

Australian Standard®

AS 4040.3:2018

Methods of testing sheet roof and wall cladding Method 3: Resistance to wind pressures for cyclone regions

METHOD

1 SCOPE

This Standard sets out methods for determining the resistance of sheet roof and wall cladding to wind pressures for cyclone regions.

The test procedure for cladding systems to be used only in wall applications is given in Clause 6. The test procedure for cladding systems to be used in roof or wall applications is given in Clause 7.

2 NORMATIVE REFERENCES

The following are the normative documents referenced in this Standard:

NOTE: Documents referenced for informative purposes are listed in the Bibliography.

AS

4040 Methods of testing sheet roof and wall cladding

4040.0 Part 0: Introduction, list of methods and general requirements

4055 Wind loads for housing

AS/NZS

1170 Structural design actions

1170.2 Part 2: Wind actions

3 PRINCIPLE

A simulation of the loading resulting from cyclonic wind pressure is applied to the test specimen to determine the deflections of the cladding and the performance of the fastenings.

Where cladding systems are to be used in roof applications, the test procedure is defined in Clause 7.

Where cladding systems are to be used in wall applications only, the test procedure is defined in Clause 6 or Clause 7.

4 APPARATUS

4.1 Supporting structure

The supporting structure shall be as specified in AS 4040.0.

4.2 Loading system

The test to resist cyclonic wind pressures is concerned with the interaction between the cladding and the fasteners and the deformation of the cladding. For continuous cladding (i.e. not single span), this necessitates a multi-span test specimen. Cladding extending over three supporting members can satisfactorily represent a double end-span condition.

A commonly used loading medium for this type of test is an air box or air chamber where the cladding forms the top surface of the box. The air chamber is pressurized thus providing a uniform load across the surface of the cladding. Oscillating valves are used to provide the pressure cycles.

For concealed fixed cladding systems, an air box without a continuous membrane (either positive or negative pressure) shall be used for testing.

Inflatable air bag loading systems, or point or line loading systems cannot be used for testing of concealed fixed cladding as they can impose constraints on the test specimen, hinder the cladding deformation, and lead to un-conservative results.

NOTE: Seccombe et al (1996) details lower failure pressures for secret fixed cladding tested in an air chamber compared with air bag method.

The following apply to the loading system:

- (a) Pressure or loading equipment shall be capable of delivering at least 5% greater than the peak pressure determined in Table 1.
- (b) For each test sequence, the upper limit of each pressure sequence shall be not less than the target value.
- (c) The lower limit shall be not greater than 10% of the upper load limit of the same load sequence.

The rate of load cycling shall be less than 3 Hz.

4.3 Measuring devices

Deflections shall be determined by means of a device capable of measuring to an accuracy of not less than 0.05 mm. Pressures or loads shall be determined to an accuracy of not less than 5%.

NOTE: An accuracy of 5% would normally be achieved by means of a device capable of measuring to an accuracy of 1% of full scale.

5 TEST SPECIMEN

The test specimen shall be as specified in AS 4040.0.

6 PROCEDURE FOR TESTING WALL CLADDING SYSTEMS

6.1 Loading

6.1.1 Design pressures

Design wind pressures for strength limit state and serviceability limit state may be calculated from the relevant wind speeds V_u and V_s listed in AS/NZS 1170.2 for the appropriate cyclone regions. The design pressure shall be derived from a combination of internal positive pressure and external negative pressure, including local pressure factors where appropriate, for the particular part of the wall being tested.

Alternatively for residential construction, the design net wall pressures shall be obtained directly for the C wind classifications from AS 4055.

6.1.2 Test pressures

The test pressure for serviceability limit state shall be equal to the relevant design pressure (determined in accordance with Clause 6.1.1) multiplied by the appropriate factor for variability. The test pressure (P_t) for strength limit state shall be the design pressure for strength limit state increased by dividing by the material capacity reduction factor (a factor less than unity). If the material capacity factor is not available, the pressure shall be divided by 0.9.

NOTES:

- 1 The factors for variability for metal cladding are set out in Table 5.1 of AS 1562.1.
- 2 Guidance on selection of number of test replications is given in *Guide to LHL Cyclic testing*.

6.2 Serviceability limit state

6.2.1 Net deflections

The deflection to be measured shall be that between the supporting structure and the cladding/fastener system. The measuring device shall be arranged in such a way that the deflection characteristics of the supporting structure do not influence the deflection readings for the cladding and fastenings, or in conjunction with other such devices, so that the effects of the deflection characteristics of the supporting structure can be evaluated and deleted from the deflection readings for the cladding and fastenings.

6.2.2 Measurements during serviceability tests

Displacements shall be measured at the point on the specimen judged to experience maximum movement and at any other location needed to calculate net deflection as described in Clause 6.2.1.

Occurrences of any de-indexing, unclipping, permanent local deformation, fracture or failure shall be noted.

Measurements shall be taken—

- (a) immediately before application of the pressure;
- (b) when the pressure had been applied for 1 min; and
- (c) not more than 5 min after the completion of removal of the pressure.

6.3 Strength limit state

The cladding/fastener system shall be subjected to the fatigue loading sequence specified in Table 1. The single load cycle shall be held for 1 min.

The behaviour of cladding, fastenings, supporting members and substructure shall be observed and recorded.

TABLE 1
FATIGUE LOADING SEQUENCE

Range of test pressure	Number of cycles
0 to 0.40 P_t	8 000
0 to 0.50 P_t	2 000
0 to 0.65 P_t	200
0 to 1.30 P_t *	1

* As a rule, this test pressure will be met by testing one sample that satisfies the criteria. If two samples are tested, the final cycle may be reduced to 1.2 P_t , and if three samples are tested, it may be reduced to 1.0 P_t .