

Wall ties —

Part 1: Methods of test for mortar joint and timber frame connections

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Committees responsible for this Draft for Development

The preparation of this Draft for Development was entrusted by the Civil Engineering and Building Structures Standards Committee (CSB/-) to Technical Committee CSB/52 upon which the following bodies were represented:

- Brick Development Association
- British Board of Agrément
- British Ceramic Research Association
- British Non-ferrous Metals Federation
- British Plastics Federation
- British Steel Industry
- British Woodworking Federation
- Constructional Steel Research and Development Organization
- Department of the Environment (Building Research Establishment)
- Department of the Environment (Building Research Establishment, Princes Risborough Laboratory)
- Galvanizers' Association
- Greater London Council
- Institute of Building Control Officers
- Institution of Mechanical Engineers
- Institution of Structural Engineers
- Royal Institute of British Architects
- Stainless Steel Fabricators' Association of GB
- Timber Research and Development Association
- Zinc Development Association

The following were also represented in the drafting of the Draft for Development through subcommittees and panels:

Coopted members

This Draft for Development, having been prepared under the direction of the Civil Engineering and Building Structures Standards Committee, was published under the authority of the Board of BSI and comes into effect on 28 February 1986

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Foreword

This Part of DD 140 has been prepared under the direction of the Civil Engineering and Building Structures Standards Committee. It is being published in Parts covering test methods for different types of wall tie connections. The aim is to provide data as a basis for a future performance specification for wall ties.

The methods given in this Part of DD 140 are based on methods in BS 5080, ASTM/E754-80 and CSA A3 70-M.

This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature because further evidence is required before the method described can be incorporated into a British Standard. It should be applied on this provisional basis, so that information and experience of its practical application may be obtained.

A review of this Draft for Development will be carried out not later than two years after its publication. Notification of the start of the review period, with a request for the submission of comments from users of this Draft for Development will be made in an announcement in the appropriate issue of *BSI News*. Observations which it is felt should receive attention before the official call for comments will be welcomed.

According to the replies received, the responsible BSI Committee will judge whether the Draft for Development can be converted into a British Standard or what other action should be taken.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of DD 140 describes methods for determining the strengths of wall ties intended for connecting two leaves of masonry or for connecting one leaf of masonry to a timber frame.

NOTE The titles of the publications referred to in this Part of DD 140 are listed on inside back cover.

2 General requirements for test equipment

2.1 All testing devices or universal test machines 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.

NOTE 1 Suitable clamps for applying tensile or compressive loads are shown in Figure 1. Clamping failures may invalidate the deformation measurement and therefore specially designed clamps may be needed for particular tie forms.

NOTE 2 The use of low melting point alloys to act as chucks is recommended. MCP70 alloy, obtainable from Mining and Chemical Products Ltd., 38 Rosemount Road, Alperton, Wembley HA0 4PE, is suitable.

2.2 Unless otherwise stated, the long axis of the tie body shall always coincide with the principal axis of the test machine.

2.3 Deformation shall be recorded using at least two symmetrically placed dial gauges or electrical linear displacement transducers to measure the change of gap between the specimen and the clamp. These shall measure the displacement to the nearest 0.01 mm.

NOTE Deformation should not be measured by recording the cross-head travel of the test machine, since this would often result in exaggerated readings for the stiffer types of ties.

2.4 The load shall be measured using a load cell device having an electrical or visual readout with a minimum resolution of 2 % of the full scale reading. The readout system shall be such that the maximum load reading or the reading at a deflection of 5 mm, whichever is less, occurs above 25 % of the full scale reading.

2.5 The maximum rate of loading and the increments between successive load increases shall be as given in Table 1, as appropriate.

2.6 For plastics ties, structural tests shall be carried out at 30_{+5}^{-0} °C, and flexibility tests shall be carried out at -10 ± 2 °C. A controlled temperature room or a controlled temperature chamber which fits on the test machine shall be used.

NOTE The performance of metal ties should not be influenced to any measurable extent by the level of temperature and humidity during the test procedure. It is advisable, however, to ensure that the measuring devices are either unaffected by such changes or that the tests are carried out under reasonably constant conditions.

Table 1 — Maximum loading rates and increments

Anticipated minimum failure load	Maximum rate of load increase	Maximum increment of load
N	N/min	N
500	200	20
2 000	1 000	100
5 000	2 000	200

3 Tests for mortar joint connections

3.1 Wall tests

3.1.1 Preparation of specimen. Lay the wall ties in a single-leaf wall constructed in accordance with BS 5628-3, using mortar designation (i) or (iv). Calculate the compressive strength of the mortar, using three 100 mm cubes for each batch as described in clause 15 of BS 4551:1980.

NOTE Admixtures or additives should not be used in mortars for type tests but may be used where performance data are required for particular designs.

Space the ties at 900 mm intervals horizontally and 450 mm intervals vertically, with their ends not less than 150 mm from any edge of the wall.

Indicate the embedment length by a pencil line drawn on each tie.

At least one-fifth of the ties to be tested shall be within three brick courses or one block course of the top surface of the wall (see Figure 2).

Build the wall either inside a building or in an enclosure protected from ingress of water at the top and from frost or excessive solar radiation. Allow the wall to cure until the appropriate mortar strength given in BS 5628-1 is reached, under normal ambient temperature and humidity conditions, with both faces exposed to the atmosphere. Do not shroud the wall in wet sacking or plastics sheeting or use other humidity/moisture control systems for more than 72 h after construction.

3.1.2 Tensile bond strength test

3.1.2.1 Apparatus. The apparatus shall comprise a U-shaped load frame (yoke) fixed to at least three reaction points in contact with the masonry [see Figure 3 a)]. The reaction points shall be large enough to ensure that the bearing stresses are not excessive and, where necessary, shall be adjustable to allow testing of ties at different angles to the wall. Each of the reaction points shall be at a horizontal distance equal to not less than twice the depth of embedment of the tie from the central axis of the load frame. A smooth rod with a clamping device on its inner end shall be passed through a free-running linear bearing in the centre of the load frame.

