



# SLOVENSKI STANDARD

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**Specifikacija za dodatne komponente zidovine - 1. del: Vezna stremena, sidrni trakovi, obešala in konzole**

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

Festlegungen für Ergänzungsbauteile für Mauerwerk - Teil 1: Maueranker, Zugbänder, Auflager und Konsolen

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

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English version

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Festlegungen für Ergänzungsbauteile für Mauerwerk - Teil  
1: Maueranker, Zugbänder, Auflager und Konsolen

This European Standard was approved by CEN on 2 October 2002.

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.

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## Foreword

This document (EN 845-1:2003) 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of an identical text or by endorsement, at the latest by October 2003, and conflicting national standards shall be withdrawn at the latest by January 2005.

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).

For relationship with EU Directives, see informative Annex ZA which is an integral part of this standard.

In this European Standard the Annexes A and B are normative.

This document supersedes EN 845-1:2001.

This Part has been modified, including the introduction of additional requirements, taking into account the detailed answer by CEN/TC 125 to EC mandate M116 for masonry as well as details of the relationship of this new harmonized European Standard with the EU Directives.

EN 845 "Specification for ancillary components for masonry" consists of the following Parts:

- <https://standards.iteh.ai/catalog/standards/sist/d8615d29-77d0-4c04-9f12-60c48a5dd25/sist-en-845-1-2004>
- Part 1: Wall ties, tension straps, hangers and brackets.
  - Part 2: Lintels.
  - Part 3: Bed joint reinforcement of steel meshwork.

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

## 1 Scope

This European Standard specifies requirements for wall 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.

This European Standard is not applicable to:

- a) anchors and fasteners other than as part of an ancillary component;
- b) shelf angles;
- c) wall starter plates for tying into existing walls;
- d) products formed from materials other than:
  - 1) austenitic stainless steel (molybdenum chrome nickel alloys or chrome nickel alloys);
  - 2) ferritic stainless steel;
  - 3) copper;
  - 4) phosphor bronze;
  - 5) aluminium bronze;
  - 6) zinc-coated-steel with or without organic coating;  
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  - 7) polypropylene;
  - 8) polyamide (for expansion plugs only).

NOTE The resistance fire performance of the products included herein cannot be assessed separately from the masonry element of which they are part and is therefore not covered under the scope of this part of this European Standard.

## 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 (including amendments).

EN 846-4, *Methods of test for ancillary components for masonry — Part 4: Determination of load capacity and load-deflection characteristics of straps.*

EN 846-5, *Methods of test for ancillary components for masonry — Part 5: Determination of tensile and compressive load capacity and stiffness of wall ties (couplet test).*

EN 846-6, *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).*

EN 846-7, *Methods of test for ancillary components for masonry — Part 7: Determination of shear load capacity and load displacement characteristics of shear ties and slip ties (couplet test for mortar joint connections).*

EN 846-8, *Methods of test for ancillary components for masonry — Part 8: Determination of load capacity and load-deflection characteristics of joist hangers.*

EN 846-10, *Methods of test for ancillary components for masonry — Part 10: Determination of load capacity and load-deflection characteristics of brackets.*

EN 846-13: 2001, *Methods of test for ancillary components for masonry — Part 13: Determination of resistance to impact, abrasion and corrosion of organic coatings.*

EN 10020, *Definitions and classification of grades of steel.*

EN 10088-1, *Stainless steels — Part 1: List of stainless steels.*

EN 10088-2, *Stainless steels — Part 2: Technical delivery conditions for sheet/plate and strip for general purposes.*

EN 10088-3, *Stainless steels — Part 3: Technical delivery conditions for sheet/plate and strip for semi-finished products, bars, rods and sections for general purposes.*

EN 10142, *Continuously hot-dip zinc coated low carbon steel sheet and strip for cold forming; technical delivery conditions.*

EN 10143:1993, *Continuously hot-dip metal coated steel sheet and strip; tolerances on dimensions and shape.*

EN 10147, *Continuously hot-dip zinc coated unalloyed structural steel sheet and strip; technical delivery conditions.*

EN 10244-1, *Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 1: General principles.*

EN 10244-2, *Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 2: Zinc and zinc alloy coatings on steel wire.*

EN 10245-1, *Steel wire and wire products — Organic coatings on wire — Part 1: General rules.*

EN 10245-2, *Steel wire and wire products — Organic coatings on wire — Part 2: PVC coated wire.*

EN 10245-3, *Steel wire and wire products — Organic coatings on wire — Part 3: PE coated wire.*

EN ISO 1461, *Metallic coatings — Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods.*

EN ISO 1463, *Metallic and oxide coatings — Measurement of coating thickness — Microscopical method (ISO 1463:1982).*

ISO 75-1, *Plastics — Determination of temperature of deflection under load — Part 1: General test method.*

ISO 75-2, *Plastics — Determination of temperature of deflection under load — Part 2: Plastics.*

ISO 178, *Plastics — Determination of flexural properties.*

ISO 180:1993, *Plastics — Determination of Izod impact strength.*

ISO 306, *Plastics — Thermoplastic materials — Determination of Vicat Softening Temperature (VST)*.

ISO 427, *Wrought copper-tin alloys — Chemical composition and forms of wrought products*.

ISO 428, *Wrought copper-aluminium alloys — Chemical composition and forms of wrought products*.

ISO 431, *Copper refinery shapes*.

ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles*.

ISO 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics*.

ISO 1133, *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics*.

ISO 1183, *Plastics — Methods for determining the density and relative density of non-cellular plastics*.

ISO 2039-2, *Plastics — Determination of hardness — Part 2: Rockwell hardness*.

### 3 Terms, definitions and symbols

#### 3.1 Terms and definitions

For the purposes of this European Standard the following terms and definitions apply.

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

##### 3.1.1

##### **asymmetrical tie**

- 1) wall 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 1 Examples are given in Figure 2 a).

- 2) wall 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 is also defined as asymmetrical for the purposes of the test procedure

NOTE 2 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

NOTE 1 Examples are given in Figures 2 and 4.



NOTE 2 Wall ties are further sub classified 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 wall 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

### 3.1.8

#### **horizontal wall tie**

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

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<sup>1)</sup>**

individual value of the failure load, or load at an extreme displacement, given in the appropriate test method, whichever is the lesser

### 3.1.12

#### **tensile/compressive/shear load capacity**

mean of the load capacities of the wall ties when tested in tension/compression/shear

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1) A convention has been adopted in this standard for terminology relating to the term 'load capacity'. It is also used in the EN 846 test methods which support EN 845. This term without a preceding qualifying adjective as shown in 3.1.11 denotes an individual value of 'load capacity', i.e. the result of one measurement on one specimen. Where the term is used with a preceding qualifying adjective e.g. 'tensile load capacity' (see 3.1.12) this relates to the mean of the load capacities from a number of specimens tested.

**3.1.13**

**vertical load capacity**

mean of the load capacities of the joist hangers/brackets when tested

**3.1.14**

**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).

**3.1.15**

**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)

**3.1.16**

**shear tie**

wall 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 sub-classified as symmetrical or asymmetrical. (Examples are given in Figure 10).

**3.1.17**

**slip tie (general purpose)**

wall 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.

**3.1.18**

**slip tie (wall-head restraint type)**

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

NOTE Examples are given in Figure 12.

**3.1.19**

**slope-tolerant tie**

cavity wall tie designed to function satisfactorily with a significant slope from the horizontal

NOTE Examples are given in Figure 5.

**3.1.20**

**slot tie**

wall 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.

**3.1.21**

**symmetrical tie**

wall 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

NOTE 1 The centre section may be symmetrical or asymmetrical in detail.

NOTE 2 Examples are given in Figure 4.

### 3.1.22

#### **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.

### 3.1.23

#### **wall tie**

device capable of transferring loads between masonry leaves or between masonry and other structures, in order to limit their relative movement in purely 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, in mm.

NOTE Examples are given in Figure 3.

## 4 Materials

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### 4.1 General

Materials for the manufacture of components covered by this standard shall be selected from Annex A and the material/coating reference shall be declared. 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.

Unless otherwise chosen by the manufacturer, the products shall be tested using masonry units conforming to EN 771 with a normalized compressive strength of not greater than 5 N/mm<sup>2</sup> and general purpose mortar conforming to EN 998-2 with a compressive strength not greater than 1,5 N/mm<sup>2</sup>.

Where the fixings are not supplied as part of the product, fixings in accordance with a European Standard or European Technical Approval shall be specified. 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.

NOTE The conformity criteria given in 5.2 to 5.6 inclusive relate to initial type tests (see 8.2) and when relevant consignment testing (see 8.4).

For production evaluation, conformity criteria in the factory production control documentation shall be defined.

## **5.2 Dimensions and limit deviations**

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

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

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

#### **5.2.2.1 Wall ties**

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

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

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

For each end of a wall tie, the design embedment length, or details and instructions for fixing shall be declared.

NOTE 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 overall dimensions of each length of a strap together with details of the number, size and location of fixings as appropriate shall be declared. When sampled in accordance with clause 8 and measured, dimensions shall be within  $\pm 5\%$  or 3 mm of the declared values 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 following dimensions shall be declared. When sampled in accordance with clause 8 and measured these dimensions shall be within  $\pm 5\%$  or 3 mm of the declared values 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 overall perpendicular length,  $L$  (see Figure 3), from the fixing surface to the extremity of the support flange shall be declared. When sampled in accordance with clause 8 and measured,  $L$  shall be within  $\pm 5\%$  or  $\pm 3$  mm of the declared value, whichever is the lesser.

### 5.2.3 Thickness or diameter

#### 5.2.3.1 Wall ties, tension straps and joist hangers

The minimum thickness of mortar joint for which the component is suitable shall be declared. This declared thickness shall be not less than the thickness of the joint as used in the tests carried out in accordance with EN 846.

#### 5.2.3.2 Brackets

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

The permissible deviations on thickness for coated steel flat materials shall be in accordance with Tables 1 and 2 of EN 10143:1993.

### 5.2.4 Other dimensions

#### 5.2.4.1 General

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 shall be declared. 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 maximum permissible range of movement shall be declared.

#### 5.2.4.3 Slope-tolerant cavity wall ties

For slope-tolerant ties the maximum and minimum permissible slopes shall be declared.

## 5.3 Mechanical strength

### 5.3.1 Wall ties and associated fixings

#### 5.3.1.1 General

Wall ties shall be designated as either symmetrical or asymmetrical and either horizontal, slope-tolerant or movement-tolerant. The mechanical performance of slope-tolerant and movement-tolerant ties at all points of their ranges of slope or movement shall be equal to or greater than the declared values.

NOTE 1 See 3.1.5 for definition of the term 'declared value'.

Where cavity wall ties are declared 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 2 The term 'load capacity' relates to test values for individual specimens whereas the terms 'compressive load capacity', 'shear load capacity' and 'vertical load capacity' relate to the mean of the test values for a sample.

### 5.3.1.2 Tensile load capacity

The tensile load capacity of the wall ties shall be declared. When sampled in accordance with clause 8 and tested by the method of EN 846-5 or EN 846-6 as appropriate, the tensile load capacity shall be equal to or greater than the declared value and additionally no load capacity of a specimen in tension shall be less than 70 % of the declared value. For asymmetrical ties, where the ends are tested separately, the tensile load capacity shall be that of the weaker end. Each of the two supplementary tests over the 15 mm wider cavity shall not give load capacities in tension less than 50 % of the declared value.

### 5.3.1.3 Compressive load capacity

The compressive load capacity of the wall ties shall be declared. When sampled in accordance with clause 8 and tested by the method of EN 846-5 or EN 846-6 as appropriate, the compressive load capacity shall be equal to or greater than the declared value and additionally no load capacity of a specimen in compression shall be less than 70 % of the declared value. For asymmetrical ties, where the ends are tested separately, the load capacity of a specimen in compression shall be that of the weaker end. Each of the two supplementary tests over the 15 mm wider cavity shall not give load capacities in compression less than 50 % of the declared value.

### 5.3.1.4 Displacement under load

When measured in accordance with EN 846-5 or EN 846-6 as appropriate, the displacement of any individual wall tie at one third of the declared value of tensile load capacity or compressive load capacity shall not exceed 1 mm. In each of the two supplementary tests over a 15 mm wider cavity the displacement of the wall tie at one sixth of the declared value shall not exceed 1 mm.

## 5.3.2 Shear ties

### 5.3.2.1 Shear load capacity

Shear ties shall be designated as either symmetrical or asymmetrical. Shear ties shall comply with the requirements of 5.3.1 and this sub-clause.

The shear load capacity of the shear ties shall be declared. When sampled in accordance with clause 8 and tested by the method of EN 846-7, the shear load capacity shall be equal to or greater than the declared value for either the horizontal or the vertical direction or for both directions. Additionally no load capacity of a specimen under shear shall be less than 70 % of the declared value.

### 5.3.2.2 Displacement under load

When measured in accordance with EN 846-7, the displacement of any individual wall tie at one third of the declared value of shear load capacity shall not exceed 1 mm.

## 5.3.3 Slip ties (general purpose)

### 5.3.3.1 General

Slip ties shall be designated as either symmetrical or asymmetrical.

### 5.3.3.2 Shear load capacity

The shear load capacity of the slip ties shall be declared. When sampled in accordance with clause 8 and tested by the method of EN 846-7, the shear load capacity shall be equal to or greater than the

declared value for either the horizontal or the vertical direction or for both directions. Additionally no load capacity of a specimen under shear shall be less than 70 % of the declared value.

### 5.3.3.3 Displacement under load

When measured in accordance with EN 846-7, the displacement of any individual wall tie at one third of the declared value of shear load capacity shall not exceed 2 mm.

### 5.3.4 Slip ties (head restraint type)

The shear load capacity of the slip ties shall be declared. When calculated in accordance with accepted engineering principles, the predicted shear load capacity shall be not less than the declared value.

### 5.3.5 Joist hangers

#### 5.3.5.1 Vertical load capacity

The vertical load capacity of the joist hangers shall be declared. When sampled in accordance with clause 8 and tested by the method of EN 846-8, the vertical load capacity shall be equal to or greater than the declared value. Additionally, no load capacity of a specimen shall be less than 90 % of the declared value.

#### 5.3.5.2 Deflection under load

When measured in accordance with EN 846-8, the deflection of any individual joist hanger at one third of the declared value of vertical load capacity shall not exceed 1 mm.

### 5.3.6 Brackets

#### 5.3.6.1 Vertical load capacity

The vertical load capacity in normal loading format shall be declared. When sampled in accordance with clause 8 and tested by the method of EN 846-10, the vertical load capacity in normal loading format shall be equal to or greater than the declared value. Additionally no load capacity of a specimen shall be less than 90 % of the declared value.

#### 5.3.6.2 Deflection under load

When measured in accordance with EN 846-10, the deflection of any individual bracket at one third of the declared value of vertical load capacity shall not exceed 2 mm.

NOTE When tested the deflection of the bracket is measured at 10 mm  $\pm$  0,5 mm from the free edge and the value obtained will, therefore, be much greater than the deflection of masonry supported by the product type.

### 5.3.7 Tension straps

#### 5.3.7.1 Tensile load capacity

The tensile load capacity shall be declared. When sampled in accordance with clause 8 and tested by the method of EN 846-4, the tensile load capacity shall be equal to or greater than the declared value. Additionally no load capacity of a specimen shall be less than 90 % of the declared value. For asymmetrical straps, where the ends are tested separately, the tensile load capacity shall be that of the weaker end.