	3.47	637	287
210	75	61	75	8	5	8.40	3.65	1044	327	6	3	5.81	3.47	650	290
210	75	62	74	8	5	8.29	3.65	1064	331	6	3	5.72	3.47	664	292
210	75	63	74	8	5	8.17	3.65	1084	334	6	3	5.64	3.47	677	295
210	75	64	73	8	5	8.05	3.65	1105	338	6	3	5.56	3.47	691	298
230	75	66	82	8	5	10.2	3.65	1146	345	6	3	7.12	3.47	720	303
230	75	68	81	8	5	9.99	3.65	1188	352	6	3	6.94	3.47	748	308
230	75	70	80	8	5	9.74	3.65	1231	359	6	3	6.77	3.47	778	314
230	75	72	79	8	5	9.50	3.65	1275	366	6	3	6.59	3.47	808	319
230	75	74	78	8	5	9.25	3.65	1320	374	6	3	6.41	3.47	839	324
230	75	76	77	8	5	9.01	3.65	1366	381	6	3	6.24	3.47	870	330
230	75	78	76	8	5	8.77	3.65	1412	388	6	3	6.07	3.47	902	335
230	75	80	75	8	5	8.52	3.65	1459	395	6	3	5.89	3.47	935	341

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
250	75	82	84	8	5	10.7	3.65	1507	403	6	3	7.49	3.47	968	346
250	75	84	83	8	5	10.5	3.65	1556	410	6	3	7.30	3.47	1002	352
250	75	86	82	8	5	10.2	3.65	1606	417	6	3	7.12	3.47	1036	357
250	75	88	81	8	5	9.99	3.65	1657	425	6	3	6.94	3.47	1071	363
250	75	90	80	8	5	9.74	3.65	1708	432	6	3	6.77	3.47	1107	368
250	75	92	79	8	5	9.50	3.65	1761	439	6	3	6.59	3.47	1144	374
250	75	94	78	8	5	9.25	3.65	1814	447	6	3	6.41	3.47	1181	379
250	75	96	77	8	5	9.01	3.65	1868	454	6	3	6.24	3.47	1218	385
250	75	98	76	8	5	8.77	3.65	1923	462	6	3	6.07	3.47	1257	390
250	75	100	75	8	5	8.52	3.65	1978	469	6	3	5.89	3.47	1295	396
220	80	25	98	10	6	17.2	5.51	569	320	6	4	9.07	3.47	268	206
220	80	26	97	10	6	17.1	5.51	582	324	6	4	8.97	3.47	276	208
220	80	27	97	10	6	16.9	5.51	596	328	6	4	8.88	3.47	284	210
220	80	28	96	10	6	16.8	5.51	610	332	6	4	8.78	3.47	292	212
220	80	29	96	10	6	16.6	5.51	624	335	6	4	8.69	3.47	300	214
220	80	30	95	10	6	16.5	5.51	638	339	6	4	8.60	3.47	309	216
220	80	31	95	10	6	16.3	5.51	652	343	6	4	8.50	3.47	317	218
220	80	32	94	10	6	16.1	5.51	667	347	6	4	8.41	3.47	326	220
220	80	33	94	10	6	16.0	5.51	682	351	6	4	8.32	3.47	335	222
220	80	34	93	10	6	15.8	5.51	697	355	6	4	8.22	3.47	344	224
220	80	35	93	10	6	15.7	5.51	712	359	6	4	8.13	3.47	354	227
220	80	36	92	10	6	15.5	5.51	728	363	6	4	8.04	3.47	363	229
220	80	37	92	10	6	15.4	5.51	743	367	6	4	7.94	3.47	373	231
220	80	38	91	10	6	15.2	5.51	759	371	6	4	7.85	3.47	382	233
220	80	39	91	10	6	15.0	5.51	775	375	6	4	7.76	3.47	392	236
220	80	40	90	10	6	14.9	5.51	792	379	6	4	7.67	3.47	402	238
220	80	41	90	10	6	14.7	5.51	808	383	6	4	7.58	3.47	413	240
220	80	42	89	10	6	14.6	5.51	825	387	6	4	7.49	3.47	423	242
220	80	43	89	10	6	14.4	5.51	842	391	6	4	7.40	3.47	433	245
220	80	44	88	10	6	14.3	5.51	859	395	6	4	7.30	3.47	444	247
220	80	45	88	10	6	14.1	5.51	876	399	6	4	7.21	3.47	455	250
220	80	46	87	10	6	14.0	5.51	894	404	6	4	7.12	3.47	466	252
220	80	47	87	10	6	13.8	5.51	911	408	6	4	7.03	3.47	477	254
220	80	48	86	10	6	13.7	5.51	929	412	6	4	6.94	3.47	489	257
220	80	49	86	10	6	13.5	5.51	947	416	6	4	6.86	3.47	500	259
220	80	50	85	10	6	13.4	5.51	966	420	6	4	6.77	3.47	512	262
220	80	51	85	10	6	13.2	5.51	984	425	6	4	6.68	3.47	523	264
220	80	52	84	10	6	13.0	5.51	1003	429	6	4	6.59	3.47	535	267
220	80	53	84	10	6	12.9	5.51	1022	433	6	4	6.50	3.47	548	269
220	80	54	83	10	6	12.7	5.51	1041	437	6	4	6.41	3.47	560	272
220	80	55	83	10	6	12.6	5.51	1061	442	6	4	6.33	3.47	572	274
220	80	56	82	10	6	12.4	5.51	1080	446	6	4	6.24	3.47	585	277
220	80	57	82	10	6	12.3	5.51	1100	450	6	4	6.15	3.47	598	279
220	80	58	81	10	6	12.2	5.51	1120	455	6	4	6.07	3.47	611	282
220	80	59	81	10	6	12.0	5.51	1141	459	6	4	5.98	3.47	624	285
220	80	60	80	10	6	11.9	5.51	1161	463	6	4	5.89	3.47	637	287
220	80	61	80	10	6	11.7	5.51	1182	468	6	4	5.81	3.47	650	290
220	80	62	79	10	6	11.6	5.51	1203	472	6	4	5.72	3.47	664	292
220	80	63	79	10	6	11.4	5.51	1224	476	6	4	5.64	3.47	677	295
220	80	64	78	10	6	11.3	5.51	1245	481	6	4	5.56	3.47	691	298

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0}$ = 28 mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
240	80	66	87	10	6	14.0	5.51	1288	490	6	4	7.12	3.47	720	303
240	80	68	86	10	6	13.7	5.51	1332	498	6	4	6.94	3.47	748	308
240	80	70	85	10	6	13.4	5.51	1377	507	6	4	6.77	3.47	778	314
240	80	72	84	10	6	13.0	5.51	1423	516	6	4	6.59	3.47	808	319
240	80	74	83	10	6	12.7	5.51	1469	525	6	4	6.41	3.47	839	324
240	80	76	82	10	6	12.4	5.51	1517	534	6	4	6.24	3.47	870	330
240	80	78	81	10	6	12.2	5.51	1565	543	6	4	6.07	3.47	902	335
240	80	80	80	10	6	11.9	5.51	1614	552	6	4	5.89	3.47	935	341
260	80	82	89	10	6	14.6	5.51	1664	561	6	4	7.49	3.47	968	346
260	80	84	88	10	6	14.3	5.51	1714	570	6	4	7.30	3.47	1002	352
260	80	86	87	10	6	14.0	5.51	1766	579	6	4	7.12	3.47	1036	357
260	80	88	86	10	6	13.7	5.51	1818	589	6	4	6.94	3.47	1071	363
260	80	90	85	10	6	13.4	5.51	1872	598	6	4	6.77	3.47	1107	368
260	80	92	84	10	6	13.0	5.51	1926	607	6	4	6.59	3.47	1144	374
260	80	94	83	10	6	12.7	5.51	1980	616	6	4	6.41	3.47	1181	379
260	80	96	82	10	6	12.4	5.51	2036	625	6	4	6.24	3.47	1218	385
260	80	98	81	10	6	12.2	5.51	2093	635	6	4	6.07	3.47	1257	390
260	80	100	80	10	6	11.9	5.51	2150	644	6	4	5.89	3.47	1295	396
230	85	25	103	10	6	17.2	5.51	569	320	6	4	9.07	3.47	268	206
230	85	26	102	10	6	17.1	5.51	582	324	6	4	8.97	3.47	276	208
230	85	27	102	10	6	16.9	5.51	596	328	6	4	8.88	3.47	284	210
230	85	28	101	10	6	16.8	5.51	610	332	6	4	8.78	3.47	292	212
230	85	29	101	10	6	16.6	5.51	624	335	6	4	8.69	3.47	300	214
230	85	30	100	10	6	16.5	5.51	638	339	6	4	8.60	3.47	309	216
230	85	31	100	10	6	16.3	5.51	652	343	6	4	8.50	3.47	317	218
230	85	32	99	10	6	16.1	5.51	667	347	6	4	8.41	3.47	326	220
230	85	33	99	10	6	16.0	5.51	682	351	6	4	8.32	3.47	335	222
230	85	34	98	10	6	15.8	5.51	697	355	6	4	8.22	3.47	344	224
230	85	35	98	10	6	15.7	5.51	712	359	6	4	8.13	3.47	354	227
230	85	36	97	10	6	15.5	5.51	728	363	6	4	8.04	3.47	363	229
230	85	37	97	10	6	15.4	5.51	743	367	6	4	7.94	3.47	373	231
230	85	38	96	10	6	15.2	5.51	759	371	6	4	7.85	3.47	382	233
230	85	39	96	10	6	15.0	5.51	775	375	6	4	7.76	3.47	392	236
230	85	40	95	10	6	14.9	5.51	792	379	6	4	7.67	3.47	402	238
230	85	41	95	10	6	14.7	5.51	808	383	6	4	7.58	3.47	413	240
230	85	42	94	10	6	14.6	5.51	825	387	6	4	7.49	3.47	423	242
230	85	43	94	10	6	14.4	5.51	842	391	6	4	7.40	3.47	433	245
230	85	44	93	10	6	14.3	5.51	859	395	6	4	7.30	3.47	444	247
230	85	45	93	10	6	14.1	5.51	876	399	6	4	7.21	3.47	455	250
230	85	46	92	10	6	14.0	5.51	894	404	6	4	7.12	3.47	466	252
230	85	47	92	10	6	13.8	5.51	911	408	6	4	7.03	3.47	477	254
230	85	48	91	10	6	13.7	5.51	929	412	6	4	6.94	3.47	489	257
230	85	49	91	10	6	13.5	5.51	947	416	6	4	6.86	3.47	500	259
230	85	50	90	10	6	13.4	5.51	966	420	6	4	6.77	3.47	512	262
230	85	51	90	10	6	13.2	5.51	984	425	6	4	6.68	3.47	523	264
230	85	52	89	10	6	13.0	5.51	1003	429	6	4	6.59	3.47	535	267
230	85	53	89	10	6	12.9	5.51	1022	433	6	4	6.50	3.47	548	269
230	85	54	88	10	6	12.7	5.51	1041	437	6	4	6.41	3.47	560	272
230	85	55	88	10	6	12.6	5.51	1061	442	6	4	6.33	3.47	572	274
230	85	56	87	10	6	12.4	5.51	1080	446	6	4	6.24	3.47	585	277

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
230	85	57	87	10	6	12.3	5.51	1100	450	6	4	6.15	3.47	598	279
230	85	58	86	10	6	12.2	5.51	1120	455	6	4	6.07	3.47	611	282
230	85	59	86	10	6	12.0	5.51	1141	459	6	4	5.98	3.47	624	285
230	85	60	85	10	6	11.9	5.51	1161	463	6	4	5.89	3.47	637	287
230	85	61	85	10	6	11.7	5.51	1182	468	6	4	5.81	3.47	650	290
230	85	62	84	10	6	11.6	5.51	1203	472	6	4	5.72	3.47	664	292
230	85	63	84	10	6	11.4	5.51	1224	476	6	4	5.64	3.47	677	295
230	85	64	83	10	6	11.3	5.51	1245	481	6	4	5.56	3.47	691	298
250	85	66	92	10	6	14.0	5.51	1288	490	6	4	7.12	3.47	720	303
250	85	68	91	10	6	13.7	5.51	1332	498	6	4	6.94	3.47	748	308
250	85	70	90	10	6	13.4	5.51	1377	507	6	4	6.77	3.47	778	314
250	85	72	89	10	6	13.0	5.51	1423	516	6	4	6.59	3.47	808	319
250	85	74	88	10	6	12.7	5.51	1469	525	6	4	6.41	3.47	839	324
250	85	76	87	10	6	12.4	5.51	1517	534	6	4	6.24	3.47	870	330
250	85	78	86	10	6	12.2	5.51	1565	543	6	4	6.07	3.47	902	335
250	85	80	85	10	6	11.9	5.51	1614	552	6	4	5.89	3.47	935	341
240	90	25	108	12	7	22.0	7.84	570	388	8	4	13.7	6.61	297	350
240	90	26	107	12	7	21.8	7.84	583	392	8	4	13.6	6.61	304	351
240	90	27	107	12	7	21.6	7.84	596	396	8	4	13.5	6.61	311	352
240	90	28	106	12	7	21.4	7.84	609	400	8	4	13.4	6.61	318	353
240	90	29	106	12	7	21.2	7.84	623	404	8	4	13.2	6.61	326	354
240	90	30	105	12	7	21.1	7.84	636	409	8	4	13.1	6.61	333	356
240	90	31	105	12	7	20.9	7.84	650	413	8	4	13.0	6.61	341	357
240	90	32	104	12	7	20.7	7.84	664	417	8	4	12.9	6.61	348	359
240	90	33	104	12	7	20.5	7.84	678	422	8	4	12.8	6.61	356	361
240	90	34	103	12	7	20.3	7.84	693	426	8	4	12.6	6.61	364	362
240	90	35	103	12	7	20.1	7.84	707	431	8	4	12.5	6.61	372	364
240	90	36	102	12	7	19.9	7.84	722	435	8	4	12.4	6.61	380	366
240	90	37	102	12	7	19.8	7.84	737	440	8	4	12.3	6.61	389	368
240	90	38	101	12	7	19.6	7.84	753	444	8	4	12.2	6.61	397	370
240	90	39	101	12	7	19.4	7.84	768	449	8	4	12.1	6.61	406	372
240	90	40	100	12	7	19.2	7.84	784	453	8	4	11.9	6.61	415	374
240	90	41	100	12	7	19.0	7.84	800	458	8	4	11.8	6.61	424	376
240	90	42	99	12	7	18.8	7.84	816	463	8	4	11.7	6.61	433	379
240	90	43	99	12	7	18.7	7.84	832	467	8	4	11.6	6.61	442	381
240	90	44	98	12	7	18.5	7.84	848	472	8	4	11.5	6.61	451	383
240	90	45	98	12	7	18.3	7.84	865	477	8	4	11.4	6.61	461	386
240	90	46	97	12	7	18.1	7.84	882	481	8	4	11.2	6.61	471	388
240	90	47	97	12	7	17.9	7.84	899	486	8	4	11.1	6.61	480	391
240	90	48	96	12	7	17.8	7.84	917	491	8	4	11.0	6.61	490	393
240	90	49	96	12	7	17.6	7.84	934	496	8	4	10.9	6.61	500	396
240	90	50	95	12	7	17.4	7.84	952	501	8	4	10.8	6.61	510	399
240	90	51	95	12	7	17.2	7.84	970	505	8	4	10.7	6.61	521	401
240	90	52	94	12	7	17.0	7.84	988	510	8	4	10.6	6.61	531	404
240	90	53	94	12	7	16.9	7.84	1006	515	8	4	10.5	6.61	542	407
240	90	54	93	12	7	16.7	7.84	1025	520	8	4	10.3	6.61	552	409
240	90	55	93	12	7	16.5	7.84	1044	525	8	4	10.2	6.61	563	412
240	90	56	92	12	7	16.3	7.84	1063	530	8	4	10.1	6.61	574	415
240	90	57	92	12	7	16.2	7.84	1082	535	8	4	10.0	6.61	585	418
240	90	58	91	12	7	16.0	7.84	1101	540	8	4	9.90	6.61	597	421

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
240	90	59	91	12	7	15.8	7.84	1121	545	8	4	9.79	6.61	608	424
240	90	60	90	12	7	15.6	7.84	1141	550	8	4	9.68	6.61	620	426
240	90	61	90	12	7	15.5	7.84	1161	555	8	4	9.57	6.61	631	429
240	90	62	89	12	7	15.3	7.84	1181	560	8	4	9.46	6.61	643	432
240	90	63	89	12	7	15.1	7.84	1201	565	8	4	9.36	6.61	655	435
240	90	64	88	12	7	14.9	7.84	1222	570	8	4	9.25	6.61	667	438
260	90	66	97	12	7	18.1	7.84	1264	581	8	4	11.2	6.61	692	445
260	90	68	96	12	7	17.8	7.84	1307	591	8	4	11.0	6.61	717	451
260	90	70	95	12	7	17.4	7.84	1350	601	8	4	10.8	6.61	743	457
260	90	72	94	12	7	17.0	7.84	1395	611	8	4	10.6	6.61	769	463
260	90	74	93	12	7	16.7	7.84	1440	622	8	4	10.3	6.61	796	470
260	90	76	92	12	7	16.3	7.84	1486	632	8	4	10.1	6.61	823	476
260	90	78	91	12	7	16.0	7.84	1533	643	8	4	9.90	6.61	851	483
260	90	80	90	12	7	15.6	7.84	1580	653	8	4	9.68	6.61	880	489
280	90	82	99	12	7	18.8	7.84	1629	664	8	4	11.7	6.61	909	496
280	90	84	98	12	7	18.5	7.84	1678	675	8	4	11.5	6.61	938	503
280	90	86	97	12	7	18.1	7.84	1729	685	8	4	11.2	6.61	969	509
280	90	88	96	12	7	17.8	7.84	1780	696	8	4	11.0	6.61	999	516
280	90	90	95	12	7	17.4	7.84	1831	707	8	4	10.8	6.61	1031	523
280	90	92	94	12	7	17.0	7.84	1884	718	8	4	10.6	6.61	1062	530
280	90	94	93	12	7	16.7	7.84	1938	728	8	4	10.3	6.61	1095	537
280	90	96	92	12	7	16.3	7.84	1992	739	8	4	10.1	6.61	1128	544
280	90	98	91	12	7	16.0	7.84	2047	750	8	4	9.90	6.61	1161	551
280	90	100	90	12	7	15.6	7.84	2103	761	8	4	9.68	6.61	1195	558
300	90	102	99	12	7	18.8	7.84	2160	772	8	4	11.7	6.61	1230	565
300	90	104	98	12	7	18.5	7.84	2217	783	8	4	11.5	6.61	1265	572
300	90	106	97	12	7	18.1	7.84	2276	794	8	4	11.2	6.61	1300	579
300	90	108	96	12	7	17.8	7.84	2335	805	8	4	11.0	6.61	1337	586
300	90	110	95	12	7	17.4	7.84	2395	816	8	4	10.8	6.61	1373	593
300	90	112	94	12	7	17.0	7.84	2456	827	8	4	10.6	6.61	1411	600
300	90	114	93	12	7	16.7	7.84	2518	838	8	4	10.3	6.61	1449	608
300	90	116	92	12	7	16.3	7.84	2581	849	8	4	10.1	6.61	1487	615
300	90	118	91	12	7	16.0	7.84	2644	860	8	4	9.90	6.61	1526	622
300	90	120	90	12	7	15.6	7.84	2708	871	8	4	9.68	6.61	1565	629
320	90	122	99	12	7	18.8	7.84	2773	882	8	4	11.7	6.61	1606	637
320	90	124	98	12	7	18.5	7.84	2839	894	8	4	11.5	6.61	1646	644
320	90	126	97	12	7	18.1	7.84	2906	905	8	4	11.2	6.61	1687	651
320	90	128	96	12	7	17.8	7.84	2974	916	8	4	11.0	6.61	1729	659
320	90	130	95	12	7	17.4	7.84	3042	927	8	4	10.8	6.61	1771	666
320	90	132	94	12	7	17.0	7.84	3111	938	8	4	10.6	6.61	1814	673
320	90	134	93	12	7	16.7	7.84	3181	950	8	4	10.3	6.61	1858	681
320	90	136	92	12	7	16.3	7.84	3252	961	8	4	10.1	6.61	1902	688
320	90	138	91	12	7	16.0	7.84	3324	972	8	4	9.90	6.61	1946	696
320	90	140	90	12	7	15.6	7.84	3396	984	8	4	9.68	6.61	1991	703

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
250	95	25	113	12	7	22.0	7.84	570	388	8	4	13.7	6.61	297	350
250	95	26	112	12	7	21.8	7.84	583	392	8	4	13.6	6.61	304	351
250	95	27	112	12	7	21.6	7.84	596	396	8	4	13.5	6.61	311	352
250	95	28	111	12	7	21.4	7.84	609	400	8	4	13.4	6.61	318	353
250	95	29	111	12	7	21.2	7.84	623	404	8	4	13.2	6.61	326	354
250	95	30	110	12	7	21.1	7.84	636	409	8	4	13.1	6.61	333	356
250	95	31	110	12	7	20.9	7.84	650	413	8	4	13.0	6.61	341	357
250	95	32	109	12	7	20.7	7.84	664	417	8	4	12.9	6.61	348	359
250	95	33	109	12	7	20.5	7.84	678	422	8	4	12.8	6.61	356	361
250	95	34	108	12	7	20.3	7.84	693	426	8	4	12.6	6.61	364	362
250	95	35	108	12	7	20.1	7.84	707	431	8	4	12.5	6.61	372	364
250	95	36	107	12	7	19.9	7.84	722	435	8	4	12.4	6.61	380	366
250	95	37	107	12	7	19.8	7.84	737	440	8	4	12.3	6.61	389	368
250	95	38	106	12	7	19.6	7.84	753	444	8	4	12.2	6.61	397	370
250	95	39	106	12	7	19.4	7.84	768	449	8	4	12.1	6.61	406	372
250	95	40	105	12	7	19.2	7.84	784	453	8	4	11.9	6.61	415	374
250	95	41	105	12	7	19.0	7.84	800	458	8	4	11.8	6.61	424	376
250	95	42	104	12	7	18.8	7.84	816	463	8	4	11.7	6.61	433	379
250	95	43	104	12	7	18.7	7.84	832	467	8	4	11.6	6.61	442	381
250	95	44	103	12	7	18.5	7.84	848	472	8	4	11.5	6.61	451	383
250	95	45	103	12	7	18.3	7.84	865	477	8	4	11.4	6.61	461	386
250	95	46	102	12	7	18.1	7.84	882	481	8	4	11.2	6.61	471	388
250	95	47	102	12	7	17.9	7.84	899	486	8	4	11.1	6.61	480	391
250	95	48	101	12	7	17.8	7.84	917	491	8	4	11.0	6.61	490	393
250	95	49	101	12	7	17.6	7.84	934	496	8	4	10.9	6.61	500	396
250	95	50	100	12	7	17.4	7.84	952	501	8	4	10.8	6.61	510	399
250	95	51	100	12	7	17.2	7.84	970	505	8	4	10.7	6.61	521	401
250	95	52	99	12	7	17.0	7.84	988	510	8	4	10.6	6.61	531	404
250	95	53	99	12	7	16.9	7.84	1006	515	8	4	10.5	6.61	542	407
250	95	54	98	12	7	16.7	7.84	1025	520	8	4	10.3	6.61	552	409
250	95	55	98	12	7	16.5	7.84	1044	525	8	4	10.2	6.61	563	412
250	95	56	97	12	7	16.3	7.84	1063	530	8	4	10.1	6.61	574	415
250	95	57	97	12	7	16.2	7.84	1082	535	8	4	10.0	6.61	585	418
250	95	58	96	12	7	16.0	7.84	1101	540	8	4	9.90	6.61	597	421
250	95	59	96	12	7	15.8	7.84	1121	545	8	4	9.79	6.61	608	424
250	95	60	95	12	7	15.6	7.84	1141	550	8	4	9.68	6.61	620	426
250	95	61	95	12	7	15.5	7.84	1161	555	8	4	9.57	6.61	631	429
250	95	62	94	12	7	15.3	7.84	1181	560	8	4	9.46	6.61	643	432
250	95	63	94	12	7	15.1	7.84	1201	565	8	4	9.36	6.61	655	435
250	95	64	93	12	7	14.9	7.84	1222	570	8	4	9.25	6.61	667	438

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
260	100	25	118	14	8	27.2	10.6	660	526	8	4	13.7	6.61	297	350
260	100	26	117	14	8	26.9	10.6	673	531	8	4	13.6	6.61	304	351
260	100	27	117	14	8	26.7	10.6	687	535	8	4	13.5	6.61	311	352
260	100	28	116	14	8	26.5	10.6	701	540	8	4	13.4	6.61	318	353
260	100	29	116	14	8	26.3	10.6	715	544	8	4	13.2	6.61	326	354
260	100	30	115	14	8	26.1	10.6	729	549	8	4	13.1	6.61	333	356
260	100	31	115	14	8	25.9	10.6	744	554	8	4	13.0	6.61	341	357
260	100	32	114	14	8	25.7	10.6	758	559	8	4	12.9	6.61	348	359
260	100	33	114	14	8	25.4	10.6	773	564	8	4	12.8	6.61	356	361
260	100	34	113	14	8	25.2	10.6	788	568	8	4	12.6	6.61	364	362
260	100	35	113	14	8	25.0	10.6	803	573	8	4	12.5	6.61	372	364
260	100	36	112	14	8	24.8	10.6	819	578	8	4	12.4	6.61	380	366
260	100	37	112	14	8	24.6	10.6	835	583	8	4	12.3	6.61	389	368
260	100	38	111	14	8	24.4	10.6	850	588	8	4	12.2	6.61	397	370
260	100	39	111	14	8	24.2	10.6	867	594	8	4	12.1	6.61	406	372
260	100	40	110	14	8	24.0	10.6	883	599	8	4	11.9	6.61	415	374
260	100	41	110	14	8	23.8	10.6	899	604	8	4	11.8	6.61	424	376
260	100	42	109	14	8	23.6	10.6	916	609	8	4	11.7	6.61	433	379
260	100	43	109	14	8	23.3	10.6	933	614	8	4	11.6	6.61	442	381
260	100	44	108	14	8	23.1	10.6	950	620	8	4	11.5	6.61	451	383
260	100	45	108	14	8	22.9	10.6	967	625	8	4	11.4	6.61	461	386
260	100	46	107	14	8	22.7	10.6	985	630	8	4	11.2	6.61	471	388
260	100	47	107	14	8	22.5	10.6	1003	636	8	4	11.1	6.61	480	391
260	100	48	106	14	8	22.3	10.6	1021	641	8	4	11.0	6.61	490	393
260	100	49	106	14	8	22.1	10.6	1039	646	8	4	10.9	6.61	500	396
260	100	50	105	14	8	21.9	10.6	1057	652	8	4	10.8	6.61	510	399
260	100	51	105	14	8	21.7	10.6	1076	657	8	4	10.7	6.61	521	401
260	100	52	104	14	8	21.5	10.6	1095	663	8	4	10.6	6.61	531	404
260	100	53	104	14	8	21.3	10.6	1114	668	8	4	10.5	6.61	542	407
260	100	54	103	14	8	21.1	10.6	1133	674	8	4	10.3	6.61	552	409
260	100	55	103	14	8	20.9	10.6	1152	680	8	4	10.2	6.61	563	412
260	100	56	102	14	8	20.7	10.6	1172	685	8	4	10.1	6.61	574	415
260	100	57	102	14	8	20.5	10.6	1192	691	8	4	10.0	6.61	585	418
260	100	58	101	14	8	20.3	10.6	1212	697	8	4	9.90	6.61	597	421
260	100	59	101	14	8	20.1	10.6	1232	702	8	4	9.79	6.61	608	424
260	100	60	100	14	8	19.9	10.6	1252	708	8	4	9.68	6.61	620	426
260	100	61	100	14	8	19.7	10.6	1273	714	8	4	9.57	6.61	631	429
260	100	62	99	14	8	19.5	10.6	1294	719	8	4	9.46	6.61	643	432
260	100	63	99	14	8	19.3	10.6	1315	725	8	4	9.36	6.61	655	435
260	100	64	98	14	8	19.1	10.6	1336	731	8	4	9.25	6.61	667	438
280	100	64	108	14	8	23.1	10.6	1336	731	8	4	11.5	6.61	667	438
280	100	66	107	14	8	22.7	10.6	1379	743	8	4	11.2	6.61	692	445
280	100	68	106	14	8	22.3	10.6	1423	754	8	4	11.0	6.61	717	451
280	100	70	105	14	8	21.9	10.6	1468	766	8	4	10.8	6.61	743	457
280	100	72	104	14	8	21.5	10.6	1513	778	8	4	10.6	6.61	769	463
280	100	74	103	14	8	21.1	10.6	1560	790	8	4	10.3	6.61	796	470
280	100	76	102	14	8	20.7	10.6	1607	802	8	4	10.1	6.61	823	476
280	100	78	101	14	8	20.3	10.6	1655	814	8	4	9.90	6.61	851	483
280	100	80	100	14	8	19.9	10.6	1704	826	8	4	9.68	6.61	880	489

Table C1 (contd.): Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
300	100	82	109	14	8	23.6	10.6	1754	838	8	4	11.7	6.61	909	496
300	100	84	108	14	8	23.1	10.6	1804	850	8	4	11.5	6.61	938	503
300	100	86	107	14	8	22.7	10.6	1856	863	8	4	11.2	6.61	969	509
300	100	88	106	14	8	22.3	10.6	1908	875	8	4	11.0	6.61	999	516
300	100	90	105	14	8	21.9	10.6	1961	887	8	4	10.8	6.61	1031	523
300	100	92	104	14	8	21.5	10.6	2015	900	8	4	10.6	6.61	1062	530
300	100	94	103	14	8	21.1	10.6	2069	912	8	4	10.3	6.61	1095	537
300	100	96	102	14	8	20.7	10.6	2125	924	8	4	10.1	6.61	1128	544
300	100	98	101	14	8	20.3	10.6	2181	937	8	4	9.90	6.61	1161	551
300	100	100	100	14	8	19.9	10.6	2238	950	8	4	9.68	6.61	1195	558
320	100	102	109	14	8	23.6	10.6	2296	962	8	4	11.7	6.61	1230	565
320	100	104	108	14	8	23.1	10.6	2355	975	8	4	11.5	6.61	1265	572
320	100	106	107	14	8	22.7	10.6	2414	987	8	4	11.2	6.61	1300	579
320	100	108	106	14	8	22.3	10.6	2475	1000	8	4	11.0	6.61	1337	586
320	100	110	105	14	8	21.9	10.6	2536	1013	8	4	10.8	6.61	1373	593
320	100	112	104	14	8	21.5	10.6	2598	1025	8	4	10.6	6.61	1411	600
320	100	114	103	14	8	21.1	10.6	2661	1038	8	4	10.3	6.61	1449	608
320	100	116	102	14	8	20.7	10.6	2725	1051	8	4	10.1	6.61	1487	615
320	100	118	101	14	8	20.3	10.6	2789	1064	8	4	9.90	6.61	1526	622
320	100	120	100	14	8	19.9	10.6	2855	1077	8	4	9.68	6.61	1565	629
340	100	122	109	14	8	23.6	10.6	2921	1090	8	4	11.7	6.61	1606	637
340	100	124	108	14	8	23.1	10.6	2988	1102	8	4	11.5	6.61	1646	644
340	100	126	107	14	8	22.7	10.6	3056	1115	8	4	11.2	6.61	1687	651
340	100	128	106	14	8	22.3	10.6	3124	1128	8	4	11.0	6.61	1729	659
340	100	130	105	14	8	21.9	10.6	3194	1141	8	4	10.8	6.61	1771	666
340	100	132	104	14	8	21.5	10.6	3264	1154	8	4	10.6	6.61	1814	673
340	100	134	103	14	8	21.1	10.6	3335	1167	8	4	10.3	6.61	1858	681
340	100	136	102	14	8	20.7	10.6	3407	1180	8	4	10.1	6.61	1902	688
340	100	138	101	14	8	20.3	10.6	3480	1193	8	4	9.90	6.61	1946	696
340	100	140	100	14	8	19.9	10.6	3553	1206	8	4	9.68	6.61	1991	703
280	110	25	128	16	9	32.8	13.9	682	624	10	5	19.3	10.7	353	558
280	110	26	127	16	9	32.5	13.9	695	629	10	5	19.2	10.7	359	557
280	110	27	127	16	9	32.3	13.9	709	633	10	5	19.0	10.7	366	556
280	110	28	126	16	9	32.1	13.9	722	638	10	5	18.9	10.7	372	555
280	110	29	126	16	9	31.8	13.9	736	643	10	5	18.7	10.7	379	555
280	110	30	125	16	9	31.6	13.9	749	647	10	5	18.6	10.7	386	555
280	110	31	125	16	9	31.3	13.9	763	652	10	5	18.4	10.7	393	554
280	110	32	124	16	9	31.1	13.9	778	657	10	5	18.3	10.7	400	555
280	110	33	124	16	9	30.9	13.9	792	662	10	5	18.2	10.7	407	555
280	110	34	123	16	9	30.6	13.9	807	667	10	5	18.0	10.7	415	555
280	110	35	123	16	9	30.4	13.9	821	672	10	5	17.9	10.7	422	556
280	110	36	122	16	9	30.1	13.9	836	678	10	5	17.7	10.7	430	556
280	110	37	122	16	9	29.9	13.9	852	683	10	5	17.6	10.7	438	557
280	110	38	121	16	9	29.7	13.9	867	688	10	5	17.4	10.7	446	558
280	110	39	121	16	9	29.4	13.9	883	694	10	5	17.3	10.7	454	559
280	110	40	120	16	9	29.2	13.9	899	699	10	5	17.2	10.7	462	561
280	110	41	120	16	9	29.0	13.9	915	704	10	5	17.0	10.7	470	562
280	110	42	119	16	9	28.7	13.9	931	710	10	5	16.9	10.7	479	563
280	110	43	119	16	9	28.5	13.9	947	716	10	5	16.7	10.7	487	565
280	110	44	118	16	9	28.2	13.9	964	721	10	5	16.6	10.7	496	567

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
280	110	45	118	16	9	28.0	13.9	981	727	10	5	16.5	10.7	505	568
280	110	46	117	16	9	27.8	13.9	998	732	10	5	16.3	10.7	514	570
280	110	47	117	16	9	27.5	13.9	1015	738	10	5	16.2	10.7	523	572
280	110	48	116	16	9	27.3	13.9	1033	744	10	5	16.0	10.7	532	574
280	110	49	116	16	9	27.1	13.9	1051	750	10	5	15.9	10.7	541	576
280	110	50	115	16	9	26.8	13.9	1068	756	10	5	15.8	10.7	551	578
280	110	51	115	16	9	26.6	13.9	1087	762	10	5	15.6	10.7	560	581
280	110	52	114	16	9	26.4	13.9	1105	768	10	5	15.5	10.7	570	583
280	110	53	114	16	9	26.2	13.9	1123	773	10	5	15.4	10.7	580	585
280	110	54	113	16	9	25.9	13.9	1142	780	10	5	15.2	10.7	590	588
280	110	55	113	16	9	25.7	13.9	1161	786	10	5	15.1	10.7	600	590
280	110	56	112	16	9	25.5	13.9	1180	792	10	5	15.0	10.7	610	593
280	110	57	112	16	9	25.2	13.9	1199	798	10	5	14.8	10.7	621	596
280	110	58	111	16	9	25.0	13.9	1219	804	10	5	14.7	10.7	631	598
280	110	59	111	16	9	24.8	13.9	1239	810	10	5	14.6	10.7	642	601
280	110	60	110	16	9	24.6	13.9	1259	816	10	5	14.4	10.7	652	604
280	110	61	110	16	9	24.3	13.9	1279	823	10	5	14.3	10.7	663	607
280	110	62	109	16	9	24.1	13.9	1299	829	10	5	14.2	10.7	674	610
300	110	64	118	16	9	28.2	13.9	1341	841	10	5	16.6	10.7	697	616
300	110	66	117	16	9	27.8	13.9	1383	854	10	5	16.3	10.7	720	622
300	110	68	116	16	9	27.3	13.9	1426	867	10	5	16.0	10.7	743	628
300	110	70	115	16	9	26.8	13.9	1470	880	10	5	15.8	10.7	767	634
300	110	72	114	16	9	26.4	13.9	1514	893	10	5	15.5	10.7	791	641
300	110	74	113	16	9	25.9	13.9	1560	906	10	5	15.2	10.7	816	648
300	110	76	112	16	9	25.5	13.9	1606	919	10	5	15.0	10.7	842	655
300	110	78	111	16	9	25.0	13.9	1653	932	10	5	14.7	10.7	868	662
300	110	80	110	16	9	24.6	13.9	1701	946	10	5	14.4	10.7	894	669
320	110	82	119	16	9	28.7	13.9	1750	959	10	5	16.9	10.7	921	676
320	110	84	118	16	9	28.2	13.9	1799	973	10	5	16.6	10.7	949	683
320	110	86	117	16	9	27.8	13.9	1850	986	10	5	16.3	10.7	977	691
320	110	88	116	16	9	27.3	13.9	1901	1000	10	5	16.0	10.7	1005	698
320	110	90	115	16	9	26.8	13.9	1953	1014	10	5	15.8	10.7	1034	706
320	110	92	114	16	9	26.4	13.9	2006	1027	10	5	15.5	10.7	1064	714
320	110	94	113	16	9	25.9	13.9	2059	1041	10	5	15.2	10.7	1094	721
320	110	96	112	16	9	25.5	13.9	2114	1055	10	5	15.0	10.7	1124	729
320	110	98	111	16	9	25.0	13.9	2169	1069	10	5	14.7	10.7	1156	737
320	110	100	110	16	9	24.6	13.9	2225	1083	10	5	14.4	10.7	1187	745
340	110	102	119	16	9	28.7	13.9	2282	1097	10	5	16.9	10.7	1219	753
340	110	104	118	16	9	28.2	13.9	2340	1111	10	5	16.6	10.7	1252	761
340	110	106	117	16	9	27.8	13.9	2398	1125	10	5	16.3	10.7	1285	769
340	110	108	116	16	9	27.3	13.9	2458	1139	10	5	16.0	10.7	1319	778
340	110	110	115	16	9	26.8	13.9	2518	1153	10	5	15.8	10.7	1353	786
340	110	112	114	16	9	26.4	13.9	2579	1168	10	5	15.5	10.7	1388	794
340	110	114	113	16	9	25.9	13.9	2641	1182	10	5	15.2	10.7	1423	803
340	110	116	112	16	9	25.5	13.9	2704	1196	10	5	15.0	10.7	1459	811
340	110	118	111	16	9	25.0	13.9	2767	1211	10	5	14.7	10.7	1495	819
340	110	120	110	16	9	24.6	13.9	2831	1225	10	5	14.4	10.7	1531	828

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
360	110	122	119	16	9	28.7	13.9	2897	1239	10	5	16.9	10.7	1569	836
360	110	124	118	16	9	28.2	13.9	2963	1254	10	5	16.6	10.7	1607	845
360	110	126	117	16	9	27.8	13.9	3029	1268	10	5	16.3	10.7	1645	854
360	110	128	116	16	9	27.3	13.9	3097	1283	10	5	16.0	10.7	1684	862
360	110	130	115	16	9	26.8	13.9	3165	1298	10	5	15.8	10.7	1723	871
360	110	132	114	16	9	26.4	13.9	3235	1312	10	5	15.5	10.7	1763	880
360	110	134	113	16	9	25.9	13.9	3305	1327	10	5	15.2	10.7	1803	889
360	110	136	112	16	9	25.5	13.9	3376	1341	10	5	15.0	10.7	1844	897
360	110	138	111	16	9	25.0	13.9	3447	1356	10	5	14.7	10.7	1885	906
360	110	140	110	16	9	24.6	13.9	3520	1371	10	5	14.4	10.7	1927	915
300	120	25	138	18	10	38.9	17.6	773	798	10	6	19.3	10.7	353	558
300	120	26	137	18	10	38.6	17.6	786	802	10	6	19.2	10.7	359	557
300	120	27	137	18	10	38.3	17.6	800	807	10	6	19.0	10.7	366	556
300	120	28	136	18	10	38.1	17.6	814	811	10	6	18.9	10.7	372	555
300	120	29	136	18	10	37.8	17.6	828	816	10	6	18.7	10.7	379	555
300	120	30	135	18	10	37.5	17.6	842	821	10	6	18.6	10.7	386	555
300	120	31	135	18	10	37.2	17.6	857	826	10	6	18.4	10.7	393	554
300	120	32	134	18	10	37.0	17.6	871	831	10	6	18.3	10.7	400	555
300	120	33	134	18	10	36.7	17.6	886	836	10	6	18.2	10.7	407	555
300	120	34	133	18	10	36.4	17.6	901	841	10	6	18.0	10.7	415	555
300	120	35	133	18	10	36.2	17.6	917	847	10	6	17.9	10.7	422	556
300	120	36	132	18	10	35.9	17.6	932	852	10	6	17.7	10.7	430	556
300	120	37	132	18	10	35.7	17.6	948	857	10	6	17.6	10.7	438	557
300	120	38	131	18	10	35.4	17.6	964	863	10	6	17.4	10.7	446	558
300	120	39	131	18	10	35.1	17.6	980	869	10	6	17.3	10.7	454	559
300	120	40	130	18	10	34.9	17.6	996	874	10	6	17.2	10.7	462	561
300	120	41	130	18	10	34.6	17.6	1013	880	10	6	17.0	10.7	470	562
300	120	42	129	18	10	34.3	17.6	1030	886	10	6	16.9	10.7	479	563
300	120	43	129	18	10	34.1	17.6	1046	892	10	6	16.7	10.7	487	565
300	120	44	128	18	10	33.8	17.6	1064	898	10	6	16.6	10.7	496	567
300	120	45	128	18	10	33.6	17.6	1081	904	10	6	16.5	10.7	505	568
300	120	46	127	18	10	33.3	17.6	1098	910	10	6	16.3	10.7	514	570
300	120	47	127	18	10	33.0	17.6	1116	916	10	6	16.2	10.7	523	572
300	120	48	126	18	10	32.8	17.6	1134	922	10	6	16.0	10.7	532	574
300	120	49	126	18	10	32.5	17.6	1152	928	10	6	15.9	10.7	541	576
300	120	50	125	18	10	32.3	17.6	1171	934	10	6	15.8	10.7	551	578
300	120	51	125	18	10	32.0	17.6	1189	940	10	6	15.6	10.7	560	581
300	120	52	124	18	10	31.7	17.6	1208	947	10	6	15.5	10.7	570	583
300	120	53	124	18	10	31.5	17.6	1227	953	10	6	15.4	10.7	580	585
300	120	54	123	18	10	31.2	17.6	1246	960	10	6	15.2	10.7	590	588
300	120	55	123	18	10	31.0	17.6	1266	966	10	6	15.1	10.7	600	590
300	120	56	122	18	10	30.7	17.6	1285	973	10	6	15.0	10.7	610	593
300	120	57	122	18	10	30.5	17.6	1305	979	10	6	14.8	10.7	621	596
300	120	58	121	18	10	30.2	17.6	1325	986	10	6	14.7	10.7	631	598
300	120	59	121	18	10	30.0	17.6	1345	992	10	6	14.6	10.7	642	601
300	120	60	120	18	10	29.7	17.6	1366	999	10	6	14.4	10.7	652	604
300	120	61	120	18	10	29.5	17.6	1386	1006	10	6	14.3	10.7	663	607
300	120	62	119	18	10	29.2	17.6	1407	1013	10	6	14.2	10.7	674	610

Table C1 (contd.): Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0}$ = 28 mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
320	120	64	128	18	10	33.8	17.6	1449	1026	10	6	16.6	10.7	697	616
320	120	66	127	18	10	33.3	17.6	1492	1040	10	6	16.3	10.7	720	622
320	120	68	126	18	10	32.8	17.6	1536	1054	10	6	16.0	10.7	743	628
320	120	70	125	18	10	32.3	17.6	1581	1068	10	6	15.8	10.7	767	634
320	120	72	124	18	10	31.7	17.6	1626	1082	10	6	15.5	10.7	791	641
320	120	74	123	18	10	31.2	17.6	1673	1096	10	6	15.2	10.7	816	648
320	120	76	122	18	10	30.7	17.6	1720	1111	10	6	15.0	10.7	842	655
320	120	78	121	18	10	30.2	17.6	1768	1125	10	6	14.7	10.7	868	662
320	120	80	120	18	10	29.7	17.6	1817	1140	10	6	14.4	10.7	894	669
340	120	82	129	18	10	34.3	17.6	1866	1154	10	6	16.9	10.7	921	676
340	120	84	128	18	10	33.8	17.6	1917	1169	10	6	16.6	10.7	949	683
340	120	86	127	18	10	33.3	17.6	1968	1184	10	6	16.3	10.7	977	691
340	120	88	126	18	10	32.8	17.6	2020	1199	10	6	16.0	10.7	1005	698
340	120	90	125	18	10	32.3	17.6	2073	1214	10	6	15.8	10.7	1034	706
340	120	92	124	18	10	31.7	17.6	2127	1229	10	6	15.5	10.7	1064	714
340	120	94	123	18	10	31.2	17.6	2181	1244	10	6	15.2	10.7	1094	721
340	120	96	122	18	10	30.7	17.6	2237	1259	10	6	15.0	10.7	1124	729
340	120	98	121	18	10	30.2	17.6	2293	1275	10	6	14.7	10.7	1156	737
340	120	100	120	18	10	29.7	17.6	2350	1290	10	6	14.4	10.7	1187	745
360	120	102	129	18	10	34.3	17.6	2407	1306	10	6	16.9	10.7	1219	753
360	120	104	128	18	10	33.8	17.6	2466	1321	10	6	16.6	10.7	1252	761
360	120	106	127	18	10	33.3	17.6	2526	1337	10	6	16.3	10.7	1285	769
360	120	108	126	18	10	32.8	17.6	2586	1352	10	6	16.0	10.7	1319	778
360	120	110	125	18	10	32.3	17.6	2647	1368	10	6	15.8	10.7	1353	786
360	120	112	124	18	10	31.7	17.6	2709	1384	10	6	15.5	10.7	1388	794
360	120	114	123	18	10	31.2	17.6	2771	1399	10	6	15.2	10.7	1423	803
360	120	116	122	18	10	30.7	17.6	2835	1415	10	6	15.0	10.7	1459	811
360	120	118	121	18	10	30.2	17.6	2899	1431	10	6	14.7	10.7	1495	819
360	120	120	120	18	10	29.7	17.6	2964	1447	10	6	14.4	10.7	1531	828
380	120	122	129	18	10	34.3	17.6	3030	1463	10	6	16.9	10.7	1569	836
380	120	124	128	18	10	33.8	17.6	3097	1479	10	6	16.6	10.7	1607	845
380	120	126	127	18	10	33.3	17.6	3165	1495	10	6	16.3	10.7	1645	854
380	120	128	126	18	10	32.8	17.6	3233	1511	10	6	16.0	10.7	1684	862
380	120	130	125	18	10	32.3	17.6	3303	1527	10	6	15.8	10.7	1723	871
380	120	132	124	18	10	31.7	17.6	3373	1544	10	6	15.5	10.7	1763	880
380	120	134	123	18	10	31.2	17.6	3444	1560	10	6	15.2	10.7	1803	889
380	120	136	122	18	10	30.7	17.6	3515	1576	10	6	15.0	10.7	1844	897
380	120	138	121	18	10	30.2	17.6	3588	1592	10	6	14.7	10.7	1885	906
380	120	140	120	18	10	29.7	17.6	3661	1609	10	6	14.4	10.7	1927	915

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0}$ = 28 mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
320	130	25	148	20	11	45.4	21.9	814	935	12	6	25.9	15.7	426	848
320	130	26	147	20	11	45.1	21.9	827	939	12	6	25.7	15.7	432	843
320	130	27	147	20	11	44.8	21.9	840	944	12	6	25.5	15.7	439	838
320	130	28	146	20	11	44.5	21.9	854	948	12	6	25.4	15.7	445	834
320	130	29	146	20	11	44.2	21.9	868	952	12	6	25.2	15.7	451	830
320	130	30	145	20	11	43.9	21.9	882	957	12	6	25.0	15.7	458	827
320	130	31	145	20	11	43.6	21.9	896	962	12	6	24.8	15.7	465	824
320	130	32	144	20	11	43.3	21.9	910	966	12	6	24.7	15.7	472	821
320	130	33	144	20	11	43.0	21.9	925	971	12	6	24.5	15.7	479	819
320	130	34	143	20	11	42.7	21.9	939	976	12	6	24.3	15.7	486	817
320	130	35	143	20	11	42.5	21.9	954	981	12	6	24.2	15.7	493	815
320	130	36	142	20	11	42.2	21.9	969	987	12	6	24.0	15.7	500	813
320	130	37	142	20	11	41.9	21.9	985	992	12	6	23.8	15.7	508	812
320	130	38	141	20	11	41.6	21.9	1000	997	12	6	23.7	15.7	515	811
320	130	39	141	20	11	41.3	21.9	1016	1003	12	6	23.5	15.7	523	810
320	130	40	140	20	11	41.0	21.9	1032	1008	12	6	23.3	15.7	531	809
320	130	41	140	20	11	40.7	21.9	1048	1014	12	6	23.2	15.7	539	809
320	130	42	139	20	11	40.4	21.9	1064	1020	12	6	23.0	15.7	547	808
320	130	43	139	20	11	40.1	21.9	1081	1026	12	6	22.9	15.7	555	808
320	130	44	138	20	11	39.9	21.9	1098	1032	12	6	22.7	15.7	563	808
320	130	45	138	20	11	39.6	21.9	1115	1038	12	6	22.5	15.7	572	808
320	130	46	137	20	11	39.3	21.9	1132	1044	12	6	22.4	15.7	580	809
320	130	47	137	20	11	39.0	21.9	1149	1050	12	6	22.2	15.7	589	809
320	130	48	136	20	11	38.7	21.9	1167	1056	12	6	22.0	15.7	598	810
320	130	49	136	20	11	38.4	21.9	1185	1062	12	6	21.9	15.7	606	811
320	130	50	135	20	11	38.1	21.9	1203	1069	12	6	21.7	15.7	615	812
320	130	51	135	20	11	37.9	21.9	1221	1075	12	6	21.6	15.7	625	813
320	130	52	134	20	11	37.6	21.9	1239	1082	12	6	21.4	15.7	634	814
320	130	53	134	20	11	37.3	21.9	1258	1088	12	6	21.2	15.7	643	816
320	130	54	133	20	11	37.0	21.9	1277	1095	12	6	21.1	15.7	653	817
320	130	55	133	20	11	36.7	21.9	1296	1101	12	6	20.9	15.7	663	819
320	130	56	132	20	11	36.5	21.9	1315	1108	12	6	20.8	15.7	672	821
320	130	57	132	20	11	36.2	21.9	1334	1115	12	6	20.6	15.7	682	822
320	130	58	131	20	11	35.9	21.9	1354	1122	12	6	20.4	15.7	692	824
320	130	59	131	20	11	35.6	21.9	1374	1129	12	6	20.3	15.7	702	826
320	130	60	130	20	11	35.4	21.9	1394	1136	12	6	20.1	15.7	713	829
320	130	61	130	20	11	35.1	21.9	1414	1143	12	6	20.0	15.7	723	831
320	130	62	129	20	11	34.8	21.9	1435	1150	12	6	19.8	15.7	733	833
340	130	64	138	20	11	39.9	21.9	1476	1164	12	6	22.7	15.7	755	838
340	130	66	137	20	11	39.3	21.9	1518	1178	12	6	22.4	15.7	777	843
340	130	68	136	20	11	38.7	21.9	1562	1193	12	6	22.0	15.7	799	849
340	130	70	135	20	11	38.1	21.9	1605	1208	12	6	21.7	15.7	822	854
340	130	72	134	20	11	37.6	21.9	1650	1223	12	6	21.4	15.7	845	860
340	130	74	133	20	11	37.0	21.9	1696	1238	12	6	21.1	15.7	869	867
340	130	76	132	20	11	36.5	21.9	1742	1253	12	6	20.8	15.7	893	873
340	130	78	131	20	11	35.9	21.9	1789	1268	12	6	20.4	15.7	918	880
340	130	80	130	20	11	35.4	21.9	1837	1284	12	6	20.1	15.7	943	887

Table C1 (contd.): Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
360	130	82	139	20	11	40.4	21.9	1886	1299	12	6	23.0	15.7	969	894
360	130	84	138	20	11	39.9	21.9	1936	1315	12	6	22.7	15.7	996	901
360	130	86	137	20	11	39.3	21.9	1986	1331	12	6	22.4	15.7	1022	908
360	130	88	136	20	11	38.7	21.9	2038	1347	12	6	22.0	15.7	1050	916
360	130	90	135	20	11	38.1	21.9	2090	1363	12	6	21.7	15.7	1077	924
360	130	92	134	20	11	37.6	21.9	2143	1379	12	6	21.4	15.7	1106	932
360	130	94	133	20	11	37.0	21.9	2197	1395	12	6	21.1	15.7	1134	940
360	130	96	132	20	11	36.5	21.9	2251	1412	12	6	20.8	15.7	1163	948
360	130	98	131	20	11	35.9	21.9	2306	1428	12	6	20.4	15.7	1193	956
360	130	100	130	20	11	35.4	21.9	2363	1445	12	6	20.1	15.7	1223	965
380	130	102	139	20	11	40.4	21.9	2420	1461	12	6	23.0	15.7	1254	973
380	130	104	138	20	11	39.9	21.9	2478	1478	12	6	22.7	15.7	1285	982
380	130	106	137	20	11	39.3	21.9	2536	1495	12	6	22.4	15.7	1317	991
380	130	108	136	20	11	38.7	21.9	2596	1512	12	6	22.0	15.7	1349	999
380	130	110	135	20	11	38.1	21.9	2656	1529	12	6	21.7	15.7	1382	1008
380	130	112	134	20	11	37.6	21.9	2717	1546	12	6	21.4	15.7	1415	1017
380	130	114	133	20	11	37.0	21.9	2779	1563	12	6	21.1	15.7	1448	1026
380	130	116	132	20	11	36.5	21.9	2842	1580	12	6	20.8	15.7	1482	1036
380	130	118	131	20	11	35.9	21.9	2905	1597	12	6	20.4	15.7	1517	1045
380	130	120	130	20	11	35.4	21.9	2970	1614	12	6	20.1	15.7	1552	1054
400	130	122	139	20	11	40.4	21.9	3035	1632	12	6	23.0	15.7	1588	1064
400	130	124	138	20	11	39.9	21.9	3101	1649	12	6	22.7	15.7	1624	1073
400	130	126	137	20	11	39.3	21.9	3168	1666	12	6	22.4	15.7	1660	1083
400	130	128	136	20	11	38.7	21.9	3235	1684	12	6	22.0	15.7	1697	1092
400	130	130	135	20	11	38.1	21.9	3304	1701	12	6	21.7	15.7	1735	1102
400	130	132	134	20	11	37.6	21.9	3373	1719	12	6	21.4	15.7	1773	1112
400	130	134	133	20	11	37.0	21.9	3443	1737	12	6	21.1	15.7	1812	1122
400	130	136	132	20	11	36.5	21.9	3514	1754	12	6	20.8	15.7	1851	1131
400	130	138	131	20	11	35.9	21.9	3586	1772	12	6	20.4	15.7	1890	1141
400	130	140	130	20	11	35.4	21.9	3658	1790	12	6	20.1	15.7	1930	1151

Table C1 (contd.):　　　Joist hanger 1.5 mm with external flanges:
　　　　　　　　　　　　Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
340	140	25	158	22	12	52.4	26.6	911	1153	12	6	25.9	15.7	426	848
340	140	26	157	22	12	52.1	26.6	924	1157	12	6	25.7	15.7	432	843
340	140	27	157	22	12	51.7	26.6	938	1161	12	6	25.5	15.7	439	838
340	140	28	156	22	12	51.4	26.6	952	1164	12	6	25.4	15.7	445	834
340	140	29	156	22	12	51.1	26.6	966	1168	12	6	25.2	15.7	451	830
340	140	30	155	22	12	50.8	26.6	980	1173	12	6	25.0	15.7	458	827
340	140	31	155	22	12	50.5	26.6	995	1177	12	6	24.8	15.7	465	824
340	140	32	154	22	12	50.1	26.6	1009	1181	12	6	24.7	15.7	472	821
340	140	33	154	22	12	49.8	26.6	1024	1186	12	6	24.5	15.7	479	819
340	140	34	153	22	12	49.5	26.6	1039	1191	12	6	24.3	15.7	486	817
340	140	35	153	22	12	49.2	26.6	1055	1196	12	6	24.2	15.7	493	815
340	140	36	152	22	12	48.9	26.6	1070	1200	12	6	24.0	15.7	500	813
340	140	37	152	22	12	48.6	26.6	1086	1206	12	6	23.8	15.7	508	812
340	140	38	151	22	12	48.2	26.6	1102	1211	12	6	23.7	15.7	515	811
340	140	39	151	22	12	47.9	26.6	1118	1216	12	6	23.5	15.7	523	810
340	140	40	150	22	12	47.6	26.6	1134	1222	12	6	23.3	15.7	531	809
340	140	41	150	22	12	47.3	26.6	1151	1227	12	6	23.2	15.7	539	809
340	140	42	149	22	12	47.0	26.6	1168	1233	12	6	23.0	15.7	547	808
340	140	43	149	22	12	46.7	26.6	1185	1239	12	6	22.9	15.7	555	808
340	140	44	148	22	12	46.4	26.6	1202	1245	12	6	22.7	15.7	563	808
340	140	45	148	22	12	46.0	26.6	1219	1250	12	6	22.5	15.7	572	808
340	140	46	147	22	12	45.7	26.6	1237	1257	12	6	22.4	15.7	580	809
340	140	47	147	22	12	45.4	26.6	1254	1263	12	6	22.2	15.7	589	809
340	140	48	146	22	12	45.1	26.6	1272	1269	12	6	22.0	15.7	598	810
340	140	49	146	22	12	44.8	26.6	1290	1275	12	6	21.9	15.7	606	811
340	140	50	145	22	12	44.5	26.6	1309	1282	12	6	21.7	15.7	615	812
340	140	51	145	22	12	44.2	26.6	1327	1288	12	6	21.6	15.7	625	813
340	140	52	144	22	12	43.9	26.6	1346	1295	12	6	21.4	15.7	634	814
340	140	53	144	22	12	43.6	26.6	1365	1301	12	6	21.2	15.7	643	816
340	140	54	143	22	12	43.3	26.6	1384	1308	12	6	21.1	15.7	653	817
340	140	55	143	22	12	43.0	26.6	1404	1315	12	6	20.9	15.7	663	819
340	140	56	142	22	12	42.7	26.6	1423	1322	12	6	20.8	15.7	672	821
340	140	57	142	22	12	42.4	26.6	1443	1329	12	6	20.6	15.7	682	822
340	140	58	141	22	12	42.1	26.6	1463	1336	12	6	20.4	15.7	692	824
340	140	59	141	22	12	41.8	26.6	1483	1343	12	6	20.3	15.7	702	826
340	140	60	140	22	12	41.5	26.6	1504	1350	12	6	20.1	15.7	713	829
340	140	61	140	22	12	41.2	26.6	1524	1357	12	6	20.0	15.7	723	831
340	140	62	139	22	12	40.9	26.6	1545	1365	12	6	19.8	15.7	733	833
360	140	64	148	22	12	46.4	26.6	1587	1379	12	6	22.7	15.7	755	838
360	140	66	147	22	12	45.7	26.6	1630	1394	12	6	22.4	15.7	777	843
360	140	68	146	22	12	45.1	26.6	1674	1409	12	6	22.0	15.7	799	849
360	140	70	145	22	12	44.5	26.6	1719	1425	12	6	21.7	15.7	822	854
360	140	72	144	22	12	43.9	26.6	1764	1440	12	6	21.4	15.7	845	860
360	140	74	143	22	12	43.3	26.6	1811	1456	12	6	21.1	15.7	869	867
360	140	76	142	22	12	42.7	26.6	1858	1472	12	6	20.8	15.7	893	873
360	140	78	141	22	12	42.1	26.6	1906	1488	12	6	20.4	15.7	918	880
360	140	80	140	22	12	41.5	26.6	1954	1505	12	6	20.1	15.7	943	887

Table C1 (contd.):　　　Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
380	140	82	149	22	12	47.0	26.6	2004	1521	12	6	23.0	15.7	969	894
380	140	84	148	22	12	46.4	26.6	2054	1538	12	6	22.7	15.7	996	901
380	140	86	147	22	12	45.7	26.6	2105	1554	12	6	22.4	15.7	1022	908
380	140	88	146	22	12	45.1	26.6	2157	1571	12	6	22.0	15.7	1050	916
380	140	90	145	22	12	44.5	26.6	2210	1588	12	6	21.7	15.7	1077	924
380	140	92	144	22	12	43.9	26.6	2264	1606	12	6	21.4	15.7	1106	932
380	140	94	143	22	12	43.3	26.6	2318	1623	12	6	21.1	15.7	1134	940
380	140	96	142	22	12	42.7	26.6	2374	1640	12	6	20.8	15.7	1163	948
380	140	98	141	22	12	42.1	26.6	2430	1658	12	6	20.4	15.7	1193	956
380	140	100	140	22	12	41.5	26.6	2487	1676	12	6	20.1	15.7	1223	965
400	140	102	149	22	12	47.0	26.6	2544	1693	12	6	23.0	15.7	1254	973
400	140	104	148	22	12	46.4	26.6	2603	1711	12	6	22.7	15.7	1285	982
400	140	106	147	22	12	45.7	26.6	2662	1729	12	6	22.4	15.7	1317	991
400	140	108	146	22	12	45.1	26.6	2722	1747	12	6	22.0	15.7	1349	999
400	140	110	145	22	12	44.5	26.6	2783	1765	12	6	21.7	15.7	1382	1008
400	140	112	144	22	12	43.9	26.6	2845	1784	12	6	21.4	15.7	1415	1017
400	140	114	143	22	12	43.3	26.6	2908	1802	12	6	21.1	15.7	1448	1026
400	140	116	142	22	12	42.7	26.6	2971	1820	12	6	20.8	15.7	1482	1036
400	140	118	141	22	12	42.1	26.6	3035	1839	12	6	20.4	15.7	1517	1045
400	140	120	140	22	12	41.5	26.6	3100	1857	12	6	20.1	15.7	1552	1054
420	140	122	149	22	12	47.0	26.6	3166	1876	12	6	23.0	15.7	1588	1064
420	140	124	148	22	12	46.4	26.6	3233	1895	12	6	22.7	15.7	1624	1073
420	140	126	147	22	12	45.7	26.6	3300	1913	12	6	22.4	15.7	1660	1083
420	140	128	146	22	12	45.1	26.6	3369	1932	12	6	22.0	15.7	1697	1092
420	140	130	145	22	12	44.5	26.6	3438	1951	12	6	21.7	15.7	1735	1102
420	140	132	144	22	12	43.9	26.6	3508	1970	12	6	21.4	15.7	1773	1112
420	140	134	143	22	12	43.3	26.6	3578	1989	12	6	21.1	15.7	1812	1122
420	140	136	142	22	12	42.7	26.6	3650	2008	12	6	20.8	15.7	1851	1131
420	140	138	141	22	12	42.1	26.6	3722	2028	12	6	20.4	15.7	1890	1141
420	140	140	140	22	12	41.5	26.6	3796	2047	12	6	20.1	15.7	1930	1151

Table C1 (contd.): Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0}$ = 28 mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
360	150	25	168	24	13	59.8	31.7	969	1340	14	7	33.4	21.7	516	1235
360	150	26	167	24	13	59.5	31.7	982	1343	14	7	33.2	21.7	522	1224
360	150	27	167	24	13	59.1	31.7	995	1346	14	7	33.0	21.7	528	1214
360	150	28	166	24	13	58.8	31.7	1009	1349	14	7	32.8	21.7	534	1205
360	150	29	166	24	13	58.5	31.7	1023	1352	14	7	32.6	21.7	540	1196
360	150	30	165	24	13	58.1	31.7	1037	1355	14	7	32.4	21.7	546	1188
360	150	31	165	24	13	57.8	31.7	1051	1359	14	7	32.2	21.7	553	1180
360	150	32	164	24	13	57.4	31.7	1065	1362	14	7	32.0	21.7	560	1173
360	150	33	164	24	13	57.1	31.7	1080	1366	14	7	31.8	21.7	566	1167
360	150	34	163	24	13	56.7	31.7	1095	1370	14	7	31.6	21.7	573	1160
360	150	35	163	24	13	56.4	31.7	1110	1374	14	7	31.4	21.7	580	1155
360	150	36	162	24	13	56.0	31.7	1125	1379	14	7	31.2	21.7	587	1149
360	150	37	162	24	13	55.7	31.7	1140	1383	14	7	31.1	21.7	594	1145
360	150	38	161	24	13	55.4	31.7	1156	1388	14	7	30.9	21.7	602	1140
360	150	39	161	24	13	55.0	31.7	1172	1393	14	7	30.7	21.7	609	1136
360	150	40	160	24	13	54.7	31.7	1188	1398	14	7	30.5	21.7	617	1132
360	150	41	160	24	13	54.3	31.7	1204	1403	14	7	30.3	21.7	624	1129
360	150	42	159	24	13	54.0	31.7	1220	1408	14	7	30.1	21.7	632	1126
360	150	43	159	24	13	53.7	31.7	1237	1413	14	7	29.9	21.7	640	1123
360	150	44	158	24	13	53.3	31.7	1254	1419	14	7	29.7	21.7	648	1120
360	150	45	158	24	13	53.0	31.7	1271	1425	14	7	29.5	21.7	656	1118
360	150	46	157	24	13	52.7	31.7	1288	1430	14	7	29.4	21.7	665	1116
360	150	47	157	24	13	52.3	31.7	1306	1436	14	7	29.2	21.7	673	1114
360	150	48	156	24	13	52.0	31.7	1323	1442	14	7	29.0	21.7	682	1113
360	150	49	156	24	13	51.7	31.7	1341	1448	14	7	28.8	21.7	690	1111
360	150	50	155	24	13	51.3	31.7	1359	1454	14	7	28.6	21.7	699	1110
360	150	51	155	24	13	51.0	31.7	1377	1461	14	7	28.4	21.7	708	1110
360	150	52	154	24	13	50.7	31.7	1396	1467	14	7	28.2	21.7	717	1109
360	150	53	154	24	13	50.3	31.7	1415	1474	14	7	28.1	21.7	726	1108
360	150	54	153	24	13	50.0	31.7	1433	1480	14	7	27.9	21.7	735	1108
360	150	55	153	24	13	49.7	31.7	1453	1487	14	7	27.7	21.7	744	1108
360	150	56	152	24	13	49.3	31.7	1472	1494	14	7	27.5	21.7	754	1108
360	150	57	152	24	13	49.0	31.7	1491	1500	14	7	27.3	21.7	764	1108
360	150	58	151	24	13	48.7	31.7	1511	1507	14	7	27.2	21.7	773	1109
360	150	59	151	24	13	48.3	31.7	1531	1514	14	7	27.0	21.7	783	1110
360	150	60	150	24	13	48.0	31.7	1551	1522	14	7	26.8	21.7	793	1110
360	150	61	150	24	13	47.7	31.7	1571	1529	14	7	26.6	21.7	803	1111
360	150	62	149	24	13	47.4	31.7	1592	1536	14	7	26.4	21.7	813	1112
380	150	64	158	24	13	53.3	31.7	1633	1551	14	7	29.7	21.7	834	1115
380	150	66	157	24	13	52.7	31.7	1676	1566	14	7	29.4	21.7	855	1118
380	150	68	156	24	13	52.0	31.7	1719	1581	14	7	29.0	21.7	877	1121
380	150	70	155	24	13	51.3	31.7	1763	1597	14	7	28.6	21.7	899	1125
380	150	72	154	24	13	50.7	31.7	1808	1613	14	7	28.2	21.7	922	1129
380	150	74	153	24	13	50.0	31.7	1854	1629	14	7	27.9	21.7	945	1134
380	150	76	152	24	13	49.3	31.7	1900	1645	14	7	27.5	21.7	968	1139
380	150	78	151	24	13	48.7	31.7	1947	1662	14	7	27.2	21.7	992	1145
380	150	80	150	24	13	48.0	31.7	1995	1679	14	7	26.8	21.7	1017	1150

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0}$ = 28 mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
400	150	82	159	24	13	54.0	31.7	2044	1696	14	7	30.1	21.7	1042	1157
400	150	84	158	24	13	53.3	31.7	2094	1713	14	7	29.7	21.7	1067	1163
400	150	86	157	24	13	52.7	31.7	2145	1730	14	7	29.4	21.7	1093	1170
400	150	88	156	24	13	52.0	31.7	2196	1748	14	7	29.0	21.7	1120	1177
400	150	90	155	24	13	51.3	31.7	2248	1765	14	7	28.6	21.7	1146	1184
400	150	92	154	24	13	50.7	31.7	2301	1783	14	7	28.2	21.7	1174	1191
400	150	94	153	24	13	50.0	31.7	2355	1801	14	7	27.9	21.7	1202	1199
400	150	96	152	24	13	49.3	31.7	2410	1819	14	7	27.5	21.7	1230	1207
400	150	98	151	24	13	48.7	31.7	2465	1838	14	7	27.2	21.7	1259	1215
400	150	100	150	24	13	48.0	31.7	2521	1856	14	7	26.8	21.7	1288	1223
420	150	102	159	24	13	54.0	31.7	2578	1875	14	7	30.1	21.7	1318	1231
420	150	104	158	24	13	53.3	31.7	2636	1894	14	7	29.7	21.7	1348	1240
420	150	106	157	24	13	52.7	31.7	2695	1912	14	7	29.4	21.7	1379	1249
420	150	108	156	24	13	52.0	31.7	2755	1931	14	7	29.0	21.7	1410	1257
420	150	110	155	24	13	51.3	31.7	2815	1951	14	7	28.6	21.7	1441	1267
420	150	112	154	24	13	50.7	31.7	2876	1970	14	7	28.2	21.7	1473	1276
420	150	114	153	24	13	50.0	31.7	2938	1989	14	7	27.9	21.7	1506	1285
420	150	116	152	24	13	49.3	31.7	3001	2009	14	7	27.5	21.7	1539	1295
420	150	118	151	24	13	48.7	31.7	3064	2028	14	7	27.2	21.7	1573	1304
420	150	120	150	24	13	48.0	31.7	3129	2048	14	7	26.8	21.7	1607	1314
440	150	122	159	24	13	54.0	31.7	3194	2068	14	7	30.1	21.7	1641	1324
440	150	124	158	24	13	53.3	31.7	3260	2087	14	7	29.7	21.7	1676	1334
440	150	126	157	24	13	52.7	31.7	3327	2107	14	7	29.4	21.7	1711	1344
440	150	128	156	24	13	52.0	31.7	3394	2127	14	7	29.0	21.7	1747	1354
440	150	130	155	24	13	51.3	31.7	3463	2147	14	7	28.6	21.7	1784	1364
440	150	132	154	24	13	50.7	31.7	3532	2168	14	7	28.2	21.7	1820	1375
440	150	134	153	24	13	50.0	31.7	3602	2188	14	7	27.9	21.7	1858	1385
440	150	136	152	24	13	49.3	31.7	3673	2208	14	7	27.5	21.7	1896	1396
440	150	138	151	24	13	48.7	31.7	3745	2229	14	7	27.2	21.7	1934	1406
440	150	140	150	24	13	48.0	31.7	3817	2249	14	7	26.8	21.7	1973	1417

Table C1 (contd.):　　　　Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0}$ = 28 mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
380	160	25	178	26	14	67.8	37.4	1074	1612	14	8	33.4	21.7	516	1235
380	160	26	177	26	14	67.4	37.4	1088	1614	14	8	33.2	21.7	522	1224
380	160	27	177	26	14	67.0	37.4	1101	1615	14	8	33.0	21.7	528	1214
380	160	28	176	26	14	66.6	37.4	1115	1617	14	8	32.8	21.7	534	1205
380	160	29	176	26	14	66.3	37.4	1129	1619	14	8	32.6	21.7	540	1196
380	160	30	175	26	14	65.9	37.4	1144	1622	14	8	32.4	21.7	546	1188
380	160	31	175	26	14	65.5	37.4	1158	1624	14	8	32.2	21.7	553	1180
380	160	32	174	26	14	65.2	37.4	1173	1627	14	8	32.0	21.7	560	1173
380	160	33	174	26	14	64.8	37.4	1188	1630	14	8	31.8	21.7	566	1167
380	160	34	173	26	14	64.4	37.4	1203	1633	14	8	31.6	21.7	573	1160
380	160	35	173	26	14	64.1	37.4	1218	1637	14	8	31.4	21.7	580	1155
380	160	36	172	26	14	63.7	37.4	1234	1640	14	8	31.2	21.7	587	1149
380	160	37	172	26	14	63.3	37.4	1250	1644	14	8	31.1	21.7	594	1145
380	160	38	171	26	14	63.0	37.4	1265	1648	14	8	30.9	21.7	602	1140
380	160	39	171	26	14	62.6	37.4	1282	1652	14	8	30.7	21.7	609	1136
380	160	40	170	26	14	62.2	37.4	1298	1657	14	8	30.5	21.7	617	1132
380	160	41	170	26	14	61.9	37.4	1314	1661	14	8	30.3	21.7	624	1129
380	160	42	169	26	14	61.5	37.4	1331	1666	14	8	30.1	21.7	632	1126
380	160	43	169	26	14	61.1	37.4	1348	1671	14	8	29.9	21.7	640	1123
380	160	44	168	26	14	60.8	37.4	1365	1676	14	8	29.7	21.7	648	1120
380	160	45	168	26	14	60.4	37.4	1383	1681	14	8	29.5	21.7	656	1118
380	160	46	167	26	14	60.0	37.4	1400	1686	14	8	29.4	21.7	665	1116
380	160	47	167	26	14	59.7	37.4	1418	1692	14	8	29.2	21.7	673	1114
380	160	48	166	26	14	59.3	37.4	1436	1697	14	8	29.0	21.7	682	1113
380	160	49	166	26	14	59.0	37.4	1454	1703	14	8	28.8	21.7	690	1111
380	160	50	165	26	14	58.6	37.4	1472	1709	14	8	28.6	21.7	699	1110
380	160	51	165	26	14	58.3	37.4	1491	1715	14	8	28.4	21.7	708	1110
380	160	52	164	26	14	57.9	37.4	1510	1721	14	8	28.2	21.7	717	1109
380	160	53	164	26	14	57.5	37.4	1529	1727	14	8	28.1	21.7	726	1108
380	160	54	163	26	14	57.2	37.4	1548	1734	14	8	27.9	21.7	735	1108
380	160	55	163	26	14	56.8	37.4	1567	1740	14	8	27.7	21.7	744	1108
380	160	56	162	26	14	56.5	37.4	1587	1747	14	8	27.5	21.7	754	1108
380	160	57	162	26	14	56.1	37.4	1607	1753	14	8	27.3	21.7	764	1108
380	160	58	161	26	14	55.8	37.4	1627	1760	14	8	27.2	21.7	773	1109
380	160	59	161	26	14	55.4	37.4	1647	1767	14	8	27.0	21.7	783	1110
380	160	60	160	26	14	55.1	37.4	1667	1774	14	8	26.8	21.7	793	1110
380	160	61	160	26	14	54.7	37.4	1688	1781	14	8	26.6	21.7	803	1111
380	160	62	159	26	14	54.4	37.4	1709	1789	14	8	26.4	21.7	813	1112
400	160	64	168	26	14	60.8	37.4	1751	1803	14	8	29.7	21.7	834	1115
400	160	66	167	26	14	60.0	37.4	1794	1818	14	8	29.4	21.7	855	1118
400	160	68	166	26	14	59.3	37.4	1838	1834	14	8	29.0	21.7	877	1121
400	160	70	165	26	14	58.6	37.4	1882	1849	14	8	28.6	21.7	899	1125
400	160	72	164	26	14	57.9	37.4	1928	1865	14	8	28.2	21.7	922	1129
400	160	74	163	26	14	57.2	37.4	1974	1882	14	8	27.9	21.7	945	1134
400	160	76	162	26	14	56.5	37.4	2021	1898	14	8	27.5	21.7	968	1139
400	160	78	161	26	14	55.8	37.4	2069	1915	14	8	27.2	21.7	992	1145
400	160	80	160	26	14	55.1	37.4	2118	1932	14	8	26.8	21.7	1017	1150

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
420	160	82	169	26	14	61.5	37.4	2167	1950	14	8	30.1	21.7	1042	1157
420	160	84	168	26	14	60.8	37.4	2218	1967	14	8	29.7	21.7	1067	1163
420	160	86	167	26	14	60.0	37.4	2269	1985	14	8	29.4	21.7	1093	1170
420	160	88	166	26	14	59.3	37.4	2321	2003	14	8	29.0	21.7	1120	1177
420	160	90	165	26	14	58.6	37.4	2373	2022	14	8	28.6	21.7	1146	1184
420	160	92	164	26	14	57.9	37.4	2427	2040	14	8	28.2	21.7	1174	1191
420	160	94	163	26	14	57.2	37.4	2481	2059	14	8	27.9	21.7	1202	1199
420	160	96	162	26	14	56.5	37.4	2537	2078	14	8	27.5	21.7	1230	1207
420	160	98	161	26	14	55.8	37.4	2593	2097	14	8	27.2	21.7	1259	1215
420	160	100	160	26	14	55.1	37.4	2649	2116	14	8	26.8	21.7	1288	1223
440	160	102	169	26	14	61.5	37.4	2707	2135	14	8	30.1	21.7	1318	1231
440	160	104	168	26	14	60.8	37.4	2766	2155	14	8	29.7	21.7	1348	1240
440	160	106	167	26	14	60.0	37.4	2825	2175	14	8	29.4	21.7	1379	1249
440	160	108	166	26	14	59.3	37.4	2885	2194	14	8	29.0	21.7	1410	1257
440	160	110	165	26	14	58.6	37.4	2946	2214	14	8	28.6	21.7	1441	1267
440	160	112	164	26	14	57.9	37.4	3008	2235	14	8	28.2	21.7	1473	1276
440	160	114	163	26	14	57.2	37.4	3070	2255	14	8	27.9	21.7	1506	1285
440	160	116	162	26	14	56.5	37.4	3133	2275	14	8	27.5	21.7	1539	1295
440	160	118	161	26	14	55.8	37.4	3198	2296	14	8	27.2	21.7	1573	1304
440	160	120	160	26	14	55.1	37.4	3262	2316	14	8	26.8	21.7	1607	1314
460	160	122	169	26	14	61.5	37.4	3328	2337	14	8	30.1	21.7	1641	1324
460	160	124	168	26	14	60.8	37.4	3395	2358	14	8	29.7	21.7	1676	1334
460	160	126	167	26	14	60.0	37.4	3462	2379	14	8	29.4	21.7	1711	1344
460	160	128	166	26	14	59.3	37.4	3530	2400	14	8	29.0	21.7	1747	1354
460	160	130	165	26	14	58.6	37.4	3599	2421	14	8	28.6	21.7	1784	1364
460	160	132	164	26	14	57.9	37.4	3669	2443	14	8	28.2	21.7	1820	1375
460	160	134	163	26	14	57.2	37.4	3740	2464	14	8	27.9	21.7	1858	1385
460	160	136	162	26	14	56.5	37.4	3811	2486	14	8	27.5	21.7	1896	1396
460	160	138	161	26	14	55.8	37.4	3884	2507	14	8	27.2	21.7	1934	1406
460	160	140	160	26	14	55.1	37.4	3957	2529	14	8	26.8	21.7	1973	1417

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
400	170	25	188	28	15	76.2	43.5	1148	1858	16	8	41.8	28.7	620	1735
400	170	26	187	28	15	75.8	43.5	1162	1858	16	8	41.6	28.7	625	1717
400	170	27	187	28	15	75.4	43.5	1175	1858	16	8	41.4	28.7	631	1699
400	170	28	186	28	15	75.0	43.5	1189	1858	16	8	41.2	28.7	637	1682
400	170	29	186	28	15	74.6	43.5	1202	1859	16	8	40.9	28.7	644	1667
400	170	30	185	28	15	74.2	43.5	1216	1859	16	8	40.7	28.7	650	1652
400	170	31	185	28	15	73.8	43.5	1231	1861	16	8	40.5	28.7	656	1638
400	170	32	184	28	15	73.4	43.5	1245	1862	16	8	40.3	28.7	663	1625
400	170	33	184	28	15	73.0	43.5	1260	1864	16	8	40.1	28.7	669	1612
400	170	34	183	28	15	72.6	43.5	1275	1866	16	8	39.9	28.7	676	1600
400	170	35	183	28	15	72.2	43.5	1290	1868	16	8	39.6	28.7	683	1589
400	170	36	182	28	15	71.8	43.5	1305	1870	16	8	39.4	28.7	690	1579
400	170	37	182	28	15	71.4	43.5	1320	1873	16	8	39.2	28.7	697	1569
400	170	38	181	28	15	71.0	43.5	1336	1876	16	8	39.0	28.7	704	1559
400	170	39	181	28	15	70.6	43.5	1352	1879	16	8	38.8	28.7	711	1551
400	170	40	180	28	15	70.2	43.5	1368	1883	16	8	38.6	28.7	718	1542
400	170	41	180	28	15	69.9	43.5	1384	1886	16	8	38.4	28.7	726	1535
400	170	42	179	28	15	69.5	43.5	1401	1890	16	8	38.1	28.7	734	1527
400	170	43	179	28	15	69.1	43.5	1417	1894	16	8	37.9	28.7	741	1521
400	170	44	178	28	15	68.7	43.5	1434	1898	16	8	37.7	28.7	749	1514
400	170	45	178	28	15	68.3	43.5	1451	1903	16	8	37.5	28.7	757	1508
400	170	46	177	28	15	67.9	43.5	1469	1907	16	8	37.3	28.7	765	1503
400	170	47	177	28	15	67.5	43.5	1486	1912	16	8	37.1	28.7	773	1497
400	170	48	176	28	15	67.1	43.5	1504	1917	16	8	36.9	28.7	782	1493
400	170	49	176	28	15	66.8	43.5	1522	1922	16	8	36.7	28.7	790	1488
400	170	50	175	28	15	66.4	43.5	1540	1927	16	8	36.5	28.7	799	1484
400	170	51	175	28	15	66.0	43.5	1558	1932	16	8	36.3	28.7	807	1480
400	170	52	174	28	15	65.6	43.5	1577	1938	16	8	36.1	28.7	816	1477
400	170	53	174	28	15	65.2	43.5	1595	1944	16	8	35.8	28.7	825	1473
400	170	54	173	28	15	64.9	43.5	1614	1949	16	8	35.6	28.7	834	1471
400	170	55	173	28	15	64.5	43.5	1633	1955	16	8	35.4	28.7	843	1468
400	170	56	172	28	15	64.1	43.5	1653	1961	16	8	35.2	28.7	853	1466
400	170	57	172	28	15	63.7	43.5	1672	1968	16	8	35.0	28.7	862	1463
400	170	58	171	28	15	63.3	43.5	1692	1974	16	8	34.8	28.7	871	1462
400	170	59	171	28	15	63.0	43.5	1712	1981	16	8	34.6	28.7	881	1460
400	170	60	170	28	15	62.6	43.5	1732	1987	16	8	34.4	28.7	891	1458
400	170	61	170	28	15	62.2	43.5	1752	1994	16	8	34.2	28.7	901	1457
400	170	62	169	28	15	61.8	43.5	1773	2001	16	8	34.0	28.7	910	1456
420	170	64	178	28	15	68.7	43.5	1815	2015	16	8	37.7	28.7	931	1455
420	170	66	177	28	15	67.9	43.5	1857	2029	16	8	37.3	28.7	951	1454
420	170	68	176	28	15	67.1	43.5	1900	2044	16	8	36.9	28.7	973	1454
420	170	70	175	28	15	66.4	43.5	1945	2060	16	8	36.5	28.7	994	1455
420	170	72	174	28	15	65.6	43.5	1989	2075	16	8	36.1	28.7	1016	1457
420	170	74	173	28	15	64.9	43.5	2035	2092	16	8	35.6	28.7	1039	1459
420	170	76	172	28	15	64.1	43.5	2082	2108	16	8	35.2	28.7	1062	1461
420	170	78	171	28	15	63.3	43.5	2129	2125	16	8	34.8	28.7	1085	1464
420	170	80	170	28	15	62.6	43.5	2177	2142	16	8	34.4	28.7	1109	1468

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
440	170	82	179	28	15	69.5	43.5	2226	2159	16	8	38.1	28.7	1134	1472
440	170	84	178	28	15	68.7	43.5	2276	2177	16	8	37.7	28.7	1159	1477
440	170	86	177	28	15	67.9	43.5	2327	2195	16	8	37.3	28.7	1184	1482
440	170	88	176	28	15	67.1	43.5	2378	2213	16	8	36.9	28.7	1210	1487
440	170	90	175	28	15	66.4	43.5	2430	2232	16	8	36.5	28.7	1236	1493
440	170	92	174	28	15	65.6	43.5	2483	2250	16	8	36.1	28.7	1263	1499
440	170	94	173	28	15	64.9	43.5	2537	2269	16	8	35.6	28.7	1290	1505
440	170	96	172	28	15	64.1	43.5	2592	2289	16	8	35.2	28.7	1318	1512
440	170	98	171	28	15	63.3	43.5	2647	2308	16	8	34.8	28.7	1346	1519
440	170	100	170	28	15	62.6	43.5	2704	2328	16	8	34.4	28.7	1374	1526
460	170	102	179	28	15	69.5	43.5	2761	2348	16	8	38.1	28.7	1403	1534
460	170	104	178	28	15	68.7	43.5	2819	2368	16	8	37.7	28.7	1433	1541
460	170	106	177	28	15	67.9	43.5	2877	2388	16	8	37.3	28.7	1463	1550
460	170	108	176	28	15	67.1	43.5	2937	2408	16	8	36.9	28.7	1493	1558
460	170	110	175	28	15	66.4	43.5	2997	2429	16	8	36.5	28.7	1524	1566
460	170	112	174	28	15	65.6	43.5	3058	2450	16	8	36.1	28.7	1556	1575
460	170	114	173	28	15	64.9	43.5	3120	2471	16	8	35.6	28.7	1587	1584
460	170	116	172	28	15	64.1	43.5	3183	2492	16	8	35.2	28.7	1620	1593
460	170	118	171	28	15	63.3	43.5	3247	2513	16	8	34.8	28.7	1652	1603
460	170	120	170	28	15	62.6	43.5	3311	2535	16	8	34.4	28.7	1686	1612
480	170	122	179	28	15	69.5	43.5	3376	2556	16	8	38.1	28.7	1719	1622
480	170	124	178	28	15	68.7	43.5	3442	2578	16	8	37.7	28.7	1754	1632
480	170	126	177	28	15	67.9	43.5	3509	2600	16	8	37.3	28.7	1788	1642
480	170	128	176	28	15	67.1	43.5	3577	2622	16	8	36.9	28.7	1823	1652
480	170	130	175	28	15	66.4	43.5	3645	2644	16	8	36.5	28.7	1859	1663
480	170	132	174	28	15	65.6	43.5	3715	2666	16	8	36.1	28.7	1895	1673
480	170	134	173	28	15	64.9	43.5	3785	2688	16	8	35.6	28.7	1931	1684
480	170	136	172	28	15	64.1	43.5	3856	2711	16	8	35.2	28.7	1968	1695
480	170	138	171	28	15	63.3	43.5	3927	2733	16	8	34.8	28.7	2006	1706
480	170	140	170	28	15	62.6	43.5	4000	2756	16	8	34.4	28.7	2043	1717

Table C1 (contd.): Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
420	180	25	198	30	16	85.0	50.1	1264	2193	16	8	41.8	28.7	620	1735
420	180	26	197	30	16	84.6	50.1	1277	2191	16	8	41.6	28.7	625	1717
420	180	27	197	30	16	84.2	50.1	1291	2189	16	8	41.4	28.7	631	1699
420	180	28	196	30	16	83.8	50.1	1305	2188	16	8	41.2	28.7	637	1682
420	180	29	196	30	16	83.3	50.1	1319	2187	16	8	40.9	28.7	644	1667
420	180	30	195	30	16	82.9	50.1	1333	2186	16	8	40.7	28.7	650	1652
420	180	31	195	30	16	82.5	50.1	1348	2185	16	8	40.5	28.7	656	1638
420	180	32	194	30	16	82.1	50.1	1363	2185	16	8	40.3	28.7	663	1625
420	180	33	194	30	16	81.6	50.1	1378	2186	16	8	40.1	28.7	669	1612
420	180	34	193	30	16	81.2	50.1	1393	2186	16	8	39.9	28.7	676	1600
420	180	35	193	30	16	80.8	50.1	1408	2187	16	8	39.6	28.7	683	1589
420	180	36	192	30	16	80.4	50.1	1423	2188	16	8	39.4	28.7	690	1579
420	180	37	192	30	16	80.0	50.1	1439	2190	16	8	39.2	28.7	697	1569
420	180	38	191	30	16	79.6	50.1	1455	2191	16	8	39.0	28.7	704	1559
420	180	39	191	30	16	79.1	50.1	1471	2193	16	8	38.8	28.7	711	1551
420	180	40	190	30	16	78.7	50.1	1488	2196	16	8	38.6	28.7	718	1542
420	180	41	190	30	16	78.3	50.1	1504	2198	16	8	38.4	28.7	726	1535
420	180	42	189	30	16	77.9	50.1	1521	2201	16	8	38.1	28.7	734	1527
420	180	43	189	30	16	77.5	50.1	1538	2204	16	8	37.9	28.7	741	1521
420	180	44	188	30	16	77.1	50.1	1555	2207	16	8	37.7	28.7	749	1514
420	180	45	188	30	16	76.7	50.1	1572	2210	16	8	37.5	28.7	757	1508
420	180	46	187	30	16	76.3	50.1	1590	2214	16	8	37.3	28.7	765	1503
420	180	47	187	30	16	75.8	50.1	1608	2218	16	8	37.1	28.7	773	1497
420	180	48	186	30	16	75.4	50.1	1626	2222	16	8	36.9	28.7	782	1493
420	180	49	186	30	16	75.0	50.1	1644	2226	16	8	36.7	28.7	790	1488
420	180	50	185	30	16	74.6	50.1	1662	2231	16	8	36.5	28.7	799	1484
420	180	51	185	30	16	74.2	50.1	1681	2235	16	8	36.3	28.7	807	1480
420	180	52	184	30	16	73.8	50.1	1699	2240	16	8	36.1	28.7	816	1477
420	180	53	184	30	16	73.4	50.1	1718	2245	16	8	35.8	28.7	825	1473
420	180	54	183	30	16	73.0	50.1	1738	2250	16	8	35.6	28.7	834	1471
420	180	55	183	30	16	72.6	50.1	1757	2256	16	8	35.4	28.7	843	1468
420	180	56	182	30	16	72.2	50.1	1777	2261	16	8	35.2	28.7	853	1466
420	180	57	182	30	16	71.8	50.1	1796	2267	16	8	35.0	28.7	862	1463
420	180	58	181	30	16	71.4	50.1	1816	2273	16	8	34.8	28.7	871	1462
420	180	59	181	30	16	71.0	50.1	1836	2279	16	8	34.6	28.7	881	1460
420	180	60	180	30	16	70.6	50.1	1857	2285	16	8	34.4	28.7	891	1458
420	180	61	180	30	16	70.2	50.1	1877	2291	16	8	34.2	28.7	901	1457
420	180	62	179	30	16	69.8	50.1	1898	2298	16	8	34.0	28.7	910	1456
440	180	64	188	30	16	77.1	50.1	1940	2311	16	8	37.7	28.7	931	1455
440	180	66	187	30	16	76.3	50.1	1983	2325	16	8	37.3	28.7	951	1454
440	180	68	186	30	16	75.4	50.1	2027	2339	16	8	36.9	28.7	973	1454
440	180	70	185	30	16	74.6	50.1	2072	2354	16	8	36.5	28.7	994	1455
440	180	72	184	30	16	73.8	50.1	2117	2369	16	8	36.1	28.7	1016	1457
440	180	74	183	30	16	73.0	50.1	2164	2385	16	8	35.6	28.7	1039	1459
440	180	76	182	30	16	72.2	50.1	2211	2401	16	8	35.2	28.7	1062	1461
440	180	78	181	30	16	71.4	50.1	2259	2417	16	8	34.8	28.7	1085	1464
440	180	80	180	30	16	70.6	50.1	2307	2434	16	8	34.4	28.7	1109	1468

Table C1 (contd.): Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
460	180	82	189	30	16	77.9	50.1	2357	2451	16	8	38.1	28.7	1134	1472
460	180	84	188	30	16	77.1	50.1	2407	2469	16	8	37.7	28.7	1159	1477
460	180	86	187	30	16	76.3	50.1	2458	2487	16	8	37.3	28.7	1184	1482
460	180	88	186	30	16	75.4	50.1	2510	2505	16	8	36.9	28.7	1210	1487
460	180	90	185	30	16	74.6	50.1	2563	2524	16	8	36.5	28.7	1236	1493
460	180	92	184	30	16	73.8	50.1	2616	2543	16	8	36.1	28.7	1263	1499
460	180	94	183	30	16	73.0	50.1	2671	2562	16	8	35.6	28.7	1290	1505
460	180	96	182	30	16	72.2	50.1	2726	2581	16	8	35.2	28.7	1318	1512
460	180	98	181	30	16	71.4	50.1	2782	2601	16	8	34.8	28.7	1346	1519
460	180	100	180	30	16	70.6	50.1	2839	2621	16	8	34.4	28.7	1374	1526
480	180	102	189	30	16	77.9	50.1	2896	2641	16	8	38.1	28.7	1403	1534
480	180	104	188	30	16	77.1	50.1	2955	2662	16	8	37.7	28.7	1433	1541
480	180	106	187	30	16	76.3	50.1	3014	2682	16	8	37.3	28.7	1463	1550
480	180	108	186	30	16	75.4	50.1	3074	2703	16	8	36.9	28.7	1493	1558
480	180	110	185	30	16	74.6	50.1	3135	2725	16	8	36.5	28.7	1524	1566
480	180	112	184	30	16	73.8	50.1	3196	2746	16	8	36.1	28.7	1556	1575
480	180	114	183	30	16	73.0	50.1	3259	2767	16	8	35.6	28.7	1587	1584
480	180	116	182	30	16	72.2	50.1	3322	2789	16	8	35.2	28.7	1620	1593
480	180	118	181	30	16	71.4	50.1	3386	2811	16	8	34.8	28.7	1652	1603
480	180	120	180	30	16	70.6	50.1	3451	2833	16	8	34.4	28.7	1686	1612
500	180	122	189	30	16	77.9	50.1	3517	2855	16	8	38.1	28.7	1719	1622
500	180	124	188	30	16	77.1	50.1	3583	2878	16	8	37.7	28.7	1754	1632
500	180	126	187	30	16	76.3	50.1	3651	2900	16	8	37.3	28.7	1788	1642
500	180	128	186	30	16	75.4	50.1	3719	2923	16	8	36.9	28.7	1823	1652
500	180	130	185	30	16	74.6	50.1	3788	2946	16	8	36.5	28.7	1859	1663
500	180	132	184	30	16	73.8	50.1	3857	2969	16	8	36.1	28.7	1895	1673
500	180	134	183	30	16	73.0	50.1	3928	2992	16	8	35.6	28.7	1931	1684
500	180	136	182	30	16	72.2	50.1	3999	3016	16	8	35.2	28.7	1968	1695
500	180	138	181	30	16	71.4	50.1	4072	3039	16	8	34.8	28.7	2006	1706
500	180	140	180	30	16	70.6	50.1	4145	3063	16	8	34.4	28.7	2043	1717

Table C1 (contd.):　　　　Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0}$ = 28 mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
440	190	25	208	32	17	94.4	57.2	1353	2507	18	9	51.2	36.6	738	2366
440	190	26	207	32	17	93.9	57.2	1366	2502	18	9	51.0	36.6	744	2337
440	190	27	207	32	17	93.5	57.2	1380	2498	18	9	50.7	36.6	749	2309
440	190	28	206	32	17	93.0	57.2	1394	2494	18	9	50.5	36.6	755	2283
440	190	29	206	32	17	92.6	57.2	1408	2491	18	9	50.3	36.6	761	2258
440	190	30	205	32	17	92.1	57.2	1422	2488	18	9	50.0	36.6	767	2234
440	190	31	205	32	17	91.7	57.2	1436	2485	18	9	49.8	36.6	774	2211
440	190	32	204	32	17	91.2	57.2	1450	2483	18	9	49.5	36.6	780	2190
440	190	33	204	32	17	90.8	57.2	1465	2482	18	9	49.3	36.6	786	2169
440	190	34	203	32	17	90.3	57.2	1480	2480	18	9	49.0	36.6	793	2150
440	190	35	203	32	17	89.9	57.2	1495	2479	18	9	48.8	36.6	800	2132
440	190	36	202	32	17	89.4	57.2	1510	2479	18	9	48.6	36.6	807	2114
440	190	37	202	32	17	89.0	57.2	1526	2478	18	9	48.3	36.6	813	2097
440	190	38	201	32	17	88.6	57.2	1542	2478	18	9	48.1	36.6	821	2082
440	190	39	201	32	17	88.1	57.2	1557	2479	18	9	47.9	36.6	828	2067
440	190	40	200	32	17	87.7	57.2	1574	2479	18	9	47.6	36.6	835	2052
440	190	41	200	32	17	87.2	57.2	1590	2480	18	9	47.4	36.6	842	2039
440	190	42	199	32	17	86.8	57.2	1606	2481	18	9	47.1	36.6	850	2026
440	190	43	199	32	17	86.4	57.2	1623	2483	18	9	46.9	36.6	857	2014
440	190	44	198	32	17	85.9	57.2	1640	2485	18	9	46.7	36.6	865	2002
440	190	45	198	32	17	85.5	57.2	1657	2487	18	9	46.4	36.6	873	1991
440	190	46	197	32	17	85.1	57.2	1674	2489	18	9	46.2	36.6	881	1980
440	190	47	197	32	17	84.6	57.2	1692	2492	18	9	46.0	36.6	889	1971
440	190	48	196	32	17	84.2	57.2	1710	2495	18	9	45.7	36.6	897	1961
440	190	49	196	32	17	83.8	57.2	1728	2498	18	9	45.5	36.6	905	1952
440	190	50	195	32	17	83.3	57.2	1746	2501	18	9	45.3	36.6	914	1944
440	190	51	195	32	17	82.9	57.2	1764	2505	18	9	45.0	36.6	922	1936
440	190	52	194	32	17	82.5	57.2	1783	2509	18	9	44.8	36.6	931	1928
440	190	53	194	32	17	82.0	57.2	1801	2513	18	9	44.6	36.6	940	1921
440	190	54	193	32	17	81.6	57.2	1820	2517	18	9	44.3	36.6	949	1915
440	190	55	193	32	17	81.2	57.2	1839	2521	18	9	44.1	36.6	958	1908
440	190	56	192	32	17	80.7	57.2	1859	2526	18	9	43.9	36.6	967	1903
440	190	57	192	32	17	80.3	57.2	1878	2531	18	9	43.7	36.6	976	1897
440	190	58	191	32	17	79.9	57.2	1898	2536	18	9	43.4	36.6	985	1892
440	190	59	191	32	17	79.5	57.2	1918	2541	18	9	43.2	36.6	995	1887
440	190	60	190	32	17	79.0	57.2	1938	2546	18	9	43.0	36.6	1004	1883
440	190	61	190	32	17	78.6	57.2	1959	2552	18	9	42.7	36.6	1014	1878
440	190	62	189	32	17	78.2	57.2	1979	2557	18	9	42.5	36.6	1024	1875
460	190	64	198	32	17	85.9	57.2	2021	2569	18	9	46.7	36.6	1044	1868
460	190	66	197	32	17	85.1	57.2	2063	2582	18	9	46.2	36.6	1064	1862
460	190	68	196	32	17	84.2	57.2	2107	2595	18	9	45.7	36.6	1085	1857
460	190	70	195	32	17	83.3	57.2	2151	2609	18	9	45.3	36.6	1106	1853
460	190	72	194	32	17	82.5	57.2	2196	2623	18	9	44.8	36.6	1128	1850
460	190	74	193	32	17	81.6	57.2	2242	2638	18	9	44.3	36.6	1150	1848
460	190	76	192	32	17	80.7	57.2	2288	2653	18	9	43.9	36.6	1172	1847
460	190	78	191	32	17	79.9	57.2	2336	2669	18	9	43.4	36.6	1195	1847
460	190	80	190	32	17	79.0	57.2	2384	2685	18	9	43.0	36.6	1219	1847

Table C1 (contd.):　　　　Joist hanger 1.5 mm with external flanges:
　　　　　　　　　　　　　Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
480	190	82	199	32	17	86.8	57.2	2433	2702	18	9	47.1	36.6	1243	1848
480	190	84	198	32	17	85.9	57.2	2483	2719	18	9	46.7	36.6	1267	1849
480	190	86	197	32	17	85.1	57.2	2533	2736	18	9	46.2	36.6	1292	1852
480	190	88	196	32	17	84.2	57.2	2585	2754	18	9	45.7	36.6	1318	1854
480	190	90	195	32	17	83.3	57.2	2637	2773	18	9	45.3	36.6	1344	1857
480	190	92	194	32	17	82.5	57.2	2690	2791	18	9	44.8	36.6	1370	1861
480	190	94	193	32	17	81.6	57.2	2744	2810	18	9	44.3	36.6	1396	1865
480	190	96	192	32	17	80.7	57.2	2799	2830	18	9	43.9	36.6	1424	1870
480	190	98	191	32	17	79.9	57.2	2854	2849	18	9	43.4	36.6	1451	1875
480	190	100	190	32	17	79.0	57.2	2911	2869	18	9	43.0	36.6	1479	1881
500	190	102	199	32	17	86.8	57.2	2968	2889	18	9	47.1	36.6	1508	1887
500	190	104	198	32	17	85.9	57.2	3026	2910	18	9	46.7	36.6	1537	1893
500	190	106	197	32	17	85.1	57.2	3084	2931	18	9	46.2	36.6	1566	1900
500	190	108	196	32	17	84.2	57.2	3144	2952	18	9	45.7	36.6	1596	1907
500	190	110	195	32	17	83.3	57.2	3204	2973	18	9	45.3	36.6	1627	1914
500	190	112	194	32	17	82.5	57.2	3266	2995	18	9	44.8	36.6	1657	1922
500	190	114	193	32	17	81.6	57.2	3328	3017	18	9	44.3	36.6	1689	1930
500	190	116	192	32	17	80.7	57.2	3390	3039	18	9	43.9	36.6	1721	1938
500	190	118	191	32	17	79.9	57.2	3454	3061	18	9	43.4	36.6	1753	1946
500	190	120	190	32	17	79.0	57.2	3518	3084	18	9	43.0	36.6	1785	1955

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
460	200	25	218	34	18	104	64.7	1480	2915	18	10	51.2	36.6	738	2366
460	200	26	217	34	18	104	64.7	1493	2908	18	10	51.0	36.6	744	2337
460	200	27	217	34	18	103	64.7	1507	2901	18	10	50.4	36.6	749	2309
460	200	28	216	34	18	103	64.7	1521	2894	18	10	50.5	36.6	755	2283
460	200	29	216	34	18	102	64.7	1535	2888	18	10	50.2	36.6	761	2258
460	200	30	215	34	18	102	64.7	1549	2883	18	10	50.2	36.6	767	2234
460	200	31	215	34	18	101	64.7	1564	2878	18	10	50.0	36.6	774	2211
460	200	32	214	34	18	101	64.7	1579	2874	18	10	49.5	36.6	780	2190
460	200	33	214	34	18	100	64.7	1593	2870	18	10	49.3	36.6	786	2169
460	200	34	213	34	18	99.9	64.7	1609	2866	18	10	49.0	36.6	793	2150
460	200	35	213	34	18	99.4	64.7	1624	2863	18	10	48.8	36.6	800	2132
460	200	36	212	34	18	99.0	64.7	1639	2861	18	10	48.6	36.6	807	2114
460	200	37	212	34	18	98.5	64.7	1655	2858	18	10	48.3	36.6	813	2097
460	200	38	211	34	18	98.0	64.7	1671	2857	18	10	48.1	36.6	821	2082
460	200	39	211	34	18	97.6	64.7	1687	2855	18	10	47.8	36.6	828	2067
460	200	40	210	34	18	97.1	64.7	1704	2854	18	10	47.6	36.6	835	2052
460	200	41	210	34	18	96.7	64.7	1720	2853	18	10	47.4	36.6	842	2039
460	200	42	209	34	18	96.2	64.7	1737	2853	18	10	47.1	36.6	850	2026
460	200	43	209	34	18	95.7	64.7	1754	2853	18	10	46.9	36.6	857	2014
460	200	44	208	34	18	95.3	64.7	1771	2853	18	10	46.7	36.6	865	2002
460	200	45	208	34	18	94.8	64.7	1788	2854	18	10	46.4	36.6	873	1991
460	200	46	207	34	18	94.3	64.7	1806	2855	18	10	46.2	36.6	881	1980
460	200	47	207	34	18	93.9	64.7	1824	2856	18	10	46.0	36.6	889	1971
460	200	48	206	34	18	93.4	64.7	1842	2857	18	10	45.7	36.6	897	1961
460	200	49	206	34	18	93.0	64.7	1860	2859	18	10	45.5	36.6	905	1952
460	200	50	205	34	18	92.5	64.7	1878	2861	18	10	45.3	36.6	914	1944
460	200	51	205	34	18	92.1	64.7	1897	2863	18	10	45.0	36.6	922	1936
460	200	52	204	34	18	91.6	64.7	1915	2866	18	10	44.8	36.6	931	1928
460	200	53	204	34	18	91.1	64.7	1934	2869	18	10	44.6	36.6	940	1921
460	200	54	203	34	18	90.7	64.7	1954	2872	18	10	44.3	36.6	949	1915
460	200	55	203	34	18	90.2	64.7	1973	2875	18	10	44.1	36.6	958	1908
460	200	56	202	34	18	89.8	64.7	1992	2879	18	10	44.0	36.6	967	1903
460	200	57	202	34	18	89.3	64.7	2012	2882	18	10	43.7	36.6	976	1897
460	200	58	201	34	18	88.9	64.7	2032	2886	18	10	43.4	36.6	985	1892
460	200	59	201	34	18	88.4	64.7	2052	2891	18	10	43.2	36.6	995	1887
460	200	60	200	34	18	88.0	64.7	2073	2895	18	10	43.0	36.6	1004	1883
460	200	61	200	34	18	87.5	64.7	2093	2900	18	10	42.7	36.6	1014	1878
460	200	62	199	34	18	87.1	64.7	2114	2905	18	10	42.5	36.6	1024	1875
480	200	64	208	34	18	95.3	64.7	2156	2915	18	10	46.7	36.6	1044	1868
480	200	66	207	34	18	94.3	64.7	2199	2926	18	10	46.2	36.6	1064	1862
480	200	68	206	34	18	93.4	64.7	2243	2938	18	10	45.7	36.6	1085	1857
480	200	70	205	34	18	92.5	64.7	2288	2950	18	10	45.3	36.6	1106	1853
480	200	72	204	34	18	91.6	64.7	2333	2963	18	10	44.8	36.6	1128	1850
480	200	74	203	34	18	90.7	64.7	2379	2977	18	10	44.3	36.6	1150	1848
480	200	76	202	34	18	89.8	64.7	2426	2991	18	10	44.0	36.6	1172	1847
480	200	78	201	34	18	88.9	64.7	2474	3006	18	10	43.4	36.6	1195	1847
480	200	80	200	34	18	88.0	64.7	2523	3022	18	10	43.0	36.6	1219	1847

Table C1 (contd.):   Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm
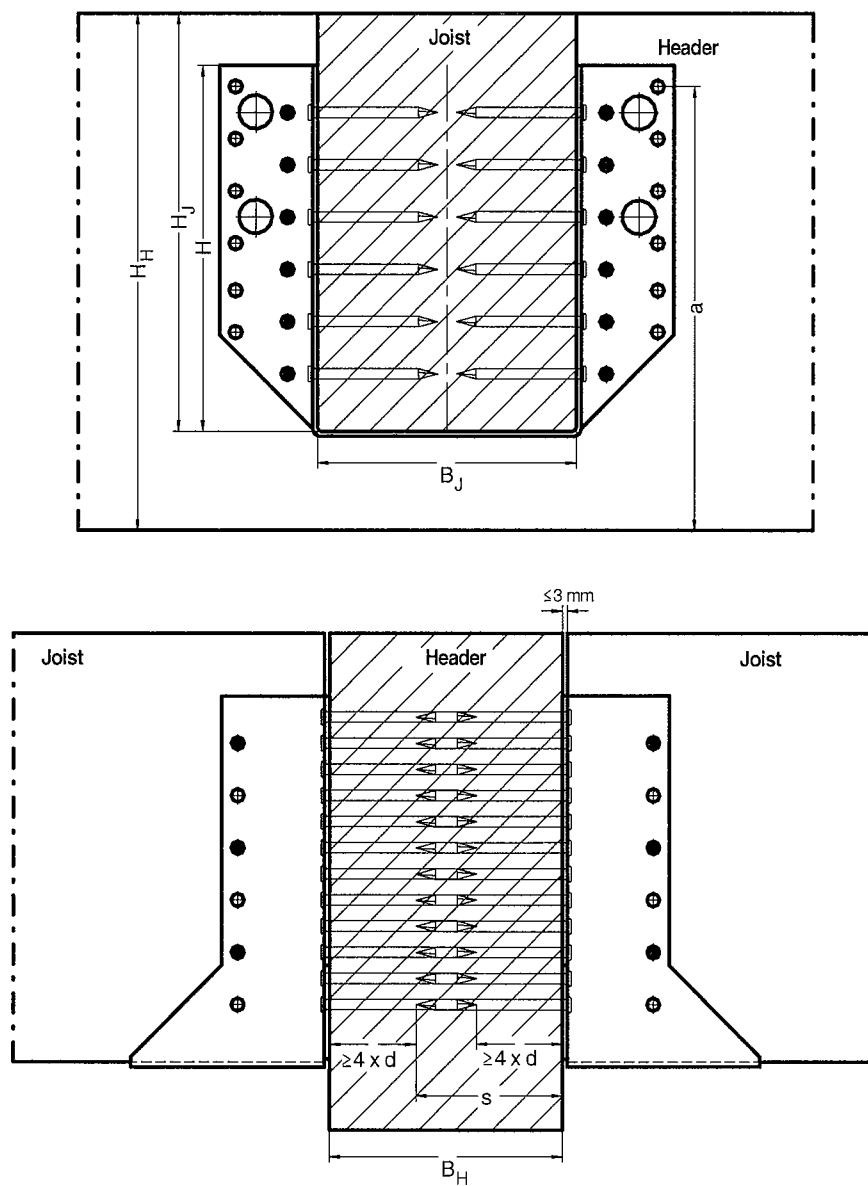
Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
500	200	82	209	34	18	96.2	64.7	2572	3037	18	10	47.1	36.6	1243	1848
500	200	84	208	34	18	95.3	64.7	2623	3054	18	10	46.7	36.6	1267	1849
500	200	86	207	34	18	94.3	64.7	2674	3071	18	10	46.2	36.6	1292	1852
500	200	88	206	34	18	93.4	64.7	2726	3088	18	10	45.7	36.6	1318	1854
500	200	90	205	34	18	92.5	64.7	2778	3106	18	10	45.3	36.6	1344	1857
500	200	92	204	34	18	91.6	64.7	2832	3124	18	10	44.8	36.6	1370	1861
500	200	94	203	34	18	90.7	64.7	2886	3143	18	10	44.3	36.6	1396	1865
500	200	96	202	34	18	89.8	64.7	2941	3162	18	10	43.9	36.6	1424	1870
500	200	98	201	34	18	88.9	64.7	2997	3181	18	10	43.4	36.6	1451	1875
500	200	100	200	34	18	88.0	64.7	3054	3201	18	10	43.0	36.6	1479	1881
480	210	25	228	36	19	114	72.7	1584	3306	20	10	61.6	45.5	870	3142
480	210	26	227	36	19	114	72.7	1597	3295	20	10	61.3	45.5	876	3100
480	210	27	227	36	19	113	72.7	1611	3285	20	10	61.0	45.5	881	3059
480	210	28	226	36	19	113	72.7	1624	3275	20	10	60.8	45.5	887	3020
480	210	29	226	36	19	112	72.7	1638	3267	20	10	60.5	45.5	893	2984
480	210	30	225	36	19	112	72.7	1653	3258	20	10	60.2	45.5	899	2948
480	210	31	225	36	19	111	72.7	1667	3250	20	10	60.0	45.5	905	2915
480	210	32	224	36	19	111	72.7	1681	3243	20	10	59.7	45.5	912	2883
480	210	33	224	36	19	110	72.7	1696	3237	20	10	59.5	45.5	918	2852
480	210	34	223	36	19	110	72.7	1711	3230	20	10	59.2	45.5	924	2823
480	210	35	223	36	19	109	72.7	1726	3225	20	10	58.9	45.5	931	2795
480	210	36	222	36	19	109	72.7	1741	3220	20	10	58.7	45.5	938	2769
480	210	37	222	36	19	108	72.7	1757	3215	20	10	58.4	45.5	945	2744
480	210	38	221	36	19	108	72.7	1773	3211	20	10	58.1	45.5	951	2719
480	210	39	221	36	19	108	72.7	1789	3207	20	10	57.9	45.5	959	2696
480	210	40	220	36	19	107	72.7	1805	3204	20	10	57.6	45.5	966	2674
480	210	41	220	36	19	107	72.7	1821	3201	20	10	57.4	45.5	973	2653
480	210	42	219	36	19	106	72.7	1838	3198	20	10	57.1	45.5	980	2633
480	210	43	219	36	19	106	72.7	1854	3196	20	10	56.8	45.5	988	2614
480	210	44	218	36	19	105	72.7	1871	3194	20	10	56.6	45.5	995	2595
480	210	45	218	36	19	105	72.7	1888	3193	20	10	56.3	45.5	1003	2578
480	210	46	217	36	19	104	72.7	1906	3192	20	10	56.1	45.5	1011	2561
480	210	47	217	36	19	104	72.7	1923	3191	20	10	55.8	45.5	1019	2545
480	210	48	216	36	19	103	72.7	1941	3191	20	10	55.5	45.5	1027	2529
480	210	49	216	36	19	103	72.7	1959	3191	20	10	55.3	45.5	1035	2515
480	210	50	215	36	19	102	72.7	1977	3191	20	10	55.0	45.5	1044	2501
480	210	51	215	36	19	102	72.7	1996	3192	20	10	54.8	45.5	1052	2487
480	210	52	214	36	19	101	72.7	2014	3193	20	10	54.5	45.5	1060	2475
480	210	53	214	36	19	101	72.7	2033	3194	20	10	54.3	45.5	1069	2462
480	210	54	213	36	19	100	72.7	2052	3196	20	10	54.0	45.5	1078	2451
480	210	55	213	36	19	99.8	72.7	2071	3198	20	10	53.8	45.5	1087	2440
480	210	56	212	36	19	99.3	72.7	2090	3200	20	10	53.5	45.5	1096	2429
480	210	57	212	36	19	98.8	72.7	2110	3202	20	10	53.3	45.5	1105	2419
480	210	58	211	36	19	98.4	72.7	2130	3205	20	10	53.0	45.5	1114	2410
480	210	59	211	36	19	97.9	72.7	2150	3208	20	10	52.7	45.5	1123	2401
480	210	60	210	36	19	97.4	72.7	2170	3211	20	10	52.5	45.5	1133	2392
480	210	61	210	36	19	96.9	72.7	2190	3215	20	10	52.2	45.5	1142	2384
480	210	62	209	36	19	96.5	72.7	2211	3218	20	10	52.0	45.5	1152	2376

Table C1 (contd.):　　　　Joist hanger 1.5 mm with external flanges:
Form factors $k_{H,1}$ and $k_{H,2}$ and dimensions e_1, e_2; $e_{J,0} = 28$ mm

Blank	Joist flap	B [mm]	H [mm]	Full nailing						Partial nailing					
				n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]	n_H	n_J	$k_{H,1}$	$k_{H,2}$	e_1 [mm]	e_2 [mm]
500	210	64	218	36	19	105	72.7	2253	3226	20	10	56.6	45.5	1171	2362
500	210	66	217	36	19	104	72.7	2295	3235	20	10	56.1	45.5	1191	2349
500	210	68	216	36	19	103	72.7	2339	3245	20	10	55.5	45.5	1212	2338
500	210	70	215	36	19	102	72.7	2383	3256	20	10	55.0	45.5	1233	2328
500	210	72	214	36	19	101	72.7	2428	3267	20	10	54.5	45.5	1254	2319
500	210	74	213	36	19	100	72.7	2474	3279	20	10	54.0	45.5	1276	2311
500	210	76	212	36	19	99.3	72.7	2520	3292	20	10	53.5	45.5	1299	2305
500	210	78	211	36	19	98.4	72.7	2568	3305	20	10	53.0	45.5	1321	2299
500	210	80	210	36	19	97.4	72.7	2616	3319	20	10	52.5	45.5	1344	2295
500	220	25	238	38	20	125	81.2	1722	3796	20	10	61.6	45.5	870	3142
500	220	26	237	38	20	125	81.2	1736	3782	20	10	61.3	45.5	876	3100
500	220	27	237	38	20	124	81.2	1749	3768	20	10	61.0	45.5	881	3059
500	220	28	236	38	20	124	81.2	1763	3755	20	10	60.8	45.5	887	3020
500	220	29	236	38	20	123	81.2	1777	3742	20	10	60.5	45.5	893	2984
500	220	30	235	38	20	123	81.2	1792	3731	20	10	60.2	45.5	899	2948
500	220	31	235	38	20	122	81.2	1806	3720	20	10	60.0	45.5	905	2915
500	220	32	234	38	20	122	81.2	1821	3710	20	10	59.7	45.5	912	2883
500	220	33	234	38	20	121	81.2	1836	3700	20	10	59.5	45.5	918	2852
500	220	34	233	38	20	120	81.2	1851	3691	20	10	59.2	45.5	924	2823
500	220	35	233	38	20	120	81.2	1866	3682	20	10	58.9	45.5	931	2795
500	220	36	232	38	20	119	81.2	1882	3674	20	10	58.7	45.5	938	2769
500	220	37	232	38	20	119	81.2	1897	3667	20	10	58.4	45.5	945	2744
500	220	38	231	38	20	118	81.2	1913	3660	20	10	58.1	45.5	951	2719
500	220	39	231	38	20	118	81.2	1930	3654	20	10	57.9	45.5	959	2696
500	220	40	230	38	20	117	81.2	1946	3648	20	10	57.6	45.5	966	2674
500	220	41	230	38	20	117	81.2	1962	3643	20	10	57.4	45.5	973	2653
500	220	42	229	38	20	116	81.2	1979	3638	20	10	57.1	45.5	980	2633
500	220	43	229	38	20	116	81.2	1996	3634	20	10	56.8	45.5	988	2614
500	220	44	228	38	20	115	81.2	2013	3630	20	10	56.6	45.5	995	2595
500	220	45	228	38	20	115	81.2	2031	3626	20	10	56.3	45.5	1003	2578
500	220	46	227	38	20	114	81.2	2048	3623	20	10	56.1	45.5	1011	2561
500	220	47	227	38	20	114	81.2	2066	3620	20	10	55.8	45.5	1019	2545
500	220	48	226	38	20	113	81.2	2084	3618	20	10	55.5	45.5	1027	2529
500	220	49	226	38	20	113	81.2	2102	3616	20	10	55.3	45.5	1035	2515
500	220	50	225	38	20	112	81.2	2120	3615	20	10	55.0	45.5	1044	2501
500	220	51	225	38	20	112	81.2	2139	3614	20	10	54.8	45.5	1052	2487
500	220	52	224	38	20	111	81.2	2158	3613	20	10	54.5	45.5	1060	2475
500	220	53	224	38	20	111	81.2	2177	3612	20	10	54.3	45.5	1069	2462
500	220	54	223	38	20	110	81.2	2196	3612	20	10	54.0	45.5	1078	2451
500	220	55	223	38	20	110	81.2	2215	3613	20	10	53.8	45.5	1087	2440
500	220	56	222	38	20	109	81.2	2235	3613	20	10	53.5	45.5	1096	2429
500	220	57	222	38	20	109	81.2	2255	3614	20	10	53.3	45.5	1105	2419
500	220	58	221	38	20	108	81.2	2275	3615	20	10	53.0	45.5	1114	2410
500	220	59	221	38	20	108	81.2	2295	3617	20	10	52.7	45.5	1123	2401
500	220	60	220	38	20	107	81.2	2315	3619	20	10	52.5	45.5	1133	2392
500	220	61	220	38	20	107	81.2	2336	3621	20	10	52.2	45.5	1142	2384
500	220	62	219	38	20	106	81.2	2356	3623	20	10	52.0	45.5	1152	2376

Annex D
Installation of joist hangers

Joist hanger in wood/wood connection

Joist hanger connected to concrete, lightweight concrete or a steel member by bolts

Joist

Header

A

H

B$_J$

Bolts M10
Washer according to
EN ISO 7094

≤3 mm

≤3 mm

Joist

Joist

Concrete