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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
**98/3493**
**Product Sheet 1**

# KEYSTONE LINTELS

## KEYSTONE LINTELS FOR INTERNAL AND EXTERNAL MASONRY AND TIMBER-FRAME WALLS

This Agrément Certificate Product Sheet[1] relates to Keystone Lintels for Internal and External Masonry and Timber-frame Walls.

(1) Hereinafter referred to as 'Certificate'.

### CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

### KEY FACTORS ASSESSED

**Structural performance** — the products are suitable for use in masonry cavity walls as indicated in Tables 1 to 7 (see section 6).

**Behaviour in relation to fire** — in a conventional brick/block construction, the lintels can have a fire resistance of one-hour (see section 7).

**Thermal performance** — opening head junctions can adequately limit heat loss (see section 9).

**Condensation risk** — the risk of local surface condensation around opening heads will be minimal (see section 10).

**Durability** — the products should have a working life commensurate with that of the building in which they are installed (see section 12).

The BBA has awarded this Certificate to the company named above for the products described herein. These products have been assessed by the BBA as being fit for their intended use provided they are installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of Second issue: 10 October 2012
Originally certificated on 15 July 1998

Brian Chamberlain
Head of Approvals — Engineering

Greg Cooper
Chief Executive

*Certificate amended on 18 October 2012 to remove some lintels from the Certificate.*

*The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk*

*Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.*

# Regulations

In the opinion of the BBA, Keystone Lintels for Internal and External Masonry and Timber-frame Walls, if installed, used and maintained in accordance with this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):

## The Building Regulations 2010 (England and Wales)

| | | |
|---|---|---|
| **Requirement:** | A1 | Loading |
| Comment: | | The lintels have sufficient strength and stiffness provided:<br>(a) they are correctly installed. See the *Installation* part of this Certificate.<br>(b) the design loads are in accordance with sections 6.1 to 6.3 of this Certificate. |
| **Requirement:** | B3(1) | Internal fire spread (structure) |
| Comment: | | When protected in accordance with this Certificate, the lintels will have the period of fire resistance as given in section 7.1 of this Certificate. |
| **Requirement:** | C2(b) | Resistance to moisture |
| Comment: | | When used in external masonry cavity walls, the products will not adversely affect the ability of the wall to satisfy the stated requirements, provided correct construction details are adopted. See sections 10.1 and 10.2 of this Certificate. |
| **Requirement:** | C2(c) | Resistance to moisture |
| Comment: | | The products can contribute to satisfying this Requirement. See section 10.3 of this Certificate. |
| **Requirement:** | L1 | Conservation of fuel and power |
| Comment: | | When installed in accordance with this Certificate, the lintels will have the thermal properties described in section 9.2 of this Certificate. |
| **Requirement:** | Regulation 7 | Materials and workmanship |
| Comment: | | The products are acceptable. See sections 12.1 and 12.2 and the *Installation* part of this Certificate. |

## The Building (Scotland) Regulations 2004 (as amended)

| | | |
|---|---|---|
| **Regulation:** | 8(1) | Fitness and durability of materials and workmanship |
| Comment: | | The products are acceptable. See sections 12.1 and 12.2 and the *Installation* part of this Certificate. |
| **Regulation:** | 9 | Building standards — construction |
| Standard: | 1.1(a)(b) | Structure |
| Comment: | | The products are acceptable, with reference to clause 1.1.1[(1)(2)]. See sections 6.1 to 6.3 of this Certificate. |
| Standard: | 2.3 | Structural protection |
| Comment: | | The products can be incorporated in a construction satisfying this Standard, with reference to clauses 2.3.1[(1)(2)] and 2.3.3[(1)(2)] and Appendices 2B[(1)] and 2D[(2)]. See section 7.1 of this Certificate. |
| Standard: | 3.15 | Condensation |
| Comment: | | When incorporated in an external masonry cavity wall, the products can satisfy this Standard, with reference to clauses 3.15.1[(1)(2)], 3.15.4[(1)(2)] and 3.15.5[(1)(2)]. See sections 10.1 to 10.3 of this Certificate. |
| Standard: | 6.1 | Carbon dioxide emissions |
| Standard: | 6.2 | Building insulation envelope |
| Comment: | | Heads of openings in external walls incorporating the product can limit heat loss and the risk of condensation, with reference to clauses 6.1.6[(1)], 6.2.3[(1)], 6.2.4[(2)], 6.2.5[(2)], 6.2.10[(1)] and 6.2.11[(2)]. See section 9.2 of this Certificate. |
| Standard: | 7.1(a)(b) | Statement of sustainability |
| Comment: | | The products can contribute to meeting the relevant requirements of Regulation 9, Standards 1 to 6, and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard. |
| **Regulation:** | 12 | Building standards — conversions |
| Comment: | | All comments given for these products under Regulation 9, Standards 1 to 6, also apply to this Regulation, with reference to clause 0.12.1[(1)(2)] and Schedule 6[(1)(2)].<br>(1) Technical Handbook (Domestic).<br>(2) Technical Handbook (Non-Domestic). |

## The Building Regulations (Northern Ireland) 2000 (as amended)

| | | |
|---|---|---|
| **Regulation:** | B2 | Fitness of materials and workmanship |
| Comment: | | The products are acceptable. See sections 12.1 and 12.2 and the *Installation* part of this Certificate. |
| **Regulation:** | C5 | Condensation |
| Comment: | | The products can contribute to satisfying this Regulation. See sections 10.2 and 10.3 of this Certificate. |
| **Regulation:** | D1 | Stability |
| Comment: | | The lintels have sufficient strength and stiffness provided:<br>(a) they are correctly installed. See the *Installation* of this Certificate.<br>(b) the design loads are in accordance with sections 6.1 to 6.3 of this Certificate. |

| | | |
|---|---|---|
| Regulation: | E4(1)(2) | Internal fire spread — Structure |
| Comment: | | When protected in accordance with this Certificate, the lintels will have the period of fire resistance as given in section 7.1 of this Certificate. |
| Regulation: | F2 | Conservation measures |
| Regulation: | F3 | Target carbon dioxide Emissions Rate |
| Comment: | | Heads of openings in external masonry cavity walls incorporating these products can limit heat loss and the risk of condensation. See section 9.2 of this Certificate. |

**Construction (Design and Management) Regulations 2007**

**Construction (Design and Management) Regulations (Northern Ireland) 2007**

Information in this Certificate may assist the client, CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See section: 1 *Description* (1.1) of this Certificate.

# Additional Information

## NHBC Standards 2011

NHBC accepts the use of Keystone Lintels for Internal and External Masonry and Timber-frame Walls, when installed, used and maintained in accordance with this Certificate, in relation to *NHBC Standards*, Chapters 6.1 *External masonry walls* and 6.3 *Internal walls*.

# Technical Specification

## 1 Description

### Profiles

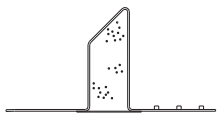
1.1 Keystone Lintels are available in various profiles and types shown in Tables 1 to 6. The tabulated safe working loads have been determined from tests and are the lesser of:

- test failure load divided by 1.6
- test load causing a deflection recovery of at least 20% of the maximum deflection sustained after one hour under load
- test load causing a vertical or horizontal deflection of 1/325 times the effective span.

*Table 1 Profiles — Type S/K lintels*

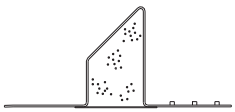
Standard

Type S/K-50[1] (cavity widths: 50 mm to 70 mm)



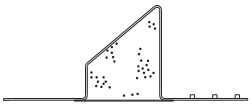
| Lengths typically in 150 mm increments | 600–1200 | 1350–1500 | 1650–1800 | 1950–2100 | 2250–2400 | 2550–2700 | 2850–3000 | 3150–3600 | 3750–4000 | 4200–4800 |
|---|---|---|---|---|---|---|---|---|---|---|
| Height of lintel (mm) | 79 | 95 | 110 | 134 | 150 | 172 | 172 | 209 | 209 | 209 |
| Thickness of lintel (mm) | 1.6 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.6 | 3.2 | 3.2 | 3.4 |
| UDL [2a] (kN) | 12 | 14 | 19 | 21 | 21 | 26 | 27 | 27 | 26 | 27 |
| UDL [2b] (kN) | 10 | 12 | 16 | 17 | 19 | 22 | 20 | 20 | 19 | 22 |
| Weight ($kg \cdot m^{-1}$) | 5.21 | 6.91 | 7.3 | 8.08 | 8.44 | 9.22 | 11.94 | 15.7 | 15.7 | 18.68 |

Type S/K-70[1] (cavity widths: 70 mm to 90 mm)



| Lengths typically in 150 mm increments | 600–1200 | 1350–1500 | 1650–1800 | 1950–2100 | 2250–2400 | 2550–3000 | 3150–3600 | 3750–4000 | 4200–4800 |
|---|---|---|---|---|---|---|---|---|---|
| Height of lintel (mm) | 98 | 89 | 106 | 130 | 142 | 168 | 204 | 204 | 204 |
| Thickness of lintel (mm) | 1.6 | 2.0 | 2.0 | 2.0 | 2.0 | 2.6 | 3.2 | 3.2 | 3.4 |
| UDL [2a] (kN) | 12 | 14 | 18 | 21 | 21 | 27 | 27 | 26 | 27 |
| UDL [2b] (kN) | 10 | 12 | 14 | 17 | 19 | 22 | 20 | 19 | 22 |
| Weight ($kg \cdot m^{-1}$) | 5.85 | 6.91 | 7.46 | 8.08 | 8.6 | 11.95 | 15.7 | 15.7 | 18.68 |

Type S/K-90[1] (cavity widths: 90 mm to 110 mm)

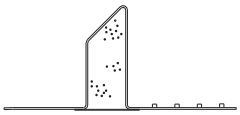


| Lengths typically in 150 mm increments | 600–1200 | 1350–1500 | 1650–1800 | 1950–2100 | 2250–2400 | 2550–2700 | 2850–3000 | 3150–3600 | 3750–4000 | 4200–4800 |
|---|---|---|---|---|---|---|---|---|---|---|
| Height of lintel (mm) | 88 | 85 | 107 | 125 | 150 | 162 | 171 | 200 | 200 | 200 |
| Thickness of lintel (mm) | 1.6 | 2.0 | 2.0 | 2.0 | 2.0 | 2.6 | 2.6 | 3.2 | 3.2 | 3.4 |
| UDL [2a] (kN) | 12 | 16 | 19 | 21 | 23 | 27 | 27 | 27 | 26 | 27 |
| UDL [2b] (kN) | 10 | 13 | 16 | 17 | 18 | 22 | 20 | 20 | 19 | 22 |
| Weight ($kg \cdot m^{-1}$) | 6.16 | 7.47 | 8.0 | 8.4 | 9.18 | 12.13 | 12.68 | 15.7 | 15.7 | 18.68 |

*Table 1 Profiles — Type S/K lintels (continued)*

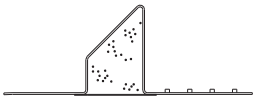
### Wider inner leaf

**Type S/K-50[1] WIL** (cavity widths: 50 mm to 70 mm)



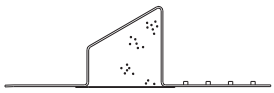
| Lengths typically in 150 mm increments | 600–1350 | 1500–1650 | 1800 | 1950–2100 | 2250–2400 | 2550–3000 | 3150–3600 | 3750–4000 | 4200 |
|---|---|---|---|---|---|---|---|---|---|
| Height of lintel (mm) | 91 | 96 | 110 | 136 | 162 | 172 | 196 | 196 | 196 |
| Thickness of lintel (mm) | 1.6 | 2.0 | 2.0 | 2.0 | 2.0 | 2.6 | 3.2 | 3.2 | 3.4 |
| UDL [2a] (kN) | 12 | 12 | 15 | 20 | 24 | 28 | 30 | 27 | 26 |
| UDL [2b] (kN) | 10 | 10 | 13 | 18 | 20 | 21 | 26 | 25 | 22 |
| Weight (kg·m$^{-1}$) | 5.91 | 7.39 | 7.65 | 8.44 | 9.22 | 12.48 | 17.7 | 17.7 | 18.68 |

**Type S/K-70[1] WIL** (cavity widths: 70 mm to 90 mm)



| Lengths typically in 150 mm increments | 600–1350 | 1500–1650 | 1800 | 1950–2100 | 2250–2400 | 2550–3000 | 3150–3600 | 3750–4000 | 4200 |
|---|---|---|---|---|---|---|---|---|---|
| Height of lintel (mm) | 93 | 90 | 100 | 134 | 158 | 167 | 191 | 192 | 190 |
| Thickness of lintel (mm) | 1.6 | 2.0 | 2.0 | 2.0 | 2.0 | 2.6 | 3.2 | 3.2 | 3.4 |
| UDL [2a] (kN) | 12 | 13 | 20 | 19 | 24 | 27 | 30 | 27 | 26 |
| UDL [2b] (kN) | 10 | 11 | 17 | 17 | 20 | 21 | 26 | 25 | 22 |
| Weight (kg·m$^{-1}$) | 6.28 | 7.45 | 7.85 | 8.6 | 9.38 | 13.04 | 17.7 | 17.7 | 18.68 |

**Type S/K-90[1] WIL** (cavity widths: 90 mm to 110 mm)



| Lengths typically in 150 mm increments | 600–1200 | 1350–1800 | 1950–2400 | 2550–3000 | 3150–3600 | 3750–4000 | 4200 |
|---|---|---|---|---|---|---|---|
| Height of lintel (mm) | 82 | 107 | 142 | 177 | 191 | 187 | 187 |
| Thickness of lintel (mm) | 1.6 | 2.0 | 2.0 | 2.6 | 3.2 | 3.2 | 3.4 |
| UDL [2a] (kN) | 13 | 17 | 23 | 24 | 30 | 27 | 26 |
| UDL [2b] (kN) | 11 | 14 | 18 | 18 | 26 | 25 | 21 |
| Weight (kg·m$^{-1}$) | 8 | 8.4 | 9.58 | 13.19 | 17.7 | 17.7 | 18.68 |

(1) Incorporating an indented inner leaf flange and a slotted 'thermal-break' plate fixed across the cavity with spot welds.

(2) Total uniformly distributed load (UDL):
(a) load ratio from 0.5 to 0.75
(b) load ratio from 0.75 to 0.95

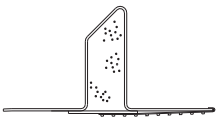
$$\text{load ratio} = \frac{w_1}{w_1 + w_2}$$

where: $w_1$ = total load on inner leaf
$w_2$ = total load on outer leaf
$w_1 + w_2$ = total load on lintel.

*Table 2 Profiles — Type HD/K lintels*

### Heavy duty

**Type HD/K-50[1]** (cavity widths: 50 mm to 70 mm)



| Lengths typically in 150 mm increments | 600–1350 | 1500 | 1650 | 1800–2100 | 2250–3000 | 3150–3600 | 3750–4000 |
|---|---|---|---|---|---|---|---|
| Height of lintel (mm) | 105 | 121 | 121 | 171 | 209 | 209 | 209 |
| Thickness of lintel (mm) | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 | 3.2 |
| UDL [2a] (kN) | 21 | 27 | 27 | 32 | 37 | 34 | 30 |
| UDL [2b] (kN) | 18 | 22 | 22 | 24 | 33 | 31 | 27 |
| Weight (kg·m$^{-1}$) | 10.74 | 13.63 | 13.63 | 16.23 | 18.17 | 18.17 | 18.17 |

(1) Incorporating an indented inner leaf flange and a slotted 'thermal-break' plate fixed across the cavity with spot welds.

(2) Total uniformly distributed load (UDL):
(a) load ratio from 0.5 to 0.75
(b) load ratio from 0.75 to 0.95

$$\text{load ratio} = \frac{w_1}{w_1 + w_2}$$

where: $w_1$ = total load on inner leaf
$w_2$ = total load on outer leaf
$w_1 + w_2$ = total load on lintel.

*Table 3 Profiles — Type L5 lintels*

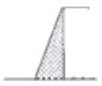
**Type CFS/K 50**[1] (cavity widths: 50 mm to 70 mm)

| Lengths typically in 150 mm increments | 600–2400 | 2250–3600 | 3750–4800 | 3750–4800 |
|---|---|---|---|---|
| Height of lintel (mm) | 228 | 228 | 228 | 228 |
| Thickness of lintel (mm) | 2.5[2] | 3.0[2] | 3.0[2] | 3.0[2] |
| UDL [2a] (kN) | – | – | – | – |
| UDL [2b] (kN) | 48 | 50 | 38 | 45 |
| Weight (kg·m$^{-1}$) | 16.28 | 19.14 | 19.14 | 20.33 |

**Type CFS/K 70**[1] (cavity widths: 70 mm to 90 mm)

| Lengths typically in 150 mm increments | 600–2400 | 2250–3600 | 3750–4800 | 3750–4800 |
|---|---|---|---|---|
| Height of lintel (mm) | 228 | 228 | 228 | 228 |
| Thickness of lintel (mm) | 2.5[2] | 3.0[2] | 3.0[2] | 3.0[2] |
| UDL [2a] (kN) | – | – | – | – |
| UDL [2b] (kN) | 48 | 50 | 38 | 45 |
| Weight (kg·m$^{-1}$) | 17.47 | 20.53 | 20.53 | 21.94 |

**Type CFS/K 90**[1] (cavity widths: 90 mm to 110 mm)



| Lengths typically in 150 mm increments | 600–2400 | 2250–3600 | 3750–4800 | 3750–4800 |
|---|---|---|---|---|
| Height of lintel (mm) | 228 | 228 | 228 | 228 |
| Thickness of lintel (mm) | 2.5[2] | 3.0[2] | 3.0[2] | 3.0[2] |
| UDL [2a] (kN) | – | – | – | – |
| UDL [2b] (kN) | 48 | 50 | 38 | 45 |
| Weight (kg·m$^{-1}$) | 18.64 | 21.78 | 21.78 | 22.72 |

(1) Incorporating an indented inner leaf flange and a slotted 'thermal-break' plate fixed across the cavity with spot welds.

(2) Total uniformly distributed load (UDL):
(a) load ratio from 0.5 to 0.75
(b) load ratio from 0.75 to 0.95

$$\text{load ratio} = \frac{w_1}{w_1 + w_2}$$

where: $w_1$ = total load on inner leaf
$w_2$ = total load on outer leaf
$w_1 + w_2$ = total load on lintel.

## *Table 4 Profiles — Type X/K lintels*

### Universal Beam

**Type X/K 50**[1] (cavity widths: 50 mm to 70 mm)

| Lengths typically in 150 mm increments | 1200–3000 | 3100–6600 |
|---|---|---|
| Height of lintel (mm) | 213 | 213 |
| Thickness of lintel (mm) | – | – |
| UDL [2a] (kN) | – | – |
| UDL [2b] (kN) | 95 | 80–40 |
| Weight (kg·m$^{-1}$) | 40.36 | 40.36 |

**Type X/K 70**[1] (cavity widths: 70 mm to 90 mm)

| Lengths typically in 150 mm increments | 1200–3000 | 3100–6600 |
|---|---|---|
| Height of lintel (mm) | 213 | 213 |
| Thickness of lintel (mm) | – | – |
| UDL [2a] (kN) | – | – |
| UDL [2b] (kN) | 95 | 80–40 |
| Weight (kg·m$^{-1}$) | 40.36 | 40.36 |

**Type X/K 90**[1] (cavity widths: 90 mm to 110 mm)

| Lengths typically in 150 mm increments | 1200–4800 | 3100–6600 |
|---|---|---|
| Height of lintel (mm) | 213 | 213 |
| Thickness of lintel (mm) | – | – |
| UDL [2a] (kN) | – | – |
| UDL [2b] (kN) | 95 | 83–43 |
| Weight (kg·m$^{-1}$) | 41.78 | 41.78 |

(1) Incorporating an indented inner leaf flange and a slotted 'thermal-break' plate fixed across the cavity with spot welds.

(2) Total uniformly distributed load (UDL):
(a) load ratio from 0.5 to 0.75
(b) load ratio from 0.75 to 0.95

$$\text{load ratio} = \frac{w_1}{w_1 + w_2}$$

where: $w_1$ = total load on inner leaf
$w_2$ = total load on outer leaf
$w_1 + w_2$ = total load on lintel.

## *Table 5 Profiles — Solid wall and single-leaf lintels*

**Type T/K 50**[1] (single leaf)

| Lengths typically in 150 mm increments | 600–1200 | 1350–1800 | 1950–2400 | 2550–3600 | 3750–4800 |
|---|---|---|---|---|---|
| Height of lintel (mm) | 110 | 110 | 135 | 175 | 250 |
| Thickness of lintel (mm) | 2.0[2] | 2.5[2] | 2.5[2] | 2.8[2] | 3.0[2] |
| UDL [2a] (kN) | 4 | 5 | 5 | 9 | 12 |
| UDL [2b] (kN) | – | – | – | – | – |
| Weight (kg·m$^{-1}$) | 3.53 | 4.43 | 4.91 | 6.59 | 8.59 |

**Type B/K 50**[1] (single leaf)

| Lengths typically in 150 mm increments | 600–1800 | 1950–2400 | 2550–4800 |
|---|---|---|---|
| Height of lintel (mm) | 150 | 225 | 225 |
| Thickness of lintel (mm) | 2.5[2] | 2.5[2] | 3.0[2] |
| UDL [2a] (kN) | 6 | 12 | 14 |
| UDL [2b] (kN) | – | – | – |
| Weight (kg·m$^{-1}$) | 5.69 | 7.16 | 8.59 |

**Type SW/K**[1]

| Lengths typically in 150 mm increments | 600–1500 | 1650–1800 | 1950–2700 |
|---|---|---|---|
| Height of lintel (mm) | 55 | 55 | 100 |
| Thickness of lintel (mm) | 2.5[2] | 3.0[2] | 3.0[2] |
| UDL [2a] (kN) | 6 | 6 | 10 |
| UDL [2b] (kN) | – | – | – |
| Weight (kg·m$^{-1}$) | 5.69 | 6.83 | 8.59 |

*Table 5 Profiles — Solid wall and single-leaf lintels (continued)*

**Type SB/K[1]**

| Lengths typically in 150 mm increments | 600–1200 | 1350–1800 | 1950–2700 |
|---|---|---|---|
| Height of lintel (mm) | 60 | 110 | 210 |
| Thickness of lintel (mm) | 3.0[2] | 3.0[2] | 3.0[2] |
| UDL [2a] (kN) | 4 | 8 | 10 |
| UDL [2b] (kN) | – | – | – |
| Weight (kg·m$^{-1}$) | 3.53 | 4.71 | 6.59 |

**Type SL/K[1]**

| Lengths typically in 150 mm increments | 600–1800 | 1950–2400 | 2550–3000 |
|---|---|---|---|
| Height of lintel (mm) | 150 | 225 | 225 |
| Thickness of lintel (mm) | 2.5[2] | 2.5[2] | 3.0[2] |
| UDL [2a] (kN) | 16 | 20 | 22 |
| UDL [2b] (kN) | – | – | – |
| Weight (kg·m$^{-1}$) | 5.69 | 7.16 | 8.59 |

**INT/K 75[1]**

| Lengths typically in 150 mm increments | 900–1200 |
|---|---|
| Height of lintel (mm) | 28 |
| Thickness of lintel (mm) | 1.2[2] |
| UDL [2a] (kN) | 5 |
| UDL [2b] (kN) | – |
| Weight (kg·m$^{-1}$) | 1.3 |

**INT/K 100[1]**

| Lengths typically in 150 mm increments | 900–1200 |
|---|---|
| Height of lintel (mm) | 28 |
| Thickness of lintel (mm) | 1.2[2] |
| UDL [2a] (kN) | 7 |
| UDL [2b] (kN) | – |
| Weight (kg·m$^{-1}$) | 1.95 |

(1) Incorporating an indented inner leaf flange and a slotted 'thermal-break' plate fixed across the cavity with spot welds.

(2) Total uniformly distributed load (UDL):
(a) load ratio from 0.5 to 0.75
(b) load ratio from 0.75 to 0.95

$$\text{load ratio} = \frac{w_1}{w_1 + w_2}$$

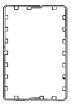
where: $w_1$ = total load on inner leaf
$w_2$ = total load on outer leaf
$w_1 + w_2$ = total load on lintel.

*Table 6 Profiles — Box lintels*

**BOX/K 75**[1]

| Lengths typically in 150 mm increments | 600–1500 | 1650–1800 |
|---|---|---|
| Height of lintel (mm) | 100 | 100 |
| Thickness of lintel (mm) | 1.6 | 1.6[2] |
| UDL (kN) | 15 | 10 |
| Weight (kg·m$^{-1}$) | 4.56 | 4.56 |

**BOX/K 100**[1]

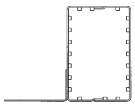


| Lengths typically in 150 mm increments | 600–1500 | 1650–2100 | 2250–2400 | 2550–2700 | 2850–3600 | 3750–4200 | 4350–4800 |
|---|---|---|---|---|---|---|---|
| Height of lintel (mm) | 75 | 140 | 140 | 140 | 215 | 215 | 215 |
| Thickness of lintel (mm) | 1.6 | 2.0[2] | 2.0[2] | 2.0[2] | 2.5[2] | 2.5[2] | 2.5[2] |
| UDL (kN) | 15 | 30 | 25 | 20 | 30 | 25 | 20 |
| Weight (kg·m$^{-1}$) | 4.57 | 7.72 | 7.72 | 7.72 | 12.52 | 12.52 | 12.52 |

**BOX/K 150**[1]

| Lengths typically in 150 mm increments | 600–1500 | 1650–2100 | 2250–2400 | 2550–2700 | 2850–3600 | 3750–4200 | 4350–4800 |
|---|---|---|---|---|---|---|---|
| Height of lintel (mm) | 145 | 145 | 145 | 145 | 220 | 220 | 220 |
| Thickness of lintel (mm) | 1.6 | 2.0[2] | 2.0[2] | 2.0[2] | 2.5[2] | 2.5[2] | 2.5[2] |
| UDL (kN) | 15 | 30 | 25 | 20 | 35 | 30 | 25 |
| Weight (kg·m$^{-1}$) | 7.34 | 9.18 | 9.18 | 9.18 | 14.42 | 14.42 | 14.42 |

**BOX/K 200**[1]



| Lengths typically in 150 mm increments | 600–1500 | 1650–2100 | 2250–2400 | 2550–2700 | 2850–3600 | 3750–4200 | 4350–4800 |
|---|---|---|---|---|---|---|---|
| Height of lintel (mm) | 75 | 140 | 140 | 140 | 215 | 215 | 215 |
| Thickness of lintel (mm) | 1.6 | 2.0[2] | 2.0[2] | 2.0[2] | 2.5[2] | 2.5[2] | 2.5[2] |
| UDL (kN) | 15 | 30 | 25 | 20 | 30 | 25 | 20 |
| Weight (kg·m$^{-1}$) | 7.51 | 10.68 | 10.68 | 10.68 | 16.05 | 16.05 | 16.05 |

(1) Incorporating an indented inner leaf flange and a slotted 'thermal-break' plate fixed across the cavity with spot welds.

(2) Total uniformly distributed load (UDL):
(a) load ratio from 0.5 to 0.75
(b) load ratio from 0.75 to 0.95

$$\text{load ratio} = \frac{w_1}{w_1 + w_2}$$

where: $w_1$ = total load on inner leaf
$w_2$ = total load on outer leaf
$w_1 + w_2$ = total load on lintel.

## Materials

1.2 The lintels incorporate plaster keys, providing a suitable substrate for plastering.

1.3 The lintels for use on cavity walls preserve the inner leaf of the wall intact and, therefore, allow plastering and the fixing of curtain tracks.

1.4 The lintels are fabricated from galvanized steel to BS EN 10346 : 2009 and have a grade DX51D + Z600 coating. Cut edges, fillet welds and rivets are treated with an anti-corrosion paint system.

1.5 Lintels for use in cavity walls incorporate an indented inner leaf flange and a slotted plate, acting as a thermal break across the cavity, spot welded to the flanges.

## Insulation

1.6 All lintels are fully insulated with expanded polystyrene [$\lambda$ declared value 0.33 W·m$^{-1}$·K$^{-1}$ (based on $\lambda_{90/90}$ data)] which is inserted into the upstand prior to the installation of the slotted plate.

## Manufacture

1.7 Steel coil is slit, straightened and cut to length to provide blanks from which the lintels are formed by press-braking.

1.8 The additional thermal-break slotted bottom plate is fixed with intermittent spot welds at 150 mm centres.

1.9 Quality control includes checks on the incoming steel for:

- chemical composition
- dimensional tolerances
- mechanical properties
- thickness and quality of galvanizing.

1.10 During manufacture, regular checks are made on lintel dimensions and weld thickness. Quality checks are made on welds, insulation and protective coating.

### 2 Manufacture

2.1 The lintels are manufactured from galvanized steel, profiled by cutting, welding and rivets and finished with a zinc coating (see sections 1.4 to 1.8).

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained

### 3 Delivery and site handling

3.1 The lintels are delivered to site or to builders' merchants in bundles, each carrying a label bearing the manufacturer's name. The BBA identification mark incorporating the number of this Certificate is marked on each lintel.

3.2 Reasonable care must be taken during unloading, stacking and storage to avoid damage to the protective coating. Lintels that have suffered deformation or major damage to the protective coatings must not be used, and minor damage must be repaired by using the same anti-corrosive paint used for treating cut edges, or zinc-rich paint.

3.3 The lintels must be stored off the ground in such a manner as to avoid the risk of either mechanical damage or contamination by corrosive substances.

## Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Keystone Lintels for Internal and External Masonry and Timber-frame Walls.

## Design Considerations

### 4 General

Keystone Lintels for Internal and External Masonry and Timber-frame Walls are satisfactory for use in cavity walls of brickwork and/or blockwork to provide support to wall, roof or floor loads (or a combination of these) above windows or door openings (see Tables 1 to 6).

### 5 Practicability of installation

The lintels are designed to be installed by a competent general builder, or a contractor, experienced with this type of product.

### 6 Structural performance

6.1 All lintels have adequate strength and stiffness to sustain the uniformly distributed working loads given in Tables 1 to 6 subject to the following conditions:

(1) The defined cavity width, size of masonry unit and clear span are not exceeded.

(2) The specified loads given in Tables 1 to 6 relate to simply-supported lintels laterally and torsionally unrestrained. Therefore, there are no requirements for composite action with, or restraint by, adjacent elements of construction.

(3) For lintels used in cavity walls, not more than half the total load on the lintel is supported at outer leaf position.

(4) Where part of the loading is applied as concentrated loads, each concentrated load must be supported over a length of lintel of not less than 200 mm. In such cases, the total applied loading must not produce bending moments, shear forces or reactions greater than those produced by the uniformly distributed loads specified in Tables 1 to 6.

(5) The applied concentrated loads must not exceed the eccentricities given in Table 7.

*Table 7 Maximum permissible eccentricities*

| Lintel type | Maximum allowable masonry width (mm) | | Allowable cavity width (mm) | Maximum allowable eccentricity[1] (mm) | |
|---|---|---|---|---|---|
| | Block inner leaf | Brick outer leaf | | Block inner leaf | Brick outer leaf |
| S/K-50, HD/K-50, | 100 | 100 | 50 | 75 | 75 |
| CFS/K-50, X/K-50 | 100 | 100 | 70[2] | 85 | 85 |
| S/K-70, | 100 | 100 | 70 | 85 | 85 |
| CFS/K-70, X/K-70 | 100 | 100 | 90[2] | 95 | 95 |
| S/K-90, | 100 | 100 | 90 | 95 | 95 |
| CFS/K-90, X/K-90 | 100 | 100 | 110[2] | 105 | 105 |
| S/K-50 WIL | 150 | 100 | 50 | 100 | 75 |
| | 125 | 100 | 70[2] | 97.5 | 85 |
| S/K-70 WIL | 150 | 100 | 70 | 110 | 85 |
| | 125 | 100 | 90[2] | 107.5 | 95 |
| S/K-90 WIL | 150 | 100 | 90 | 120 | 95 |
| | 125 | 100 | 110[2] | 117.5 | 105 |

(1) Eccentricity: centre of lintel width to centre of leaf.

(2) Maximum.

6.2 In addition to the requirements specifically referred to in this Certificate, structures of brickwork or blockwork in which the lintels are incorporated must be designed and constructed to comply with Eurocode 6[1], and the national Building Regulations:

***England and Wales*** — Approved Document A1/2, Part C, Section 1

***Scotland*** — Part C, Small Building Guide

***Northern Ireland*** — Technical Booklet D, Section 3.

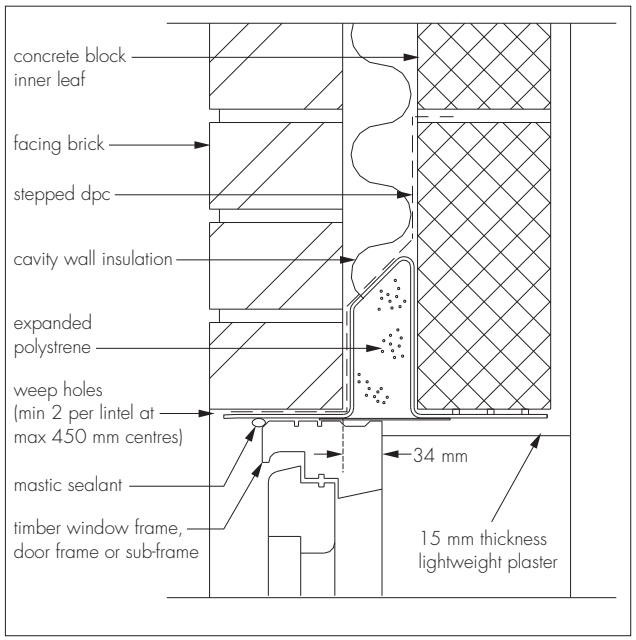
(1) BS EN 1996-1-1 : 2005, BS EN 1996-1-2 : 2005, BS EN 1996-2 : 2006 and BS EN 1996-3 : 2006.

6.3 Guidance on the assessment of loads on lintels in masonry is given in BS 5977-1 : 1981.

## 7 Behaviour in relation to fire

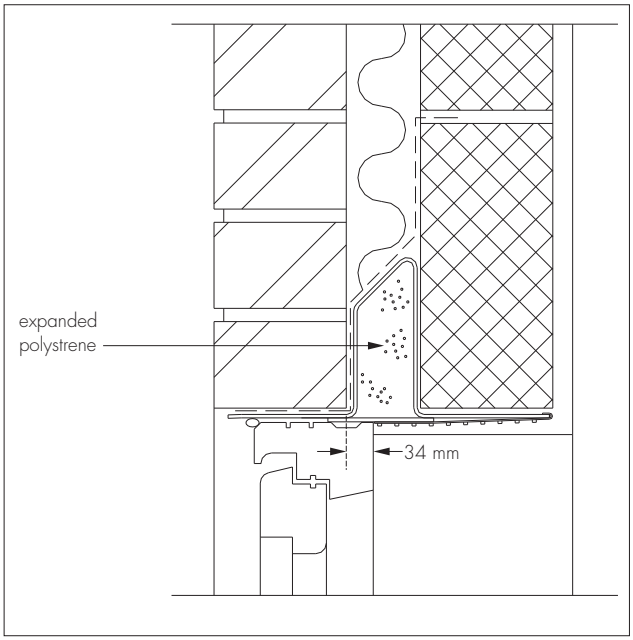
7.1 The construction details shown in Figures 1 and 2 have been assessed as capable of satisfying the national Building Regulations in situations where a one-hour fire resistance is required.

*Figure 1 Installation details — S/K-50*




Note: For the thermal performance of the lintels of buildings in Scotland, the inner face of the door or window frame must be set in by a minimum of 34 mm from the inside of the outer leaf.

*Figure 2 Installation detail — HD/K-50*




Note: For the thermal performance of the lintels of buildings in England and Wales, and Scotland, the inner face of the door or window frame must be set in by a minimum of 34 mm from the inside of the outer leaf.

7.2 Where any other form of wall construction incorporating the lintels is subject to fire resistance requirements, an appropriate assessment or test must be carried out by a United Kingdom Accreditation Service (UKAS) accredited laboratory for the test concerned.

## 8 Corrosion protection

The lintels have adequate protection against corrosion providing:

- the protective zinc is undamaged or minor changes repaired
- mortar complies with the requirements of BS EN 1996-1-1 : 2005
- timber door or window frames in contact with the lintels are treated with boron compounds or organic solvent type preservatives. The risks of corrosion associated with other forms of preservative treatment and with treatment with inorganic flame retardant salts are described in BRE Digest 301 *Corrosion of metals by wood*
- contact with, or contamination from, copper, copper-bearing materials or aqueous run-off from copper-bearing materials (including copper, brass or bronze wall ties), are avoided
- sands from marine sources used in mortars are washed in fresh water to reduce the sodium chloride content to a value of less than 0.1% by weight of dry material
- all cut edges of the lintel are painted with an approved, anti-corrosion exterior paint.

## 9 Thermal performance

9.1 Typical example details containing type S/K and type HD/K lintels, based on the construction details shown in Figures 1, 2 and 3, were analysed numerically to determine their likely hygrothermal performance.

9.2 Opening head soffits will adequately limit excessive heat loss and allow use of the following psi values in carbon emission rate calculations. Detailed guidance in this respect and on limiting heat loss by air infiltration can be found in the documents referred to in section 10.2:

- 0.50 $W \cdot m^{-1} \cdot K^{-1}$ details shown in Figures 1 and 2, where the door/window is set-back at least 34 mm into the cavity, sealed at the front and back against the external wall and the internal surface of the reveal is covered by at least a 15 mm thickness of lightweight plaster or material with equivalent thermal resistance
- 0.30 $W \cdot m^{-1} \cdot K^{-1}$ details shown in Figure 3, where the door/window is set-back at least 40 mm into the cavity, sealed at front and the internal surface of reveal is covered by at least a 15 mm thickness of lightweight plaster, wall U value is 0.28 $W \cdot m^{-2} \cdot K^{-1}$ and equivalent conductivity of a baseplate is 17.9 $W \cdot m^{-1} \cdot K^{-1}$
- 0.26 $W \cdot m^{-1} \cdot K^{-1}$ details shown in Figure 4, where the door/window is fully set-back over the wall cavity, the blockwork conductivity is 0.15 $W \cdot m^{-1} \cdot K^{-1}$, the wall U value is 0.30 $W \cdot m^{-2} \cdot K^{-1}$ and equivalent conductivity of baseplase is 17.9 $W \cdot m^{-1} \cdot K^{-1}$.

*Figure 3 Installation detail — S/K-90 (100 mm cavity/full fill)*

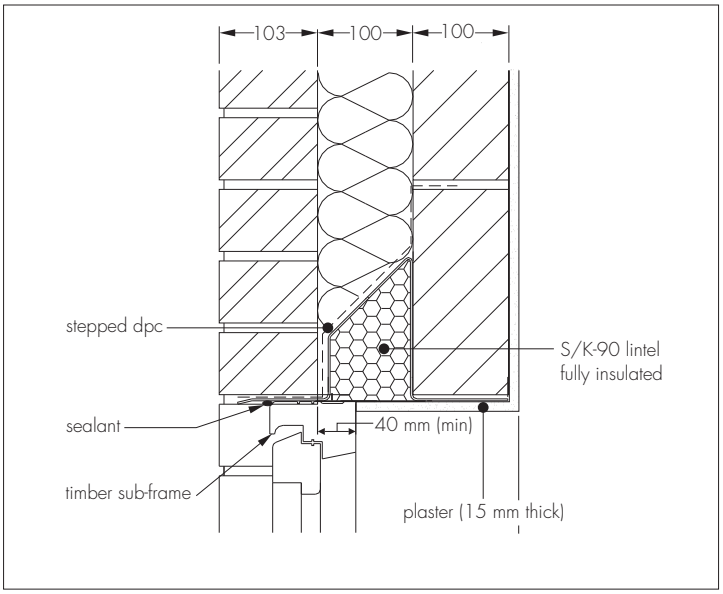
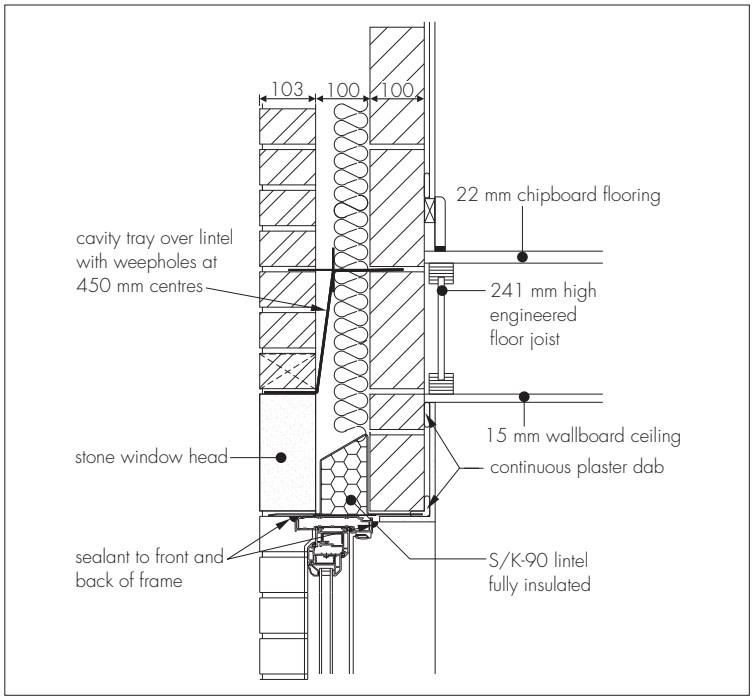


*Figure 4 Installation detail — S/K-90 (100 mm cavity/partial fill)*




9.3 For other junction details, the linear thermal transmittance and temperature factor should be calculated following the guidance given in BRE Report 497 : 2007 *Conventions for calculating linear thermal transmittance and temperature factors*.

## 10 Condensation risk

### Surface condensation

10.1 The constructions described in section 9.2 will achieve a minimum temperature factor in excess of 0.75 and will adequately limit the risk of surface condensation in buildings of all humidity classes except 'Special Buildings', eg buildings such as laundries, breweries, swimming pools as defined in BS 5250 : 2011, Table D.7. The surface condensation risk of other constructions should be established by numerical modelling in accordance with BRE Information Paper IP 1/06 *Assessing the effects of thermal bridging at junctions and around openings* using for the baseplate lintel a thermal conductivity value of 10 $W \cdot m^{-1} \cdot K^{-1}$ and a thickness of 1 mm.

10.2 Further guidance on limiting the risk of surface condensation can be found in:

*England and Wales* — *Limiting thermal bridging and air leakage: Robust construction details for dwellings and similar buildings* TSO 2002 or Accredited Construction Details (version 1.0)

*Scotland* — Accredited Construction Details (Scotland)

*Northern Ireland* — Accredited Construction Details (version 1.0).

### Interstitial condensation

10.3 Under normal domestic conditions, the level of interstitial condensation associated with the product will be low and the risk of any resultant damage minimal.

## 11 Maintenance

Maintenance is not required, but the exposed toe of the lintel may be painted to improve appearance using finishes compatible with the zinc coating.

## 12 Durability

12.1 The lintels will have adequate durability subject to the following conditions:

(1) The lintels are installed and used within the temperature and humidity conditions described in section 10 of this Certificate.

(2) The conditions specified in sections 8 and 9 of this Certificate must be observed.

12.2 The durability of the lintel will not be impaired by contact with conventional cavity insulation material or mortar admixtures.

## 13 Reuse and recyclability

The products comprise galvanized steel that is readily recyclable.

# Installation

## 14 Procedure

General

14.1 Typical installation details are shown in Figures 1, 2 and 3. Lintels must be installed with at least the minimum end bearing dimension illustrated in Figure 5, and be fully bedded on bricklaying mortar on a full-size masonry unit.

14.2 The inner and outer leaves supporting the lintel must be raised together to avoid excessive eccentricity of loading.

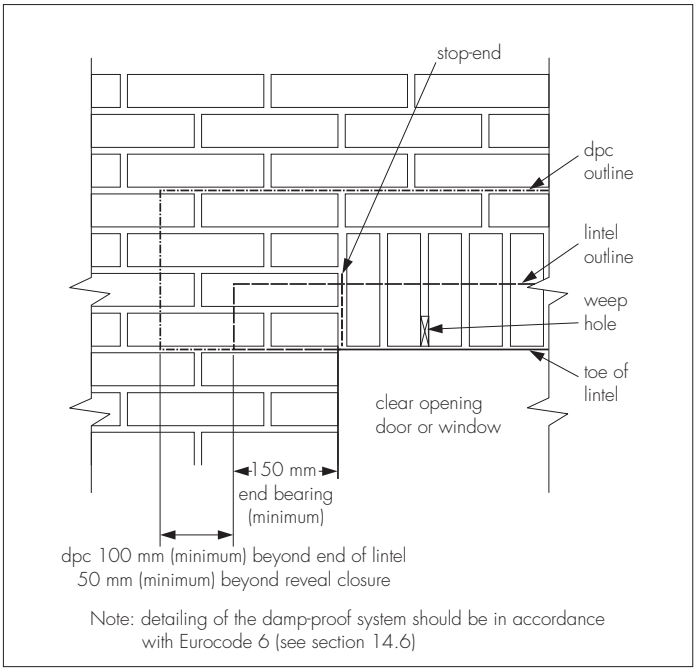
14.3 Weep holes should be provided in the outer leaf above the lintel to drain moisture from the cavity. A minimum of two weep holes should be provided per lintel. For fair-faced masonry, weep holes should be provided at centres not greater than 450 mm. The use of stopends to the lintel should also be considered; where required by *NHBC Standards*, and particularly in areas of severe exposure and where full-fill cavity insulation is specified (see Figure 5).

14.4 The lintels must be used in conjunction with a dpc.

14.5 To comply with *NHBC Standards* in Scotland, Northern Ireland and areas of severe exposure as detailed in BRE Report *Thermal Insulation : avoiding risks*, Second Edition, separate dpc protection must be provided over the lintels and stopend to the lintel, and cavity trays are required under all exposure conditions.

14.6 The durability assessment assumes that water does not collect on the lintel, therefore, precautions must be taken in cavity wall construction to prevent mortar dropping through the cavity and onto the lintels and obstructing the weep holes.

*Figure 5 Typical Installation detail*




# Technical Investigations

## 15 Tests

Tests were carried out to establish:

- load–deflection characteristics
- effectiveness of plastering key
- fire resistance test to BS 476-20 : 1987 on constructional detail incorporating lintel type S/K-70.

## 16 Investigations

16.1 To establish structural performance, calculations were undertaken and examined in conjunction with the results of the load–deflection tests (see section 15).

16.2 Calculations were undertaken to determine:

- the U value in accordance with CIBSE A3 : 1986, and
- the condensation risk.

16.3 Existing information relating to the suitability of the corrosion protection, including results of long-term exposure tests on galvanized steel carried out by the British Steel Corporation, was examined.

16.4 Assessment on the basis of existing data was made of:

- practicability of installation
- suitability, where appropriate, of the indentation and perforations provided to establish the plastering key
- behaviour in relation to fire of construction detail incorporating the lintels.

16.5 The manufacturing process was examined, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

## Bibliography


BS 476-20 : 1987 *Fire tests on building materials and structures — Method for determination of the fire resistance of elements of construction (general principles)*

BS 5250 : 2011 *Code of practice for control of condensation in buildings*

BS 5977-1 : 1981 *Lintels — Method for assessment of load*

BS EN 1996-1-1 : 2005 *Eurocode 6 : Design of masonry structures — General rules for reinforced and unreinforced masonry structures*

BS EN 1996-1-2 : 2005 *Eurocode 6 : Design of masonry structures — General rules — Structural fire design*

BS EN 1996-2 : 2006 *Eurocode 6 : Design of masonry structures — Design considerations, selection of materials and execution of masonry*

BS EN 1996-3 : 2006 *Eurocode 6 : Design of masonry structures : Simplified calculation methods for unreinforced masonry structures*

BS EN 10346 : 2009 *Continuously hot-dip coated steel flat products — Technical delivery conditions*

CIBSE A3 : 1986 *Thermal properties of building structures*

## 17 Conditions

17.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page — no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

17.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

17.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

17.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

17.5 In issuing this Certificate, the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- actual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

17.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.

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