British Standard

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BS 5268-7.1: 1989

Structural use of timber —

Part 7: Recommendations for the calculation basis for span tables —

Section 7.1 Domestic floor joists

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Committees responsible for this British Standard

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Building Employers' Confederation
Chartered Institute of Building
Department of the Environment (Building Research Establishment, Princes Risborough Laboratory)
Department of the Environment for Northern Ireland
Department of the Environment (Housing and Construction Industries)
Department of the Environment (Property Services Agency)
Health and Safety Executive
Incorporated Association of Architects and Surveyors
Institute of Clerks of Works of Great Britain Inc.
Institute of Wood Science
Institution of Civil Engineers
Institution of Structural Engineers
International Truss Plate Association
National House-building Council
Royal Institute of British Architects
Royal Institution of Chartered Surveyors
Timber Research and Development Association
Timber Trade Federation
Coopted members

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Contents

Foreword

This Section of Part 7 of BS 5268 has been prepared under the direction of the Civil Engineering and Building Structures Standards Committee.

The general principles for the design of structural timber components are given in BS 5268-2 and using these principles it is possible for span tables to be prepared for a wide range of components.

Experience has shown that different interpretations of these principles has led to inconsistencies in span tables prepared by different compilers. It is the purpose of BS 5268-7 to eliminate these differences by recommending the design equations and the loading to be used in the preparation of span tables. Part 7 is intended to ensure that different organizations produce span tables on a consistent basis in the future, and is not necessarily intended for use by designers for individual designs carried out in their day-to-day work, where simplified equations may produce adequate designs. This Section deals with domestic floor joists. Other Sections of BS 5268-7, published or in preparation, are as follows.

— *Section 7.2: Joists for flat roofs;*

— *Section 7.3: Ceiling joists;*

— *Section 7.4: Ceiling binders;*

— *Section 7.5: Rafters;*

— *Section 7.6: Purlins supporting rafters;*

— *Section 7.7: Purlins suppporting sheeting or decking.*

BS 5268-2 gives grade stresses for very many combinations of species and grade and it is considered impractical to publish in a British Standard span tables for all possible combinations of species, grades and sizes. BS 5268-7 is therefore restricted to the basis of the calculations.

The solution of the design equations for many combinations of geometry and material is most conveniently undertaken by computer. A program written by the Timber Research and Development Association (TRADA) was used to prepare Appendix A and Appendix B. For users wishing to prepare their own span tables or computer programs Appendix A gives a sample calculation. Appendix B gives span tables for three typical combinations of species and grade. Although the presentation of span tables is not covered in BS 5268-7, it is recommended that tables for predetermined domestic floor joist centres and loading follow this format.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Section of BS 5268 recommends a calculation basis for the permissible clear span for simply supported domestic floor joists of solid timber. The recommendations apply to joists at a maximum spacing of 610 mm centre-to-centre, this being the maximum spacing for which the "load-sharing" assumption may be adopted as described in BS 5268-2. The method of calculation makes no allowance for any contribution of the flooring to the load resistance of the joists where such action can be provided by adequate attachments between the elements as in a stressed skin panel floor. Only uniform loading is considered and concentrated or line loads applied by partitions, trimmers and other similar causes are excluded.

This Section of BS 5268 is applicable to the species and grades of timber given in BS 5268-2.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Section of BS 5268, the definitions given in BS 6100-4.1 to BS 6100-4.4, BS 6100-2.1 and BS 5268-2 apply, together with the following.

2.1
grade stress

stress that can safely be permanently sustained by material of a specific section size and of a particular strength class or species and grade

2.2
load-sharing system

assembly of pieces or members that are constrained to act together to support a common load

2.3
permissible stress

stress that can safely be sustained by a structural material under a particular condition

NOTE For the purpose of this Section of BS 5268 it is the product of the grade stress and the appropriate modification factors for section size, service and loading.

2.4
strength class

classification of timber based on particular values of grade stress

2.5
bearing length

length at each end of the joist in contact with the support

2.6
notional bearing length

bearing length required for the calculation of permissible clear spans

2.7
effective span

span from centre-to-centre of the minimum bearing lengths at each end

2.8
permissible effective span

lowest value of effective span found from the calculations for bending strength, shear strength and deflection

2.9
permissible clear span

permissible unsupported span of a joist, measured between the faces of the supports at its two ends

NOTE Permissible clear span is equal to permissible effective span less the notional bearing length.

3 Symbols

For the purposes of this Section of BS 5268, the following symbols apply.

NOTE The symbols used are generally in accordance with ISO 3898, published by the International Organization for Standardization, supplemented by the recommendations of CIB-W18-1 "Symbols for use in structural timber design", published by the International Council for Building Research Studies and Documentation, which takes particular account of timber properties.

The symbols used are:

a	Distance (notional bearing length)
b	Breadth of joist
E	Modulus of elasticity
F	Total load per metre length
F_d	Dead load per square metre applied by mass of ceiling and flooring materials (excluding joist self weight)
F_j	Self weight of joist per metre length
G	Shear modulus
h	Depth of joist
I	Second moment of area
K	Modification factor (always with a subscript)
L	Effective span
L_{adm}	Permissible effective span
L_{cl}	Permissible clear span
M	Bending moment
s	Spacing of joists, centre-to-centre
w	Deflection
Z	Section modulus
ρ	Density
σ	Stress
τ	Shear stress

The following subscripts are used:

a) **Type of force, stress etc**.

c Compression
m Bending

b) **Significance**

adm Permissible
cl Clear
g Grade
max Maximum

c) **Geometry**

tra or ⊥ Perpendicular (to the grain)

It is recommended that where more than one subscript is used, the categories should be separated by commas.

Subscripts may be omitted when the context in which the symbols are used is unambiguous except in the case of modification factor K.

4 Design considerations

4.1 General

The design calculations recommended by this Section of BS 5268 are based on engineers' bending theory and are consistent with the recommendations of BS 5268-2. The design method ensures that the permissible bending and shear stresses as given in BS 5268-2, are not exceeded and that the deflection does not exceed the recommended limit of 0.003 times the span or 14 mm (see **14.7** of BS 5268-2:1988), whichever is smaller.

NOTE A sample calculation is given in Appendix A and Table 1 to Table 3 in Appendix B contain specimen span tables.

4.2 Qualifying assumptions

The calculations given in this Section apply to systems of at least four domestic floor joists, at a maximum spacing of 610 mm centre-to-centre and having adequate flooring to provide lateral load distribution. Because load sharing takes place the load sharing modification factor K_8 and the mean modulus of elasticity should be used.

Lateral support should be provided in accordance with **14.8** of BS 5268-2:1988.

The bearing length required at each end of the joist, calculated in accordance with **5.5**, may not be sufficient for practical construction purposes.

4.3 Loading

The design calculations provide for domestic floor loads which consist of the following.[1)]

a) *Imposed load*

1) for an effective span equal to or greater than 2 400 mm, the imposed load is 1.5 kN/m^2 uniformly distributed;

2) for an effective span less than 2 400 mm, the imposed load is 3.6 kN per metre width of floor (measured perpendicular to the span) uniformly distributed over the span.

NOTE This imposed load of 1.5 kN/m^2 entirely fulfils the recommendations of BS 6399-1. The maximum imposed load of 3.6 kN per metre width is a more onerous load applied to ensure that very small joist sizes do not result from the calculations for small spans.

The imposed load should be considered to be a long term load.

b) *Dead load*. Dead load per square metre F_d (in kN/m^2) to provide for the mass of ceiling and flooring materials, pugging, etc. Weights of materials are given in BS 648.

c) *Self weight*. Self weight per metre length F_j (in kN/m) to provide for the mass of the joist. The timber densities (in kg/m^3), given in Tables 9 and 92 of BS 5268-2:1988 should be used.

4.4 Design loads

The total load per metre length of span, F, is found in different ways depending on whether the span is less than or greater than 2 400 mm.

For spans equal to or greater than 2 400 mm F (in kN/m) is given by the equation

$$F = (1.5 + F_d)\left(\frac{s}{1000}\right) + F_j \qquad (1)$$

For spans equal to or less than 2 400 mm F (in kN/m) is given by the equation

$$F = \left(\frac{3600}{L} + F_d\right)\left(\frac{s}{1000}\right) + F_j \qquad (2)$$

where

s is the joist spacing (in mm);
L is the effective span (in mm);
F_d is the dead load (in kN/m^2);
F_j is the self weight of joist (in kN/m).

NOTE At a span of 2 400 mm, equations (1) and (2) give the same value for F.

[1)] Concentrated or line loads applied by partitions, trimmers and other similar causes are excluded.

The value of F_j (in kN/m) may be found from the equation

$$F_j = 9.80665 \times 10^{-9} pbh \quad (3)$$

where

ρ is the timber density (in kg/m^3);

b is the joist breadth (in mm);

h is the joist depth (in mm).

NOTE The value of F is regarded as being in N/mm in the equations given in clause **5**, where all values are in newtons and millimetres because BS 5268-2 gives stresses in N/mm^2.

5 Permissible spans

5.1 General

The permissible effective span of a timber joist subjected to the applied loads given in **4.3** should be the shortest effective span resulting from calculations for bending strength, shear strength and deflection, as given in **5.2**, **5.3** and **5.4**.

The permissible clear span should be calculated as the permissible effective span less the notional bearing length, calculated in accordance with **5.5**.

5.2 Limitation of bending stress

From BS 5268-2, the permissible bending stress $\sigma_{m,adm}$(in N/mm^2) is given by the equation

$$\sigma_{m,adm} = \sigma_{m,}g\, K_3\, K_7\, K_8 \quad (4)$$

where

$\sigma_{m,g}$ is the grade bending stress (in N/mm^2) (see BS 5268-2);

K_3 is the load duration modification factor, 1.0 for long term (see Table 17 of BS 5268-2:1988);

K_7 is the section depth modification factor (see **14.6** of BS 5268-2:1988);

K_8 is the load sharing modification factor, 1.1 (see clause **13** item a) of BS 5268-2:1988).

Expanding the equation

$$\sigma_{m,adm} = \frac{M}{Z} \quad (5)$$

leads to the following equations.

Effective span, L, $\geqslant$ 2 400 mm

$\sigma_{m,g} \times 1.0 \times K_7 \times 1.1$

$$= \left\{(1.5 + F_d)\ \left(\frac{s}{1000}\right) + F_j\right\} \frac{L^2}{8}\ \frac{6}{bh^2} \quad (6)$$

Effective span, L, $\leqslant$ 2 400 mm

$\sigma_{m,g} \times 1.0 \times K_7 \times 1.1$

$$= \left\{\left(\frac{3600}{L} + F_d\right)\ \left(\frac{s}{1000}\right) + F_j\right\} \frac{L^2}{8}\ \frac{6}{bh^2} \quad (7)$$

NOTE These equations lead to the following polynomials in L.

$L \geqslant$ 2 400 mm

$$\frac{3}{4bh^2}\left\{(1.5 + F_d)\ \left(\frac{s}{1000}\right) + F_j\right\} L^2 - \sigma_{m,g} \times 1.0 \times K_7 \times 1.1 = 0 \quad (8)$$

$L \leqslant$ 2 400 mm

$$\frac{3}{4bh^2}\left\{F_d\ \left(\frac{s}{1000}\right) + F_j\right\} L^2 + \frac{2700}{bh^2}\left(\frac{s}{1000}\right) L - \sigma_{m,g} \times 1.0 \times K_7 \times 1.1 = 0 \quad (9)$$

5.3 Limitation of shear stress

From BS 5268-2, the permissible shear stress τ_{adm} (in N/mm^2) is given by the equation

$$\tau_{adm} = \tau_g\, K_3\, K_8 \quad (10)$$

where

τ_g is the grade shear stress (in N/mm^2) (see BS 5268-2);

K_3 is the load duration modification factor, 1.0 for long term (see Table 17 of BS 5268-2:1988);

K_8 is the load sharing modification factor, 1.1 (see clause **13** item a) of BS 5268-2:1988).

Expanding the equation

$$\tau_{adm} = \frac{3}{2}\frac{FL}{2bh} \quad (11)$$

leads to the following equations.

Effective span $L \geqslant$ 2 400 mm

$\tau_g \times 1.0 \times 1.1$

$$= \frac{3}{2}\left\{(1.5 + F_d)\ \left(\frac{s}{1000}\right) + F_j\right\} \frac{L}{2bh} \quad (12)$$

Effective span $L \leqslant$ 2 400 mm

$\tau_g \times 1.0 \times 1.1$

$$= \frac{3}{2}\left\{\left(\frac{3600}{L} + F_d\right)\ \left(\frac{s}{1000}\right) + F_j\right\} \frac{L}{2bh} \quad (13)$$

NOTE These equations lead to the following polynomials in L.

$L \geqslant 2\,400$ mm

$$\frac{3}{4bh}\left\{(1.5+F_d)\left(\frac{s}{1000}\right)+F_j\right\}L - \\ -\tau_g \times 1.0 \times 1.1 = 0 \qquad (14)$$

$L \leqslant 2\,400$ mm

$$\frac{3}{4bh}\left\{F_d\left(\frac{s}{1000}\right)+F_j\right\}L+\frac{2700}{bh}\left(\frac{s}{1000}\right) - \\ -\tau_g \times 1.0 \times 1.1 = 0 \qquad (15)$$

5.4 Limitation of deflection

From BS 5268-2, the recommended deflection limitation W_{max} (in mm) is given by the equation

$$W_{max} = 0.003\,L \qquad (16)$$

with an overriding limitation of 14 mm (see **14.7** of BS 5268-2:1988).

The design equation limiting deflection[2] is

$$w_{max} = \frac{5}{384}\,\frac{FL^4}{EI} + \frac{3}{20}\,\frac{FL^2}{Gbh} \qquad (17)$$

where E is the mean modulus of elasticity.

Taking G as $\frac{E}{16}$ (see clause **11** of BS 5268-2:1988), leads to the equation

$$w_{max} = \frac{5}{384}\,\frac{FL^4}{EI} + \frac{12}{5}\,\frac{FL^2}{Ebh} \qquad (18)$$

or, inserting the expressions for equivalent uniformly distributed load, for an effective span $L \geqslant 2\,400$ mm

$$w_{max} = \left\{(1.5+F_d)\left(\frac{s}{1000}\right)+F_j\right\} \times \\ \times \left(\frac{5}{384}\,\frac{L^4}{EI} + \frac{12}{5}\,\frac{L^2}{Ebh}\right) \qquad (19)$$

and for an effective span $L \leqslant 2\,400$ mm

$$w_{max} = \left\{\left(\frac{3600}{L}+F_d\right)\left(\frac{s}{1000}\right)+F_j\right\} \times \\ \times \left(\frac{5}{384}\,\frac{L^4}{EI} + \frac{12}{5}\,\frac{L^2}{Ebh}\right) \qquad (20)$$

With a deflection limitation of $0.003L$

for an effective span $L \geqslant 2\,400$ mm

$$0.003L = \left\{(1.5+F_d)\left(\frac{s}{1000}\right)+F_j\right\} \times \\ \times \left(\frac{5}{384}\,\frac{L^4}{E}\,\frac{12}{bh^3} + \frac{12}{5}\,\frac{L^2}{Ebh}\right) \qquad (21)$$

and for an effective span $L \leqslant 2\,400$ mm

$$0.003L = \left\{\left(\frac{3600}{L}+F_d\right)\left(\frac{s}{1000}\right)+F_j\right\} \times \\ \times \left(\frac{5}{384}\,\frac{L^4}{E}\left(\frac{12}{bh^3}\right) + \frac{12}{5}\,\frac{L^2}{Ebh}\right) \qquad (22)$$

A further design equation is required for the 14mm limitation on deflection of spans greater than or equal to 2 400 mm: this is similar to equation (21) but with "$0.003L$" replaced by "14". The deflection of spans less than 2 400 mm will be limited to less than 14 mm by equation (22).

NOTE The three design equations lead to the following polynomials in L.

Limitation $0.003L$

$L \geqslant 2400$ mm

$$\frac{5}{32Ebh^3}\left\{(1.5+F_d)\left(\frac{s}{1000}\right)+F_j\right\}L^3 + \\ + \frac{12}{5Ebh}\left\{(1.5+F_d)\left(\frac{s}{1000}\right)+F_j\right\}L - 0.003 = 0 \qquad (23)$$

$L \leqslant 2400$ mm

$$\frac{5}{32Ebh^3}\left\{F_d\left(\frac{s}{1000}\right)+F_j\right\}L^3 + \\ + \frac{1125}{2Ebh^3}\left(\frac{s}{1000}\right)L^2 + \frac{12}{5Ebh}\left\{F_d\left(\frac{s}{1000}\right)+ \\ + F_j\right\}L + \frac{8640}{Ebh}\left(\frac{s}{1000}\right) - 0.003 = 0 \qquad (24)$$

Limitation 14 mm

$L \geqslant 2400$ mm

$$\frac{5}{32Ebh^3}\left\{(1.5+F_d)\left(\frac{s}{1000}\right)+F_j\right\}L^4 + \\ + \frac{12}{5Ebh}\left\{(1.5+F_d)\left(\frac{s}{1000}\right)+ \\ + F_j\right\}L^2 - 14 = 0 \qquad (25)$$

[2] In addition to the deflection due to bending the shear deflection may be significant and has been taken into account.

5.5 Permissible clear spans

The calculation of clear span requires the deduction of a notional bearing length from an effective span.

The calculation of the notional bearing length to be deducted from the permissible effective span to produce the clear span is made after finding L_{adm}, the smallest of the effective spans for a given cross section, as limited by:

a) bending stress, $L \geq 2\,400$ mm;

b) bending stress, $L \leq 2\,400$ mm;

c) shear stress, $L \geq 2\,400$ mm;

d) shear stress, $L \leq 2\,400$ mm;

e) deflection, limitation $0.003L$, $L \geq 2\,400$ mm;

f) deflection, limitation $0.003L$, $L \leq 2\,400$ mm;

g) deflection, limitation 14 mm.

From BS 5268-2, the permissible compression perpendicular to the grain stress $\sigma_{c,\perp,adm}$ (in N/mm^2) is given by the equation

$$\sigma_{c,\perp,adm} = \sigma_{c,\perp,g} K_3 K_8 \qquad (26)$$

where

$\sigma_{c,\perp,g}$ is the grade compression perpendicular to the grain stress (in N/mm^2) (see BS 5268-2)[a];

K_3 is the load duration modification factor, 1.0 for long term (see Table 17 of BS 5268-2:1989);

K_8 is the load sharing modification factor, 1.1(see clause **13** item a) of BS 5268-2:1989).

[a] BS 5268-2 provides two values for the grade compression perpendicular to the grain stress. When the specification specifically prohibits wane at bearing areas, the higher value may be used, otherwise the lower level applies.
(See footnotes to Tables 9, 10, 11, 12, and 13 in BS 5268-2:1988.)
The span table should indicate whether wane is permitted.

The notional bearing length a (in mm) required at each end should be found from the equation

$$\sigma_{c,\perp,adm}\, ba = \frac{F L_{adm}}{2} \qquad (27)$$

where

b is the breadth of the joist (in mm);

L_{adm} is the permissible effective span (in mm).

Inserting the expressions for F, equation (27) gives for an effective span $L \geq 2\,400$ mm

$$\sigma_{c,\perp,g} \times 1.0 \times 1.1 ba = \left\{ (1.5 + F_d) \left(\frac{s}{1000} \right) + F_j \right\} \frac{L_{adm}}{2} \qquad (28)$$

for $L \leqslant 2\,400$ mm

$$\sigma_{c,\perp,g} \times 1.0 \times 1.1 ba = \left\{ \left(\frac{3600}{L_{adm}} + F_d \right) \left(\frac{s}{1000} \right) + F_j \right\} \frac{L_{adm}}{2} \qquad (29)$$

The equation corresponding to the loading condition governing the permissible effective span should be solved for a, and half the value of a should be deducted from each end of the span (total deduction a, see Figure 1) to give the permissible clear span. L_{cl} (in mm) is given by the equation

$$L_{cl} = L_{adm} - a \qquad (30)$$

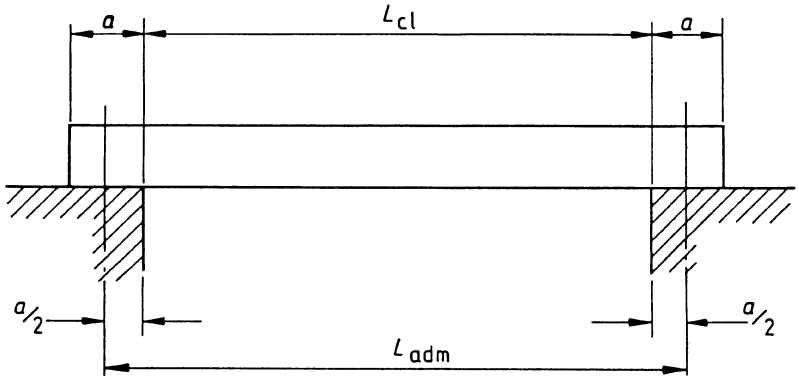

Figure 1 — Bearing length, permissible effective and permissible clear span

6 Bearing length

Although correct for the calculation of clear span the procedure given in **5.5** for the calculation of notional bearing length may not ensure that the permissible compression perpendicular to the grain stress is not exceeded for all loading cases.

The design of some members may be governed by a loading case which does not represent the greatest total load of all loading cases. For example, the governing design case may include a concentrated load, but another less critical loading case may consist of a greater total load uniformly distributed along the span.

7 Information to be given in span tables

There are many possible formats for span tables. A typical format suitable for domestic floor joists at predetermined centres and for quoted loading is given in Appendix B.

This Section of BS 5268 does not recommend formats for different components but whatever format is used the following information should be given in the heading or in the main body or in the footnotes of the span tables, or in an introduction to the tables:

a) the loading;

b) details of the arrangement of the members;

c) the member sizes and their maximum permissible deviations and/or the standards that define these quantities;

d) the species, stress grade or strength class and/or the standards that define these properties;

e) a statement specifying any requirements additional to those given in the stress grading rules, e.g. whether wane is prohibited at bearings;

f) a statement that the spans have been calculated in accordance with the recommendations of BS 5268-2 and BS 5268-7.1;

g) a statement specifying any structural requirements that may be necessary to comply with the qualifying assumptions made in **4.2**, e.g. lateral support requirements, accommodation of lateral thrust at supports;

h) the permissible clear spans.

Appendix A Sample calculation for a domestic floor joist

The object is to find the permissible clear span, given the following data as applicable to a particular design case.

Timber	Strength class SC3		(see Tables 3 to 6 of BS 5268-2:1988)
Dimensions	Joist breadth, b	= 50 mm	
	Joist depth, h	= 122 mm	
	Joist spacing, s	= 600 mm	
Loading	Dead load, F_d	= 0.25 kN/m^2	[see **4.3** b)]
	Imposed load	= 1.5 kN/m^2	[$L \geq$ 2 400 mm, see **4.3** a)]
		or = 3.6 kN/m width of floor	[$L \leqslant$ 2 400 mm, see **4.3** a)]

The following data are given in BS 5268-2:1988.

Grade stresses and density		**BS 5268-2:1988 reference**
Grade bending stress, $\sigma_{m,g}$	= 5.3 N/mm^2	Table 9
Grade shear stress, τ_g	= 0.67 N/mm^2	Table 9
Grade mean modulus of elasticity, E	= 8 800 N/mm^2	Table 9
Grade compression perpendicular to the grain stress (with wane permitted), $\sigma_{c,\perp,g}$	= 1.7 N/mm^2	Table 9
Density, ρ	= 540 kg/m^3	Table 9
Modification factors		
Load duration, K_3	= 1.0 long term	Table 17
Depth, K_7	= $(300/h)^{0.11}$	**14.6**
Load sharing, K_8	= 1.1	clause **13**

Permissible stresses and recommended deflection limitation		**BS 5268-7.1 reference**
Permissible bending stress, $\sigma_{m,adm}$ (in N/mm^2)	= $\sigma_{m,g}K_3K_7K_8$ = 6.437 N/mm^2	**5.2**
Permissible shear stress, τ_{adm} (in N/mm^2)	= $\tau_g K_3 K_8$ = 0.737 N/mm^2	**5.3**
Recommended deflection limitation, W_{max} (in mm)	= 0.003L	**5.4**
	or= 14 mm	**5.4**
Permissible compression perpendicular to the grain stress, $\sigma_{c,\perp adm}$ (in N/mm^2)	= $\sigma_{c,\perp adm}K_3 K_8$ = 1.87 N/mm^2	**5.5**

Application of the design equations from **5.2** to **5.4** leads to the following solutions for effective span L:

a) limitation of bending stress — L = 2 429 mm [equation (8)] or L = 2 450 mm [equation (9)];

b) limitation of shear stress — L = 5 538 mm [equation (14)] or L = 21 032 mm [equation (15)];

c) limitation of deflection (0.003 L) — L = 2 389 mm [equation (23)] or L = 2 384 mm [equation (24)];

d) limitation of deflection (14 mm) — L = 2 832 mm [equation (25)].

NOTE Solutions to all seven design equations have been provided in a) to d) for illustrative purposes but in practice fewer solutions would be required for any individual permissible span calculation. Some solutions are invalid; for example the solution of equation (9) is invalid because it exceeds 2 400 mm.

The permissible effective span L_{adm} is therefore

L_{adm} = 2 384 mm

The appropriate equation is selected from **5.5** (i.e. in this case for L < 2 400 mm) to calculate the notional bearing length, a, as 14 mm.

The permissible clear span L_{cl} for the joists is then

$L_{cl} = L_{adm} - a$

L_{cl} = 2 370 mm

Appendix B Specimen span tables for domestic floor joists

There are many possible formats for span tables and Table 1, Table 2 and Table 3 are typical examples. Whatever format is used, the information listed in clause **7** should be given.

Table 1 — Permissible clear spans for domestic floor joists: SC3[a]: regularized sizes[b]

Size of joist	Dead load (in kN/m^2) supported by joist, excluding the self weight of the joist								
	Not more than 0.25 (25.5 kg/m^2)			More than 0.25 but not more than 0.50 (51 kg/m^2)			More than 0.50 but not more than 1.25 (127.5 kg/m^2)		
	Centre-to-centre spacing of joists (in mm)								
	400	450	600	400	450	600	400	450	600
	Permissible clear span								
mm	m	m	m	m	m	m	m	m	m
38 × 72	1.130	1.011	0.767	1.061	0.954	0.731	0.920	0.834	0.652
97	1.828	1.692	1.303	1.717	1.556	1.214	1.423	1.301	1.037
122	2.482	2.385	1.925	2.368	2.215	1.755	1.947	1.791	1.448
147	2.983	2.868	2.510	2.853	2.707	2.331	2.453	2.290	1.872
170	3.442	3.306	2.873	3.281	3.098	2.690	2.808	2.649	2.267
195	3.939	3.752	3.263	3.724	3.518	3.056	3.189	3.010	2.609
220	4.434	4.193	3.648	4.161	3.932	3.418	3.567	3.367	2.920
44 × 72	1.281	1.160	0.884	1.207	1.088	0.839	1.035	0.941	0.740
97	1.962	1.854	1.491	1.862	1.758	1.380	1.587	1.454	1.166
122	2.606	2.506	2.186	2.493	2.396	1.979	2.156	1.987	1.616
147	3.131	3.012	2.697	2.996	2.881	2.526	2.636	2.488	2.077
170	3.612	3.475	3.087	3.457	3.325	2.891	3.018	2.848	2.470
195	4.132	3.977	3.505	3.956	3.776	3.284	3.426	3.235	2.807
220	4.648	4.476	3.917	4.453	4.219	3.672	3.830	3.617	3.140
47 × 72	1.324	1.233	0.942	1.272	1.154	0.891	1.091	0.993	0.783
97	2.024	1.914	1.583	1.920	1.818	1.460	1.665	1.527	1.228
122	2.663	2.561	2.302	2.548	2.450	2.087	2.255	2.081	1.696
147	3.200	3.078	2.786	3.062	2.945	2.609	2.723	2.570	2.174
170	3.691	3.551	3.188	3.533	3.398	2.987	3.116	2.942	2.552
195	4.221	4.063	3.619	4.042	3.889	3.391	3.538	3.341	2.900
220	4.723	4.572	4.044	4.549	4.354	3.791	3.954	3.735	3.244
50 × 72	1.365	1.287	0.999	1.311	1.218	0.943	1.145	1.043	0.825
97	2.084	1.971	1.673	1.975	1.871	1.539	1.741	1.598	1.288
122	2.718	2.615	2.370	2.601	2.501	2.192	2.327	2.171	1.774
147	3.265	3.142	2.855	3.125	3.006	2.690	2.807	2.650	2.269
170	3.765	3.624	3.285	3.605	3.469	3.078	3.212	3.032	2.632
195	4.306	4.146	3.728	4.125	3.969	3.495	3.646	3.443	2.990
220	4.793	4.660	4.166	4.641	4.467	3.907	4.074	3.849	3.345
63 × 147	3.518	3.388	3.084	3.370	3.244	2.950	3.037	2.920	2.577
170	4.055	3.905	3.558	3.886	3.741	3.404	3.504	3.370	2.950
195	4.633	4.465	4.070	4.442	4.278	3.896	4.009	3.850	3.350
220	5.061	4.923	4.580	4.905	4.770	4.365	4.512	4.301	3.745
75 × 195	4.830	4.700	4.306	4.683	4.523	4.125	4.242	4.084	3.646
220	5.268	5.128	4.793	5.109	4.971	4.641	4.740	4.595	4.074

NOTE 1 The tables are computed on the basis that the specification does not exclude wane at bearings.
NOTE 2 The spans have been calculated in accordance with the recommendations of BS 5268-2 and BS 5268-7.1. Lateral support should be provided in accordance with **14.8** of BS 5268-2:1988.
NOTE 3 The material should be stress graded in accordance with BS 4978.
NOTE 4 The sizes and their maximum permissible deviations should be in accordance with BS 4471.

[a] For species/grade combinations in this strength class see Tables 3 to 7 of BS 5268-2:1988.
[b] Regularized sizes are given in BS 4471.

Table 2 — Permissible clear spans for domestic floor joists: redwood/whitewood, SS grade, basic sizes[a]

Size of joist	Dead load (in kN/m^2) supported by joist, excluding the self weight of the joist								
	Not more than 0.25 (25.5 kg/m^2)			More than 0.25 but not more than 0.50 (51 kg/m^2)			More than 0.50 but not more than 1.25 (127.5 kg/m^2)		
	Centre-to-centre spacing of joists (in mm)								
	400	450	600	400	450	600	400	450	600
	Permissible clear span								
mm	m	m	m	m	m	m	m	m	m
38 × 75	1.381	1.302	1.123	1.326	1.252	1.079	1.204	1.139	0.932
100	2.082	1.968	1.709	1.972	1.867	1.627	1.747	1.658	1.424
125	2.702	2.598	2.346	2.585	2.484	2.208	2.306	2.194	1.935
150	3.235	3.111	2.824	3.095	2.975	2.699	2.780	2.671	2.418
175	3.765	3.622	3.290	3.603	3.465	3.144	3.239	3.111	2.812
200	4.293	4.131	3.754	4.109	3.952	3.588	3.695	3.551	3.185
225	4.774	4.637	4.216	4.614	4.438	4.031	4.151	3.989	3.555
44 × 75	1.485	1.401	1.211	1.423	1.345	1.167	1.288	1.220	1.050
100	2.231	2.111	1.838	2.108	1.998	1.746	1.862	1.769	1.556
125	2.837	2.728	2.478	2.714	2.610	2.362	2.439	2.334	2.065
150	3.395	3.266	2.968	3.249	3.125	2.837	2.922	2.808	2.544
175	3.950	3.801	3.456	3.782	3.638	3.304	3.403	3.270	2.964
200	4.502	4.334	3.942	4.312	4.149	3.770	3.882	3.732	3.384
225	4.946	4.808	4.427	4.790	4.654	4.235	4.359	4.191	3.802
47 × 75	1.534	1.448	1.253	1.469	1.388	1.206	1.327	1.258	1.099
100	2.300	2.178	1.898	2.172	2.059	1.802	1.915	1.821	1.603
125	2.899	2.789	2.533	2.774	2.668	2.422	2.494	2.397	2.124
150	3.469	3.338	3.034	3.321	3.194	2.901	2.987	2.871	2.603
175	4.035	3.884	3.533	3.864	3.718	3.379	3.478	3.344	3.032
200	4.599	4.427	4.030	4.405	4.239	3.855	3.968	3.815	3.461
225	5.025	4.885	4.524	4.867	4.730	4.329	4.456	4.285	3.889
50 × 75	1.581	1.493	1.293	1.512	1.430	1.243	1.365	1.294	1.132
100	2.367	2.242	1.956	2.233	2.118	1.855	1.966	1.870	1.648
125	2.958	2.846	2.587	2.832	2.723	2.473	2.547	2.447	2.181
150	3.539	3.406	3.097	3.389	3.260	2.962	3.050	2.932	2.659
175	4.117	3.963	3.606	3.943	3.794	3.449	3.551	3.414	3.097
200	4.681	4.517	4.113	4.494	4.326	3.935	4.050	3.895	3.535
225	5.099	4.958	4.617	4.939	4.801	4.419	4.547	4.374	3.971
63 × 150	3.812	3.671	3.344	3.653	3.516	3.200	3.293	3.167	2.876
175	4.431	4.269	3.891	4.247	4.090	3.724	3.832	3.687	3.350
200	4.943	4.808	4.435	4.790	4.658	4.247	4.369	4.204	3.822
225	5.383	5.237	4.891	5.218	5.075	4.736	4.837	4.700	4.292
75 × 200	5.146	5.009	4.681	4.990	4.855	4.494	4.621	4.450	4.050
225	5.602	5.453	5.099	5.434	5.287	4.939	5.043	4.903	4.547

NOTE 1 The tables are computed on the basis that the specification does not exclude wane at bearings.
NOTE 2 The spans have been calculated in accordance with the recommendations of BS 5268-2 and BS 5268-7.1. Lateral support should be provided in accordance with **14.8** of BS 5268-2:1988.
NOTE 3 The material should be stress graded in accordance with BS 4978.
NOTE 4 The sizes and their maximum permissible deviations should be in accordance with BS 4471.

[a] Basic sizes are given in BS 4471.

Table 3 — Permissible clear spans for domestic floor joists: spruce-pine-fir, joist and plank no. 2 grade, CLS sizes[a]

Size of joist	Dead load (in kN/m^2) supported by joist, excluding the self weight of the joist								
	Not more than 0.25 (25.5 kg/m^2)			More than 0.25 but not more than 0.50 (51 kg/m^2)			More than 0.50 but not more than 1.25 (127.5 kg/m^2)		
	Centre-to-centre spacing of joists (in mm)								
	400	450	600	400	450	600	400	450	600
	Permissible clear span								
mm	m	m	m	m	m	m	m	m	m
38 × 140	2.870	2.759	2.469	2.744	2.637	2.271	2.413	2.238	1.825
184	3.759	3.614	3.186	3.595	3.437	2.982	3.114	2.937	2.543
235	4.746	4.599	3.999	4.564	4.311	3.745	3.908	3.688	3.196
285	5.463	5.307	4.779	5.287	5.135	4.478	4.672	4.411	3.826

NOTE 1 The tables are computed on the basis that the specification does not exclude wane at bearings.
NOTE 2 The spans have been calculated in accordance with the recommendations of BS 5268-2 and BS 5268-7.1. Lateral support should be provided in accordance with **14.8** of BS 5268-2:1988.
NOTE 3 The material should be stress graded in accordance with NLGA rules.
NOTE 4 The sizes and their maximum permissible deviations should be in accordance with Appendix A of BS 4471:1987.

[a] CLS sizes are given in Appendix A of BS 4471:1987.

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Publications referred to

BS 648, *Schedule of weights of building materials.*

BS 4471, *Specification for sizes of sawn and processed softwood.*

BS 4978, *Specification for timber grades for structural use.*

BS 5268, *Structural use of timber.*

BS 5268-2, *Code of practice for permissible stress design, materials and workmanship.*

BS 5268-2-7.2, *Joists for flat roofs*[3)].

BS 5268-2-7.3, *Ceiling joists*[3)].

BS 5268-2-7.4, *Ceiling binders*[3)].

BS 5268-2-7.5, *Rafters*[3)].

BS 5268-2-7.6, *Purlins supporting rafters*[3)].

BS 5268-2-7.7, *Purlins supporting sheeting or decking*[3)].

BS 6100, *Glossary of building and civil engineering terms.*

BS 6100-2.1, *Structural design and elements.*

BS 6100-4.1, *Characteristics and properties of timber and wood based panel products.*

BS 6100-4.2, *Sizes and quantities of solid timber.*

BS 6100-4.3, *Wood based panel products.*

BS 6100-4.4, *Carpentry and joinery.*

BS 6399, *Loading for buildings.*

BS 6399-1, *Code of practice for dead and imposed loads.*

ISO 3898, *Bases for design of structures — Notations — General symbols.*

CIB-W18-1, Symbols for use in structural timber design. International Council for Building Research Studies and Documentation, Post Box 20704, 3001 JA Rotterdam, The Netherlands.

NLGA 1979, The national grading rules for dimension lumber. National Lumber Grades Authority, 1450-1055 West Hastings Street, Vancouver, British Colombia, Canada V6E 2G8.

[3)] Referred to in the foreword only.

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