

Australian Standard™

AS 4046.9

Methods of testing roof tiles

Method 9: Determination of dynamic weather resistance

1 SCOPE

This Standard sets out a method to assess the weather resistance of the body of a properly fixed tiled roof.

NOTES:

- 1 The wind speed and rate of water application used for the dynamic weather resistance test are not claimed to represent actual conditions during rain storms. They have been arbitrarily chosen and found to give results that correlate reasonably with the observed performance of roofs on low-rise buildings, e.g., up to 10 m.
- 2 The test has evolved from original studies carried out for the Standards Association of Australia by the then Commonwealth Experimental Building Station with facilities later becoming part of the CSIRO DBCE at North Ryde. The test is not absolute but comparative so that the acceptance criteria can accommodate the performance characteristics of different tile designs. The selection of standard Marseille tiles for the control specimen conforms to the philosophy of the original experimental studies, in which the performance of such imported tiles was recognized by the industry as a satisfactory benchmark. The use of imported tiles also avoided any sensitive comparison between the products of competing local manufacturers. It is recognized that a fully reproducible cladding is preferable as the datum and development of this is under ongoing review.
- 3 Where sarking and specific fixings are required, these should be included in the test specimen.

2 PRINCIPLE

Rain is simulated by blowing waterspray on to the specimen and assessing the penetration as compared to a control specimen.

3 REFERENCED DOCUMENT

The following document is referred to in this Standard:

AS

2049 Roof tiles

4 APPARATUS

The following equipment is required:

- (a) *Wind generator* A wind generator capable of producing a windstream of 16 m/s that varies not more than ± 2 m/s over the area of the discharge duct. The discharge duct is square with 1.2 m sides.

- (b) *Water sprays* A controlled supply of water capable of introducing a spray into the windstream through two sets of nozzles. The first set shall comprise an array of fine jets in a square pattern, in a vertical plane, so as to discharge a spray parallel to the windstream, and in a downstream direction. The face of the jets shall be not more than 400 mm horizontally downstream from the face of the duct discharge.

The second set shall comprise a row or rows of coarse jets set between 150 mm and 400 mm above the top of the discharge duct in a manifold set symmetrically equidistant over a length of 1.0 m such that they discharge downwards at an angle of 60° in the direction of the windstream.

The quantity of water shall be determined by collecting the discharge from a gutter from the control specimen with the windstream as specified in Step (a) over a period of 2 min. The water sprays shall be capable of maintaining a total discharge from the gutter of 0.17 L/s. The coarse jets shall discharge three times the amount of the fine jets.

- (c) *Roof support* A full-scale model roof that will accept a panel of roofing 1800 mm × 1800 mm. The rafter pitch and attitude of the specimen shall be adjustable and the model roof shall be provided with a rotating mechanism that ensures that the mid-point of the test panel remains substantially within the windstream throughout the test. The underside of the model roof shall be accessible for observation of specimen performance during tests.
- (d) *Measuring equipment* The following items of equipment shall be provided to monitor the test conditions:
- (i) A device to measure wind velocity to an accuracy of ± 1 m/s.
 - (ii) A device to indicate water flow. The device shall be calibrated by a collection/time method at periods not exceeding six months.
 - (iii) A device to measure the rafter pitch. A clinometer capable of measuring to at least one degree would be suitable.

5 TEST SPECIMEN

The test specimen shall consist of a panel of roof tiles, 1800 mm × 1800 mm laid on the model roof in an identical manner to that of the roof in practice.

Prototype tiles and accessories shall be as supplied by the manufacturer.

Production tiles and accessories shall be independently selected at random from an identifiable lot as defined in AS 2049, individually marked and identified in the test report.

NOTE: At the time of publication, an identifiable lot is defined in AS 2049 as 'a batch of tiles or accessories of the same type, material and finish, produced in a single shift on a particular date and on a particular date and at essentially the same time'.

Weather resistance of accessories, ridge and hip installations may need to be tested, with appropriate tiles used in the assembly adjacent to the item under test. An abutment of tile and accessory or ridge unit, not less than 3.6 m in length, shall be tested. This may require the testing of repeated model units. Each repeat test shall comprise a model construction. In the case of a unique unit, at least three different assemblies of both tiles and the test unit are required.

Where sarking is specified for the test conditions, the sarking material shall be replaced with clear plastic sheeting to allow observation of the roof's performance. When testing tiles, the ridge, eaves and gables shall be flashed to prevent water penetration at these points which might mask the performance of the body of the specimen roof.

NOTE: It is advisable that the specimens are laid by competent roof tilers.

6 CONTROL SPECIMEN

A control specimen shall be used to establish a datum for the assessment of weather resistance. It shall consist of a panel of Marseille pattern terracotta tiles. To aid identification, these tiles are marked on the underside 'GUICHARD CARVIN & Cie' and 'MARSEILLE ST ANDRE' and display on both surfaces a bas-relief of a bee. If alternative Marseille tiles are used, they shall be compared to the 'GUICHARD CARVIN & Cie/MARSEILLE ST ANDRE' tile for equivalence.

NOTE: The Committee recognizes that the stock of suitable tiles is finite and may not be readily available. Clean undamaged tiles from other Marseille manufacturers may provide a suitable control specimen.

The tiles are laid without sarking; otherwise they are exactly as per the test specimen defined in Clause 5, on battens on the model roof.

7 PROCEDURE

The procedure is as follows:

- (a) *Datum* Establish a datum as follows:
 - (i) Set the control specimen to a rafter pitch of 27°. (This is known as quarter pitch as the height of the ridge is quarter the span of the roof.)
 - (ii) Set the wind generator to 16 m/s and introduce water into the windstream until a run-off of 0.17 L/s is maintained. These settings will be used for all subsequent tests.
 - (iii) Apply the test conditions to the control specimen for 2 min with the ridge normal to the windstream and observe and record its performance.
 - (iv) Immediately alter the attitude of the control specimen so that the ridge is at 27° to the windstream and the overlocks are facing into the wind. Apply the test conditions for a further 2 min and observe and record the performance.
 - (v) Comment on any water that may have penetrated to the underside of the specimen, noting drainage or dripping from tiles and the position on the specimen. Water on the underside of the tiles that is discharged onto the top surface of tiles below is not considered to be leakage.

The performance of the control specimen shall be used as the benchmark for all subsequent tests.

- (b) *Test* The test shall be performed on at least the maximum and minimum pitches. If other rafter pitches are to be tested, they should be done in order of diminishing pitch. Carry out the test as follows:
 - (i) Set the test specimen to the maximum specified rafter pitch. In the absence of a specification, the default pitch is 27°.
 - (ii) Apply the datum test conditions to the specimen and perform Steps (iii) to (v) in Item (a) above.
 - (iii) Set the roof to the next lower pitch specified and repeat Steps (iii) to (v) in Item (a) above for each pitch required, or in the absence of a specification to the minimum pitch (this will usually be the rafter pitch above which sarking is not required).
 - (iv) Assess the results of the test at each pitch against the performance of the control specimen, recording the results for each pitch as 'penetration less, equal or more than' the datum test.