

Australian Standard®

AS 4040.2—1992

Methods of testing sheet roof and wall cladding
Method 2: Resistance to wind pressures for
non-cyclone regions

This Standard incorporates Amendment No. 1 (February 2018). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

METHOD

1 SCOPE

This Standard sets out a test method for determining the resistance of sheet roof and wall cladding to wind pressures for non-cyclone regions.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

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|--------|--|
| 1562 | Design and installation of sheet roof and wall cladding |
| 1562.1 | Part 1: Metal |
| 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

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|--------|---------------------------|
| 1170 | Structural design actions |
| 1170.2 | Part 2: Wind action |

3 PRINCIPLE

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

4 APPARATUS**4.1 Supporting structure**

The supporting structure shall be as specified in AS 4040.0.

4.2 Loading system

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

NOTES:

- 1 Inflatable air bag loading systems, 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
- 2 Secombe et al (1996) details lower failure pressures for secret fixed cladding tested in air chamber compared with air bag method.
- 3 Whatever method is used for testing the resistance to wind pressures, it is emphasized that it is the cladding and its fastenings that are under test. Rigid materials may not be used as a loading medium. Air pressure is required to satisfactorily model the performance of both sheeting and fastenings.

For pierced fixed cladding tests, if inflatable bags are used as a loading medium, the bags should be sufficiently flexible to apply pressure evenly to the area under test by making contact over the entire soffit of the area of cladding to be loaded, and to maintain such contact, irrespective of the deflection. Care must be taken to ensure that the air pressure as measured, e.g. by a manometer, is actually the pressure in the bag. Gauges on the inlet side may not always give a correct reading and it has been found in such cases that measurement of the pressure on the outlet side of the system is necessary. For two-span specimens, it is good practice to measure the reaction force of the central purlin.

For ribbed profile cladding, consideration should be given to the effects of wind pressure acting on the surfaces of individual ribs. Such pressure would not normally be generated during a test using rigid loading materials, or even air bags, unless specific provisions were made.

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 $\pm 1\%$ of full scale.

5 TEST SPECIMEN

The test specimen shall be as specified in AS 4040.0.

6 PROCEDURE

6.1 Loading

6.1.1 General

If a cladding is tested in other than its intended format, account shall be taken of the effect that the mass of the sheeting and fasteners has on the specified test pressure. For example, if a model roof is tested in an inverted position, the actual test pressure shall be equal to the test pressure (as determined from Clause 6.1.3) less a pressure equal to twice the dead load of the sheeting.

6.1.2 *Design pressures*

A1 | Design wind pressures for strength limit state and serviceability limit state can be calculated from the relevant wind speeds V_u and V_s listed in AS/NZS 1170.2. The design pressure is derived from a combination of internal positive pressure and external negative pressure, including local pressure factors where appropriate, for the particular part of the cladding being tested. Alternatively, the design net pressures shall be obtained directly for the N wind classifications from AS 4055.

6.1.3 *Test pressures*

The test pressures shall be equal to the design pressure determined in accordance with Clause 6.1.2 for the relevant limit state multiplied by the appropriate factor for variability.

NOTE: The factors for variability for metal cladding are set out in Table 5.1 of AS 1562.1.

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.

Measurements shall be taken—

- (a) immediately before application of the pressure;
- (b) when the pressure has been applied for 1 min; and
- (c) no more than 5 min after the completion of removal of the pressure.

6.3 **Strength limit state**

The model shall be subjected to the specified pressures for a period of not less than 1 min. The behaviour of cladding, fastenings, supporting members and substructure shall be observed and recorded.

7 **REPORT**

The following information shall be reported:

- (a) The date and location of the test.
- (b) The name of the testing officer.
- A1 | (c) Details of the cladding system.
- (d) For the serviceability test—
 - (i) the deflections determined in Clause 6.2.2; and
 - A1 | (ii) the performance of the fastenings.
- (e) For the strength test, the behaviour of the specimen as recorded in accordance with Clause 6.3.
- A1 | (f) Test pressure and design pressure.
- (g) Reference to this Australian Standard, i.e. AS 4040.2.