

Structural design of low-rise buildings —

Part 3: Code of practice for timber floors and roofs for housing

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee B/204, Structural design of low-rise buildings, upon which the following bodies were represented:

- Building Employers' Confederation
- Chartered Institute of Building
- Consumer Policy Committee of BSI
- Department of the Environment (Building Research Establishment)
- Department of the Environment (Construction Directorate)
- Federation of Master Builders
- House Builders' Federation
- Institute of Building Control
- Institution of Civil Engineers
- Institution of Structural Engineers
- National Council of Building Material Producers
- National House-Building Council
- Royal Institute of British Architects
- Scottish Office (Building Directorate)

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- British Woodworking Federation
- Council of the Forest Industries of British Columbia
- Swedish Finnish Timber Council
- Timber Research and Development Association
- Timber Trade Federation

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Foreword

This Part of BS 8103 has been prepared under the direction of Technical Committee B/204, Structural design of low rise buildings.

BS 8103 is published in four Parts:

- *Part 1: Code of practice for stability, site investigation, foundations and ground floor slabs for housing;*
- *Part 2: Code of practice for masonry walls for housing;*
- *Part 3: Code of practice for timber floors and roofs for housing;*
- *Part 4: Code of practice for suspended concrete floors for housing.*

A large proportion of the national building programme is concerned with new housing and extensions in the public and private sectors, where the majority of houses are constructed with masonry walls and timber floors and roofs. This Part of BS 8103 covers timber used in that form of construction. It does not cover joinery or wood trim.

It is assumed that this standard will be used by those with expertise in building design and construction but not necessarily in structural engineering design. Therefore the recommendations are intended to provide safe designs without the need for strength calculations, except for trussed rafter design which is normally entrusted to a specialist. It is particularly important that the erection of trussed rafter roofs is carried out under competent supervision. Houses constructed within the limitations stated in the relevant clauses will not require additional specialist advice. For any conditions outside the scope of this standard (e.g. trimmers assembled from three or more members or supporting heavy partitions, or the use of connections other than nails, screws, bolts or toothed-plate connectors), appropriate specialist advice should be obtained.

When using this standard, it is important to ensure overall stability of the building, by following the recommendations of BS 8103-1.

For terms used in conjunction with structural design, reference should be made to BS 6100-2.1.

It should be noted that the provisions and limitations of this standard do not preclude other designs, provided that a specialist provides evidence of their adequacy.

Although design code BS 5268-2 permits load-sharing to be considered for spacings etc. up to 610 mm centres, the span tables in this standard are limited to 600 mm centres as in BS 5268-3 on trussed rafter roofs.

As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification, and particular care should be taken to ensure that claims of compliance are not misleading.

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 to viii, pages 1 to 160, 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.

Introduction

The object of this Part of BS 8103 is to provide sufficient information to enable supervisory/technical staff of building companies to determine the size, grade and any limitations such as notching of certain timber components for floors and roofs of dwellings of limited size. It has to be emphasized, however, that a structural designer should be employed where the building falls outside the scope of this Part of BS 8103.

Much of the information provided is linked to or extends the guidance of deemed-to-satisfy provisions given in supporting technical documents to the current UK statutory building regulations. Significant additions are as follows:

- a) tables for determining timber sizes for roof members to buildings situated at sites where the imposed roof loading is 1.25 kN/m^2 ;
 - b) a wider range of sizes;
 - c) minimum bearing lengths to satisfy the loading on joists, beams or trimmers, trimming joists, purlins and ceiling binders (see Table 5);
- NOTE The bearing lengths quoted are minimum design values and may need to be increased to accommodate fixings, tolerances in building, or to give stability to masonry walls.
- d) the inclusion of alternative decking materials for floors;
 - e) guidance relating to the construction of trussed rafter roofs (see Annex H and Annex J);
 - f) tiling batten sizes (see Table 74);
 - g) timber bracing for single-storey non-residential buildings and annexes (see Annex Q);
 - h) tables for trimmers and beams (see Table 5);
 - i) guidance on how to determine the imposed snow loading for a particular site (see Annex P).

The tables for plywood floor decking or roof decking have been agreed with the major associations representing imported structural plywood for which strength values are given in BS 5268-2. The tables are not intended, however, to negate more detailed tables produced by these associations.

The committee was advised by checking authorities that joist span tables were erroneously being used as though they applied also for trimmers and beams supporting joists. The tables for trimmers and beams have been added in an attempt to prevent this unacceptable practice and to make this Part of BS 8103 as useful as possible. It was difficult to evolve an easy method of deriving sizes, but it is hoped that, with a little familiarity, the new tables will prove useful even though they are for a limited range of spans, are only for single or twin members, and cover dead loading not heavier than 0.5 kN/m^2 .

The span tables do not include sizes that are based on the North American NLGA/NGRDL rules [1] [2] for green Imperial sawn sizes and tolerances. It should be clear therefore, as with Approved Document A to the Building Regulations for England and Wales 1991 [3], that none of the span tables is relevant for such sizes and tolerances. The tables may be used, however, if North American timber, stress-graded to the NLGA/NGRDL rules or to BS 4978, is sawn, resawn or processed to the BS EN 336 basic dry metric sizes and tolerances, or to the tolerances of clause 8 of BS 5268-2:1991.

One aim of this Part of BS 8103 is to minimize the extent to which other British Standards and Codes need to be examined. To cover those cases where the final grading of timber needs to be completed on site, e.g. for floor boards of solid timber, or tiling battens, grading rules are included in an annex. For those cases where grading needs to be completed before the timber, plywood or chipboard arrives on site, grading rules are not repeated, but marks are given in Annex C, Annex F and Annex G, which will assist site staff to identify that the correct grade has been delivered.

Throughout this Part of BS 8103, the figures are only illustrative, and do not show all the details of construction.

1 Scope

This Part of BS 8103 gives recommendations for the sizes of timber elements, fixings, and their connections with masonry walls etc. It applies to detached, semi-detached, terraced houses and flats (with not more than four self-contained dwelling units per floor, accessible from one staircase), of not more than three storeys above ground, intended for domestic occupation. The recommendations also apply to single-storey non-residential buildings, e.g. domestic garages and annexes, not exceeding 36 m^2 in floor area. The design of proprietary housing systems, i.e. cross wall constructions, timber framed houses, steel or concrete framed constructions, concrete panel constructions, is not covered by this standard.

The recommendations of this Part of BS 8103 are applicable only to housing where:

- a) the construction comprises masonry walls, timber roofs, suspended timber or precast concrete intermediate floors, suspended timber or concrete ground floors (either suspended or ground bearing);
- b) the roof profile is symmetrical duopitch, monopitch or flat;

NOTE Pitched roofs of trussed rafter or traditional construction are covered, but not constructions using principal trusses. Hip ends and "L" shaped plans are not specifically covered although values are given for jack rafters.

c) the maximum clear span of a pitched roof does not exceed 12.0 m and imposes a total load on the supporting perimeter walls not greater than 12 kN/m run;

d) gable and separating walls are of masonry construction extending up to the roof line in the case of pitched roofs;

e) the roof area is not larger than 200 m² on plan; or, in the case of pitched roofs where no parapets exist, one of the roof dimensions does not exceed 10 m;

f) there are no other buildings within 1.5 m of the perimeter of the building;

g) the roof has no abrupt changes of height greater than 1 m on which snow drifting could occur;

NOTE This limitation does not apply to the change of height between the main roof and the roof of a lower annexe, if the roof area of the annexe does not exceed 36 m².

Chimneys and dormers whose vertical elevation areas, against which a drift could form, are less than 1 m², need not be considered as being an abrupt change of height.

h) the maximum clear span of any floor joist or flat roof joist does not exceed 6.0 m;

i) the design wind speed does not exceed 44 m/s;

NOTE Guidance is given in BS 8103-1 and 8103-2 on how to determine whether a building is on a site with a design wind speed of more than 44 m/s. See also Figure H.3, related to standard trussed rafter bracing, in this Part of BS 8103. Guidance is given in Annex P regarding the determination of snow load for a particular site.

j) no part of any wall or roof is higher than 15 m above the lowest adjacent ground level;

k) floor joists, ceiling joists, flat roof joists, common or jack rafters or trussed rafters are spaced at centres which do not exceed 600 mm;

l) the stability requirements and dimensional limitations accord with clause 5 of BS 8103-1.

The sizes of timber shown in the span tables are limited to those normally readily available but do not preclude the use of larger or different sizes if justified by specialist calculation.

The design requirements and those for durability and timber preservation given in this Part of BS 8103 are related only to structural considerations. Reference should be made to other appropriate British Standards or statutory regulations to satisfy other considerations such as resistance to damp penetration, durability and timber preservation, fire resistance and surface spread of flame, thermal and sound insulation, and ventilation.

For trussed rafter roofs, this standard contains only as much information as is necessary for builders' staff to prepare specifications for trussed rafters and instructions on how to construct a simple trussed rafter roof.

2 References

2.1 Normative references

This Part of BS 8103 incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on page 160. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this Part of BS 8103 only when incorporated in the reference by updating or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

2.2 Informative references

This Part of BS 8103 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Definitions

For the purposes of this Part of BS 8103, the definitions given in BS 6100 apply, together with the following.

3.1

clear span

the clear distance between supports of joists, trimmed joists etc. and rafters, measured along the member

3.2

common rafter

timber rafter, not forming part of a truss, extending from eaves to ridge board, normally supported by purlins

3.3

flat roof

roof having a slope of not more than 10° from the horizontal

3.4

jack rafter

shortened rafter abutting a hip rafter or valley rafter

3.5

spacing of joists or rafters

the distance between the centres of joists or rafters

3.6

trimming joist

joist which, for part or all of its length, forms the edge of an opening (such as a stair well) and supports the end of a trimmer joist (see Figure 12 and Figure 13)

3.7

trimmer joist

joist supported at one or both ends by a trimming joist and supporting the ends of trimmed joists (see Figure 12 and Figure 13)

3.8

trimmed joist

joist supported at one or both ends by a trimmer joist

4 Materials

4.1 Timber

4.1.1 *Maximum moisture content*

The maximum moisture content at the time of erection or fixing should conform to Annex A.

4.1.2 *Flooring*

Softwood flooring should conform to and be graded in accordance with BS 1297. The timber should be one of the species listed in Annex B of this standard. The thickness should conform to 5.2.1.

As an alternative to softwood flooring, a hardwood of at least the same thickness as that given in 5.2.1 and having a density of at least 500 kg/m³ at 12 % moisture content should be used. In such a case, the grading should conform to Annex B.

4.1.3 *Flat roof decking*

Softwood flat roof decking should be tongued and grooved and should conform to BS 1297. The timber should be one of the species listed in Annex B of this standard. The thickness should conform to 8.2.1.1.

4.1.4 *Joists, beams or trimmers, trimming joists, common or jack rafters, purlins, ceiling joists and binders, trussed rafter material, and secondary solid timber structural members*

Joists, beams or trimmers, trimming joists, common or jack rafters, purlins, ceiling joists and binders, trussed rafter material, and secondary timber structural members of solid softwood, but not strutting or solid bridging between joists, should be stress-graded and marked in accordance with BS 4978 or BS EN 519 or the Canadian NLGA rules [1] or the USA NGRDL rules [2]. The sizes can be sawn, or processed in accordance with BS EN 336, or CLS/ALS sizes [4] [5] as defined in the NLGA or NGRDL rules outlined in National annex NA of BS EN 336:1987, all with the tolerances given in BS EN 336, or, for trussed rafter material, sizes as processed in accordance with BS 5268-3.

It should be noted that sizes to BS EN 336 are referred to by a target size and a tolerance class. The target size is the size desired by the specifier.

Tolerance class 1, designated (T1), is appropriate to sawn timber and tolerance class 2, designated (T2), is appropriate to planed or processed timber. The term “regularized” is not used in BS EN 336, but the same end result can be achieved by specifying the thickness dimension to be tolerance class 1 and the width dimension to be tolerance class 2, for example 50(T1) × 194(T2) (see National annex NA of BS EN 336. The span tables given in this standard (Table 6 to Table 73) are for sawn or processed sizes or surfaced CLS/ALS sizes.

Table 6 to Table 73 cover stress-grade/species combinations which, conform to strength classes C16 and C24 as defined in BS 5268-2:1996.

Softwood stress-grade/species combinations which conform to stress classes C16 and C24 are listed in Table 1. Identification marks for stress-graded timber should be in accordance with Annex C.

4.1.5 *Solid timber roof bracing, gable ladders, noggings, strutting, bridging or blocking between joints*

Timber for roof bracing, gable ladders, noggings, strutting, bridging or blocking between joists should be one of the species given in Table 1 and should be free from any major strength-reducing defects, and from distortions which could affect the serviceability.

Standard bracing for domestic trussed rafter roofs is described in Annex H with an erection procedure in Annex J.

4.1.6 *Wallplates*

Wallplates should be of one of the species given in Table 1 and should be free from any major distortion. The top surface should be free of wane. Sizes should be as recommended in 6.2.4 and 7.10.

4.1.7 *Battens for roof slating and tiling*

Battens to support roof slates or tiles should be of one of the species listed in Annex D. The sizes should be as recommended in 7.5.

Battens should span over at least three supports (i.e. at least two bays).

4.2 Plywood

4.2.1 *Flooring*

Plywood used for structural flooring where design is covered by Table 6 to Table 73 should be one of the types and grades given in Annex E. The thickness should conform to 5.2.2.

Table 1 — Stress-grade/species combinations which meet strength classes C16 and C24

Species	Grade to meet strength class C16	Grade to meet strength class C24
All species listed in this table, machine graded to BS EN 519 and marked accordingly	Machine graded to C16	C24
Imported redwood or whitewood graded to BS 4978	GS	SS
British-grown graded to BS 4978		
Douglas fir	SS	—
larch	SS	—
pine	SS	—
spruce	SS	—
Canadian graded to BS 4978		
Douglas fir-larch	GS	SS
hem-fir	GS	SS
spruce-pine-fir	GS	SS
Sitka spruce	SS	—
Canadian graded to NLGA		
Douglas fir-larch	Joist and Plank No. 1 and No. 2 Structural L.F. No. 1 and No. 2	Joist and Plank Select Structural L.F. Select
hem-fir	Joist and Plank No. 1 and No. 2 Structural L.F. No. 1 and No. 2	Joist and Plank Select Structural L.F. Select
spruce-pine-fir	Joist and Plank No. 1 and No. 2 Structural L.F. No. 1 and No. 2	Joist and Plank Select Structural L.F. Select
Sitka spruce	Joist and Plank Select Structural L.F.	—
Canadian graded to MSR Standard		
Douglas fir-larch	Machine stress-rated, 1 450f-1.3E	Machine stress-rated, 1 800f-1.6E
hem-fir	Machine stress-rated, 1 450f-1.3E	Machine stress-rated, 1 800f-1.6E
spruce-pine-fir	Machine stress-rated, 1 450f-1.3E	Machine stress-rated, 1 800f-1.6E
USA graded to BS 4978		
Douglas fir-larch	GS	SS
hem-fir	GS	SS
southern pine	GS	SS
spruce-pine-fir	GS	SS
western white woods	SS	—

Table 1 — Stress-grade/species combinations which meet strength classes C16 and C24

Species	Grade to meet strength class C16	Grade to meet strength class C24
USA graded to NGRDL		
Douglas fir-larch	Joist and Plank No. 1 and No. 2 Structural L.F. No. 1 and No. 2	Joist and Plank Select Structural L.F. Select
hem-fir	Joist and Plank No. 1 and No. 2 Structural L.F. No. 1 and No. 2	Joist and Plank Select Structural L.F. Select
spruce-pine-fir	Joist and Plank No. 1 and No. 2 Structural L.F. No. 1 and No. 2	Joist and Plank Select Structural L.F. Select
western white woods	Joist and Plank Select Structural L.F. Select	—
southern pine	Joist and Plank No. 3 Stud grade	Joist and Plank Select
USA graded to MSR Standard		
Douglas fir-larch	Machine stress-rated, 1 450f-1.3E	Machine stress-rated, 1 800f-1.6E
hem-fir	Machine stress-rated, 1 450f-1.3E	Machine stress-rated, 1 800f-1.6E
southern pine	Machine stress-rated, 1 450f-1.3E	Machine stress-rated, 1 800f-1.6E
spruce-pine-fir	Machine stress-rated, 1 450f-1.3E	Machine stress-rated, 1 800f-1.6E
NOTE 1 Where one stress grade is tabulated, any stronger stress grade of the same species also meets the strength class.		
NOTE 2 BS 5268-2 contains a larger selection of stress-grade/species combinations which meet C16 and C24 strength classes.		

4.2.2 Flat roof decking

Plywood used for structural flat roof decking where design is covered by Table 6 to Table 73 should be one of the types and grades given in Annex E. The thickness should conform to 8.2.1.

4.2.3 Identification marks

Identification marks for structural plywoods should be in accordance with Annex F.

4.3 Wood chipboard**4.3.1 Flooring**

Wood chipboard used for flooring where design is covered by Table 6 to Table 73 should be of type C4 or C5 of BS 5669-2. The thickness should conform to 5.2.3.

4.3.2 Flat roof decking

Wood chipboard used for decking on flat roofs of uninsulated roof design, or warm deck design, where covered by Table 6 to Table 73, should be of type C3, C4 or C5 of BS 5669-2.

The thickness should conform to 8.1.4.

NOTE The National House-Building Council (NHBC) does not accept type C3 for this use.

4.3.3 Identification marks

Identification marks for wood chipboard covered by 4.3.1 and 4.3.2 should be as given in Annex G.

4.4 Mechanical fasteners**4.4.1 Nails**

Nails should conform to BS 1202-1.

4.4.2 Screws

Steel screws should conform to BS 1210.

4.4.3 Bolts and washers

Bolts should conform to BS 4190. Bolts for timber fixings should be fitted with extra-large washers (form G, i.e. outside diameter approximately three times bolt diameter) which conform to BS 4320, or are made from equivalent steel plate of a size at least three times the bolt diameter.

4.4.4 Toothed-plate connector units

Toothed-plate connector units should conform to BS 1579.

4.4.5 Punched metal plate fasteners

Punched metal plate fasteners with either integral teeth or holes, through which separate nails are driven, should be manufactured from hot-dip galvanized plain sheet or coil of a grade defined in BS EN 10147 and with a maximum tensile strength of 450 N/mm² and a minimum elongation of 20 % over a 50 mm gauge length; or, where a greater resistance to corrosion is required, they should be manufactured from bare austenitic stainless steel of a grade defined in BS 1449-2.

4.4.6 Joist hangers

For timber to masonry connections, joist hangers should conform to BS 6178-1.(See also Figure 13.1 and Figure 13.2.)

4.4.7 Metal restraint straps

Straps providing lateral restraint or restraint against uplift of roofs should normally be of low-carbon steel protected by galvanizing, or of other suitably strong and durable materials as recommended in BS 5628-3.

5 Flooring

5.1 General

5.1.1 Loading

Flooring constructed in accordance with this standard is capable of supporting the loadings specified for residential occupancy class type 1 in BS 6399-1:1984.

The timber sizes given in the span tables can be used when a bath is to be placed on the floor area being supported, provided that the joists supporting the bath are doubled-up. This applies whether the joists are parallel or perpendicular to the length of a rectangular bath. Other shapes of bath may need special consideration. Special consideration should be given for other heavy concentrated loads.

5.1.2 Non-loadbearing lightweight partitions

Non-loadbearing lightweight partitions should be supported directly by a joist, beam, solid blocking or a nogging between joists (see Figure 9, Figure 10 or Figure 11). Partitions should not be supported directly by flooring.

NOTE 1 For the purposes of this standard, a non-loadbearing lightweight partition is considered to be one which weighs not more than 1 kN/m run. No member referred to in this standard is designed to support a loadbearing partition.

NOTE 2 Examples of non-loadbearing partitions which weigh 0.8 kN/m run (82 kg/m) or less, are those with facings of 12.7 mm thick plasterboard on timber studding or a lightweight core.

5.1.3 Support members

Members supporting domestic flooring should be at least 35 mm thick, or 38 mm thick if supporting a plasterboard ceiling.

5.2 Materials and fixing recommendations

5.2.1 Timber flooring

5.2.1.1 Species and size

Tongued and grooved softwood flooring of the species and grading detailed in Annex B should be of at least the finished thickness shown in Table 2.

Table 2 — Thickness of tongued and grooved softwood flooring for domestic loading

Maximum centres of support members mm	Finished thickness mm
505	16
600	19

5.2.1.2 Fixing

Timber flooring should be fixed in accordance with K.1.

5.2.2 Plywood flooring

5.2.2.1 Species and size

Plywood flooring should be of one of the grades listed in Annex E. The nominal thicknesses for the range of plywood described in 4.2 and Annex E, in relation to the joist centres, should conform to Table 3.

5.2.2.2 Fixing

Plywood flooring should be fixed in accordance with K.2.

5.2.3 Wood chipboard flooring

5.2.3.1 Specification and size

Wood chipboard flooring should be of one of the grades specified in 4.3.1 (i.e. type C4 or C5) and should have a nominal thickness conforming to Table 4.

5.2.3.2 Fixing

Wood chipboard flooring should be fixed in accordance with K.3.

6 Spans, sizes and spacings for solid timber members, notching, drilling and end-trimming

6.1 General

6.1.1 Span tables

Table 6 to Table 73 inclusive recommend timber sizes, spans and spacings for certain timber floor, flat roof, pitched roof and ceiling members. Explanatory notes and diagrams are also provided. In these tables all spans are measured as the clear distance between supports. All spacings are the distance between longitudinal centres of members. Table 5 is a key to the contents of the span Table 6 to Table 73.

Table 3 — Thicknesses of plywood flooring for domestic loading

Plywood type	Required nominal thickness mm	
	Support members at 450 mm centres maximum	Support members at 600 mm centres maximum
American Construction and Industrial Plywood: C-D Grade Exterior: Unsanded	15.0	18.0
American Construction and Industrial Plywood: C-C Grade Exterior: Unsanded	15.0	18.0
Canadian Douglas Fir Plywood: Select Tight Face: Select and Sheathing Grades: Unsanded	15.5	15.5
Canadian Softwood Plywood: Select Tight Face: Select and Sheathing Grades: Unsanded	15.5	18.5
Finnish Birch Faced Plywood: I/I, I/II etc.: Sanded	15.0	18.0
Finnish Conifer Plywood: I/I, I/II etc.: Sanded	15.0	18.0
Swedish Softwood Plywood: P30 Grade: Unsanded	16.0	16.0
NOTE The thicknesses shown apply to boards spanning three or more joists, where the face grain of the boards is perpendicular to the support members.		

Table 4 — Thickness of wood chipboard flooring for domestic loading

Maximum centres of support members mm	Nominal thickness mm
450	18
600	22

6.1.2 Loading

The recommendations given in this clause assume that the dead and imposed loads to be sustained by the floor, ceiling or roof of which the member forms part do not exceed the values given in the notes to the appropriate diagrams and tables. See also 5.1.1 and 5.1.2.

Examples of dead loading for typical floor, pitched roof and flat roof constructions are given in Annex N. These relate to the dead loading categories stated in individual span tables.

6.1.3 Strength classes

Combinations of species and stress grades of timber which achieve the strength classes to which the span tables relate are listed in Table 1. A more comprehensive listing of species/stress-grade combinations satisfying a particular strength class is given in BS 5268-2.

6.1.4 Sizes of solid timber members

The dimensions of solid timber members given in Table 6 to Table 73 are based upon the size and tolerance requirements of BS EN 336. For certain joist members (e.g. those supporting a ceiling) the tables have been prepared on the basis that members are processed in accordance with tolerance class 2 of BS EN 336 across the timber width (joist depth) or are CLS/ALS processed sizes to provide level surfaces for ease of ceiling lining and the fixing of structural decking. For other timber members (e.g. rafters, purlins and binders), the tables have been prepared on the basis of sawn dimensions or CLS/ALS processed sizes. The notes to individual tables state whether basic sawn or processed dimensioned timber is appropriate for the particular use. For timber of North American origin, the sizes shown are CLS/ALS sections, or sawn, resawn or processed to the BS EN 336 sizes and tolerances.

6.1.5 Recommendations for particular uses

6.2, 6.3 and 6.4 give recommendations for particular uses of solid timber structural members. These recommendations relate only to the particular constructional use identified and supplement the information given in the notes to particular span tables.

6.2 Floor joists and flat roof joists**6.2.1 Span tables**

Span Table 6 to Table 9 inclusive give recommendations on the sizing of floor joists. These members have been calculated in accordance with BS 5268-7.1:1989 to be capable of supporting the loadings given for each table.

Table 6 and Table 7 should be applied where there are no partitions on the floor area being supported. Table 8 and Table 9 should be applied where non-loadbearing lightweight partitions as described in 5.1.2, at centres as close as is likely to occur, are supported on the floor. Table 8 and Table 9 should be used in conjunction with Figure 10, Figure 11 and Figure 12. See also 5.1.1 regarding support for baths and other heavy concentrated loads.

Span Table 60 to Table 67 inclusive give recommendations on the sizing of flat roof joists. These members have been calculated in accordance with BS 5268-7.2:1989 to be capable of supporting the loadings given for each table. Table 60, Table 61, Table 62, Table 64, Table 65 and Table 66 should be applied to situations where the only access is for the purposes of maintenance and repair. Table 63 and Table 67 should be applied to situations where access is not limited to the purposes of maintenance and repair. See Annex P for guidance on the snow loading which is relevant for a particular site.

6.2.2 Notching, drilling and end-trimming

Notches, holes and end-trimming in floor joists and flat roof joists should be within the limits shown in Figure 1.

6.2.3 Strutting or bridging

Where the span of a floor joist or flat roof joist is more than 2.5 m, strutting is necessary. This should be provided either by timber bridging or strutting in accordance with Figure 3, or by a proprietary system.

Timber strutting can be in the form of solid bridging of at least 38 mm basic thickness and with a depth equal to at least three-quarters of the depth of the joists; or it can consist of herringbone strutting with members of at least 38 mm by 38 mm basic size. Herringbone strutting should not be used where the distance between the joists is more than approximately three times the depth of the joists.

6.2.4 Wallplates

Timber wallplates used to support floor joists and flat roof joists should be at least 70 mm wide. In England and Wales it is normal for wallplates to have a basic thickness of 38 mm, whilst in Scotland thicknesses of 25 mm or 47 mm are common. These thicknesses are acceptable for this Part of BS 8103. Joints along a wallplate should be made either with a halving joint at least 100 mm long with at least two nail fixings (see Figure 4), or by means of a proprietary fixing at a butt joint. A joint between wallplates at a corner should either be a halving joint with at least two nail fixings, or a proprietary fixing at a butt joint.

6.2.5 Bearing length

The ends of floor joists and flat roof joists are normally supported on masonry, a wallplate or a hanger. The bearing lengths given with each span table are minimum design values. It may be necessary to provide a longer bearing to accommodate the end fixings or, in the case of floor joists supported on masonry, to provide at least a 90 mm bearing to give restraint to the masonry wall.

6.2.6 Tying of floors and flat roofs to walls

Tying of floors and flat roofs to walls should be in accordance with 5.2 of BS 8103-1:1995. The strap details are shown in Figure 2 and Figure 7 a).

6.3 Trimmers, trimming joists and beams supporting floor joists

6.3.1 Span tables

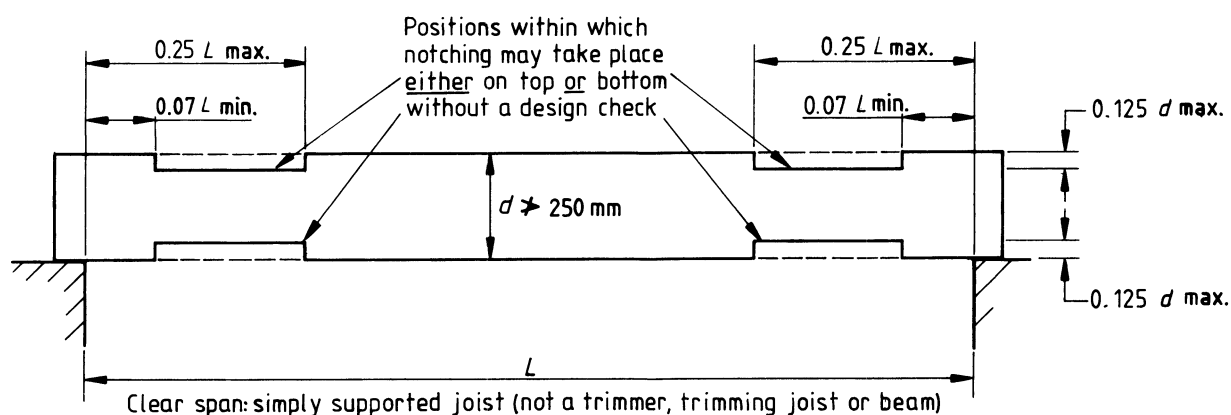
Span Table 10 to Table 19 inclusive give recommendations on the sizing of trimmers, trimming joists and beams supporting a range of floor joist arrangements. These members are defined diagrammatically in the plans in Figure 12 to Figure 14, related to the relevant span tables. These members have been calculated in accordance with BS 5268-2:1996 to be capable of supporting the loadings applied by the various floor joist arrangements. Table 10, Table 11, Table 12, Table 13, Table 16 and Table 17 should be applied to situations where partitions do not occur on the floor area being supported. Table 14, Table 15, Table 18 and Table 19 should be applied to situations where non-loadbearing lightweight partitions (see 5.1.2) are supported on the floor.

6.3.2 Notching, drilling and end-trimming

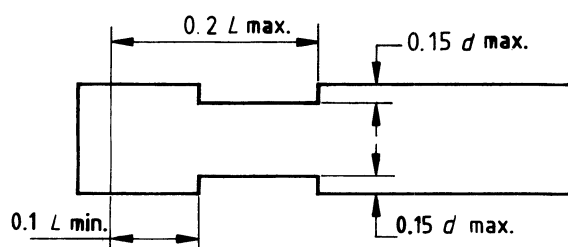
Trimmers, trimming joists and beams supporting floor joists should not be notched, drilled or end-trimmed unless justified by specialist calculation.

6.3.3 Bearing

The ends of trimmers, trimming joists and beams supporting floor joists are normally supported on masonry, a wallplate or a hanger. The recommended minimum bearing length needed to support the design load is given with each span table for the worst design case within each table. It may be necessary to provide longer bearing to accommodate fixings or to give restraint to masonry.

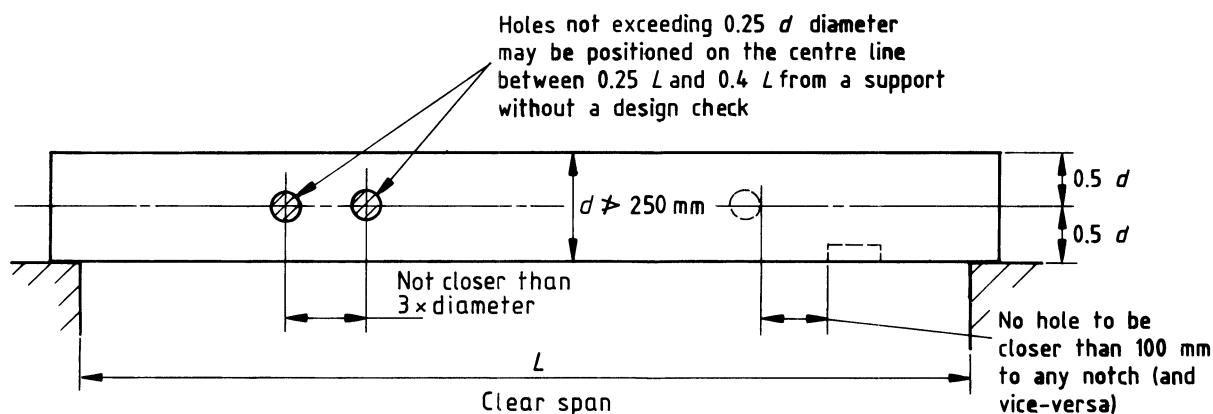


a) Limits for notching



NOTE This alternative notching may occur at both ends, either on top or bottom, without a design check.

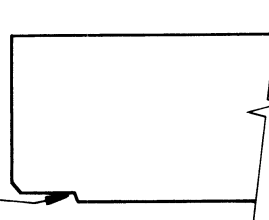
b) Alternative limits for notching



NOTE The holes permitted on the centre line may occur as well as a notch on the top or bottom.

c) Limits for drilling

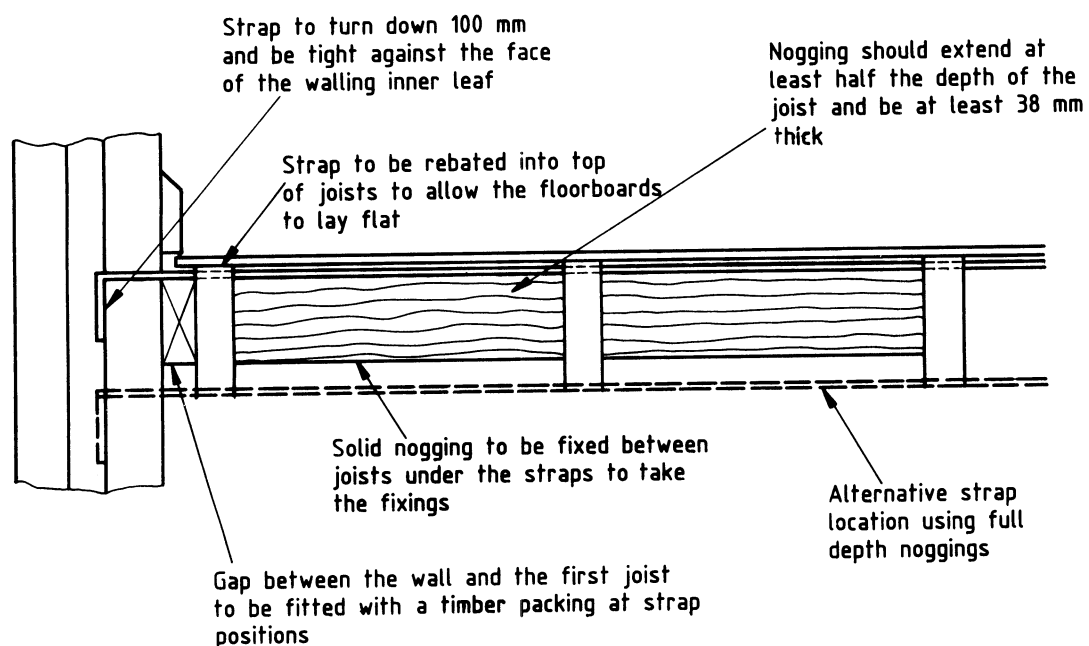
Ends of joists, trimmers etc. supported by a joist hanger of the type shown in figure 13 should be shaped to house the thickness of the joist hanger as shown



NOTE The type shown in Figure 13.4 does not require the additional angled trim cut.

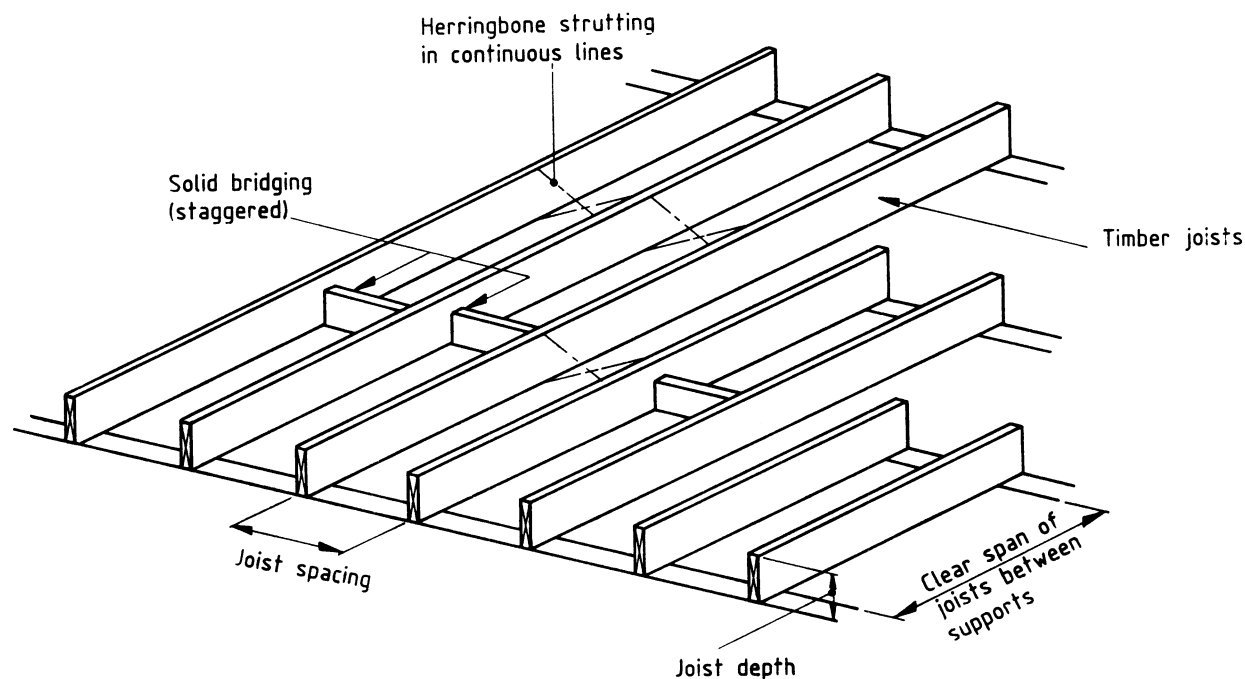
d) End trimming

Figure 1 — Limits for notching and drilling of floor joists, and end-trimming to fit steel hangers



NOTE The strap should be carried over at least three joists and be secured with four fixings, of which at least one should be in the third joist or in a nogging beyond the third joist.

Figure 2 — Timber floor spanning parallel with a wall

**Solid bridging**

Solid timber with a basic thickness of at least 38 mm

Herringbone strutting

Formed from solid timber sections

Joist clear span m	Number of rows of bridging/strutting required	Position of bridging/strutting
Up to 2.5	None	—
Over 2.5 and up to 4.5	One	At joist mid-span
Over 4.5	Two	At joist one-third span positions

NOTE Herringbone strutting should not be used where the spacing of the joists is greater than approximately three times the depth of the joist. In these instances only solid bridging should be used.

Figure 3 — Timber joist bridging/strutting requirements

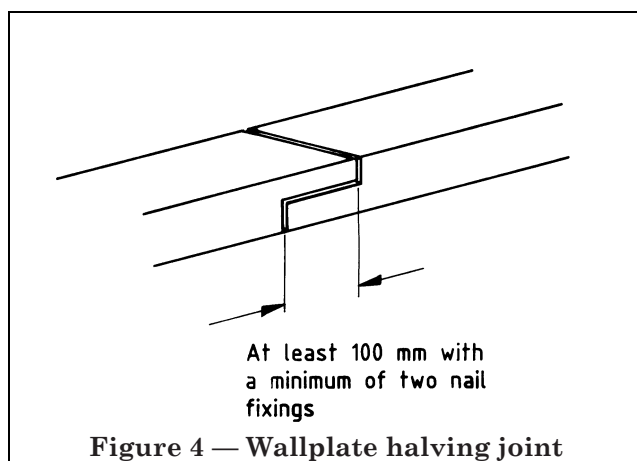


Figure 4 — Wallplate halving joint

6.4 Traditional cut, framed pitched roof construction

6.4.1 General

A typical arrangement of a traditional cut, framed pitched roof construction is shown in Figure 5.

Span Table 20 to Table 59 inclusive recommend member sizes for traditional cut, framed pitched roofs which include ceiling joists, binders to support ceiling joists, rafters, and purlins to support rafters. A number of rafter pitches and rafter loading conditions are covered which are in accordance with BS 6399-3:1988. The span tables may be used for member selection without further calculation, provided that the conditions referred to in the scope apply, together with the following:

- a) the dead and imposed loadings to be sustained by the ceiling, or the roof of which the members form a part do not exceed the values given in the notes to the appropriate diagrams or tables; and
- b) the timber is not holed or notched, other than birdsmouthing of rafters to a depth not exceeding one third of the depth of a rafter.

See Annex P for guidance on the snow loading which is relevant for a particular site.

6.4.2 Bracing

A traditional cut, framed pitched roof generally has sufficient built-in resistance to instability and wind forces by virtue of the nature of the roof and supporting construction (e.g. use of purlins and binders, propping to members, hip ends etc.). It is therefore not normally necessary to provide specific and purpose-installed bracing for such roofs, unless aspects of the design are of unusual layout such that bracing would need to be considered. Such unusual layouts are not covered by this Part of BS 8103.

6.4.3 Battens for roof slating and tiling

Battens for roof slating and tiling of the species listed in Annex D should be in accordance with the sizes and tolerances given in 7.5.

NOTE This information has been presented in 7.5, which deals with trussed rafters, rather than in 6.4.3, as trussed rafters are the most common current form of construction for pitched roofs on small buildings.

6.4.4 Wallplates

Cut, framed, pitched roofs are normally supported on timber wallplates or similar flat bearing surfaces which should be carefully levelled and positioned to ensure that the roof is correctly aligned, with the bearings located at the positions assumed in the design and shown on the drawings. In all cases, the bearing areas should be sufficient to ensure that the permissible stresses for compression perpendicular to the grain are not exceeded in either the bearing or the roof timber. As a guide, the length of the bearing should be not less than 0.008 times the span of the roof, with a minimum value of 70 mm.

Joints along a wallplate should be made either with a halving joint at least 100 mm long with at least two nail fixings (see Figure 4), or by use of a proprietary fixing at a butt joint. A joint, between wallplates at a corner should either be a halving joint with at least two nail fixings, or consist of a proprietary fixing at a butt joint.

In England and Wales it is normal for wallplates to have a basic thickness of 38 mm, whilst in Scotland thicknesses of 25 mm or 47 mm are typical. These thicknesses are acceptable for this Part of BS 8103.

6.4.5 Connections including metal restraint straps

For recommendations regarding tying the roof to the walls, see 4.4 of BS 8103-1:1995. The tying details are shown in Figure 6 and Figure 7 b).

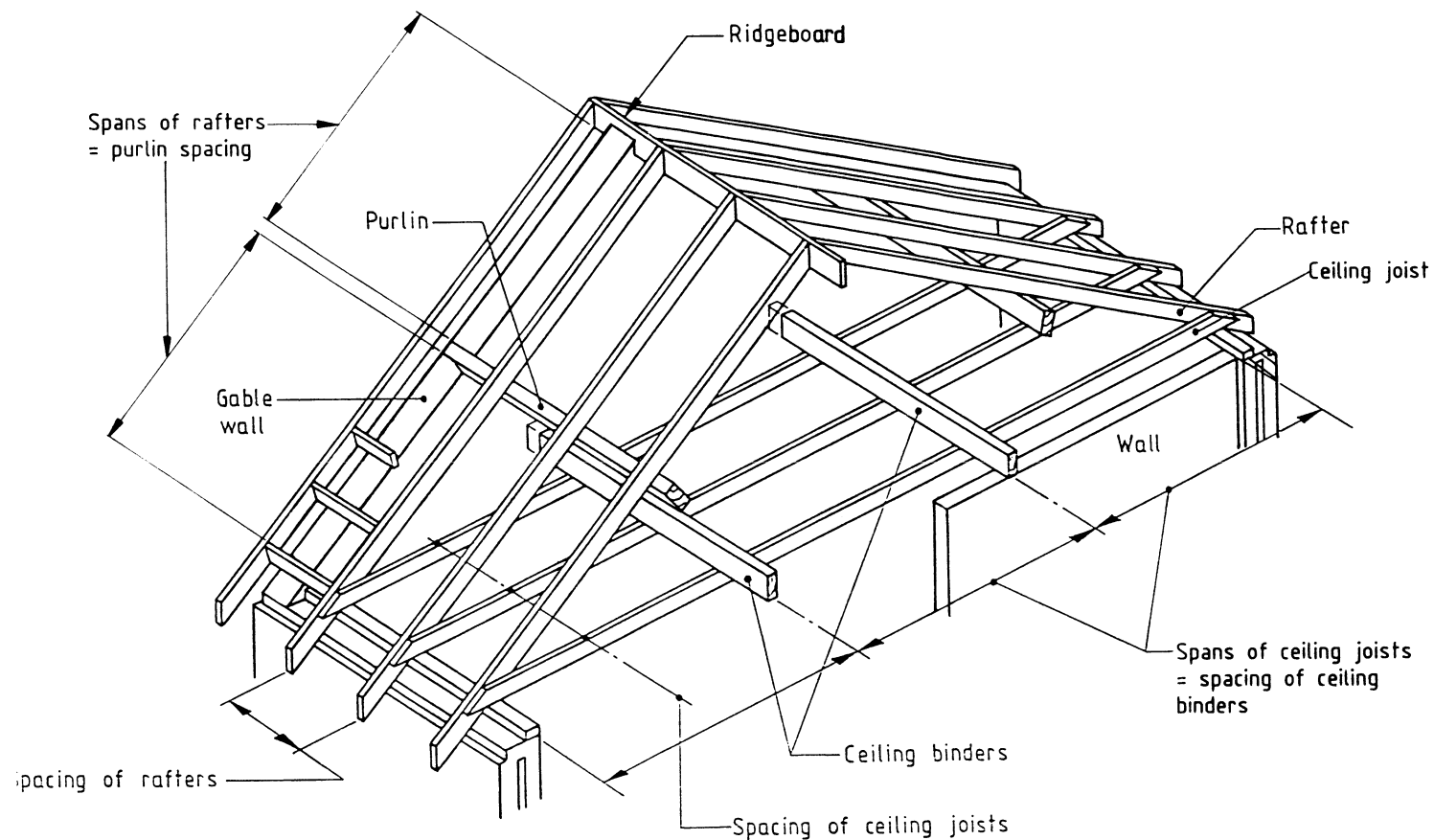
Wallplates can be held down by one of the proprietary types of fixings [see Figure 7 b)] or, in the case of certain pitched roofs [see 5.4.1 c) of BS 8103-1:1995], but not flat roofs, by nails into blockwork (but not into brickwork) by 75 mm long masonry nails at centres not exceeding 1 m, taking care to avoid vertical mortar joints.

At the eaves, each rafter or ceiling joist should be fixed to a wallplate by one of the proprietary types of fixings [see Figure 7 b)] or by nails. If nails are used, the minimum fixing at each bearing position should consist of two 4.5 mm diameter by 100 mm long round wire nails skew-nailed from each side of the ceiling joist or rafter into the wallplate.

If it is necessary to join lengths of rafters, the joint should be at a support position if bending is to be avoided in the connection. A typical detail which is not designed to take bending is shown in Figure 5 b).

If it is necessary to join lengths of ceiling joists, the joint should occur at a support position if bending is to be avoided in the connection. A typical detail which is not designed to take bending is shown in Figure 5 d).

It is necessary to join rafters to ceiling joists at the eaves. Typical details are shown in Figure 5 e).

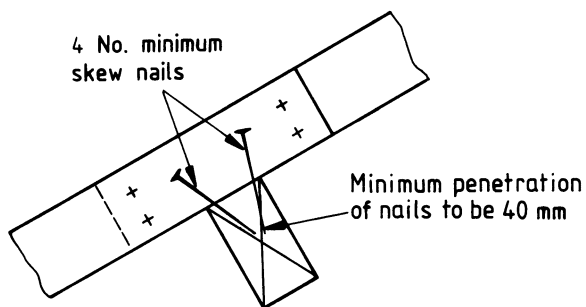


NOTE 1 Span of purlins and binders is not shown.

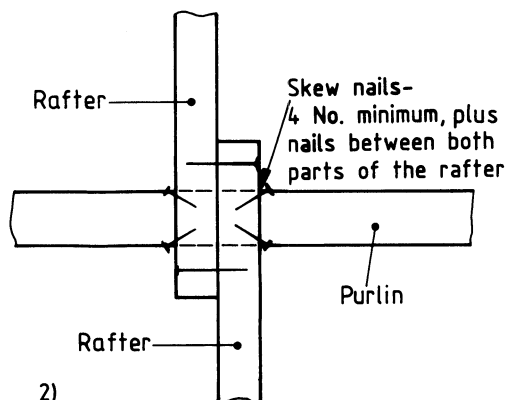
NOTE 2 Rafters may be jointed along their length over a purlin [see Figure 5 b)]. For a typical connection of rafter to ridgeboard, see Figure 5 c). Ceiling joists will probably be jointed along their length under a binder [see Figure 5 d)].

a) Typical arrangement

Figure 5 — Traditional cut framed pitched roof (continued)



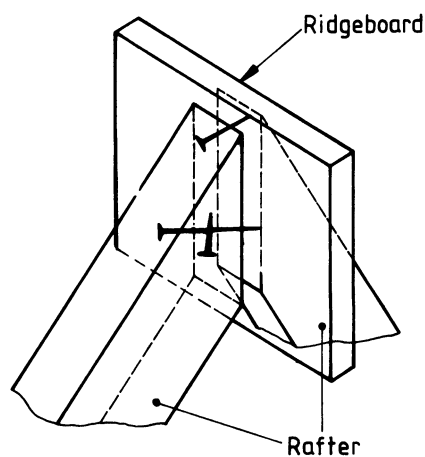
1)



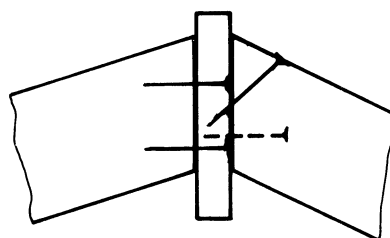
2)

NOTE This joint is not designed to take axial compression.

b) Typical detail of joint in a rafter over a purlin

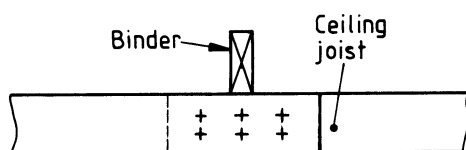


1)

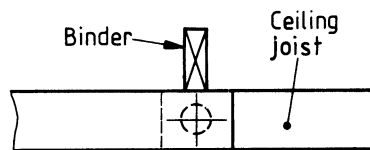


2)

c) Typical detail of joint of rafter to ridgeboard



1) Typical detail with nails between binder and ceiling joist

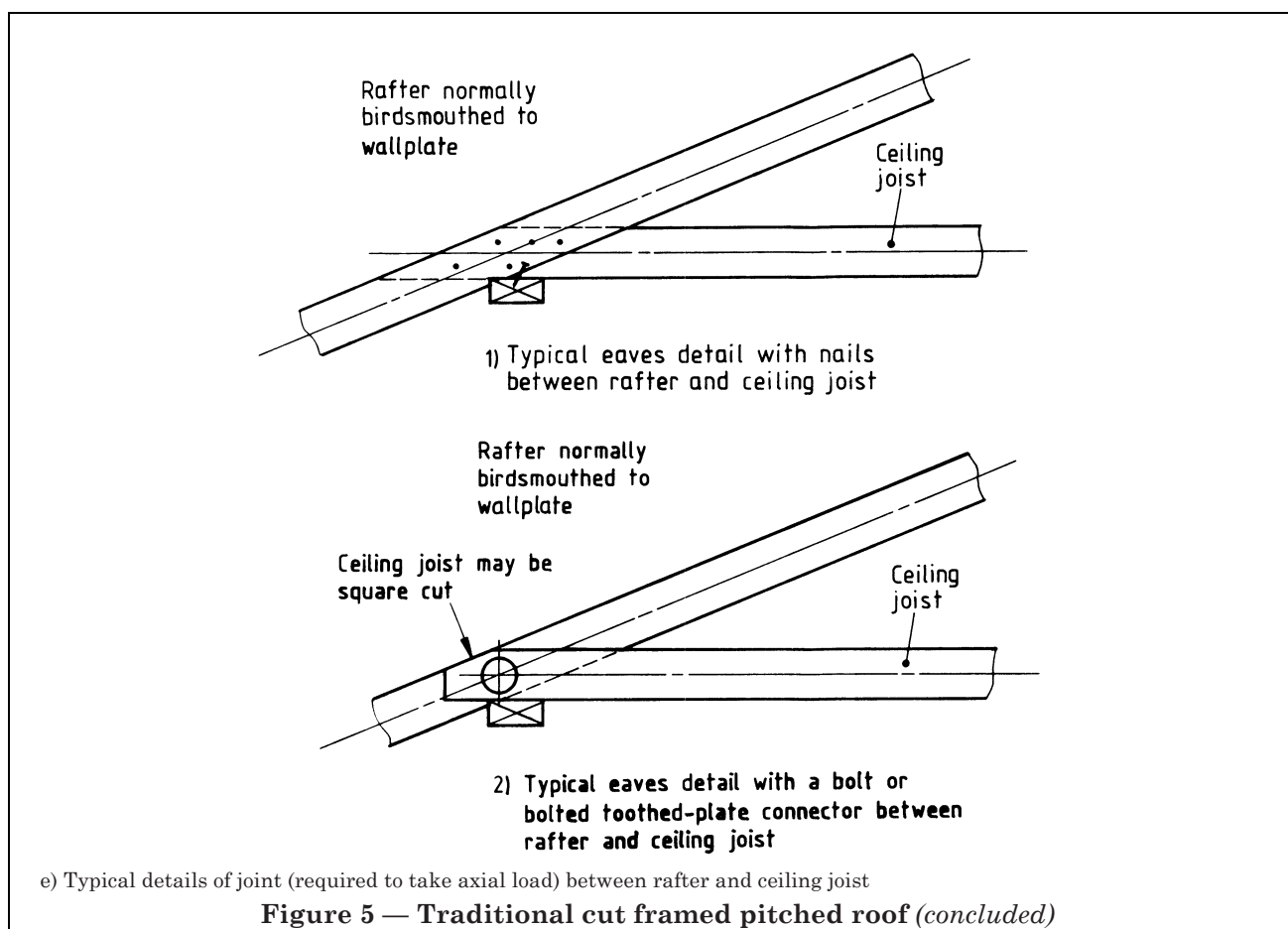


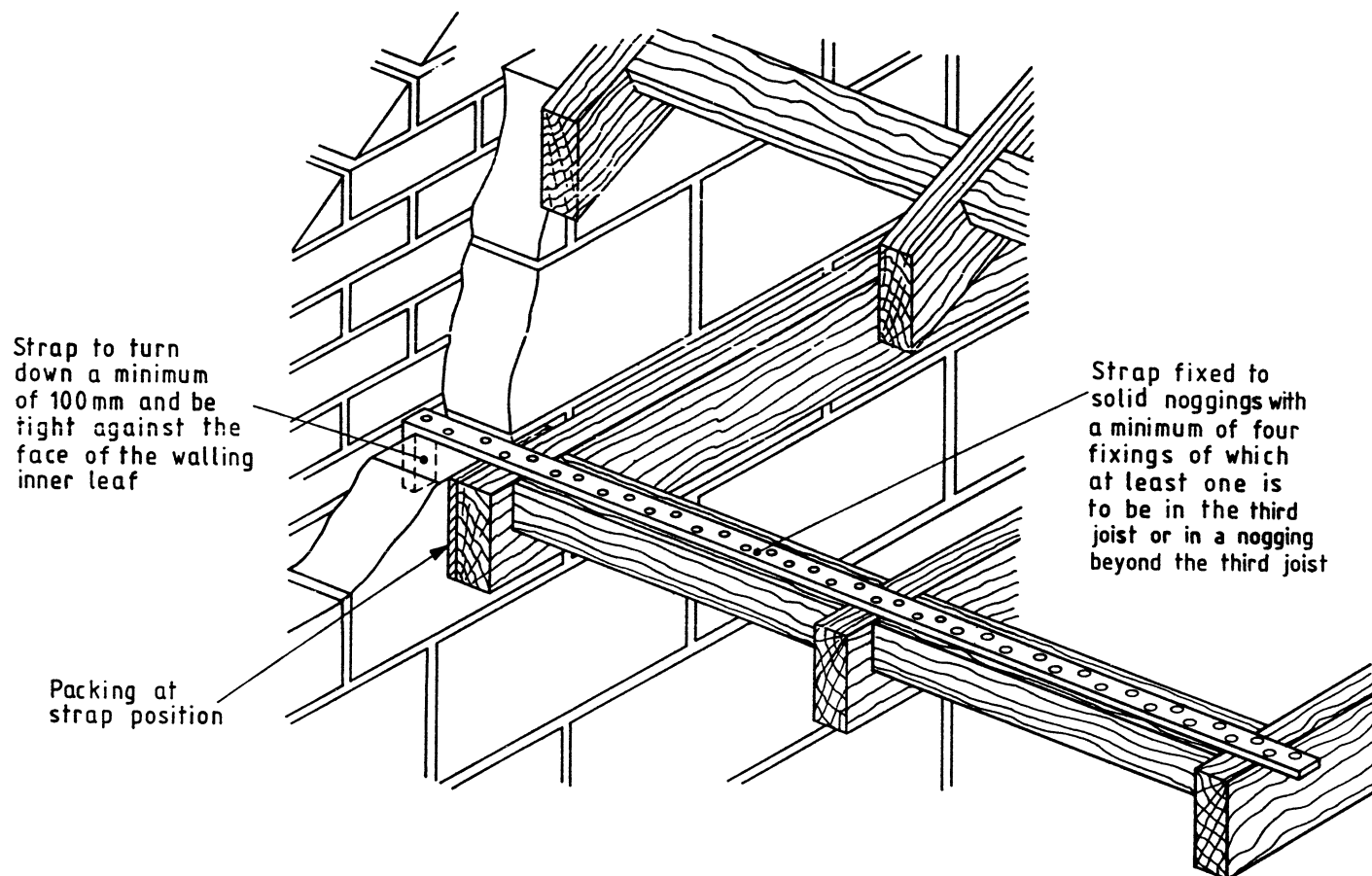
2) Typical detail with bolt or bolted toothed-plate connector between binder and ceiling joist

NOTE Binders and ceiling joists are fixed together by nails, a hanger or proprietary clip.

d) Typical details of joint (required to take axial tension) along length of ceiling joists at a binder position

Figure 5 — Traditional cut framed pitched roof (continued)

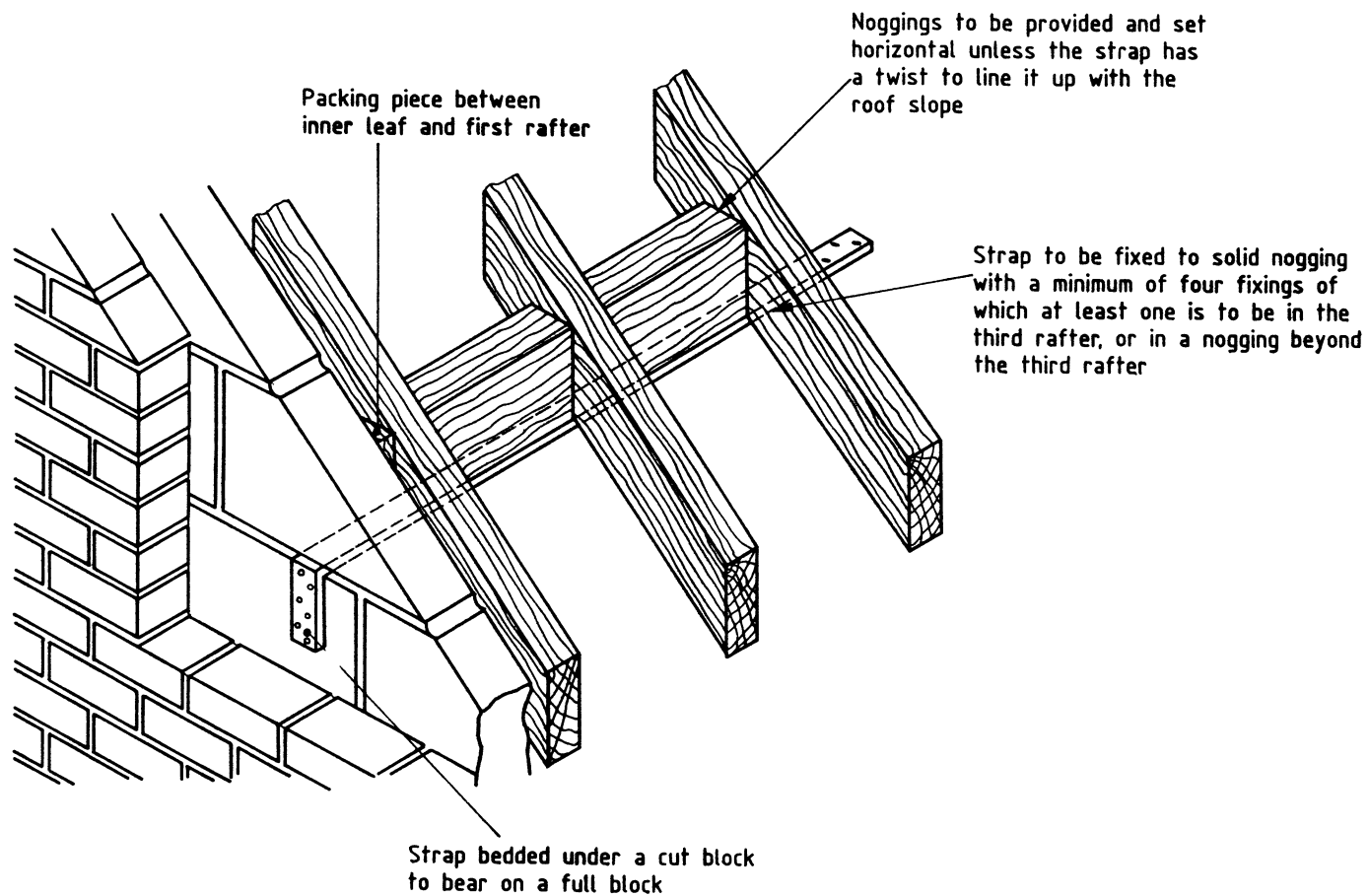




NOTE A similar detail applies for a flat roof spanning parallel with a wall.

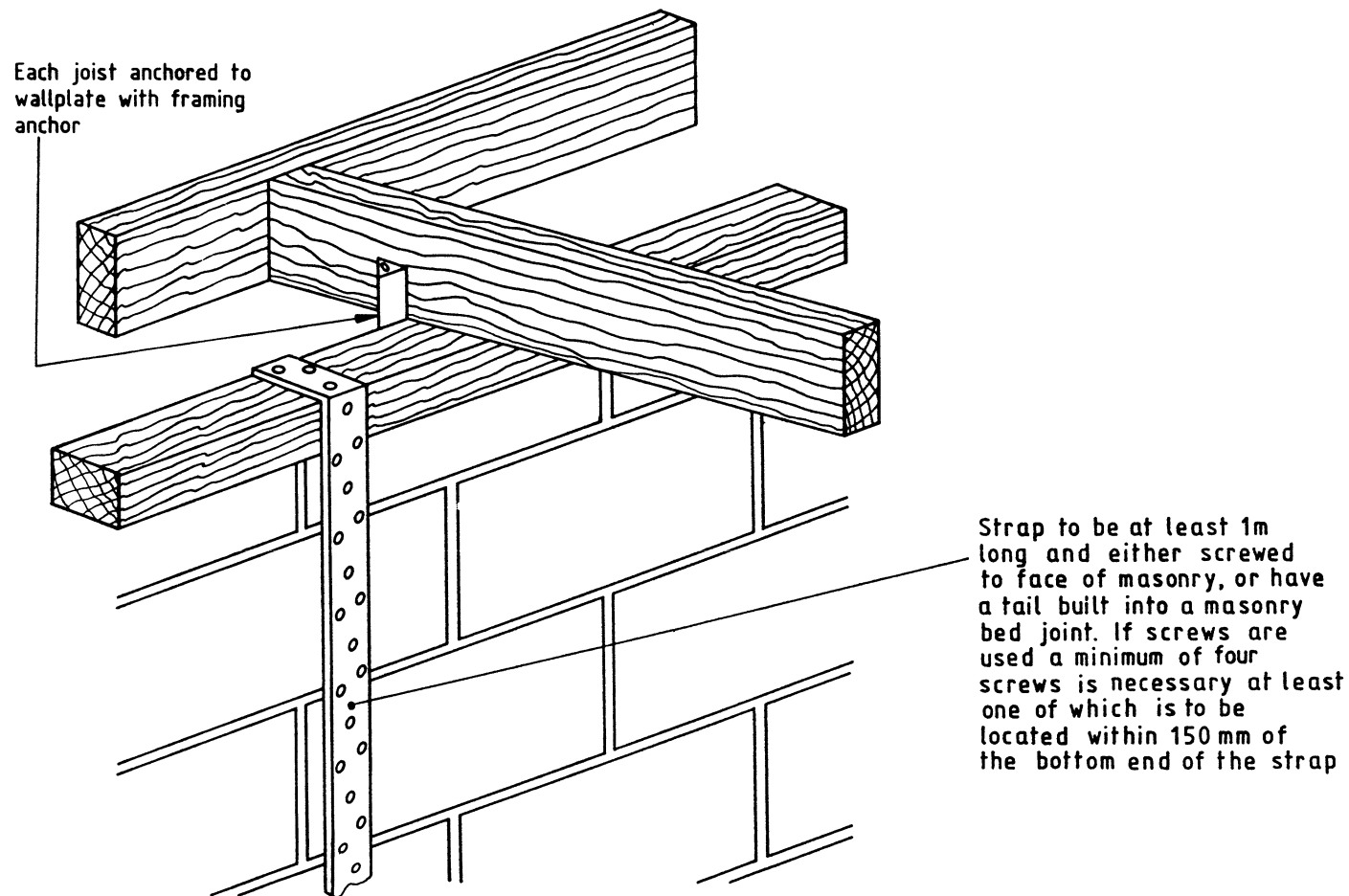
a) Pitched roof: strapping at ceiling where roof spans are parallel with a wall

Figure 6 — Tying of pitched roofs to gable walls *(continued)*



b) Pitched roof: connections at gable verge line

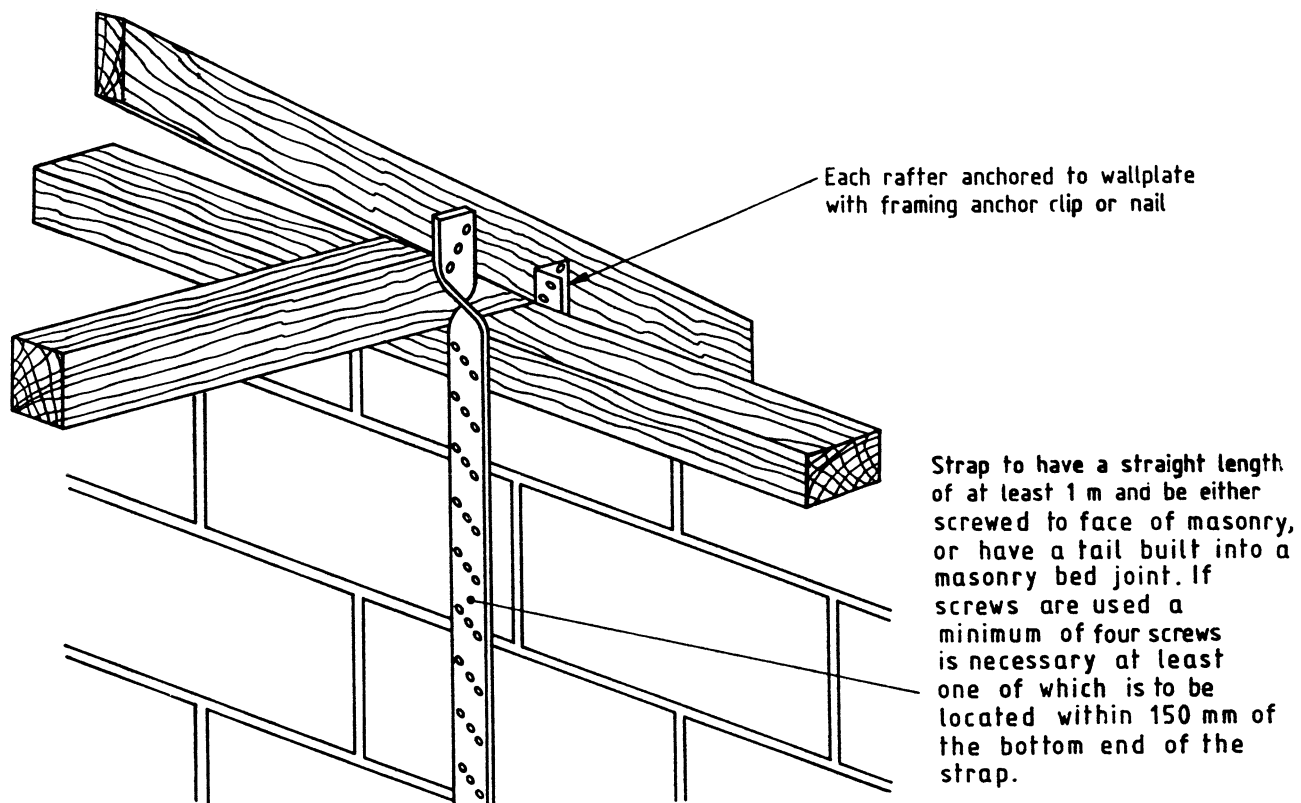
Figure 6 — Tying of pitched roofs to gable walls (concluded)



a) Restraining a roof against uplift by use of a framing anchor and wallplate straps

NOTE Vertical restraint straps as detailed should be provided at centres not exceeding 2 m.

Figure 7 — Pitched or flat roof bearing on to a wallplate *(continued)*



b) Rafter strap

NOTE Vertical restraint straps as detailed should be provided at centres not exceeding 2 m, and every rafter should be fixed to the wallplate.

Figure 7 — Pitched or flat roof bearing on to a wallplate (concluded)

Table 5 — Key to Table 6 to Table 73

Construction element	Timber member	Table reference	
		Timber strength class (see Table 1)	
		C16	C24
Floors:			
Not supporting partitions	Joists	6	7
	Beams or trimmers	10 and 11	12 and 13
	Trimming joists	16	17
Supporting non-loadbearing lightweight partitions	Joists	8	9
	Beams or trimmers	14	15
	Trimming joists	18	19
Ceilings:	Joists	20	22
	Binders	21	23
Pitched roofs:			
Pitch greater than 15° but not more than 22½°			
— Imposed snow load 0.75 kN/m ²	Rafters	24	30
	Purlins	25	31
— Imposed snow load 1.00 kN/m ²	Rafters	36	42
	Purlins	37	43
— Imposed snow load 1.25 kN/m ²	Rafters	48	54
	Purlins	49	55
Pitch greater than 22½° but not greater than 30°			
— Imposed snow load 0.75 kN/m ²	Rafters	26	32
	Purlins	27	33
— Imposed snow load 1.00 kN/m ²	Rafters	38	44
	Purlins	39	45
— Imposed snow load 1.25 kN/m ²	Rafters	50	56
	Purlins	51	57
Pitch greater than 30° but not greater than 45°			
— Imposed snow load 0.75 kN/m ²	Rafters	28	34
	Purlins	29	35
— Imposed snow load 1.00 kN/m ²	Rafters	40	46
	Purlins	41	47
— Imposed snow load 1.25 kN/m ²	Rafters	52	58
	Purlins	53	59

Table 5 — Key to Table 6 to Table 73

Construction element	Timber member	Table reference	
		Timber strength class (see Table 1)	
		C16	C24
Flat roofs: With access for the purposes of maintenance and repair only — Imposed snow load 0.75 kN/m^2 — Imposed snow load 1.00 kN/m^2 — Imposed snow load 1.25 kN/m^2	Joists Joists Joists	60 61 62	64 63 66
With access not limited to the purposes of maintenance and repair — 1.50 kN/m^2	Joists	63	67
Sheeted or decked roofs: Pitch greater than 10° but not greater than 35° — Imposed snow load 0.75 kN/m^2 — Imposed snow load 1.00 kN/m^2 — Imposed snow load 1.25 kN/m^2	Purlins Purlins Purlins	68 69 70	71 72 73
NOTE 1 The strength classes given in Table 6 to Table 73 assume that the qualifying species/stress grade combinations to be used are those given in Table 1. NOTE 2 The illustrations which accompany the span tables are diagrammatic and do not show all details of construction. Adequate connections between members should be provided as appropriate. NOTE 3 The imposed snow loading categories assume that actual imposed loads on roof constructions will be calculated under the small buildings criteria as set out in BS 6399-3. See Annex P for guidance on which snow loading condition is relevant for a particular site. NOTE 4 Span tables are not given for trussed rafter roof constructions. Trussed rafters should be designed in accordance with BS 5268-3.			

FLOOR JOISTS

Notes to Table 6, Table 7, Table 8 and Table 9

NOTE 1 The sizes, spacings and spans given will support the dead loads stated in the tables together with an imposed load not exceeding 1.50 kN/m^2 . Examples of some typical floor constructions and their respective dead loadings are given in Annex N. In addition, Table 8 and Table 9 make allowance for non-loadbearing lightweight partitions weighing not more than 0.8 kN/m run at spacings as close as is likely to occur in practice. See also Figure 8.

When a lightweight partition is parallel to the joist span, one additional joist should be provided directly under the partition, as shown in Figure 9 or Figure 10, or noggings should be provided as shown in Figure 11. Non-loadbearing lightweight partitions perpendicular to floor joists spaced at centres not exceeding 600 mm do not require support from noggings.

The timber sizes given in the span tables can be used when a bath is to be placed on the floor area being supported providing that the joists supporting the bath are doubled-up. This applies both if the joists are parallel or perpendicular to the length of a rectangular bath. Other shapes of bath may need special consideration. Special consideration may also be required for other heavy concentrated loads.

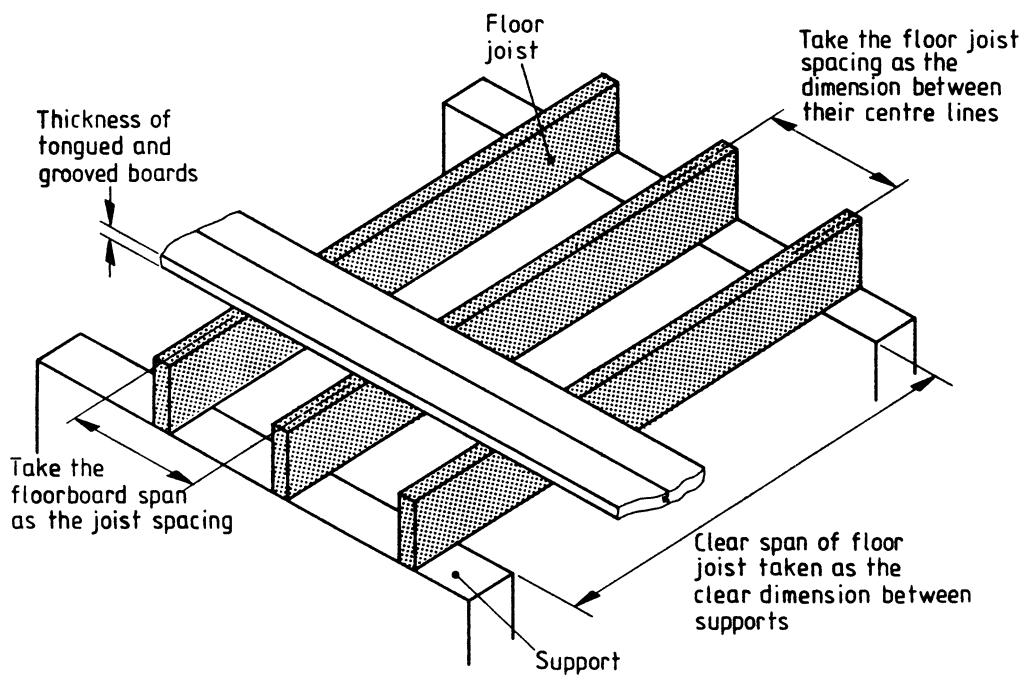
NOTE 2 The section sizes given in the tables are either sawn across the timber thickness in accordance with tolerance class 1 of BS EN 336 and processed in accordance with tolerance class 2 across the timber width (joist depth), or are CLS/ALS processed sizes in accordance with tolerance class 2, to provide level surfaces for ease of ceiling lining and the fixing of structural decking. BS EN 336 tolerances are as follows:

- a) on a sawn thickness of less than 100 mm (tolerance class 1):
 - 1 mm;
 - + 3 mm;
- b) on a processed depth (tolerance class 2):
 - 1.5 mm;
 - + 1.5 mm.

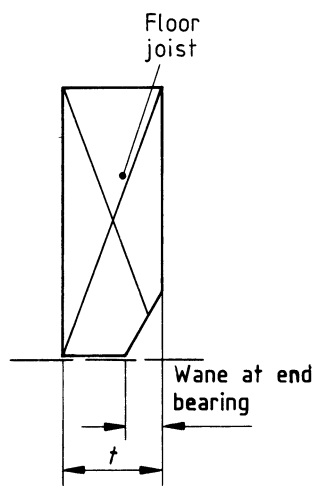
NOTE 3 Unless justified by specialist calculation, the minimum bearing length at supports for floor joists should be as stated at the base of each table. It may be necessary to provide longer bearing to accommodate fixings or simply for practical reasons such as construction tolerances. If the end of a joist is supported on a steel hanger, the end should if necessary be shaped to fit the hanger neatly as indicated in diagrammatic form in Figure 1d), and the gap between the end of the joist and the inside face of the hanger should not exceed 6 mm. If the end of a joist is supported on masonry, the end bearing should be at least 90 mm to provide restraint to the masonry wall.

NOTE 4 Notching and drilling of floor joists should not exceed the limits given in 6.2.2 and Figure 1.

NOTE 5 Permissible clear spans have been calculated in accordance with BS 5268-7.1:1989.



a) General



b) Wane

Figure 8 — Floor joist arrangement

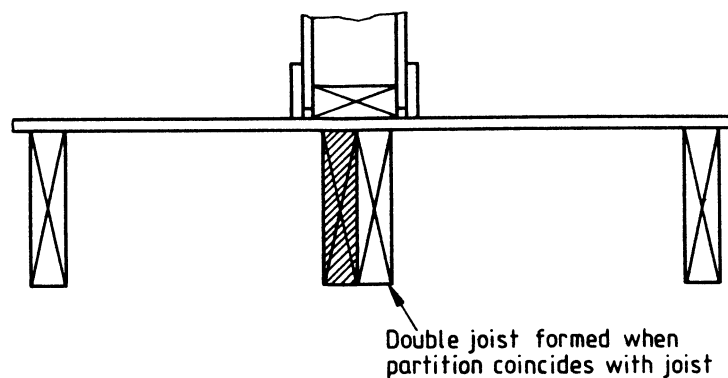


Figure 9 — Double joist construction

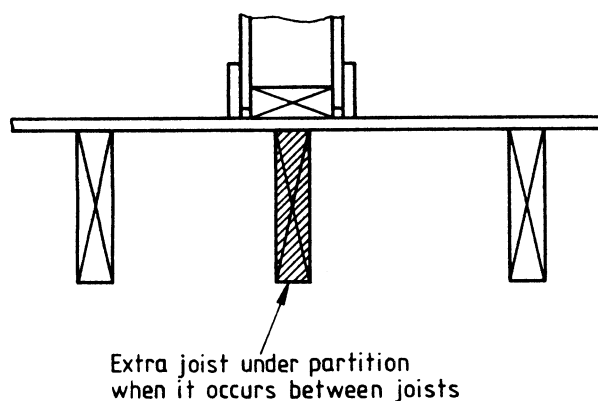


Figure 10 — Provision of extra joist

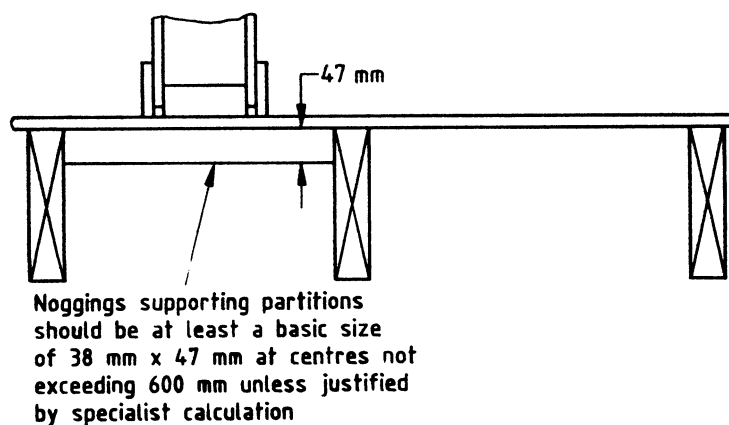


Figure 11 — Noggings supporting partitions

Table 6 — Permissible clear spans of joists supporting floors with no partitions.
Timber of strength class C16

C16 **No partitions**

Size of joist ^a mm × mm		Dead load kN/m ²								
		Not more than 0.25			More than 0.25 but not more than 0.50			More than 0.50 but not more than 1.25		
		Spacing of joists mm								
		400	450	600	400	450	600	400	450	600
		Maximum clear span of joist m								
BS EN 336 sizes with sawn thickness to tolerance class 1 and processed depth to tolerance class 2	38 × 72	1.130	1.011	0.767	1.061	0.954	0.731	0.920	0.834	0.652
	38 × 97	1.828	1.692	1.303	1.717	1.556	1.214	1.423	1.301	1.037
	38 × 122	2.482	2.385	1.925	2.368	2.215	1.755	1.947	1.791	1.448
	38 × 147	2.983	2.868	2.510	2.853	2.707	2.331	2.453	2.290	1.872
	38 × 170	3.442	3.306	2.873	3.281	3.098	2.690	2.808	2.649	2.267
	38 × 195	3.939	3.752	3.263	3.724	3.518	3.056	3.189	3.010	2.609
	38 × 220	4.434	4.193	3.648	4.161	3.932	3.418	3.567	3.367	2.920
	47 × 72	1.324	1.233	0.942	1.272	1.154	0.891	1.091	0.993	0.783
	47 × 97	2.024	1.914	1.583	1.920	1.818	1.460	1.665	1.527	1.228
	47 × 122	2.663	2.561	2.302	2.548	2.450	2.087	2.255	2.081	1.696
	47 × 147	3.200	3.078	2.786	3.062	2.945	2.609	2.723	2.570	2.174
	47 × 170	3.691	3.551	3.188	3.533	3.398	2.987	3.116	2.942	2.552
	47 × 195	4.221	4.063	3.619	4.042	3.889	3.391	3.538	3.341	2.900
	47 × 220	4.723	4.572	4.044	4.549	4.354	3.791	3.954	3.735	3.244
	63 × 97	2.319	2.197	1.919	2.191	2.079	1.822	1.934	1.839	1.533
	63 × 122	2.931	2.821	2.566	2.807	2.700	2.454	2.527	2.429	2.088
	63 × 147	3.518	3.388	3.084	3.370	3.244	2.950	3.037	2.920	2.577
	63 × 170	4.055	3.905	3.558	3.886	3.741	3.404	3.504	3.370	2.950
	63 × 195	4.633	4.465	4.070	4.442	4.278	3.896	4.009	3.850	3.350
	63 × 220	5.061	4.923	4.580	4.905	4.770	4.365	4.512	4.301	3.745
	75 × 12	3.100	2.985	2.718	2.970	2.859	2.601	2.677	2.575	2.327
	2	3.719	3.582	3.265	3.564	3.432	3.125	3.216	3.094	2.807
	75 × 147	4.283	4.128	3.765	4.107	3.957	3.605	3.709	3.569	3.212
	75 × 170	4.830	4.700	4.306	4.683	4.523	4.125	4.242	4.084	3.646
	75 × 195	5.268	5.128	4.793	5.109	4.971	4.641	4.740	4.595	4.074
75 × 220										
CLS/ALS sizes	38 × 89	1.617	1.463	1.121	1.499	1.356	1.052	1.259	1.149	0.910
	38 × 140	2.843	2.733	2.398	2.719	2.587	2.167	2.330	2.149	1.752
	38 × 184	3.721	3.557	3.092	3.530	3.334	2.895	3.022	2.852	2.471
	38 × 235	4.710	4.460	3.890	4.430	4.180	3.640	3.800	3.590	3.110

Minimum design bearing length

If wane at end-bearing [see Figure 8 b)] is permitted to the strength class limit, i.e. one-third of thickness for strength class C16, the minimum design bearing length is 38 mm.

If wane is not permitted, the minimum design bearing length is 20 mm.

See also note 3 to Table 6, Table 7, Table 8 and Table 9.

^a The availability of section sizes should be checked.

**Table 7 — Permissible clear spans of joists supporting floors with no partitions.
Timber of strength class C24**

C24

No partitions

Size of joist ^a mm × mm		Dead load kN/m ²								
		Not more than 0.25			More than 0.25 but not more than 0.50			More than 0.50 but not more than 1.25		
		Spacing of joists mm								
		400	450	600	400	450	600	400	450	600
		Maximum clear span of joist m								
BS EN 336 sizes with sawn thickness to tolerance class 1 and processed depth to tolerance class 2	38 × 72	1.262	1.189	1.023	1.215	1.146	0.989	1.108	1.048	0.874
	38 × 97	1.936	1.829	1.586	1.838	1.739	1.514	1.635	1.551	1.358
	38 × 122	2.582	2.482	2.200	2.469	2.369	2.076	2.180	2.073	1.826
	38 × 147	3.103	2.984	2.709	2.969	2.854	2.588	2.667	2.561	2.305
	38 × 170	3.580	3.444	3.128	3.426	3.294	2.989	3.079	2.958	2.678
	38 × 195	4.096	3.941	3.581	3.921	3.771	3.423	3.526	3.388	3.068
	38 × 220	4.609	4.436	4.034	4.413	4.246	3.856	3.971	3.816	3.458
	47 × 72	1.404	1.324	1.144	1.347	1.273	1.103	1.223	1.159	1.010
	47 × 97	2.141	2.025	1.763	2.026	1.920	1.678	1.795	1.705	1.499
	47 × 122	2.770	2.664	2.421	2.651	2.549	2.290	2.382	2.268	2.006
	47 × 147	3.327	3.201	2.910	3.185	3.064	2.783	2.865	2.754	2.496
	47 × 170	3.836	3.693	3.359	3.674	3.535	3.212	3.307	3.179	2.883
	47 × 195	4.387	4.224	3.845	4.202	4.045	3.678	3.786	3.640	3.302
	47 × 220	4.860	4.725	4.328	4.707	4.552	4.141	4.262	4.099	3.720
	63 × 97	2.432	2.321	2.030	2.308	2.192	1.925	2.032	1.934	1.709
	63 × 122	3.046	2.933	2.669	2.918	2.808	2.553	2.628	2.527	2.273
	63 × 147	3.665	3.521	3.207	3.503	3.372	3.069	3.158	3.038	2.759
	63 × 170	4.211	4.058	3.699	4.037	3.888	3.541	3.643	3.505	3.185
	63 × 195	4.770	4.637	4.231	4.614	4.445	4.052	4.168	4.011	3.646
	63 × 220	5.204	5.064	4.731	5.046	4.908	4.560	4.678	4.514	4.106
	75 × 122	3.220	3.102	2.827	3.086	2.972	2.705	2.784	2.678	2.433
	75 × 147	3.862	3.721	3.394	3.703	3.567	3.250	3.344	3.218	2.925
	75 × 170	4.446	4.286	3.913	4.265	4.110	3.748	3.855	3.711	3.376
	75 × 195	4.966	4.833	4.474	4.816	4.686	4.287	4.408	4.245	3.864
	75 × 220	5.415	5.272	4.932	5.253	5.113	4.778	4.878	4.743	4.350
CLS/ALS sizes	38 × 89	1.713	1.617	1.399	1.633	1.544	1.341	1.464	1.388	1.201
	38 × 140	2.957	2.844	2.581	2.829	2.719	2.466	2.541	2.440	2.170
	38 × 184	3.869	3.723	3.382	3.703	3.561	3.232	3.329	3.199	2.897
	38 × 235	4.850	4.710	4.310	4.700	4.540	4.120	4.240	4.080	3.700

Minimum design bearing length

If wane at end-bearing [see Figure 8 b)] is permitted to the strength class limit, i.e. one-third of thickness for strength class C24, the minimum design bearing length is 45 mm.

If wane is not permitted, the minimum design bearing length is 24 mm.

See also note 3 to Table 6, Table 7, Table 8 and Table 9.

^a The availability of section sizes should be checked.

Table 8 — Permissible clear spans of joists for floors supporting non-loadbearing lightweight partitions^a. Timber of strength class C16

C16 **Lightweight partitions**

Size of joist ^b mm × mm		Dead load kN/m ²								
		Not more than 0.25			More than 0.25 but not more than 0.50			More than 0.50 but not more than 1.25		
		Spacing of joists mm								
		400	450	600	400	450	600	400	450	600
		Maximum clear span of joist m								
BS EN 336 sizes with sawn thickness to tolerance class 1 and processed depth to tolerance class 2	38 × 72	1.017	0.910	0.690	0.955	0.859	0.658	0.828	0.751	0.586
	38 × 97	1.646	1.523	1.173	1.545	1.401	1.093	1.281	1.171	0.933
	38 × 122	2.234	2.147	1.732	2.131	1.993	1.579	1.753	1.612	1.303
	38 × 147	2.685	2.581	2.259	2.568	2.437	2.098	2.207	2.061	1.684
	38 × 170	3.098	2.976	2.586	2.953	2.788	2.421	2.527	2.384	2.040
	38 × 195	3.545	3.377	2.937	3.352	3.166	2.750	2.871	2.709	2.348
	38 × 220	3.990	3.773	3.284	3.745	3.539	3.076	3.210	3.030	2.628
	47 × 72	1.191	1.110	0.848	1.145	1.038	0.802	0.982	0.894	0.705
	47 × 97	1.822	1.723	1.424	1.728	1.636	1.314	1.498	1.375	1.105
	47 × 122	2.397	2.305	2.071	2.293	2.205	1.878	2.030	1.872	1.526
	47 × 147	2.880	2.770	2.507	2.756	2.650	2.348	2.451	2.313	1.957
	47 × 170	3.322	3.196	2.869	3.180	3.059	2.688	2.805	2.648	2.297
	47 × 195	3.799	3.657	3.257	3.638	3.500	3.052	3.184	3.007	2.610
	47 × 220	4.250	4.115	3.640	4.094	3.918	3.412	3.559	3.362	2.920
	63 × 97	2.087	1.978	1.727	1.972	1.871	1.640	1.740	1.655	1.380
	63 × 122	2.638	2.539	2.309	2.526	2.430	2.209	2.274	2.186	1.879
	63 × 147	3.166	3.049	2.775	3.033	2.919	2.655	2.733	2.628	2.319
	63 × 170	3.649	3.515	3.202	3.497	3.367	3.064	3.153	3.033	2.655
	63 × 195	4.170	4.018	3.663	3.998	3.850	3.506	3.608	3.465	3.015
	63 × 220	4.555	4.431	4.122	4.415	4.293	3.928	4.061	3.871	3.370
	75 × 122	2.790	2.687	2.446	2.673	2.573	2.341	2.409	2.317	2.094
	75 × 147	3.347	3.224	2.939	3.208	3.089	2.813	2.894	2.785	2.526
	75 × 170	3.855	3.715	3.389	3.697	3.561	3.245	3.338	3.212	2.891
	75 × 195	4.347	4.230	3.875	4.214	4.070	3.712	3.818	3.675	3.281
	75 × 220	4.741	4.615	4.314	4.598	4.474	4.177	4.266	4.136	3.667
CLS/ALS sizes	38 × 89	1.455	1.317	1.009	1.349	1.220	0.947	1.133	1.034	0.819
	38 × 140	2.559	2.460	2.158	2.447	2.329	1.951	2.097	1.934	1.577
	38 × 184	3.349	3.201	2.783	3.177	3.000	2.606	2.720	2.567	2.224
	38 × 235	4.236	4.009	3.490	3.979	3.760	3.270	3.412	3.221	2.794

Minimum design bearing length

If wane at end-bearing [see Figure 8 b)] is permitted to the strength class limit, i.e. one-third of thickness for strength class C16, the minimum design bearing length is 34 mm.

If wane is not permitted, the minimum design bearing length is 18 mm.

See also note 3 to Table 6, Table 7, Table 8 and Table 9.

^a See note 1 to Table 6, Table 7, Table 8 and Table 9 when a partition is parallel to the joists.

^b The availability of section sizes should be checked.

Table 9 — Permissible clear spans of joists for floors supporting non-loadbearing lightweight partitions^a. Timber of strength class C24

C24

Lightweight partitions

Size of joist ^b mm × mm		Dead load kN/m ²								
		Not more than 0.25			More than 0.25 but not more than 0.50			More than 0.50 but not more than 1.25		
		Spacing of joists mm								
		400	450	600	400	450	600	400	450	600
		Maximum clear span of joist m								
BS EN 336 sizes with sawn thickness to tolerance class 1 and processed depth to tolerance class 2	38 × 72	1.136	1.070	0.921	1.093	1.031	0.890	0.997	0.943	0.786
	38 × 97	1.742	1.646	1.427	1.654	1.565	1.362	1.472	1.396	1.222
	38 × 122	2.324	2.234	1.980	2.222	2.132	1.868	1.962	1.865	1.644
	38 × 147	2.793	2.686	2.438	2.672	2.568	2.330	2.400	2.305	2.074
	38 × 170	3.222	3.099	2.815	3.083	2.965	2.690	2.771	2.662	2.410
	38 × 195	3.686	3.547	3.223	3.529	3.394	3.081	3.173	3.049	2.761
	38 × 220	4.148	3.993	3.630	3.972	3.821	3.471	3.574	3.435	3.112
	47 × 72	1.263	1.191	1.029	1.213	1.145	0.993	1.101	1.043	0.909
	47 × 97	1.926	1.823	1.587	1.824	1.728	1.510	1.615	1.535	1.349
	47 × 122	2.493	2.398	2.179	2.386	2.294	2.061	2.144	2.042	1.806
	47 × 147	2.994	2.881	2.619	2.866	2.757	2.504	2.579	2.478	2.246
	47 × 170	3.453	3.323	3.023	3.306	3.181	2.891	2.977	2.861	2.594
	47 × 195	3.948	3.801	3.460	3.782	3.640	3.310	3.407	3.276	2.972
	47 × 220	4.374	4.253	3.895	4.237	4.097	3.727	3.836	3.689	3.348
	63 × 97	2.189	2.089	1.827	2.077	1.972	1.732	1.829	1.741	1.538
	63 × 122	2.742	2.639	2.402	2.626	2.527	2.298	2.366	2.275	2.046
	63 × 147	3.290	3.168	2.886	3.152	3.035	2.762	2.842	2.734	2.483
	63 × 170	3.790	3.652	3.329	3.634	3.499	3.187	3.279	3.155	2.866
	63 × 195	4.293	4.174	3.808	4.153	4.001	3.646	3.751	3.610	3.282
	63 × 220	4.684	4.558	4.258	4.541	4.417	4.104	4.211	4.063	3.696
	75 × 122	2.898	2.792	2.544	2.778	2.675	2.435	2.505	2.410	2.190
	75 × 147	3.475	3.349	3.055	3.333	3.210	2.925	3.009	2.896	2.633
	75 × 170	4.001	3.858	3.522	3.839	3.699	3.374	3.470	3.340	3.039
	75 × 195	4.469	4.350	4.027	4.334	4.217	3.858	3.968	3.820	3.478
	75 × 220	4.874	4.745	4.438	4.728	4.601	4.300	4.390	4.268	3.915
CLS/ALS sizes	38 × 89	1.542	1.456	1.259	1.470	1.390	1.207	1.318	1.249	1.081
	38 × 140	2.662	2.560	2.323	2.546	2.448	2.220	2.287	2.196	1.953
	38 × 184	3.482	3.350	3.044	3.333	3.205	2.909	2.996	2.879	2.607
	38 × 235	4.361	4.238	3.874	4.222	4.077	3.704	3.814	3.666	3.322

Minimum design bearing length

If wane at end-bearing [see Figure 8 b)] is permitted to the strength class limit, i.e. one-third of thickness for strength class C24, the minimum design bearing length is 41 mm.

If wane is not permitted, the minimum design bearing length is 21 mm.

See also note 3 to Table 6, Table 7, Table 8 and Table 9.

^a See note 1 to Table 6, Table 7, Table 8 and Table 9 when a partition is parallel to the joists.

^b The availability of section sizes should be checked.

BEAMS AND TRIMMERS

Notes to Table 10 to Table 15

NOTE 1 The overall sizes of the double (or single) beams or trimmers shown in Figure 12 will support load from the area shown hatched in plans A and B, including the following loads:

- a) load from the trimmed floor joists;
- b) a dead load not exceeding 0.5 kN/m^2 ;
- c) an imposed load not exceeding 1.5 kN/m^2 ;
- d) and, in the case of Table 14 and Table 15, loads from non-loadbearing lightweight partitions weighing not more than 0.8 kN/m run at spacings as close as those likely to occur in practice.

Examples of some typical floor constructions and their respective dead loadings are given in Annex N.

NOTE 2 The section sizes given in the tables are either sawn across the timber thickness in accordance with tolerance class 1 of BS EN 336 and processed in accordance with tolerance class 2 across the timber width (joist depth), or are CLS/ALS processed sizes in accordance with tolerance class 2, to provide level surfaces for ease of ceiling lining and the fixing of structural decking. BS EN 336 tolerances are as follows:

- a) on a sawn thickness of less than 100 mm (tolerance class 1):
 - 1 mm;
 - + 3 mm;
- b) on a processed depth (tolerance class 2):
 - 1.5 mm;
 - + 1.5 mm.

NOTE 3 Where the beams or trimmers in Table 14 and Table 15 consist of double members, they should be fixed together with their tops flush. Unless justified by specialist calculation, the fixings should be by nailing as follows, or as in the more extensive tables of *The Approved Document to the Building Regulations 1991, Timber Intermediate Floors for Dwellings* [6].

Overall width of double member mm	Nail length and diameter mm	Nominal centres of nails mm
76	75×3.75	150
94	90×4.00	150
126	125×5.60	200
150	150×6.00	200

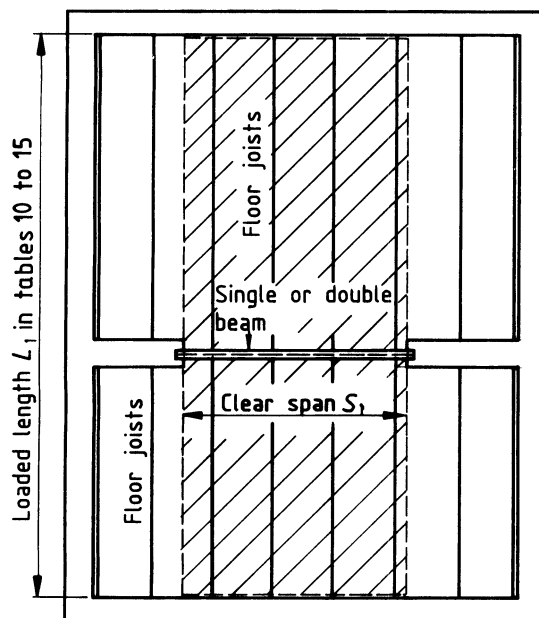
These values are relevant only where the span of floor joists, which are supported by a beam or trimmer, does not exceed 6 m. The centres quoted apply where two rows of nails in line are used. If staggered nailing is used, the values refer to the centres in one row.

NOTE 4 Unless justified by specialist calculation, the minimum design bearing length at supports should be as stated at the base of each table. It may be necessary to provide longer bearing to accommodate fixings or simply for practical reasons such as construction tolerances. If a beam or trimmer is supported by a hanger, it is strongly recommended that a structural designer be consulted or that a proprietary design of hanger be used. If the end of a beam or trimmer is supported on masonry, the end bearing should be at least 90 mm to provide restraint to the masonry wall. Also, where the bearing is on masonry, the bearing area provided should conform to BS 8103-2.

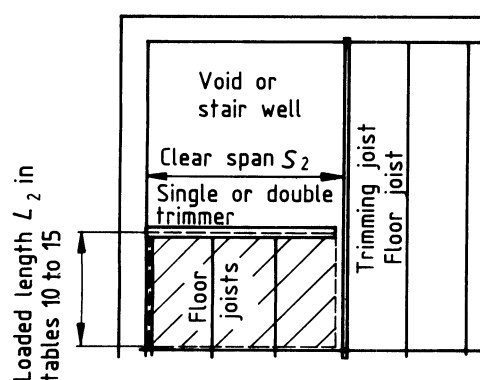
NOTE 5 Notching or drilling of a beam or trimmer should not be carried out unless justified by specialist calculation.

NOTE 6 The design of the beams and trimmers has been based on BS 5268-2. Spans of less than 1.8 m are not tabulated.

NOTE 7 For guidance on fixing joists to beams or trimmers by a hanger, see Figure 13. Particularly where floor joists occur only on one side of a beam or trimmer and are supported on steel hangers, it is recommended that consideration be given to preventing rotation of the beam or trimmer, e.g. by a fixing into the beam or trimmer near the bottom of the hangers.



a) **Plan A.** Plan on single or double beam supporting floor joists and loads from the hatched area



b) **Plan B.** Plan on single or double trimmer supporting floor joists and loads from the hatched area

NOTE 1 Connections of joists to trimmers, or trimming joists or beams should be by:

- a) a proprietary joist hanger of adequate capacity; or
- b) a connection justified by specialist calculation; or
- c) a beam positioned beneath the floor joist.

Typical joist hangers are shown in Figure 13.

NOTE 2 If the floor joists are perpendicular to the trimming joist, the latter should be designed as a beam. (See Table 10 to Table 13.)

Figure 12 — Plans relating to Table 10 to Table 15

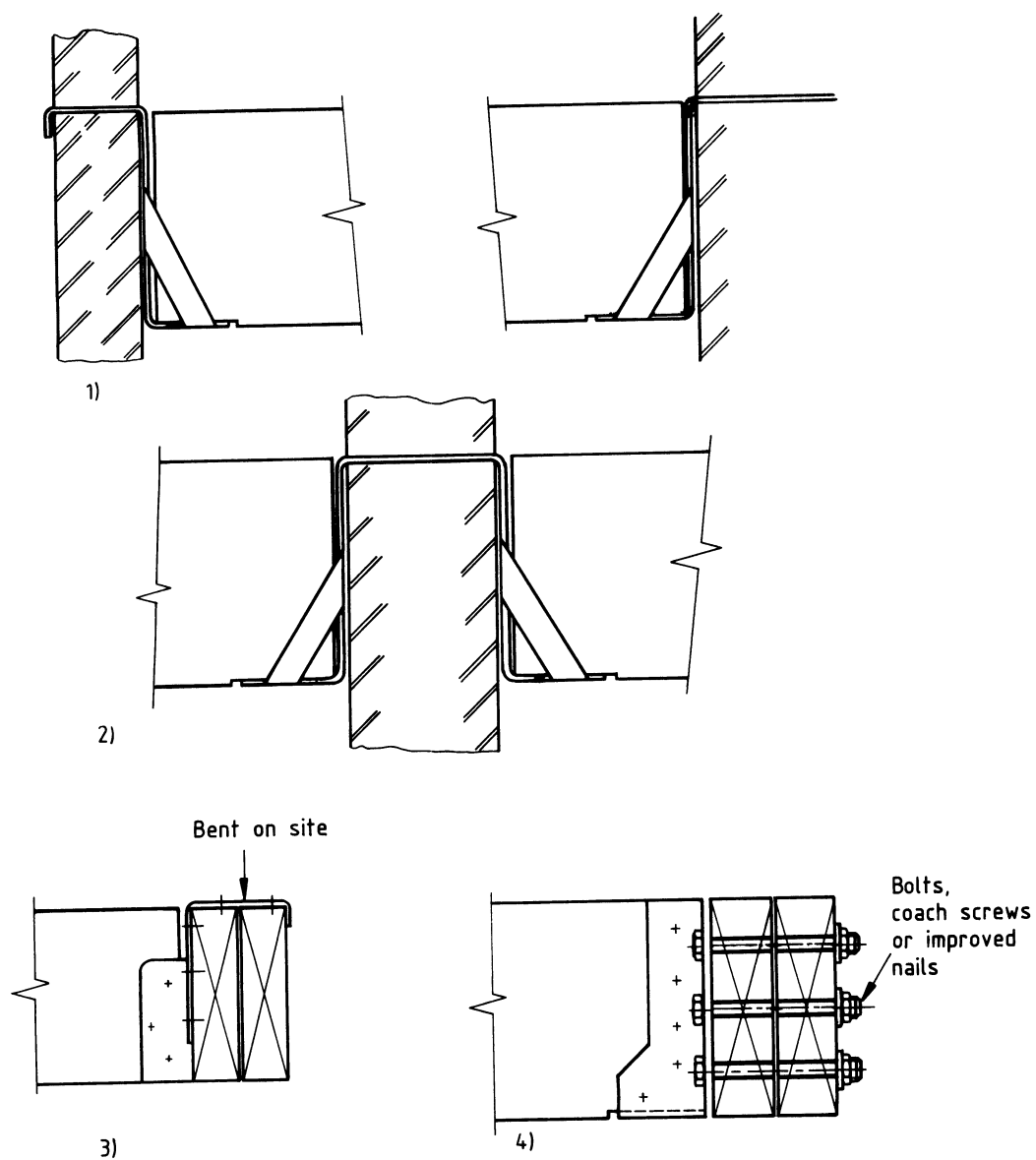


Figure 13 — Typical steel hanger details

Table 10 — Permissible clear spans of single-member beams or trimmers which support floor joists, and floors with no partitions. Timber of strength class C16

C16 Single members

No partitions

Size of beam or trimmer ^a Single member mm × mm		Loaded length, L_1 in plan A or L_2 in plan B in Figure 12 m											
		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
		Clear spans, S_1 in plan A or S_2 in plan B in Figure 12 m											
BS EN 336 sizes with sawn thickness to tolerance class 1 and processed depth to tolerance class 2	38 × 72												
	38 × 97												
	38 × 122	1.903											
	38 × 147	2.289											
	38 × 170	2.643	1.983										
	38 × 195	3.027	2.255	1.833									
	38 × 220	3.409	2.524	2.052									
	47 × 72												
	47 × 97												
	47 × 122	2.048											
	47 × 147	2.462	1.927										
	47 × 170	2.842	2.208										
	47 × 195	3.253	2.510	2.044									
	47 × 220	3.662	2.809	2.289	1.974								
	63 × 147	2.716	2.145	1.821									
	63 × 170	3.133	2.477	2.087	1.803								
	63 × 195	3.584	2.837	2.372	2.050	1.828							
	63 × 220	4.033	3.197	2.655	2.295	2.047	1.862						
	75 × 195	3.793	3.013	2.589	2.240	1.999	1.820						
	75 × 220	4.265	3.394	2.897	2.507	2.239	2.038	1.881					
CLS/ALS sizes	38 × 89												
	38 × 140	2.181											
	38 × 184	2.858	2.136										
	38 × 235	3.638	2.685	2.183	1.879								
Minimum design bearing length If wane at end-bearing [see Figure 8 b)] is permitted to the strength class limit, i.e. one-third of thickness for strength class C16, the minimum design bearing length is 63 mm. If wane is not permitted, the minimum design bearing length is 33 mm. See also note 4 to Table 10 to Table 15.													
^a The availability of section sizes should be checked.													

Table 11 — Permissible clear spans of double-member beams or trimmers which support floor joists, and floors with no partitions. Timber of strength class C16

C16 Double members**No partitions**

Size of beam or trimmer ^a Double member mm × mm		Loaded length, L_1 in plan A or L_2 in plan B in Figure 12 m											
		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
		Clear spans, S_1 in plan A or S_2 in plan B in Figure 12 m											
BS EN 336 sizes with sawn thickness to tolerance class 1 and processed depth to tolerance class 2	76 × 147	3.023	2.397	2.082	1.818								
	76 × 170	3.485	2.768	2.405	2.083	1.860							
	76 × 195	3.985	3.170	2.736	2.369	2.115	1.926						
	76 × 220	4.481	3.570	3.061	2.651	2.360	2.157	1.992	1.858				
	94 × 147	3.237	2.577	2.243	2.024	1.808							
	94 × 170	3.730	2.975	2.590	2.319	2.072	1.889						
	94 × 195	4.262	3.405	2.967	2.636	2.356	2.148	1.985	1.853				
	94 × 220	4.790	3.834	3.343	2.949	2.637	2.405	2.223	2.075	1.952	1.848		
	126 × 147	3.551	2.842	2.481	2.247	2.078	1.912						
	126 × 170	4.087	3.279	2.864	2.595	2.400	2.191	2.207	1.894				
	126 × 195	4.664	3.751	3.279	2.972	2.729	2.491	2.305	2.154	2.028	1.921	1.829	
	126 × 220	5.236	4.220	3.692	3.349	3.053	2.788	2.580	2.411	2.271	2.151	2.048	1.958
	150 × 147	3.747	3.010	2.631	2.386	2.209	2.072	1.932	1.806				
	150 × 170	4.309	3.470	3.037	2.756	2.552	2.392	2.214	2.069	1.949	1.847		
	150 × 195	4.914	3.968	3.476	3.155	2.923	2.718	2.517	2.353	2.217	2.101	2.001	1.913
	150 × 220	5.512	4.462	3.913	3.554	3.293	3.041	2.816	2.634	2.482	2.352	2.240	2.143
CLS/ALS sizes	76 × 89	1.844											
	76 × 140	2.881	2.284	1.983									
	76 × 184	3.765	2.993	2.592	2.244	2.003	1.824						
	76 × 235	4.778	3.810	3.255	2.820	2.519	2.295	2.119	1.977	1.858			
Minimum design bearing length If wane at end-bearing [see Figure 8 b)] is permitted to the strength class limit, i.e. one-third of thickness for strength class C16, the minimum design bearing length is 63 mm. If wane is not permitted, the minimum design bearing length is 33 mm. See also note 4 to Table 10 to Table 15.													
^a The availability of section sizes should be checked.													

Table 12 — Permissible clear spans of single-member beams or trimmers which support floor joists, and floors with no partitions. Timber of strength class C24

C24 Single members

No partitions

Size of beam or trimmer ^a Single member mm × mm		Loaded length, L_1 in plan A or L_2 in plan B in Figure 12 m											
		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
		Clear spans, S_1 in plan A or S_2 in plan B in Figure 12 m											
BS EN 336 size with sawn thickness to tolerance class 1 and processed depth to tolerance class 2	38 × 72												
	38 × 97												
	38 × 122	1.990											
	38 × 147	2.394	1.876										
	38 × 170	2.764	2.168	1.868									
	38 × 195	3.164	2.485	2.141									
	38 × 220	3.563	2.800	2.413	1.900								
	47 × 72												
	47 × 97												
	47 × 122	2.140											
	47 × 147	2.573	2.025										
	47 × 170	2.969	2.339	2.021	1.815								
	47 × 195	3.398	2.680	2.316	2.081								
	47 × 220	3.825	3.020	2.611	2.346	1.880							
	63 × 147	2.836	2.244	1.945									
	63 × 170	3.271	2.591	2.247	2.025	1.864							
	63 × 195	3.741	2.968	2.575	2.321	2.136	1.867						
	63 × 220	4.208	3.343	2.902	2.616	2.409	2.103						
	75 × 195	3.957	3.150	2.739	2.473	2.280	2.130	1.906					
	75 × 220	4.449	3.547	3.086	2.787	2.570	2.401	2.147	1.875				
CLS/ALS sizes	38 × 89												
	38 × 140	2.281											
	38 × 184	2.988	2.345	2.021									
	38 × 235	3.802	2.990	2.577	2.028								
Minimum design bearing length If wane at end-bearing [see Figure 8 b)] is permitted to the strength class limit, i.e. one-third of thickness for strength class C24, the minimum design bearing length is 67 mm. If wane is not permitted, the minimum design bearing length is 35 mm. See also note 4 to Table 10 to Table 15.													
^a The availability of section sizes should be checked.													

Table 13 — Permissible clear spans of double-member beams or trimmers which support floor joists, and floors with no partitions. Timber of strength class C24

C24 Double members**No partitions**

Size of beam or trimmer ^a Double member mm × mm		Loaded length, L_1 in plan A or L_2 in plan B in Figure 12 m											
		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
		Clear spans, S_1 in plan A or S_2 in plan B in Figure 12 m											
BS EN 336 sizes with sawn thickness to tolerance class 1 and processed depth to tolerance class 2	76 × 147	3.154	2.506	2.179	1.968	1.815							
	76 × 170	3.636	2.893	2.517	2.273	2.097	1.961	1.851					
	76 × 195	4.156	3.313	2.883	2.605	2.404	2.248	2.120	1.860				
	76 × 220	4.673	3.731	3.249	2.936	2.710	2.534	2.375	2.096	1.859			
	94 × 147	3.377	2.693	2.346	2.122	1.960	1.835						
	94 × 170	3.890	3.108	2.709	2.451	2.265	2.121	2.004	1.907				
	94 × 195	4.443	3.557	3.103	2.809	2.595	2.430	2.297	2.186	2.048	1.840		
	94 × 220	4.991	4.004	3.495	3.165	2.295	2.740	2.590	2.465	2.307	2.073	1.882	
	126 × 147	3.700	2.968	2.593	2.350	2.175	2.039	1.930	1.839				
	126 × 170	4.258	3.423	2.993	2.714	2.512	2.356	2.230	2.125	2.035	1.957	1.889	
	126 × 195	4.857	3.914	3.426	3.108	2.878	2.700	2.555	2.435	2.333	2.244	2.165	2.059
	126 × 220	5.450	4.403	3.857	3.501	3.243	3.042	2.880	2.745	2.630	2.529	2.441	2.319
	150 × 147	3.902	3.141	2.749	2.495	2.311	2.169	2.054	1.958	1.877	1.806		
	150 × 170	4.486	3.621	3.172	2.881	2.669	2.505	2.373	2.263	2.169	2.087	2.015	1.931
	150 × 195	5.113	4.139	3.630	3.298	3.057	2.870	2.719	2.593	2.486	2.392	2.310	2.237
	150 × 220	5.733	4.654	4.086	3.714	3.444	3.234	3.064	2.923	2.802	2.697	2.604	2.522
CLS/ALS sizes	76 × 89	1.926											
	76 × 140	3.007	2.388	2.076	1.875								
	76 × 184	3.928	3.129	2.722	2.459	2.269	2.122	2.003					
	76 × 235	4.981	3.981	3.468	3.135	2.893	2.706	2.526	2.237	1.985			
Minimum design bearing length If wane at end-bearing [see Figure 8 b)] is permitted to the strength class limit, i.e. one-third of thickness for strength class C24, the minimum design bearing length is 67 mm. If wane is not permitted, the minimum design bearing length is 35 mm. See also note 4 to Table 10 to Table 15.													
^a The availability of section sizes should be checked.													

Table 14 — Permissible clear spans of double-member beams or trimmers which support floor joists, and floors supporting non-loadbearing lightweight partitions. Timber of strength class C16

C16 Double members**Lightweight partitions**

Size of beam or trimmer ^a Double member mm × mm		Loaded length, L_1 in plan A or L_2 in plan B in Figure 12 m											
		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
		Clear spans, S_1 in plan A or S_2 in plan B in Figure 12 m											
BS EN 336 sizes with sawn thickness to tolerance class 1 and processed depth to tolerance class 2	76 × 147	2.369	1.913										
	76 × 170	2.753	2.228	1.851									
	76 × 195	3.169	2.567	2.140	1.856								
	76 × 220	3.583	2.903	2.429	2.112	1.881							
	94 × 147	2.556	2.148										
	94 × 170	2.967	2.503	2.090	1.812								
	94 × 195	3.412	2.881	2.413	2.100	1.872							
	94 × 220	3.856	3.253	2.734	2.385	2.131	1.934						
	126 × 147	2.830	2.393	2.115	1.837								
	126 × 170	3.281	2.784	2.462	2.146	1.916							
	126 × 195	3.769	3.209	2.835	2.479	2.218	2.017	1.856					
	126 × 220	4.254	3.632	3.205	2.809	2.519	2.295	2.115	1.966	1.841			
	150 × 147	3.003	2.548	2.267	2.030	1.812							
	150 × 170	3.479	2.962	2.641	2.367	2.118	1.926						
	150 × 195	3.993	3.411	3.048	2.730	2.449	2.231	2.056	1.912				
	150 × 220	4.504	3.858	3.453	3.089	2.776	2.534	2.339	2.178	2.042	1.925	1.823	
CLS/ALS sizes	76 × 140	2.252	1.817										
	76 × 184	2.986	2.418	2.013									
	76 × 235	3.831	3.103	2.601	2.265	2.019							
Minimum design bearing length If wane at end-bearing [see Figure 8 b)] is permitted to the strength class limit, i.e. one-third of thickness for strength class C16, the minimum design bearing length is 54 mm. If wane is not permitted, the minimum design bearing length is 28 mm. See also note 4 to Table 10 to Table 15.													
^a The availability of section sizes should be checked.													

Table 15 — Permissible clear spans of double-member beams or trimmers which support floor joists, and floors supporting non-loadbearing partitions. Timber of strength class C24

C24 Double members**Lightweight partitions**

Size of beam or trimmer ^a Double member mm × mm		Loaded length, L_1 in plan A or L_2 in plan B in Figure 12 m											
		1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
		Clear spans, S_1 in plan A or S_2 in plan B in Figure 12 m											
BS EN 336 sizes with sawn thickness to tolerance class 1 and processed depth to tolerance class 2	76 × 147	2.482	2.083	1.837									
	76 × 170	2.883	2.428	2.148	1.950								
	76 × 195	3.317	2.802	2.484	2.259	1.900							
	76 × 220	3.749	3.176	2.821	2.569	2.226							
	94 × 147	2.675	2.254	1.996	1.814								
	94 × 170	3.105	2.625	2.330	2.121	1.962							
	94 × 195	3.569	3.028	2.693	2.456	2.275	2.026						
	94 × 220	4.031	3.429	3.055	2.790	2.587	2.362	1.964					
	126 × 147	2.960	2.508	2.229	2.033	1.884							
	126 × 170	3.430	2.917	2.599	2.374	2.203	2.066	1.953					
	126 × 195	3.938	3.360	2.999	2.744	2.549	2.394	2.265	2.103	1.808			
	126 × 220	4.443	3.801	3.399	3.114	2.896	2.721	2.576	2.401	2.127	1.857		
	150 × 147	3.139	2.668	2.377	2.172	2.016	1.891						
	150 × 170	3.635	3.101	2.769	2.534	2.355	2.212	2.094	1.993	1.890			
	150 × 195	4.170	3.569	3.193	2.927	2.723	2.560	2.425	2.311	2.192	2.005		
	150 × 220	4.701	4.035	3.616	3.319	3.091	2.908	2.757	2.629	2.492	2.350	2.084	1.859
CLS/ALS sizes	76 × 140	2.360	1.977										
	76 × 184	3.126	2.638	2.336	2.123								
	76 × 235	4.008	3.400	3.023	2.753	2.421	1.948						
Minimum design bearing length If wane at end-bearing [see Figure 8 b)] is permitted to the strength class limit, i.e. one-third of thickness for strength class C24, the minimum design bearing length is 60 mm. If wane is not permitted, the minimum design bearing length is 31 mm. See also note 4 to Table 10 to Table 15.													
^a The availability of section sizes should be checked.													

TRIMMING JOISTS

Notes to Table 16, Table 17, Table 18 and Table 19.

NOTE 1 The overall size of the double trimming joists shown in Figure 14 will support load from the area shown hatched in plans C and D, including the following loads:

- a) load from the trimmer and floor joists;
- b) a dead load not exceeding 0.5 kN/m^2 ;
- c) an imposed load not exceeding 1.5 kN/m^2 ;
- d) and, in the case of Table 18 and Table 19, loads from non-loadbearing lightweight partitions weighing not more than 0.8 kN/m run at spacings as close as those likely to occur in practice.

Examples of some typical floor constructions and their respective dead loadings are given in Annex N.

NOTE 2 The section sizes given in the tables are either sawn across the timber thickness in accordance with tolerance class 1 of BS EN 336 and processed in accordance with tolerance class 2 across the timber width (joist depth), or are CLS/ALS processed sizes in accordance with tolerance class 2, to provide level surfaces for ease of ceiling lining and the fixing of structural decking. BS EN 336 tolerances are as follows:

- a) on a sawn thickness of less than 100 mm (tolerance class 1):
 - 1 mm;
 - + 3 mm;
- b) on a processed depth (tolerance class 2):
 - 1.5 mm;
 - + 1.5 mm.

NOTE 3 Trimming joists in Table 16, Table 17, Table 18 and Table 19 are double members and should be fixed together with their tops flush. Unless justified by specialist calculation, the fixings should be by nailing as follows, or as in the more extensive tables of *The Approved Document to the Building Regulations 1991, Timber Intermediate Floors for Dwellings* [6].

Overall width of double member mm	Nail length and diameter mm × mm	Nominal centres of nails mm
76	75 × 3.75	300
94	90 × 4.00	300
126	125 × 5.60	300
150	150 × 6.00	300

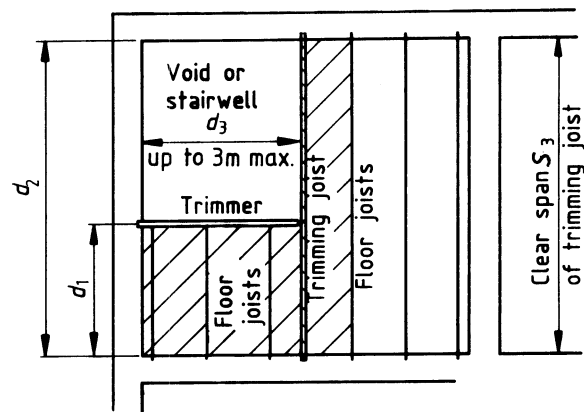
These values are relevant only where the span of floor joists or trimmer, which are supported by a trimming joist, does not exceed 6 m. The centres quoted apply where two rows of nails in line are used. If staggered nailing is used, the values refer to the centres in one row.

NOTE 4 Unless justified by specialist calculation, the minimum design bearing length at supports should be as stated at the base of each table. It may be necessary to provide longer bearing to accommodate fixings or simply for practical reasons such as construction tolerances. If a trimming joist is supported by a hanger, it is strongly recommended that a structural designer be consulted or that a proprietary design of hanger be used. If the end of a trimming joist is supported on masonry, the end bearing should be at least 90 mm to provide restraint to the masonry wall. Also, where the bearing is on masonry, the bearing area provided should conform to BS 8103-2.

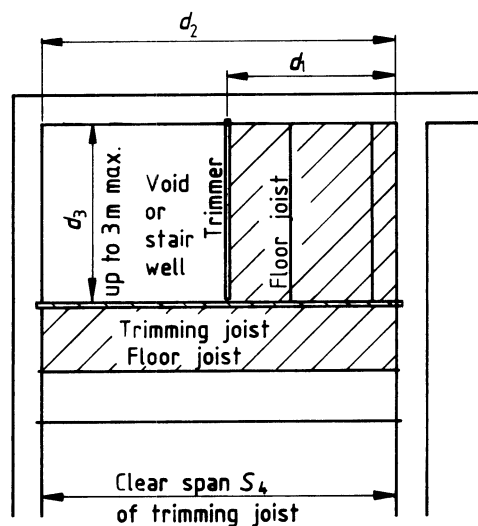
NOTE 5 Notching or drilling of a trimming joist should not be carried out unless justified by specialist calculation.

NOTE 6 The design of the trimming joists has been based on BS 5268-2.

NOTE 7 For guidance on fixing a trimmer to a trimming joist by a hanger, see Figure 13. Where a trimmer is supported by a hanger, it is strongly recommended that a proprietary hanger be used or a specialist designer consulted. It is also recommended that consideration be given to preventing rotation of the trimming joist, e.g. by a fixing into the trimming joist near the bottom of the hanger.



a) **Plan C.** Plan on double trimming joist supporting trimmer and loads from hatched areas



b) **Plan D.** Plan on double trimming joist supporting trimmer and loads from hatched areas

NOTE Connections of joists to trimmers or trimming joists, and of trimmer to trimming joist, should be by:

- a) a proprietary joist hanger of adequate capacity; or
- b) a connection justified by specialist calculation.

Typical joist hangers are shown in Figure 13.

Figure 14 — Plans relating to Table 16, Table 17, Table 18 and Table 19

Table 16 — Permissible clear spans of trimming joists which support a trimmer, loading area as shown in plans C or D in Figure 14, but no partitions. Timber of strength class C16

C16

No partitions

Size of trimming joist ^a mm × mm		For ratios of d_1/d_2 up to 0.25			For ratios of d_1/d_2 greater than 0.25 but less than 0.5			For ratios of d_1/d_2 greater than 0.5 but less than 0.75		
		Dimension d_3^b m			Dimension d_3^b m			Dimension d_3^b m		
		1.0	2.0	3.0	1.0	2.0	3.0	1.0	2.0	3.0
		Clear spans, S_3 in plan C or S_4 in plan D in Figure 14 m								
BS EN 336 sizes with sawn thickness to tolerance class 1 and processed depth to tolerance class 2	76 × 147	3.334	3.158	3.012	3.021	2.702	2.482	3.012	2.692	2.410
	76 × 170	3.841	3.639	3.473	3.483	3.118	2.866	3.473	3.106	2.760
	76 × 195	4.387	4.159	3.971	3.983	3.569	3.272	3.971	3.555	3.135
	76 × 220	4.929	4.676	4.466	4.479	4.017	3.658	4.466	4.001	3.505
	94 × 147	3.564	3.379	3.226	3.236	2.900	2.667	3.226	2.888	2.655
	94 × 170	4.102	3.892	3.717	3.728	3.345	3.078	3.717	3.331	3.063
	94 × 195	4.682	4.444	4.248	4.260	3.826	3.523	4.248	3.810	3.477
	94 × 220	5.255	4.992	4.774	4.788	4.304	3.965	4.774	4.287	3.887
	126 × 147	3.898	3.701	3.539	3.549	3.190	2.940	3.539	3.177	2.926
	126 × 170	4.480	4.258	4.073	4.085	3.676	3.390	4.073	3.661	3.374
	126 × 195	5.105	4.856	4.649	4.662	4.201	3.877	4.649	4.184	3.859
	126 × 220	5.722	5.448	5.219	5.234	4.722	4.361	5.219	4.703	4.341
	150 × 147	4.105	3.902	3.734	3.745	3.373	3.112	3.734	3.358	3.096
	150 × 170	4.713	4.485	4.295	4.307	3.884	3.587	4.295	3.868	3.569
	150 × 195	5.365	5.110	4.898	4.912	4.436	4.100	4.898	4.418	4.080
	150 × 220	6.008	5.728	5.494	5.509	4.983	4.609	5.494	4.963	4.588
CLS/ALS sizes	76 × 140	3.179	3.010	2.871	2.880	2.575	2.365	2.871	2.565	2.303
	76 × 184	4.147	3.931	3.752	3.763	3.371	3.098	3.752	3.358	2.970
	76 × 235	5.252	4.984	4.762	4.775	4.284	3.888	4.762	4.268	3.726
Minimum design bearing length If wane at end-bearing [see Figure 8 b)] is permitted to the strength class limit, i.e. one-third of thickness for strength class C16, the minimum design bearing length is 25 mm. If wane is not permitted, the minimum design bearing length is 13 mm. See also note 4 to Table 16, Table 17, Table 18 and Table 19.										
^a Double members. The availability of section sizes should be checked. ^b For values of d_3 other than 1.0 m, 2.0 m or 3.0 m, interpolation is permitted.										

Table 17 — Permissible clear spans of trimming joists which support a trimmer, loading area as shown in plans C or D in Figure 14, but no partitions. Timber of strength class C24

C24 **No partitions**

Size of trimming joist ^a mm × mm		For ratios of d_1/d_2 up to 0.25			For ratios of d_1/d_2 greater than 0.25 but less than 0.5			For ratios of d_1/d_2 greater than 0.5 but less than 0.75		
		Dimension d_3^b m			Dimension d_3^b m			Dimension d_3^b m		
		1.0	2.0	3.0	1.0	2.0	3.0	1.0	2.0	3.0
		Clear spans, S_3 in plan C or S_4 in plan D in Figure 14 m								
BS EN 336 sizes with sawn thickness to tolerance class 1 and processed depth to tolerance class 2	76 × 147	3.477	3.294	3.143	3.153	2.823	2.594	3.143	2.811	2.583
	76 × 170	4.003	3.795	3.624	3.634	3.257	2.995	3.624	3.244	2.981
	76 × 195	4.571	4.336	4.142	4.154	3.726	3.428	4.142	3.711	3.413
	76 × 220	5.134	4.873	4.657	4.670	4.193	3.860	4.657	4.177	3.843
	94 × 147	3.714	3.523	3.365	3.375	3.028	2.786	3.365	3.015	2.773
	94 × 170	4.273	4.056	3.876	3.888	3.491	3.215	3.876	3.477	3.200
	94 × 195	4.874	4.630	4.427	4.440	3.992	3.678	4.427	3.976	3.662
	94 × 220	5.469	5.199	4.974	4.989	4.490	4.140	4.974	4.472	4.121
	126 × 147	4.058	3.855	3.688	3.699	3.328	3.069	3.688	3.314	3.054
	126 × 170	4.661	4.433	4.243	4.256	3.834	3.538	4.243	3.818	3.521
	126 × 195	5.309	5.054	4.841	4.855	4.380	4.045	4.841	4.362	4.026
	126 × 220	5.948	5.667	5.432	5.448	4.922	4.549	5.432	4.901	4.528
	150 × 147	4.270	4.062	3.889	3.901	3.516	3.247	3.889	3.501	3.230
	150 × 170	4.900	4.666	4.471	4.484	4.049	3.741	4.471	4.031	3.723
	150 × 195	5.575	5.314	5.096	5.111	4.622	4.275	5.096	4.603	4.255
	150 × 220	6.239	5.954	5.714	5.730	5.190	4.805	5.714	5.169	4.782
CLS/ALS sizes	76 × 140	3.316	3.141	2.997	3.006	2.690	2.472	2.997	2.680	2.461
	76 × 184	4.322	4.099	3.914	3.926	3.520	3.238	3.914	3.506	3.223
	76 × 235	5.469	5.193	4.964	4.979	4.472	4.118	4.964	4.455	4.100
Minimum design bearing length If wane at end-bearing [see Figure 8 b)] is permitted to the strength class limit, i.e. one-third of thickness for strength class C24, the minimum design bearing length is 27 mm. If wane is not permitted, the minimum design bearing length is 14 mm. See also note 4 to Table 16, Table 17, Table 18 and Table 19.										
^a Double members. The availability of section sizes should be checked. ^b For values of d_3 other than 1.0 m, 2.0 m or 3.0 m, interpolation is permitted.										