BRITISH STANDARD

BS 5977-1:1981

Incorporating
Amendment No. 1

Lintels —

Part 1: Method for assessment of load

Confirmed
January 2010

UDC 624.072.22.042:692.299

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This British Standard, having been prepared under the direction of the Elements and Components (of Diverse Materials) for Building Standards Committee, was published under the authority of the Executive Board and comes into effect on
31 December 1981

The following BSI references relate to the work on this standard:
Committee reference ECB/36
Draft for comment 79/13060 DC

ISBN 0 580 12486 X

Amendments issued since publication

Amd. No.	Date of issue	Comments
4796	April 1985	Indicated by a sideline in the margin

Contents

Foreword

This British Standard has been prepared under the direction of the Elements and Components (of Diverse Materials) for Building Standards Committee and covers the design and use of all types of lintel (up to 4.5 m in span) in masonry. This Part describes a method for assessing the load carried by lintels.

— *Part 2: of this standard is a specification for prefabricated lintels.*

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

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

1 Scope

This Part of BS 5977 describes a method for assessing the load carried by lintels in masonry:

a) where lintels span up to 4.5 m in single storey buildings and up to 3.6 m in two or three storey buildings in normal domestic use; *and*

b) where no openings are wholly or partly within the load triangle (see **3.2**).

Appendix A gives guidance on the use of assessed loads for design or selection of lintels, but does not cover assessment of the overall stability of the structure or the design of adjacent masonry.

NOTE It has been assumed in the drafting of this Part that the assessment of load on a lintel is entrusted to chartered structural or civil engineers or other appropriately qualified persons, for whose guidance it has been prepared.
The responsibility for providing adequate support for lintels and for compatibility between lintels and other parts of the supporting structure rests with the designer responsible for the overall stability of the building. For guidance, see BS 5628-1.

2 References

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

3 Definitions

For the purposes of this British Standard, the following definitions apply.

3.1
lintel

a beam spanning an opening in a wall

3.2
load triangle

a 45° triangle having 1.1 times the clear span of the lintel as its base (see Figure 1)

3.3
interaction zone

a zone outside the load triangle but within a 60° triangle having 1.1 times the clear span of the lintel as its base (see Figure 1)

3.4
application level

the top surface of the lintel under consideration (see Figure 1)

3.5
application length

the length over which a load is distributed at the application level (see Figure 2 and Figure 3)

3.6
equivalent uniformly distributed load (UDL)

that uniformly distributed load which gives the same bending moment at the centre of the span as the maximum bending moment anywhere in the span given by the actual loads

4 Basic principles

4.1 General. Experience has shown that, subject to the conditions given in **4.2**, it is safe to design a lintel to carry less than the sum of the applied loads and the weight of masonry immediately above the lintel. The remainder is dispersed through the masonry on either side of the lintel.

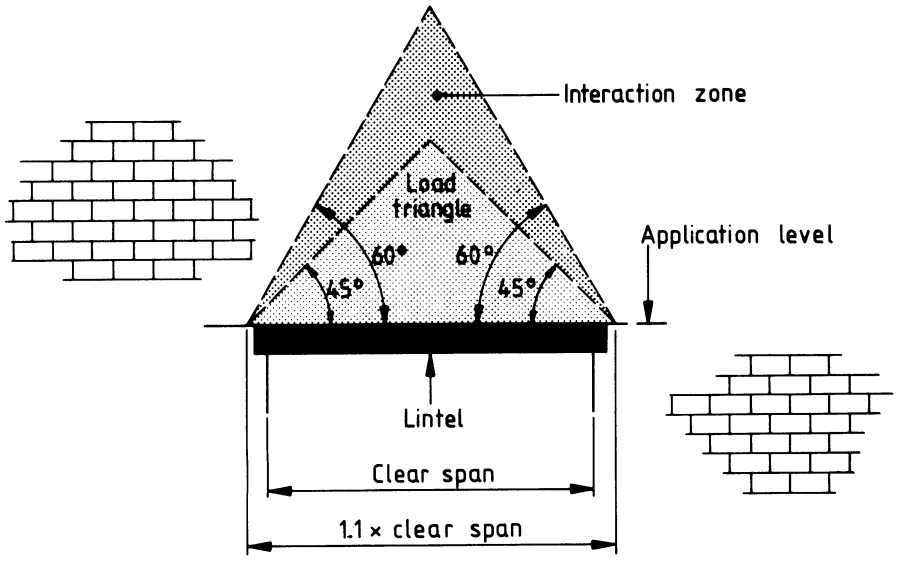


Figure 1 — Load triangle and interaction zone

4.2 Assumptions. For the methods described in clauses **7** and **8**, it is assumed that:

a) all the weight of the masonry within the load triangle is carried as a load on the lintel;

b) any point or distributed loads applied to the masonry within the load triangle are dispersed at 45° and carried by the lintel [see Figure 2(a)];

c) any point or distributed loads applied to the masonry within the interaction zone are reduced by 50 %, dispersed at 45° and carried by the lintel [see Figure 2(b)];

d) the weight of masonry in the interaction zone is not carried by the lintel.

5 Limiting conditions

For the methods described in clauses **7** and **8**, it is assumed that the following limiting conditions are satisfied.

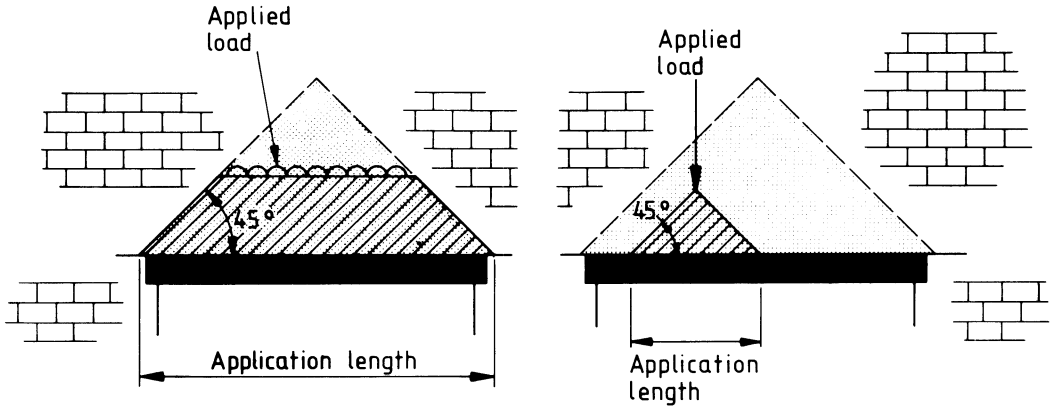
a) The masonry is constructed following the recommendations of BS 5628-3.

b) The height of masonry above the lintel at mid-span is not less than 0.6 times the clear span of the lintel.

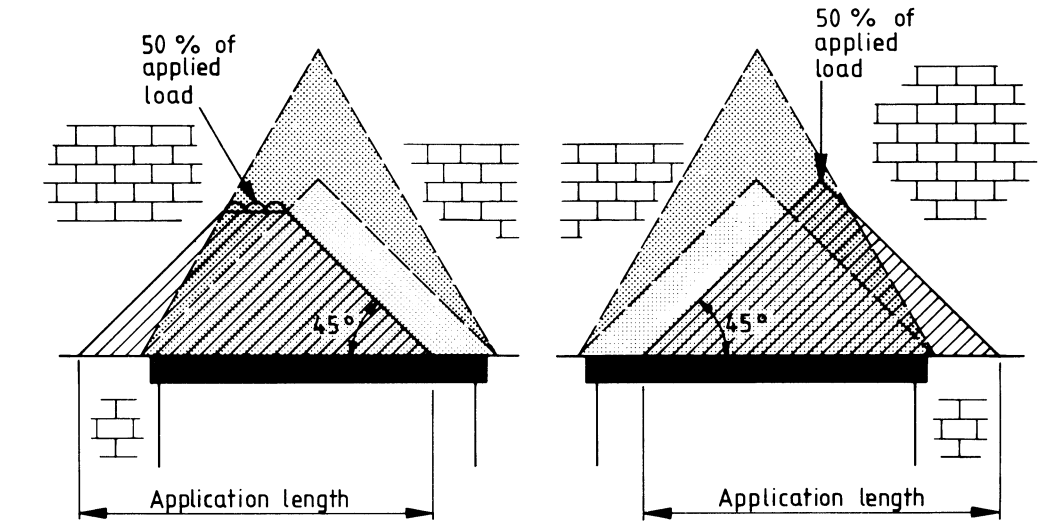
c) The height of masonry above the supports is not less than 600 mm.

d) The masonry is continuous within the area defined by the conditions given in b) and c).

e) Where there is a single opening spanned by the lintel, the width of masonry on either side of the opening is not less than 600 mm or 0.2 times the clear span of the lintel, whichever is the greater.



(a) Dispersion of loads applied within load triangle



(b) Dispersion of loads applied within interaction zone

Figure 2 — Dispersion of loads

f) Where there are a series of openings at the level of the opening spanned by the lintel, the length of masonry between the external corner of the wall and the side of the adjacent opening is not less than 600 mm or 0.2 times the longest clear span, whichever is the greater.

Where conditions b), c) and d) are not satisfied, see clause **9**.

6 Loads

The principal dead and imposed loads on a lintel arise from one or more of the following:

a) masonry;

b) floors;

c) roofs;

d) partitions;

e) trimmer beams;

f) self-weight of the lintel.

NOTE For guidance, see BS 648 and BS 6399-1.

7 Assessment of load for lintel supporting wall without openings within the interaction zone

Where the wall supported by the lintel has no other openings within the interaction zone [see Figure 3(a)], the load carried by the lintel shall be assessed as follows.

a) Take the load due to the masonry above the lintel to be the weight of masonry within the load triangle.

b) Disperse any loads applied to the masonry within the load triangle at 45° and consider them uniformly distributed at the application level [see Figure 2(a)].

c) Reduce all loads applied to the masonry within the interaction zone by 50 % and then disperse them at 45° to produce a uniformly distributed load at the application level [see Figure 2(b)].

d) Neglect the weight of masonry in the interaction zone.

e) Neglect loads applied outside the interaction zone.

f) Add the above components of the applied loads to the self-weight of the lintel to obtain the total design load.

8 Assessment of load for lintel supporting wall with one or more openings within the interaction zone

8.1 Openings that do not intersect boundaries of the interaction zone shall be neglected [see Figure 3(a)].

8.2 Where openings intersect the boundaries of the interaction zone, the effect is to apply an additional load to the lintel unless a single opening crosses the entire interaction zone [see Figure 3(b) and Figure 3(c)].

The intensity of load across the section xy shown in Figure 3(c) shall be assessed by taking into account all self-weight and applied loads on the wall above this level. The load across the section xy, which lies in the interaction zone, shall be halved before dispersing it at 45° to the lintel below.

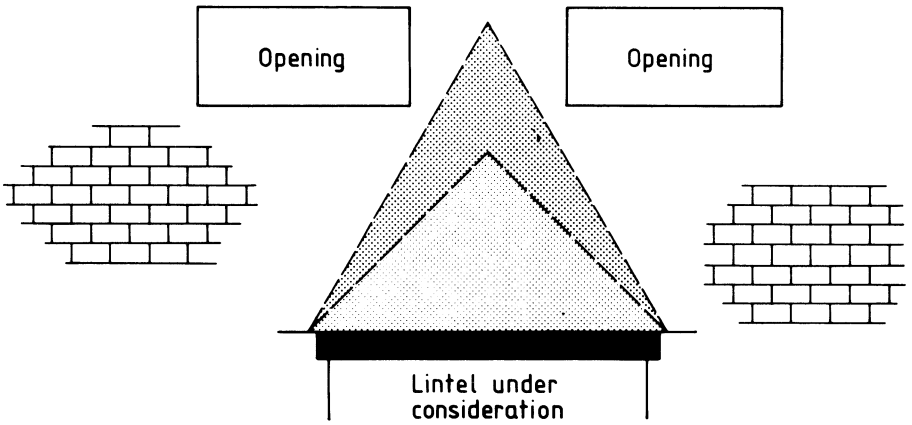
If two openings intersect the interaction zone, the load shall be taken to act at the bottom of the lowest opening.

All other loads shall be assessed as described in clause **7**.

NOTE Examples showing loads on lintels supporting walls with openings are given in Figure 4 and Figure 5.

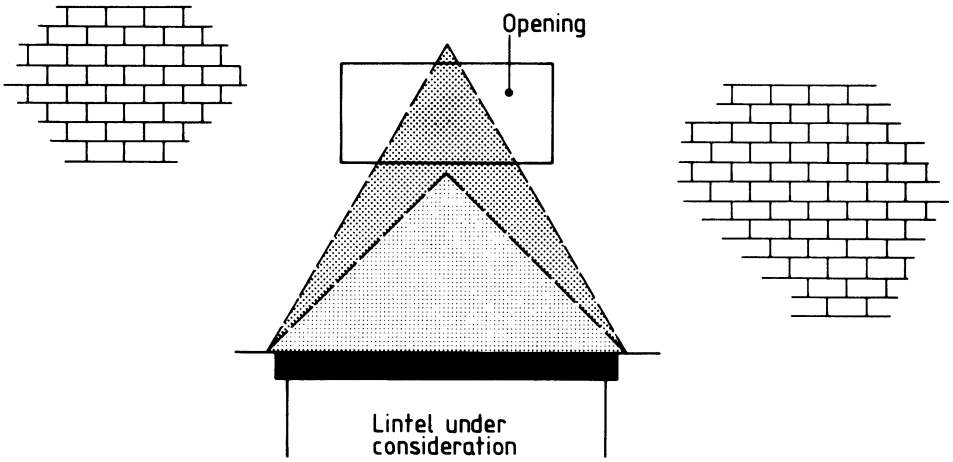
9 Assessment of load for lintel directly supporting roof or point loads

Where the lintel directly supports a roof or a point load and in other cases where the conditions b), c) or d) given in clause **5** are not satisfied, the load on the lintel shall be taken to be the full value of the imposed load, plus the self-weight of the lintel.



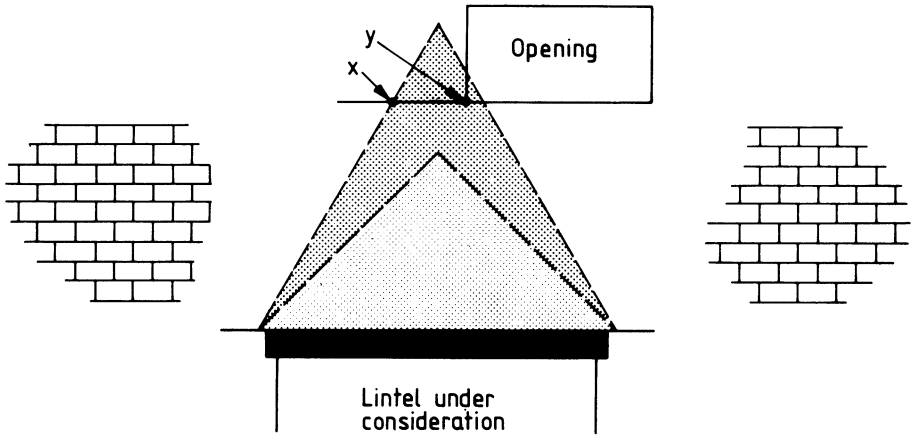
NOTE. No additional load on the lintel below (see **8.1**).

(a) Openings outside interaction zone



NOTE. No additional load on the lintel below (see **8.2**).

(b) Opening passing across entire interaction zone



NOTE. Load in masonry across section xy is carried on the lintel below (see **8.2**).

(c) Opening intersecting boundary of interaction zone

Figure 3 — Effect of openings above the lintel

Appendix A Use of assessed loads for design or selection of lintels

A.1 Design. The maximum bending moment, shear and deflection of a lintel are derived from the assessed loads and the lintel designed using normal structural engineering principles.

A.2 Selection of lintels using published load-span tables. For selection of lintels using published load-span tables, it may be convenient to convert triangular loads and part span loads to the equivalent uniformly distributed loads (see **3.6**) over the whole span. However, it should be noted that:

a) equivalent uniformly distributed loads do not give correct shear forces; and

b) bending moments calculated at mid-span by the use of equivalent uniformly distributed loads may occur in practice at other points in the span. Thus if lintels do not have a uniform bending strength throughout their length, it is essential to use equivalent uniformly distributed loads with discretion.

Equivalent uniformly distributed loads for assessment of bending strength and deflection are calculated as follows:

a) for triangular loads

$W_e = 1.33\ W$

b) for uniformly distributed loads over part of the length of the lintel, or for point loads

$W_e = K \times W$

where

W is the assessed load (see clauses **7**, **8** and **9**),

W_e is the equivalent UDL,

K is the appropriate factor taken from Table 1 or Table 2.

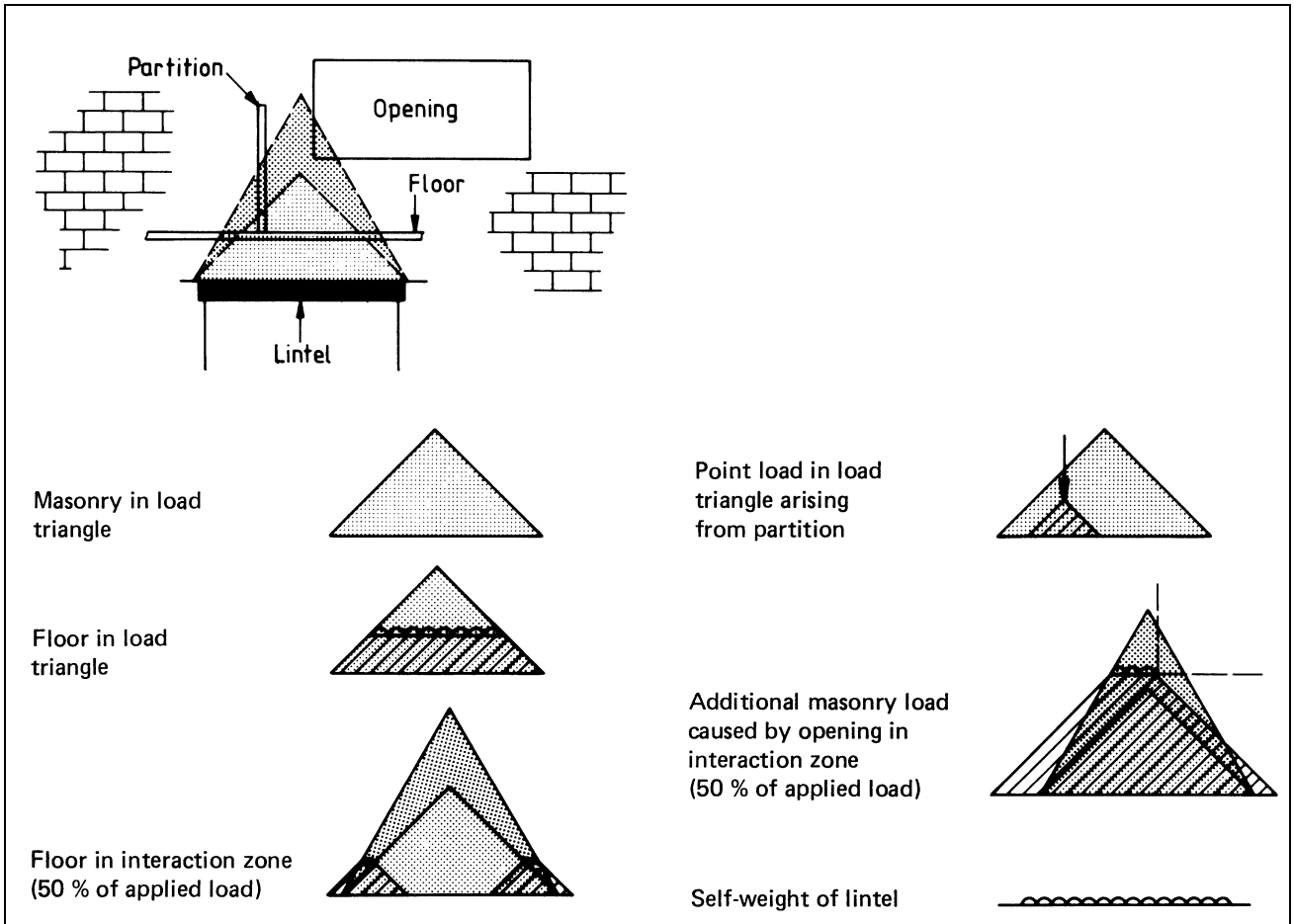
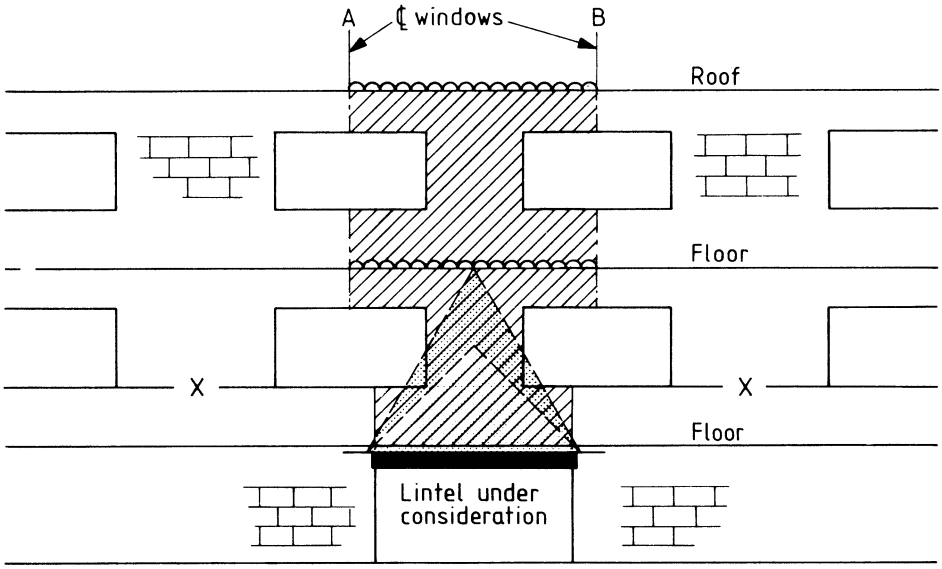


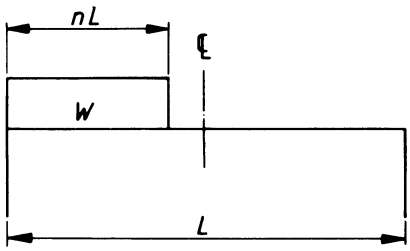
Figure 4 — Example showing the loads on lintel with floor, partition and opening over the lintel



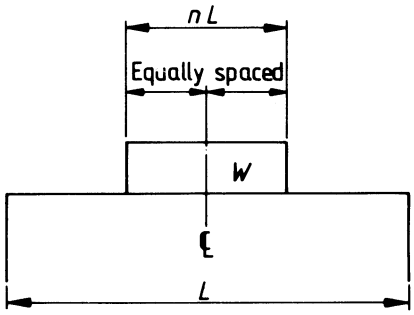
NOTE All wall, floor and roof loads in the area bounded by vertical lines A and B are applied across the section XX to the lintel under consideration.

Figure 5 — Example showing the loads on lintels supporting walls

Table 1 — Conversion factors for determining equivalent UDLs from assessed UDLs[a]



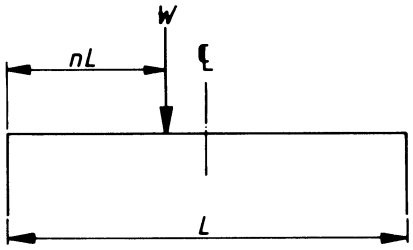
n	K
0	—
0.05	0.190
0.1	0.361
0.15	0.513
0.2	0.648
0.25	0.766
0.3	0.867
0.333	0.926
0.35	0.953
0.4	1.024
0.45	1.081
0.5	1.125
0.55	1.156
0.60	1.176
0.65	1.185
0.666	1.185
0.70	1.183
0.75	1.172
0.80	1.152
0.85	1.124
0.90	1.089
0.95	1.047
1.00	1.00



n	K
0	2.0
0.05	1.95
0.1	1.9
0.15	1.85
0.2	1.8
0.25	1.75
0.3	1.7
0.333	1.667
0.35	1.65
0.4	1.6
0.45	1.55
0.5	1.5
0.55	1.45
0.60	1.40
0.65	1.35
0.666	1.334
0.70	1.30
0.75	1.25
0.80	1.20
0.85	1.15
0.90	1.10
0.95	1.05
1.00	1.00

[a] It is essential to read these tables in conjunction with **A.2**.

Table 2 — Conversion factors for determining equivalent UDLs from point loads close to the lintel[a]



n	K	n	K
0.05	0.38	0.30	1.68
0.10	0.72	0.35	1.82
0.15	1.02	0.40	1.92
0.20	1.28	0.45	1.98
0.25	1.50	0.50	2.00

[a] It is essential to read these tables in conjunction with **A.2**.

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Publications referred to

BS 648, *Schedule of weights of building materials.*
BS 5628, *Code of practice for use of masonry.*
BS 5628-1, *Structural use of unreinforced masonry.*
BS 5628-2, *Structural use of reinforced and prestressed masonry.*
BS 5628-3, *Materials and components, design and workmanship.*
BS 6399, *Design loading for buildings.*
BS 6399-1, *Code of practice for dead and imposed loads.*
CP 3, *Code of basic data for the design of buildings.*

CP 121, *Walling.*

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