
Metode preskušanja dodatnih komponent zidovine - 5. del: Ugotavljanje natezne in tlačne nosilnosti ter lastnosti sila-pomik zidnih veznih stremen (preskus z dvema zidakoma)

Methods of test for ancillary components for masonry - Part 5: Determination of tensile and compressive load capacity and load displacement characteristics of wall ties (couple test)

Prüfverfahren für Ergänzungsbauteile für Mauerwerk - Teil 5: Bestimmung der Zug- und Drucktragfähigkeit sowie der Steifigkeit von Mauerankern (Steinpaar-Prüfung)

Méthodes d'essai des composants accessoires de maçonnerie - Partie 5: Détermination de la résistance à la traction et à la compression et des caractéristiques effort-déformation des attaches de murs (essai entre deux éléments)

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91.080.30 Zidane konstrukcije Masonry

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Methods of test for ancillary components for masonry - Part 5:
Determination of tensile and compressive load capacity and load
displacement characteristics of wall ties (couplet test)

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This European Standard was approved by CEN on 4 December 1999.

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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 Central Secretariat has the same status as the official versions.

[SIST EN 846-5:2001](https://standards.iteh.ai/catalog/standards/sist/70779de5-a717-4573-8516-d31d412b7e2c/en-846-5:2000)

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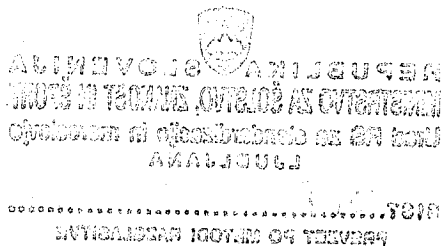
EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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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of an identical text or by endorsement, at the latest by August 2000, and conflicting national standards shall be withdrawn at the latest by September 2000.

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.

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.

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1 Scope

This European Standard specifies the couplet method for determining the tensile and compressive load capacity and load displacement characteristics of wall ties embedded in mortar joints. The test is intended for ties used for connecting together two leaves of masonry and for the mortar-bedded end of ties for connecting masonry leaves to other structures.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate place 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 771-1 | Specification for masonry units - Part 1: Clay masonry units. |
| prEN 771-2 | Specification for masonry units - Part 2: Calcium silicate masonry units. |
| prEN 771-3 | Specification for masonry units - Part 3: Aggregate concrete masonry units (dense and lightweight aggregates). |
| prEN 771-4 | Specification for masonry units - Part 4: Autoclaved aerated concrete masonry units. |
| prEN 771-5 | Specification for masonry units - Part 5: Manufactured stone masonry units. |
| prEN 771-6 | Specification for masonry units - Part 6: Natural stone masonry units. |
| prEN 772-1 | Methods of test for masonry units - Part 1: Determination of compressive strength. |
| EN 772-10 | Methods of test for masonry units - Part 10: Determination of moisture content of calcium silicate, and autoclaved aerated concrete masonry units. |
| prEN 845-1 | Specification for ancillary components for masonry - Part 1: Ties, straps, hangers, brackets and supports angles. |
| prEN 998-2 | Specification for mortar for masonry - Part 2: Masonry mortar. |
| EN 1015-3 | Methods of test for mortar for masonry - Part 1: Determination of consistence of fresh mortar by flow table. |

- EN 1015-7 Methods of test for mortar for masonry - Part 7: Determination of air content of fresh mortar.
- prEN 1015-11 Methods of test for mortar for masonry - Part 11: Determination of flexural and compressive strength of hardened mortar.

3 Principle

The tie is embedded in a mortar typical of the type for which the tie is specified between a pair (couplet) of masonry units. The tie is then subjected to tension or compression until failure occurs.

4 Materials

4.1 Masonry units

4.1.1 Sampling and conditioning

Masonry units shall be as specified in accordance with prEN 771. All of the masonry units for individual tests or for making the couplet specimens shall be taken from the same consignment.

The conditioning of masonry units shall be as specified.

Record the method of conditioning the masonry units prior to laying. Measure the moisture content by mass of autoclaved aerated concrete and calcium silicate units in accordance with prEN 772-10. Record the age of non-autoclaved concrete units at the time of testing the masonry specimens.

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4.1.2 Testing

Determine the compressive strength of a sample of masonry units using the method given in prEN 772-1. For non-autoclaved concrete units, determine the compressive strength at the time of testing the couplet specimens.

4.2 Mortar

The mortar, its mixing procedure and its flow value shall conform to the requirements of prEN 998-2, unless otherwise specified and these shall be reported in the test report.

Take representative samples of fresh mortar from the mason's board to make mortar prisms to determine the flow value in accordance with EN 1015-3, and to determine the air content in accordance with EN 1015-7. Use the prism specimens to determine the mean compressive strength at the time of testing of the masonry specimens in accordance with prEN 1015-11.

4.3 Wall ties

The method of sampling shall be in accordance with prEN 845-1. The minimum number of specimens shall be 12, but this number shall be doubled where both ends of asymmetrical ties are tested separately.

5 Apparatus

5.1 Simple support, for the couplet specimen such that the reaction (e.g. hardwood bearer - see Figure 1) is no closer to the centre line of the tie than 75 mm. The support system shall not apply any restraint against splitting of the specimen, apart from the friction generated at the reaction due to the applied load. A possible arrangement is shown in Figure 1 for tension and for compression.

In cases where slope tolerant ties are required to be tested at their maximum design slope the load should be applied to the tie end via a rigid loading assembly and the support arrangement should allow the specimen to be offset from the machine axis by the specified offset distance.

5.2 Means of applying and maintaining a constant compressive, stress of $0,1 \text{ N/mm}^2 \pm 0,01 \text{ N/mm}^2$ on the couplet. A possible device is shown in Figure 2.

Note: The device is optional where ultimate failure does not occur by splitting apart of the couplet.

5.3 Clamp, for gripping the free end of the tie and applying a load. Typical clamps are shown in Figure 3.

Note: Movement of the specimen within the clamp will invalidate the deformation measurement and therefore specially designed clamps may be needed for particular tie forms. The use of low melting point alloys to act as chucks is recommended. Some frame ties will require special clamps.

5.4 Test machine, capable of applying the load without distortion such that the maximum load reading occurs above 20 % of the full scale reading. The load shall be measured using a load cell device having a digital or analogue readout with a maximum error of 2 % of the full scale reading. The system shall apply an axial force to the specimen. The system or universal test machine shall be fitted with a rigid connection between the clamp which is used to apply tension or compression loads and the machine cross-head or loading device, i.e. any pivot ball joint or universal joint connections to the load cells shall be locked.

5.5 Means of measuring displacement, of the couplet in relation to the clamp using at least two symmetrically placed dial gauges or electrical linear displacement transducers as shown in Figure 1. Displacement shall be measured to the nearest 0,01 mm.

Displacement shall not be measured by recording the cross-head travel of the test machine.

5.6 For polymer-based (plastics) products only, a **controlled temperature and humidity chamber or room**, which may be a chamber which fits over the specimen.

6 Preparation and storage of test specimens

6.1 General

Ten couplet specimens each for compression and tensile testing shall be prepared with ties embedded to accord with the design cavity width and a further two, each over the design width plus 15 mm. The number of specimens for each shall be doubled where both ends of asymmetrical ties are tested separately.

6.2 Preparation

Build the specimens on a flat horizontal surface, and lay the ties in the bed joints between two masonry units by normal bricklaying techniques, using a jig to ensure axial alignment of each tie. A typical jig is shown in Figure 4. Align the two stretcher faces to be used for reaction to give a plane surface. Strike off the mortar flush with the faces of the specimen.

General purpose and lightweight masonry mortar joints shall be between 8 mm and 15 mm thick. Thin layer mortar joints shall be between 1 mm and 3 mm thick.

Record the position of the ties in relation to any perforations, frogs or other depressions of the bed face of the units.

Deviations from axiality of the tie in a couplet is liable to reduce its measured strength. This effect may be assessed by measuring the compressive strength of offset ties in a suitable test machine.

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6.3 Length of embedment of ties in mortar beds

For symmetrical ties, physically identical at each end and designed or intended to be used in mortar at each end, the length of embedment in millimetres shall be $(\text{length of tie} - \text{design cavity width})/2$. The two additional ties shall be embedded 7,5 mm less, i.e. $[(\text{length of tie} - \text{design cavity width})/2] - 7,5$.

For asymmetrical ties either of a different physical design at each end or designed or used in different materials at each end, the length of embedment (in mm) shall be $(\text{length of tie} - \text{design cavity width} - \text{design embedment length in other leaf})$. The two additional ties shall be embedded 15 mm less, i.e. $(\text{length of tie} - \text{design cavity width} - \text{design embedment length in other leaf} - 15)$.

In each case record the length of mortar beyond the embedment length.

6.4 Storage

Take appropriate steps to prevent the test specimen from drying out during the first three days after construction, e.g. by covering with polyethylene sheets, and then leave uncovered in a laboratory environment until tested. Use a curing period of 7 days for thin layer mortars and 28 days for general purpose mortars.