
Metode preskušanja dodatnih komponent zidovine - 7. del: Ugotavljanje strižne nosilnosti in lastnosti sila-pomik zidnih veznih stremen, obremenjenih na strig in zdrs (preskus v malti med dvema zidakoma)

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)

Prüfverfahren für Ergänzungsbauteile für Mauerwerk - Teil 7: Bestimmung der Schubtragfähigkeit und der Steifigkeit von Mauerverbindern (Steinpaar-Prüfung in Mörtelfugen)

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Méthodes d'essai des composants accessoires de maçonnerie - Partie 7: Détermination de la résistance au cisaillement et des caractéristiques effort-déformation des attaches résistant au cisaillement et des attaches de glissement (essai dans un joint de mortier entre deux éléments)

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Determination of shear load capacity and load displacement
characteristics of shear ties and slip ties (couplet test for mortar
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Mörtelfugen)

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

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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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of an identical text or by endorsement, at the latest by August 2000, and conflicting national standards shall be withdrawn at the latest by September 2000.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 horizontal and vertical shear load resistance and load-deflection behaviour of shear ties and slip ties embedded in mortar joints. The test is intended for ties for connecting together two leaves of masonry forming a collar jointed wall or two walls at right angles. It also applies to ties used for connecting the edges of infill panel walls to frames which encircle them.

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 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 support angles.
prEN 998-2	Specification for mortar for masonry - Part 2: Masonry mortar.
EN 1015-3	Methods of test for mortar for masonry - Part 3: 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

One end of the tie is embedded in a mortar joint, typical of the type for which the tie is specified, between a pair (couplet) of typical masonry units. The tie is then clamped at its free end and subjected to shear against a reactive support for the couplet. Slip ties may be tested by the same method.

Note: The method measures the capacity of the tie alone and does not measure the contribution to the total shear resistance given by two masonry faces separated by a vertical mortar joint. This value should be obtained by walette tests if required.

4 Materials

4.1 Masonry units

4.1.1 Sampling and conditioning

Masonry units shall be as specified. All of the masonry units for individual tests or for making the couplet specimens shall be taken from the same consignment. Masonry units shall be in an air-dried condition, unless otherwise specified.

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. Measure the moisture content by mass of AAC or calcium silicate units in accordance with EN 772-10. For other types of units record the method of conditioning prior to laying.

4.2 Mortar

The mortar, its mixing procedure and its flow value shall conform with 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 prism specimens, to determine the flow value in accordance with EN 1015-3 and 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 couplet specimens in accordance with prEN 1015-11.

4.3 Ties

The method of sampling shall be in accordance with prEN 845-1. The minimum number of specimens shall be 10 for each direction of test, but this number shall be doubled where both ends of asymmetrical ties are tested separately.

5 Apparatus

5.1 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 simulating the restraint within a masonry wall. A possible device is shown in Figures 1 and 2.

5.2 Clamp, for gripping the free end of the tie and applying a load. Typical clamps are shown in Figures 1 and 2.

Note: Clamping failures will invalidate the deformation measurement and therefore specially designed clamps or packing pieces may be needed for particular tie forms. The use of low melting point alloys to act as chucks is recommended for complex pressings. Some frame ties will require special clamps to deal with the nailing/screwing tab.

5.3 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.

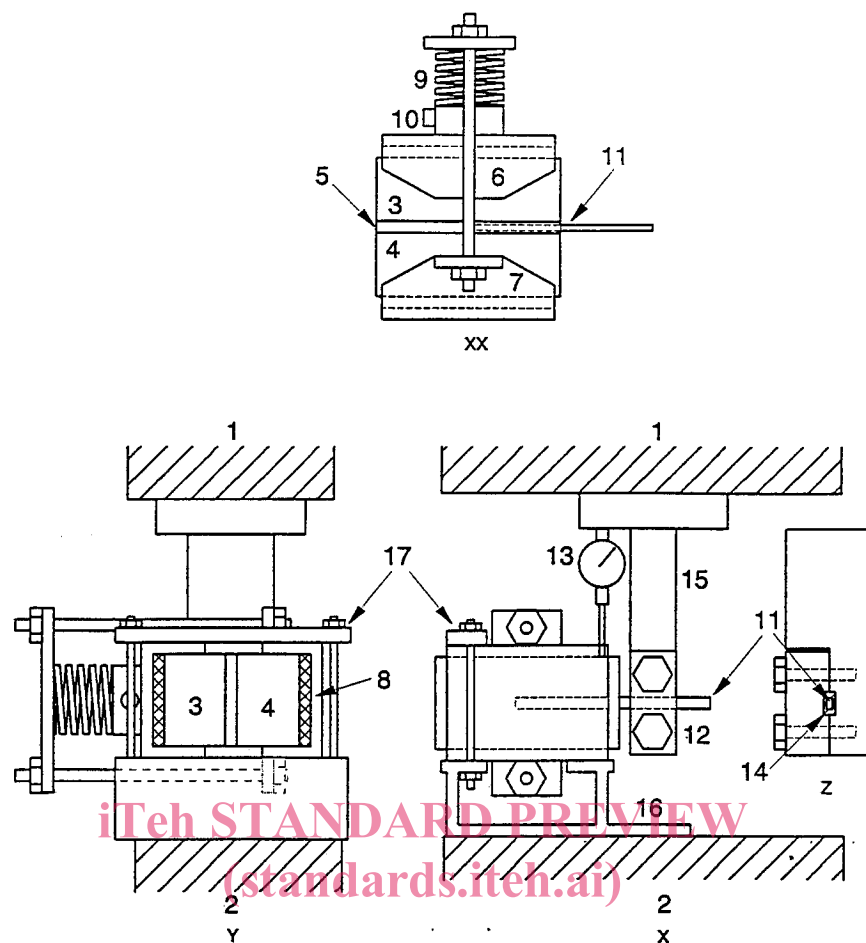
The device shall apply a shear force to the specimen. The upper platen of the universal test machine shall be fitted with a rigidly connected pillar and clamp which is used to apply the load to the tie end as depicted in Figures 1 and 2. The couplet specimen within the prestressing clamp shall bear on the lower platen of the test machine and the support shall be extended through the main axis of the test machine to prevent any rotation of the couplet assembly. This will necessitate a restraint clamp for the horizontal test arrangement (Figure 1). Figure 1 shows the assembly arranged for a horizontal shear test and Figure 2 for vertical shear.

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5.4 Means of measuring displacement, of the couplet in relation to the clamp using a dial gauge or electrical linear displacement transducer as shown in Figures 1 and 2. Displacement shall be measured to the nearest 0,01 mm.

Displacement shall be measured between the tie end clamp and the unit forming one half of the couplet. Displacement shall not be measured by recording the cross-head travel of the test machine.

5.5 For polymer-based (plastic) fixing components only, a **controlled temperature and humidity chamber or room**, which may be a chamber which fits over the specimen.



- (X) Side elevation of couplet in test machine (Y) End elevation of couplet in test machine
(Z) End elevation of clamping device (XX) Side elevation of couplet

Key

- 1 Test machine upper platen
- 2 Test machine lower platen
- 3 Upper unit
- 4 Lower unit
- 5 Mortar joint
- 6 Upper couplet clamp
- 7 Lower couplet clamp
- 8 Packing material
- 9 Load spring
- 10 Load cell
- 11 Tie
- 12 Tie clamp
- 13 Deflection gauge
- 14 Packing around tie in clamp
- 15 Loading pillar
- 16 Specimen support device
- 17 Anti-rotation restraint clamp

**Figure 1 - Typical apparatus for testing horizontal shear resistance of ties
(shown for brick-sized couplets)**