

Clay roofing tiles and fittings

Part 1. Specification for plain tiles and fittings

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Clay and Calcium Silicate Products Policy Standards Committee (CLB/-) to Technical Committee CLB/6, upon which the following bodies were represented:

- British Ceramic Research Ltd.
- Clay Roofing Tile Council
- National Clayware Federation
- National Federation of Roofing Contractors
- National House-building Council
- Royal Institute of British Architects
- Royal Institution of Chartered Surveyors

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Foreword

This British Standard, which is published under the direction of the Clay and Calcium Silicates Products Standards Policy Committee, was first issued in 1930 and revised in 1945. A metric edition was published as BS 402 : Part 2 in 1970. BS 402 was revised again in 1979. This revision is published as Part 1, as a further Part dealing with single lap tiles is envisaged.

In this revision the water absorption requirement has been removed, although the method of test is retained and used in relation to the performance of tiles in a laboratory test for frost resistance. The requirement for longitudinal camber has been revised and a new requirement for twist, related to camber, has been introduced. Improved guidance is given on sampling and on the methods of measurement to ensure dimensional compliance.

Fitting requirements for tiles which may be used as both courses and top course tiles have been separated from those which apply to tiles for use only at the eaves. With the exception of a note regarding durability, the remainder of the requirements for fittings have not been amended.

The frost resistance test was developed by British Ceramic Research Limited and consists of subjecting saturated tiles to a severe freeze/thaw regime. Tiles which pass the test should be frost resistant. However, for tiles made by a particular process and from a particular clay, there is a limiting water absorption below which the tiles would normally be frost resistant. This value may vary significantly from one type of tile to another and hence the single limiting value included in the previous version of the standard has been removed. A procedure has been included whereby frost resistance may be demonstrated by relating the water absorption of tiles to that of similar tiles which pass the frost resistance test.

No requirements for colour are included. The tiles and their fittings should be supplied substantially similar in colour and texture to samples agreed with the specifier.

Natural variations in shape are an inherent property of clay tiles, however, tiles should be manufactured to avoid undue twist and a test has now been included in the standard.

The requirements for thickness, twist and camber do not apply to hand made tiles as quite wide natural variations are often a desirable characteristic, and consequently these are not amenable to standardization. When the specifier wishes to exercise some control over twist of hand made tiles it is a matter to be agreed with the supplier.

This British Standard specifies the properties of the product. Durability depends not only on these but also on the design of the roof, the conditions of exposure and the use of the material. Guidance on these factors can be found in BS 5534 : Part 1.

Compliance with a British standard does not of itself confer immunity from legal obligations.

Specification

1 Scope

This British Standard specifies requirements for plain roofing tiles and fittings and vertical hanging tiles of clay.

NOTE 1. It is recognized that certain plain tiles are manufactured nibless and/or in irregular sizes, shape and camber, to meet special requirements. This standard is not intended to provide for such tiles in these respects and its issue is not intended in any way to exclude their use.

NOTE 2. The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard the definitions given in BS 6100 : Subsection 1.3.2 apply, together with the following:

- 2.1 hand made tile.** Tile formed by hand in a moulding frame.
- 2.2 universal eaves and top tile.** Tile which can be used either as an eaves tile or a top course tile and in both situations maintains the lap and allows for nailing.

3 Tiles

3.1 General

The tiles shall be either hand made or machine made. The requirements for thickness, camber and twist shall be as given in 3.5, 3.6 and 3.8 and shall not apply to hand made tiles (see foreword).

3.2 Manufacture

The basic raw material for the tiles shall be clay.
NOTE. Other minerals may be added to assist in processing.

3.3 Nibs

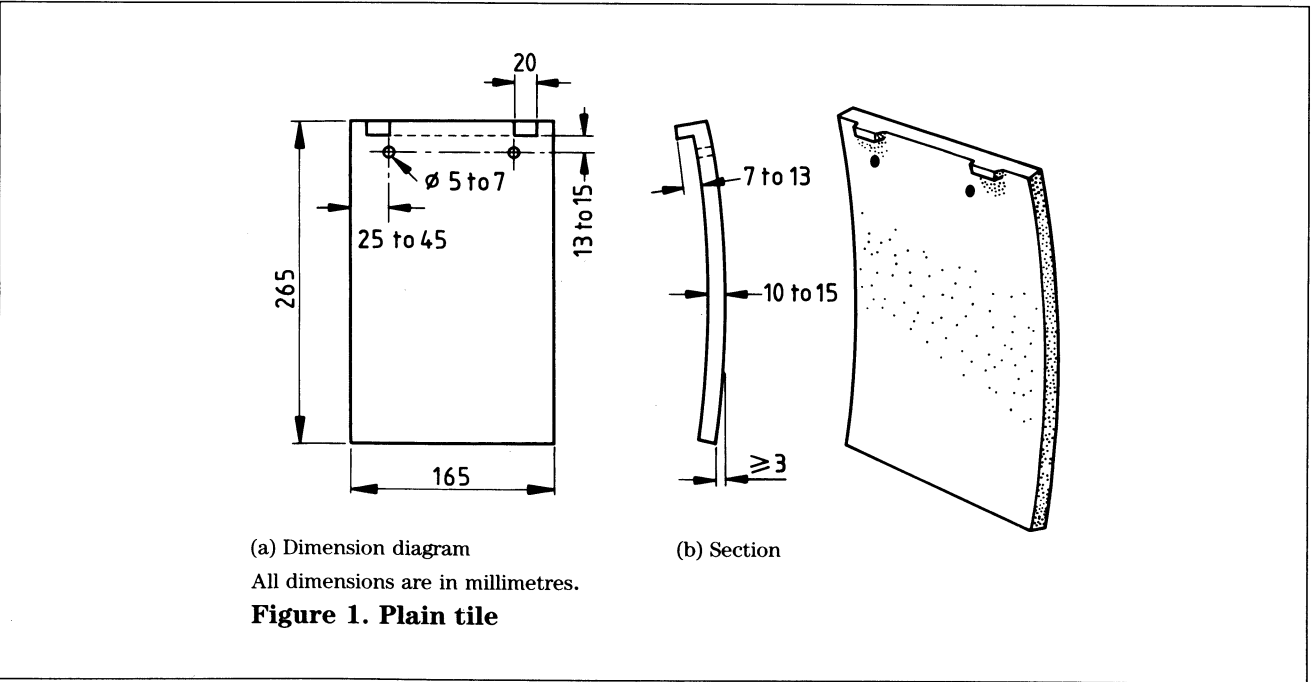
- Tiles shall have either:
- (a) a minimum of two nibs, each of a width at the base measured across the tile of not less than 20 mm;
 - (b) one continuous nib.

The projection of the nib shall be not less than 7 mm and not more than 13 mm and shall be sufficient to support the tile when hanging vertically from a batten (see figure 1).

3.4 Size

The nominal size of tiles shall be the work size given in table 1. When sampled as described in clause 4 and measured as described in appendix A, the mean length and mean width of the tile shall lie within the maximum and minimum sizes given in table 1.

Table 1. Size of clay plain tiles		
	Length	Width
	mm	mm
Maximum size	268	168
Minimum size	262	162
Work size	265	165



3.5 Thickness

The mean thickness of the tile shall be stated. The thickness of individual tiles shall not differ from the mean by more than 10 % when sampled in accordance with clause 4 and measured as described in appendix A. Capillary grooves, where present, shall be disregarded when measuring overall thickness.

3.6 Camber

Tiles shall be either plain in cross section or cross-cambered. The mean longitudinal camber of tiles when sampled as described in clause 4 and measured as described in appendix A shall be not less than 3 mm and shall not vary by more than ± 2 mm from the long-term established mean.

3.7 Nail holes

Two nail holes shall be provided. The holes shall be pierced so that their centres shall be not less than 25 mm nor more than 45 mm from the side of the tile and not less than 13 mm nor more than 15 mm from the underside of the nib when sampled in accordance with clause 4 and measured as described in appendix A. When checked by means of a plug gauge or other suitable method, the nail hole shall have a minimum diameter of 5 mm throughout the thickness of the tile. At no point through the thickness of the tile shall the diameter exceed 7 mm.

3.8 Twist

When the tiles are sampled in accordance with clause 4 and measured in accordance with appendix B, the twist shall not exceed the longitudinal camber.

3.9 Transverse strength

When sampled in accordance with clause 4 and determined by the method described in appendix C, the transverse strength shall be not less than 780 N.

3.10 Resistance to frost damage

Tiles shall either be tested for resistance to frost damage by the method in appendix D or assessed by a comparison of their water absorption, as determined by the method of appendix E, with that of tiles produced by the same manufacturer which are known to pass the test described in appendix D.

When tested by the method given in appendix D no tiles shall fail due to lamination, cracking or flaking of the upper or lower surfaces.

NOTE 1. Flakes formed due to the detachment of fringes do not constitute failure.

When the frost resistance is to be assessed by means of the water absorption the manufacturer shall make available reports of tests carried out in

accordance with appendix D. When a sample of 10 tiles sampled from the consignment in accordance with clause 4 is tested in accordance with appendix E, the largest water absorption of an individual tile shall not exceed that of the tile with the largest value taken from the manufacturers' records which satisfied the test requirement for resistance to frost damage.

NOTE 2. Should the comparison of water absorption figures in this way not confirm that the tiles should be deemed resistant to frost damage then it will be necessary to establish this using the method described in appendix D.

4 Sampling for tests

4.1 General

The required number of tiles shall be sampled from a consignment of not more than 15 000 tiles, as specified in 4.2.

NOTE. If the full range of tests required by this standard are specified a minimum sample of 40 tiles is necessary.

4.2 Sampling procedure

NOTE. The choice of the method of sampling will normally be dictated by the physical form of the consignment in question.

4.2.1 Sampling from the roof or unpacked consignment.

Whenever possible, the sampling method shall be one where every tile in the consignment has an equal chance of being selected for the sample. The appropriate number of tiles shall be selected from positions throughout the consignment without any consideration being given to the condition or quality of the selected tiles.

NOTE. In practice, sampling in this way is normally only convenient either when the tiles forming the consignment are being moved in a loose, i.e. unpacked, form from one place to another or when they have been split into a large number of small stacks, e.g. on the roof prior to laying.

4.2.2 Sampling from stacks or packs

4.2.2.1 General

When sampling according to 4.2.1 is impracticable or not convenient, e.g. when the tiles form a large stack or stacks with ready access to only a limited number of tiles, one of the procedures given in 4.2.2.2 and 4.2.2.3 shall be used.

4.2.2.2 Sampling from a stack

The consignment shall be divided into at least six real or imaginary sections, each of a similar size. An equal number of not more than four tiles shall be selected from different parts of each section in order to give the required number of representative samples without any consideration being given to the condition or quality of the selected tiles.

NOTE. It will be necessary to remove some sections of the stack or stacks in order to gain access to tiles within the body of such stacks when taking samples.

4.2.2.3 Sampling from a consignment formed of banded or wrapped packs

At least five packs shall be selected from different parts of the consignment, and an equal number of not more than eight tiles shall be sampled from different parts of each of the packs in order to give the required number of samples, without any consideration being given to the condition or quality of the selected tiles.

4.2.3 Dividing the sample

When the sample is to provide tiles for more than one test, the total number shall be collected together and then divided by taking tiles from different parts of the total sample to form each successive sub-sample.

NOTE. Where samples are taken for independent tests then these should have been completed and the results of the test should have shown compliance with the standard before the tiles are fixed.

5 Fittings

NOTE. Fittings should be at least as durable as plain tiles. The resistance to frost damage of fittings may be demonstrated by use of apparatus similar to that referred to in appendix D. In such cases it is essential that the model roof is wetted such that the normally exposed surfaces of the fittings are evenly wetted by the spray system and that free drainage is not inhibited.

5.1 Universal eaves tiles and top course tiles

Eaves tiles and top course tiles shall be 165 ± 3 mm wide and 215 ± 3 mm long. They shall have two nail holes and shall have either not less than two nibs or one continuous nib (see figure 2).

NOTE. Tiles less than 215 mm long, typically 190 ± 70 mm long (i.e. made to the dimensions given in the previous edition of this standard) may be used as eaves tiles provided they comply with the other requirements of this standard and the lap is maintained.

5.2 Tile-and-a-half tiles

Tile-and-a-half tiles shall be 248 ± 3 mm wide and 265 ± 3 mm long. They shall have not less than two nail holes and shall have either not less than three nibs or one continuous nib (see figure 3). The thickness, camber, twist and colour shall not vary from those of the consignment of plain tiles with which they are supplied.

5.3 Hip tiles

5.3.1 General

The three patterns of hip tiles shall be as illustrated in figures 4, 5 and 6. Hip tiles shall be formed in such a way that the sides AF and CD are parallel to the uncut edges of the abutting plain tiles within a tolerance of 7 mm. The nail hole, G, shall intersect the centre line BE and shall be not less than 7 mm in diameter through the tile. The length of the lines XD and XF shall be $265 + 7, -0$ mm and the angles AFE and CDE shall be $90 \pm 1.5^\circ$.

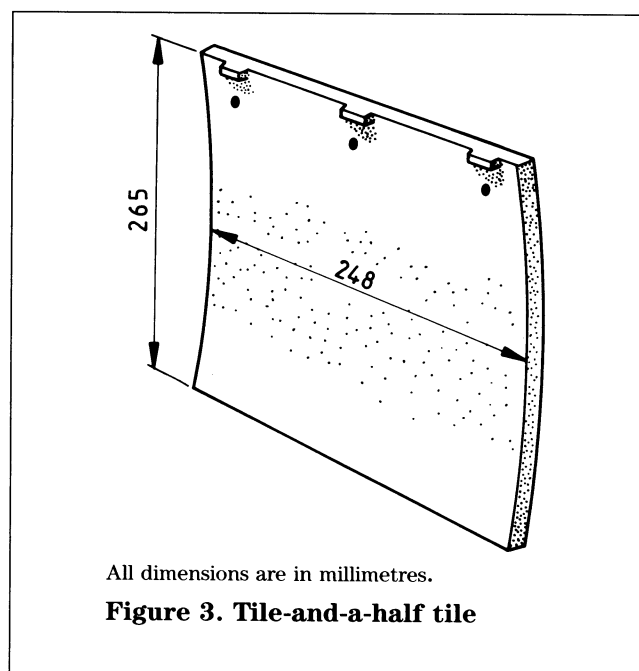
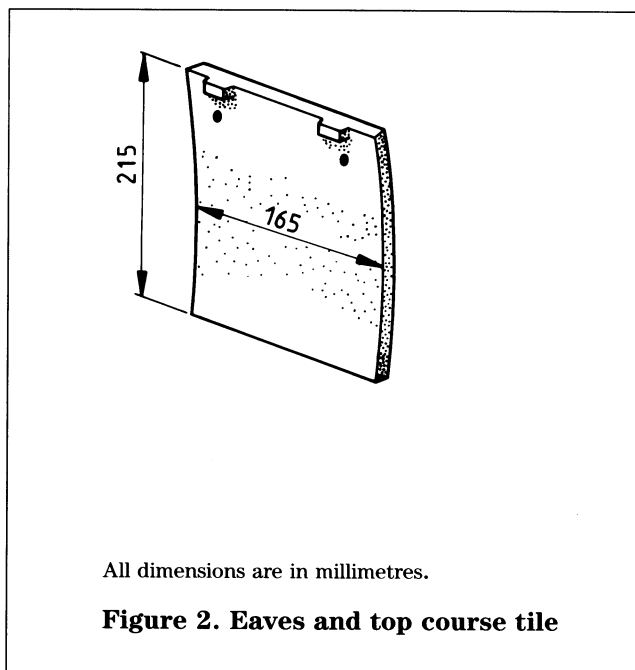


Table 2 gives angles and permissible deviations which shall apply to angular and round pattern hip tiles but not to bonnet hip tiles.

The lengths of the lines AF and CD for all hip tiles shall be not less than 200 mm whilst the length of line BG shall be not less than 25 mm nor more than 38 mm.

5.3.2 Angular hip tiles

Angular hip tiles shall be formed in such a way that the lower edges FE and ED (see figure 4) when