

Lintels —

Part 2: Specification for prefabricated lintels

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Cooperating organizations

The Elements and Components (of Diverse Materials) for Buildings Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following:

Agrément Board	Glass and Glazing Federation
Aluminium Federation	Health and Safety Executive
Asbestos Cement Manufacturers' Association Limited	Incorporated Association of Architects and Surveyors
Association of British Roofing Felt Manufacturers	Institute of Building Control
Brick Development Association*	Institute of Quality Assurance
British Ceramic Research Association	Institution of Municipal Engineers
British Hardware Federation	Institution of Structural Engineers*
British Plastics Federation	Local Authorities Organization
British Precast Concrete Federation Ltd.*	Mastic Asphalt Council and Employers' Federation
British Steel Industry*	National Council of Building Materials Producers
British Woodworking Federation	National Federation of Building Trades Employers
Consumer Standards Advisory Committee of BSI	National Federation of Roofing Contractors
Convention of Scottish Local Authorities	Royal Institute of British Architects*
Department of the Environment (Building Research Establishment, Princes Risborough Laboratory)	Royal Institution of Chartered Surveyors*
Department of the Environment (Housing and Construction)	Scottish Development Department
Department of the Environment (PSA)*	Society of Chemical Industry
Flat Glass Manufacturers' Association	Timber Research and Development Association
	Trades Union Congress

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the Technical Committee entrusted with the preparation of this British Standard:

Aerated Autoclaved Concrete Products Association	Department of the Environment (Building Research Establishment)
Aggregate Concrete Block Association	District Surveyors' Association
British Precast Concrete Federation Ltd.	Greater London Council
Cement and Concrete Association	Institution of Building Control Officers Ltd.
Constructional Steel Research and Development Organisation	North Wales Slate Quarries Association
	Steel Lintel Manufacturers' Association
	Zinc Development Association

This British Standard, having been prepared under the direction of the Elements and Components (of Diverse Materials) for Buildings Standards Committee, was published under the authority of the Board of BSI and comes into effect on 28 February 1983

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Foreword

This British Standard has been prepared under the direction of the Elements and Components (of Diverse Materials) for Buildings Standards Committee. This Part of the standard specifies requirements for prefabricated lintels up to 4.5 m span in masonry. BS 5977-1, already published, describes a method for assessing the load carried by lintels for use in masonry walls.

The committee agreed at the outset that the standard should specify materials and performance criteria appropriate to all lintels in common use. Although lintels made with materials other than those listed in section 2 may meet all the performance criteria given in section 3, they will not be considered to comply with the requirements of this standard, either because there is at present insufficient evidence of long term performance or because the material is too variable to give consistent results under test (e.g. natural stone). Reinforced masonry lintels are covered by BS 5628-2.

The requirements for protection of steel lintels against corrosion will be reviewed in the light of further research by organizations represented on the committee, and of the forthcoming revision of BS 5493 and DD 24.

The tests described in Appendix B are based on the latest advice from BSI committees responsible for the appropriate structural design codes.

The tests described in Appendix C were devised by the Building Research Establishment (BRE) to simulate the worst conditions likely to be encountered on site. Traditional impact tests are based on a dropping ball, which does not reproduce sharp or angular impacts. The impact test in this standard may be considered to be representative of the type of impact experienced in normal handling. The abrasion test is intended to reproduce the effect of one lintel sliding over another. Existing cross-hatch tests for paint coatings have been found to be unsuitable for the thicker coatings used on lintels.

The recommendations for damp-proof courses in Appendix D are based on known good practice pending further investigation by the committee currently revising BS 5628-3.

Certification. Attention is drawn to the certification facilities described on the inside back cover of this standard.

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 18, 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.

Section 1. General

1 Scope

This Part of BS 5977 specifies requirements for concrete, steel and timber prefabricated lintels, including prefabricated elements used in composite and two-parts lintels. It covers lintels designed to span up to 4.5 m in single storey buildings and up to 3.6 m in two or three storey buildings in domestic use.

Appendix D gives recommendations for installation of lintels.

NOTE The titles of the publications referred to in this standard are listed on page 18.

2 Definitions

For the purposes of this standard, the following definitions apply:

2.1

lintel

a beam spanning an opening in a wall

2.2

composite lintel

a type of lintel in which two or more structural elements assembled on the site act together in resisting the applied loads (see Figure 8)

2.3

two-part lintel

a type of lintel consisting of two elements, one structural and the other structural or infill (see Figure 2)

2.4

effective span

the distance between the centres of bearings *or* the clear distance between supports plus *D*, whichever is the lesser, where *D* is the effective depth (for composite and concrete lintels) or the actual depth (for steel and two-part lintels)

3 Information to be given to the manufacturer or supplier in an enquiry or order

For an enquiry or order to be fully understood, it is essential that the manufacturer or supplier be given the information set out in Appendix A.

Section 2. Materials and workmanship

4 Materials

4.1 Concrete lintels. Materials used in the manufacture of reinforced and prestressed concrete lintels shall be in accordance with the recommendations of section 6 and 7 and section 6 and 8 of BS 8110-1:1985, respectively. Materials used in the manufacture of aerated concrete lintels shall be in accordance with the recommendations of section 6 of BS 8110-2:1985.

4.2 Steel lintels. Steel lintels shall be made using steel grades having a yield stress not less than 200 N/mm² and complying with BS 1449, BS 2989 or BS 4360.

It is essential to protect all steels except austenitic stainless steel from corrosion. Lintels to be used with separate damp-proof courses shall be protected as shown in Table 1. Lintels having integral damp-proof systems shall be protected as shown in Table 2.

An integral damp-proof system for a lintel shall be such as to ensure that when the lintel is installed on site the recommendations in **D.2.1.3** are followed.

4.3 Timber lintels. Timber used in the manufacture of lintels shall be in accordance with the recommendations of BS 5268-2.

Timber lintels shall be protected by chemical impregnation following the recommendations of BS 5268-5.

4.4 Composite and two-part lintels. Materials for concrete, steel or timber elements of composite or two-part lintels shall comply with the requirements of **4.1**, **4.2** or **4.3** as appropriate. Masonry units used in two-part lintels shall follow the recommendations of BS 5628-3.

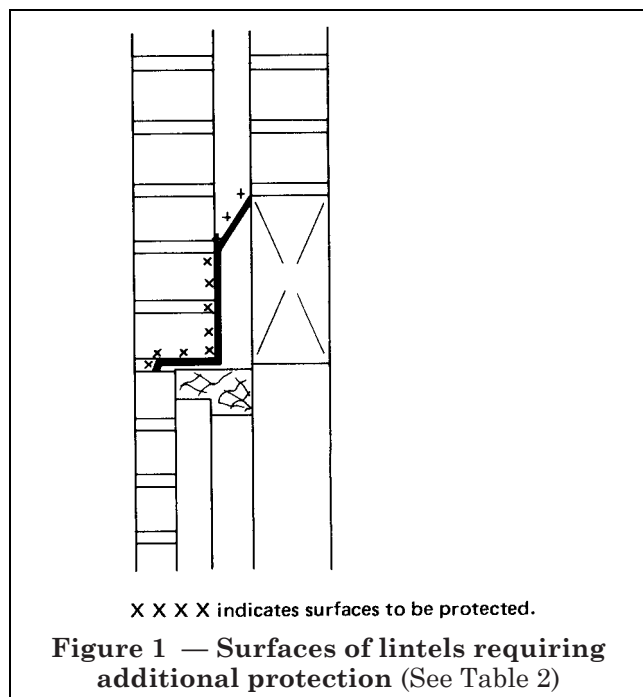


Table 1 — Protection of steel lintels to be used with separate damp-proof courses

Zinc coating	Additional protection	Organic protective coating
Post-galvanized following the procedure given in BS 729 Minimum mass of zinc coating 920 g/m ² including both sides.	Not necessary	
Pre-galvanized to comply with the requirements for coating type G600 in BS 2989 Minimum mass of zinc coating 600 g/m ² including both sides.	All external cut edges to be protected using organic protective coating	<i>Either</i> a) bituminous solution complying with the requirements of BS 3416 and of minimum dry film thickness 25 µm <i>or</i> b) a one pack chemical resistant paint complying with the requirements of HF1A to HF2F in Table 4H of Part 4 of BS 5493, modified to give adequate adhesion to the zinc coated lintel, and of minimum dry film thickness 25 µm Where the zinc is removed on internal surfaces during fabrication, e.g. by welding, further additional protection should be applied to these areas before delivery to site.
Pre-galvanized to comply with the requirements for coating type G275 in BS 2989 Minimum mass of zinc coating 275 g/m ² including both sides.	All external surfaces of the lintel to be protected using organic protective coating	

Table 2 — Protection of steel lintels having integral damp-proof systems

Zinc coating	Additional protection	Organic protective coating
Post-galvanized following the procedure given in BS 729 Minimum mass of zinc coating 1 420 g/m ² including both sides.	Not necessary	
Post-galvanized following the procedure given in BS 729 Minimum mass of zinc coating 920 g/m ² including both sides.	Surfaces indicated in Figure 1 to be protected using organic coating	<i>Either</i> a) bituminous solution complying with the requirements of BS 3416 and of minimum dry film thickness 25 µm <i>or</i> b) a one pack chemical resistant paint complying with the requirements of HF1A to HF2F in Table 4H of Part 4 of BS 5493, modified to give adequate adhesion to the zinc coated lintel, and of minimum dry film thickness 25 µm Where the zinc is removed on internal surfaces during fabrication, e.g. by welding, further additional protection should be applied to these areas before delivery to site.
Pre-galvanized to comply with the requirements for coating type G600 in BS 2989 Minimum mass of zinc coating 600 g/m ² including both sides.	Surfaces indicated in Figure 1 to be protected using organic coating	
Pre-galvanized to comply with the requirements for coating type G275 in BS 2989 Minimum mass of zinc coating 275 g/m ² including both sides.	All external surfaces of the lintel to be protected using organic coating	A system which meets the test requirements for impact, abrasion and corrosion resistance described in Appendix C. Where the zinc is removed on internal surfaces during fabrication, e.g. by welding, further additional protection should be applied to these areas before delivery to site.

5 Workmanship

5.1 Dimensional deviations. Dimensional deviations from work sizes shall not be outside the following limits:

Length up to 3 m	± 6 mm
Length 3 m to 4.5 m	± 9 mm
Width and depth	± 3 mm
Straightness or bow:	
Length up to 3 m	6 mm
Length 3 m to 4.5 m	10 mm

5.2 Concrete lintels. Workmanship for reinforced and prestressed concrete lintels shall be in accordance with the recommendations of section 6 and 7 and section 6 and 8 of BS 8110-1:1985 respectively. Workmanship for aerated concrete lintels shall be in accordance with the recommendations of section 6 of BS 8110-2:1985.

NOTE Particular attention should be paid to the recommendations for cover to reinforcement and minimum cement content for durability in Table 6.2 of BS 8110-1:1985, or 6.3 of BS 8110-2:1985, as appropriate.

5.3 Steel lintels. Steel lintels shall be formed to the desired shape without rupture of either the steel or any pre-applied surface protection.

Where applicable, minimum bend radii shall comply with the requirements of the appropriate material standard listed in 4.2.

Spot welding shall comply with BS 1140 with the proviso that the nugget diameter shall be not less than

$$4\sqrt{t}$$

where t is the lesser thickness of the two sheets being welded. Metal-arc welding shall comply with BS 5135.

5.4 Timber lintels. The quality of workmanship for timber used in lintels shall be as recommended in BS 5268-2. Where timber has been treated with copper/chrome/arsenic (CCA) preservatives, the recommendations concerning fixings in 8.2 of BS 5268-5:1977 shall be followed.

6 Identification of lintels

6.1 The following particulars relating to lintels made in accordance with this standard shall be indicated clearly on the delivery note, invoice, manufacturer’s or supplier’s certificate or brochure supplied with the consignment of lintels:

- a) the name, trade mark or other means of identification of the manufacturer;
- b) the number of this British Standard, i.e. BS 5977-2¹⁾;
- c) the safe working load and, where applicable, the load ratio and/or the composite lintel depth;
- d) whether a separate damp-proof course is required.

6.2 Lintels designed to meet the maximum stresses set up by loading only when tested or laid in a specified position shall be marked with an indelible mark “Top” on the top face.

6.3 Concrete lintels intended for internal use only shall be marked with an indelible mark “INT”.

NOTE The type of lintel and whether a separate damp-proof course is required should be verifiable by inspection of the lintel on site, if necessary by reference to the manufacturer’s literature.

Section 3. Design and testing

7 Performance

7.1 General

7.1.1 The manufacturer shall state, in his trade literature and technical data sheets, the maximum effective span and the safe working load for the lintel and the appropriate load ratios (see 7.2.2). For composite lintels, the composite lintel depth (see Figure 8) shall also be stated.

When limit state design methods have been used, the stated safe working load shall be taken to be the characteristic load.

7.1.2 The manufacturer shall prove by design from first principles (see 7.2) or by design based on test (see 7.3) that the lintel:

- a) has the margin of safety against failure provided by the use of that design method when subjected to the stated safe working load;
- b) will deflect in either plane not more than 1/325 times the effective span when subjected to the stated safe working load.

The manufacturer shall, if requested (see Appendix A), provide copies of calculations or test certificates to satisfy the purchaser that the design of the lintel is in accordance with the requirements of this standard.

7.2 Design from first principles

7.2.1 Introduction. The design of lintels shall follow either the method given in the appropriate standard listed in Table 3 or an independent design method based on proven structural engineering principles. Two-part lintels shall be designed using the appropriate method given in 7.2.2 or 7.2.3.

NOTE Where lintels are to be designed from first principles, the design should be the responsibility of a chartered engineer or other appropriately qualified person.

Table 3 — British Standards for design of lintels

Type of lintel or element of two-part lintel	British Standard	Additional requirements
Prestressed concrete	BS 8110-1	Where separate values for dead and live loads are not stated a partial safety factor for load of 1.5 shall be used.
Reinforced concrete		
Aerated concrete	BS 8110-2	
Steel	BS 449-2 and Addendum No. 1 to BS 449-2	A partial safety factor for load not less than 1.6 shall be used.
Timber	BS 5268-2	

¹⁾ Marking BS 5977-2 on or in relation to a product is a claim by the manufacturer that the product has been manufactured in accordance with the requirements of the standard. The accuracy of such a claim is therefore solely the manufacturer’s responsibility. Enquiries as to the availability of third party certification to support such claims should be addressed to the Director, Quality Assurance Division, British Standards Institution, Maylands Avenue, Hemel Hempstead, Herts HP2 4SQ in the case of certification marks administered by BSI or to the appropriate authority for other certification marks.