

# Specification for ancillary components for masonry —

## Part 1; Ties, tension straps, hangers and brackets

The European Standard EN 845-1:2001 has the status of a  
British Standard

ICS 91.080.30

National foreword

This British Standard is the official English language version of EN 845-1:2001.

This edition of EN 845-1, which is an “ordinary” European Standard, will be superseded in due course by a “Harmonized” European Standard EN 845-1 which fully takes into account the requirements of the European Commission mandate M116 “Masonry and related products”, given under the EU Construction Products Directive (89/106/EEC), and intended to lead to CE marking.

EN 845-1 is the subject of transitional arrangements agreed under the Commission mandate. The Member States have agreed a nominal transition period for the co-existence of the future “Harmonized” European Standard EN 845-1 and their corresponding national standard(s). It is intended that this period will comprise a nominal nine month period during which any required changes to national regulations are to be made, followed by a further nominal twelve month period for the implementation of CE marking. At the end this co-existence period, the national standard(s) will be withdrawn. In the UK, the corresponding national standards are;

- BS 1243:1978, *Specification for metal ties for cavity wall construction.*
- DD 140-1:1986, *Wall ties. Methods of test for mortar joint and timber frame connections.\**

\* Relevant non-conflicting information in this DD will be retained elsewhere

The UK participation in its preparation was entrusted by Technical Committee B/519, Masonry and associated testing, to Subcommittee B/519/3, Ancillary components for masonry, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

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.**

This British Standard, having been prepared under the direction of the Sector Committee for Building and Civil Engineering, was published under the authority of the Standards Committee and comes into effect on 15 August 2001

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 36, an inside back cover and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

| Amd. No. | Date | Comments |
|----------|------|----------|
|          |      |          |
|          |      |          |
|          |      |          |
|          |      |          |

English version

Specification for ancillary components for masonry —  
Part 1: Ties, tension straps, hangers and brackets

Spécification pour composants accessoires de maçonnerie  
— Partie 1: Attaches, brides de fixation, brides de  
suspension et consoles

Festlegungen für Ergänzungsbauteile für Mauerwerk —  
Teil 1: Anker, Zugbänder, Auflager und Konsolen

This European Standard was approved by CEN on 12 May 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

**Contents**

|                                                                | <b>Page</b> |
|----------------------------------------------------------------|-------------|
| Foreword.....                                                  | 3           |
| 1 Scope.....                                                   | 4           |
| 2 Normative references .....                                   | 4           |
| 3 Terms, definitions and symbols .....                         | 5           |
| 4 Materials .....                                              | 8           |
| 5 Requirements.....                                            | 8           |
| 6 Description and designation.....                             | 13          |
| 7 Marking .....                                                | 13          |
| 8 Evaluation of conformity .....                               | 15          |
| Annex A (informative) Fixings .....                            | 17          |
| Annex B (normative) Materials and protective coatings .....    | 19          |
| Annex C (normative) Scheme of factory production control ..... | 23          |
| Bibliography .....                                             | 25          |

## Foreword

This European Standard has been prepared by Technical Committee CEN/TC 125, Masonry, the Secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2001, and conflicting national standards shall be withdrawn at the latest by December 2001.

Annex A is informative. The annexes B and C are normative.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports the essential requirements of the EU Construction Products Directive (89/106/EEC) and includes the performance requirements referred to in the Eurocode for masonry structures.

In the present state of the art it is not practicable to include a means of verification of compliance with fire performance requirements for all products covered by this standard. Consequently none are included.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## 1 Scope

This European Standard specifies requirements for ties, tension straps, hangers and brackets for interconnecting masonry and for connecting masonry to other parts of works and buildings including walls, floors, beams, and columns. Where anchors or fasteners are supplied or specified as part of an ancillary component, the requirements including performance requirements apply to the complete product.

The following are not covered by this standard:

- fire performance requirements;
- anchors and fasteners other than as part of an ancillary component;
- shelf angles;
- wall starter plates for tying-in to existing walls.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

|             |                                                                                                                                                                                       |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| prEN 846-4  | <i>Methods of test for ancillary components for masonry — Part 4: Determination of tensile and compressive load capacity and stiffness of wall ties (wall test).</i>                  |
| EN 846-5    | <i>Methods of test for ancillary components for masonry — Part 5: Determination of tensile and compressive load capacity and stiffness of wall ties (couplet test).</i>               |
| EN 846-6    | <i>Methods of test for ancillary components for masonry — Part 6: Determination of tensile and compressive load capacity and stiffness of wall ties (single end test).</i>            |
| EN 846-7    | <i>Methods of test for ancillary components for masonry — Part 7: Determination of shear load resistance and stiffness of shear ties (couplet test for mortar joint connections).</i> |
| EN 846-8    | <i>Methods of test for ancillary components for masonry — Part 8: Determination of strength and stiffness of joist hangers.</i>                                                       |
| EN 846-10   | <i>Methods of test for ancillary components for masonry — Part 10: Determination of flexural resistance and stiffness of brackets and support angles.</i>                             |
| prEN 846-13 | <i>Methods of test for ancillary components for masonry — Part 13: Determination of resistance to impact, abrasion and corrosion of organic coatings.</i>                             |
| EN 10020    | <i>Definitions and classification of grades of steel.</i>                                                                                                                             |
| EN 10088-1  | <i>Stainless steels — Part 1: List of stainless steels.</i>                                                                                                                           |
| EN 10088-2  | <i>Stainless steels — Part 2: Technical delivery conditions for sheet/plate and strip for general purposes.</i>                                                                       |
| EN 10142    | <i>Continuously hot-dip zinc coated low carbon steel strip and sheet for cold forming — Technical delivery conditions.</i>                                                            |
| EN 10143    | <i>Continuously hot-dip metal coated steel strip and sheet — Tolerances on dimensions and shape.</i>                                                                                  |

|                 |                                                                                                                                                                                        |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EN 10147        | <i>Continuously hot-dip zinc coated unalloyed structural steel sheet and strip — Technical delivery conditions.</i>                                                                    |
| EN 10214        | <i>Continuously hot-dip zinc-aluminium (ZA) coated steel strip and sheet — Technical delivery conditions.</i>                                                                          |
| EN 10244        | <i>Steel wire and wire products — Non-ferrous metallic coatings on steel wire:</i><br><i>Part 1: General principles;</i><br><i>Part 2: Zinc and zinc alloy coatings on steel wire.</i> |
| EN 10245        | <i>Steel wire and wire products — Organic coatings on wire:</i><br><i>Part 1: General rules;</i><br><i>Part 2: PVC coated wire;</i><br><i>Part 3: PE coated wire.</i>                  |
| EN ISO 1463     | <i>Metallic and oxide coatings — Measurement of coating thickness — Microscopical method (ISO 1463:1982).</i>                                                                          |
| ISO 75          | <i>Plastics — Determination of temperature of deflection under load:</i><br><i>Part 1: General test method;</i><br><i>Part 2: Plastics and ebonite.</i>                                |
| ISO 178:1993    | <i>Plastics — Determination of flexural properties.</i>                                                                                                                                |
| ISO 180:1993    | <i>Plastics — Determination of Izod impact strength.</i>                                                                                                                               |
| ISO 306:1994    | <i>Plastics — Thermoplastic materials — Determination of Vicat softening temperature (VST).</i>                                                                                        |
| ISO 427:1983    | <i>Wrought copper-tin alloys — Chemical composition and forms of wrought products.</i>                                                                                                 |
| ISO 428:1983    | <i>Wrought copper-aluminium alloys — Chemical composition and forms of wrought products.</i>                                                                                           |
| ISO 431:1981    | <i>Copper refinery shapes.</i>                                                                                                                                                         |
| ISO 527:1993    | <i>Plastics — Determination of tensile properties:</i><br><i>Part 1: General principles;</i><br><i>Part 2: Test conditions for moulding and extrusion plastics.</i>                    |
| ISO 1133:1997   | <i>Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics.</i>                                                                |
| ISO 1183:1987   | <i>Plastics — Method for determining the density and relative density of non-cellular plastics.</i>                                                                                    |
| EN ISO 1461     | <i>Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods (ISO 1461:1999).</i>                                                            |
| ISO 2039-2:1987 | <i>Plastics — Determination of hardness — Part 2: Rockwell hardness.</i>                                                                                                               |

### 3 Terms, definitions and symbols

#### 3.1 Terms and definitions

For the purposes of this standard the following terms and definitions apply.

NOTE 1 Dimensions and terms relating to wall ties are given in Figure 1.

##### 3.1.1 asymmetrical tie

- (1) tie which is of a different physical design at either end over its embedment depth (or end fixing)

The centre section may be symmetrical or asymmetrical in detail.

NOTE Examples are given in Figure 2 a).

- (2) tie which is physically identical at either end over its embedment depth (or end fixing) but which is fixed in a different manner at each end which is also defined as asymmetrical for the purposes of the test procedure

NOTE Examples are given in Figure 2 b).

### **3.1.2 bracket**

device attached to structural elements, comprising an individual support for two adjacent masonry units, which form part of a masonry wall

NOTE Examples are given in Figure 3.

### **3.1.3 cavity wall tie**

device for connecting a masonry leaf across a cavity to another masonry leaf or to a structural frame to resist tension and compression forces while allowing limited differential movement in the plane of the wall (examples are given in Figures 2 and 4)

NOTE Wall ties are further subclassified as asymmetrical or symmetrical and as horizontal, slope-tolerant or movement-tolerant. Examples are given in Figures 2, 4 and 5 respectively.

### **3.1.4 cavity width**

distance between the cavity faces of the masonry leaves of a cavity wall, measured perpendicular to the plane of the wall

### **3.1.5 declared value**

value for a product property, determined in accordance with this standard, that a manufacturer is confident of achieving bearing in mind the variability of the manufacturing process

### **3.1.6 design embedment length**

length of a tie, strap or hanger designed to be embedded in mortar (see Figure 1)

### **3.1.7 fixing**

device (e.g. a nail, screw, screw/plug, anchor or bolt) used to connect ancillary components to masonry or to supporting structures to resist tension and shear forces

NOTE Examples are listed in annex A.

### **3.1.8 horizontal wall tie**

wall tie which is designed to be installed approximately horizontally and in the plane of the mortar joint across a cavity and which is tested axially and in the plane of the mortar joint

NOTE Examples are given in Figures 2 and 4.

### **3.1.9 joist hanger (face fixing type)**

device for supporting a joist, beam, truss or rafter on a masonry wall via fixing bolts or screws

NOTE Examples are given in Figure 6.

### **3.1.10 joist hanger (joint fixing type)**

device for supporting a joist, beam, truss or rafter on a masonry wall by direct loading via a flange which is embedded in a mortar joint

NOTE Examples are given in Figure 7.

### **3.1.11 load capacity**

mean value for a sample of product specimens of the failure load or load at an extreme displacement given in the appropriate test method, whichever is the lesser

### **3.1.12 movement-tolerant cavity wall tie**

cavity wall tie which is designed to allow large in-plane differential movements of the walls, without generating large shear stresses, by the use of flexible body materials, free-running slot systems, articulated joints or other means

NOTE Examples are given in Figures 8 and 9 c).

### **3.1.13 profile height**

maximum overall height (distance between the upper and lower surface at right angles to the length and width of the joint) of the embedded portion of a wall tie, strap or hanger (see Figure 1)

### **3.1.14 shear tie**

tie designed to transmit shear, tension and compression forces between two adjacent sections of masonry or between structural frames and masonry

NOTE Shear ties are subclassified as symmetrical or asymmetrical. (Examples are given in Figure 10.)

### **3.1.15 slip tie (general purpose)**

tie designed to transmit only shear forces between two adjacent sections of masonry or between masonry and structural frames while allowing in-plane movement

NOTE Examples are given in Figure 11.

### **3.1.16 slip tie (head restraint type)**

tie designed to transmit only shear forces between masonry and structural frames while allowing vertical in-plane movement

NOTE Examples are given in Figure 12.

### **3.1.17 slope-tolerant tie**

wall tie designed to be installed across a cavity and to function satisfactorily with a significant slope from the horizontal

NOTE Examples are given in Figure 5.

### **3.1.18 slot tie**

tie whose end fixing (at one end) is by means of engaging a re-entrant key (e.g. dovetail) into a slot either embedded in a concrete wall or surface fixed to concrete, steel or masonry walls or frame elements and which is free to slide in the slot either only during installation (for adjustment purposes) or both during installation and while in service (to allow differential movement)

NOTE Examples are given in Figure 9.

### **3.1.19 symmetrical tie**

tie which is physically identical at each end over its embedment depth (or end fixing) and which is fixed in an identical manner at each end

The centre section may be symmetrical or asymmetrical in detail.

NOTE Examples are given in Figure 4.

### **3.1.20 tension strap**

device for connecting masonry walls to other adjacent components such as floors and roofs and which resists tension forces

NOTE Examples are given in Figure 13.

### **3.1.21 tie**

device capable of transferring loads between masonry leaves or between masonry and other structures, in order to limit their relative movement in one or more planes, as required

NOTE Examples are given in Figures 1, 2, 4, 8, and 10.

## **3.2 Symbols**

*L* the overall perpendicular length of a bracket from the fixing surface to the extremity of the support flange (mm).

NOTE Examples are given in Figure 3.

## **4 Materials**

### **4.1 General**

Materials for the manufacture of components covered by this standard shall be selected from annex B and the manufacturer shall declare the material/coating reference. The materials within a product, including those for any fixings, shall be compatible and stainless steel shall not be in contact with other types of steel.

### **4.2 Fixings and materials not supplied by the manufacturer**

The manufacturer shall declare the combinations of masonry units, mortars and fixings (where appropriate) for which the relevant declared values of product performance characteristics are valid.

Where the required fixings are not supplied as part of the product, the manufacturer of the ancillary component shall specify such fixings in accordance with a European Standard or European Technical Approval. The materials for such fixings shall be compatible with that of the component.

## **5 Requirements**

### **5.1 General**

The requirements and properties specified in this standard shall be defined in terms of the test methods and procedures referred to in this European Standard.

The conformity criteria given in the following sub-clauses relate to initial type tests (see 8.2) and consignment testing (see 8.4). For production evaluation the manufacturer shall define the conformity criteria in the factory production control documentation.

### **5.2 Dimensions and tolerances**

#### **5.2.1 Method of measurement and accuracy**

Dimensions shall be measured using a calibrated device capable of achieving an accuracy of  $\pm 1\%$ .

## **5.2.2 Length, applicable cavity width, embedment and fixings (number, size and location)**

### **5.2.2.1 Ties**

The design embedment length of ties shall be at least 40 mm.

The manufacturer shall declare the overall length of ties. When sampled in accordance with clause 8 and measured, the overall length of ties shall be within  $\pm 2,5$  % of the declared value given by the manufacturer.

For cavity wall ties, the manufacturer shall declare the range of cavity widths over which the declared values of product performance characteristics are valid.

The manufacturer shall declare, for each end of a tie, the design embedment length, or details and instructions for fixing.

NOTE 1 For symmetrical ties the design embedment length in mortar is equal to (the overall length – cavity width)/2.

NOTE 2 The requirements of this standard may be applied to some component parts of more complex tying systems (e.g. head restraint slip ties of the types shown in Figure 12).

### **5.2.2.2 Tension straps**

The manufacturer shall declare the overall dimensions of each length of a strap together with details of the number, size and location of fixings as appropriate. When sampled in accordance with clause 8 and measured, dimensions shall be within  $\pm 5$  % or 3 mm of the declared values given by the manufacturer, whichever is the lesser.

### **5.2.2.3 Joist hangers**

The design embedment length of joist hangers (joint fixing type) shall be at least 60 mm. The clear length of the joist flange (all types) shall be at least 75 mm.

The manufacturer shall declare the following dimensions. When sampled in accordance with clause 8 and measured these dimensions shall be within  $\pm 5$  % or 3 mm of the declared values given by the manufacturer, whichever is the lesser:

- the clear length of the masonry flange;
- the clear length of the joist flange;
- the perpendicular distance between the bearing surface of the masonry flange and the bearing surface of the joist flange (joint fixing type only);
- the width of the joist for which the hanger is intended.

### **5.2.2.4 Brackets**

The manufacturer shall declare the overall perpendicular length,  $L$  (see Figure 3), from the fixing surface to the extremity of the support flange. When sampled in accordance with clause 8 and measured,  $L$  shall be within  $\pm 5$  % or  $\pm 3$  mm of the declared value given by the manufacturer, whichever is the lesser.

### **5.2.3 Thickness or diameter**

#### **5.2.3.1 Ties, tension straps and joist hangers**

The manufacturer shall declare the minimum thickness of mortar joint for which the component is suitable and, when sampled in accordance with clause 8 and measured, the parts of the component to be embedded in mortar shall:

- a) have neither a thickness nor diameter greater than half the declared value of joint thickness;
- b) have a profile height not greater than 0,75 times the declared value of joint thickness.

#### **5.2.3.2 Brackets**

The manufacturer shall declare the minimum thickness of the material. When sampled in accordance with clause 8 and measured, the minimum thickness shall be equal to or greater than the declared value given by the manufacturer.

The tolerance on thickness for coated steel flat materials shall be in accordance with Tables 1 and 2 of EN 10143.

### **5.2.4 Other dimensions**

#### **5.2.4.1 General**

The manufacturer shall declare any other dimensions, including the number, size and location of fixings, which affect the structural performance of a product or which co-ordinate with other components. When sampled in accordance with clause 8 and measured, these dimensions shall be within  $\pm 5\%$  of the declared values.

#### **5.2.4.2 Movement-tolerant cavity wall ties**

For movement-tolerant cavity wall ties the manufacturer shall declare the maximum permissible range of movement.

#### **5.2.4.3 Slope-tolerant cavity wall ties**

For slope-tolerant ties the manufacturer shall declare the maximum and minimum permissible slopes.

### **5.3 Mechanical strength**

#### **5.3.1 General**

Where cavity wall ties are declared by the manufacturer to be movement-tolerant and/or slope-tolerant then their mechanical strength shall be determined for the maximum condition of movement and/or maximum slope.

NOTE Additional information in the form of recommendations for fixings relevant to the products referred to in this European Standard is given in annex A (informative).