Australian Standard®

Methods of testing thermal insulation

Method 7: Determination of the average thermal resistance of low-density mineral wool thermal insulation — batt and blanket

PREFACE

This Standard was prepared by the Standards Australia Committee on insulating materials as a method for the determination of the thermal resistance of low-density mineral wool batt and blanket type thermal insulation. It has been derived from the ASTM method C653-83, to which acknowledgement is hereby made. It has been produced in conjunction with AS 3742, Mineral wool thermal insulation – batt and blanket.

FOREWORD

Because of the relatively high cost of testing and relatively low cost of insulation, it is considered that this method gives a practical evaluation of the average thermal resistance of a pack of thermal insulation.

It will not necessarily give a valid result for a lot from which an isolated piece was taken without consideration of the whole lot.

The term 'thermal conductivity' is not appropriate for expressing the insulating properties of materials such as low-density fibrous batt and blanket thermal insulation materials as used in dwellings in Australia.

AS 2352 defines thermal conductivity as follows:

'The quantity of heat under steady state conditions passing in unit time through unit area of a homogeneous material of infinite extent with flat and parallel faces and unit thickness when unit temperature difference is maintained between these faces. Unit: watt per metre kelvin (W/m.K).'

In Note 1 to this definition, in reference to 'homogeneous material', the definition says:

'Materials may be considered as homogeneous when the value of thermal conductivity is not affected by variations in thickness or in area within the range normally used.'

More recently, a homogeneous material has been defined as one in which every geometrically identical portion has the same thermal conductivity.

Low-density fibrous materials do not comply with this requirement of homogeneity because they exhibit non-linear relationships between thermal resistance and thickness and do not have a constant resistance across a given area of batt or blanket because of density variations within the material. It is therefore not correct to refer to the thermal conductance of such material. It is more correct to refer to the thermal conductance or resistance of a specimen. This test method will be a convenient means of determining the average thermal resistance of a pack of such material.

METHOD

1 SCOPE. This Standard sets out a method for determining the average thermal resistance of a pack of low-density mineral wool batt or blanket type thermal

insulation. This method is for low-density mineral wool thermal insulation, exclusive of any membrane facings, air films or structural materials.

2 REFERENCED DOCUMENTS. The following documents are referred to in this Standard:

AS
2352 Glossary of terms for thermal insulation of buildings

2464 Methods of testing thermal insulation
2464.4 Part 4: Length, width and thickness of batt or blanket type thermal insulation
2464.5 Part 5: Steady-state thermal transmission properties by means of the heat flow meter
2464.6 Part 6: Steady-state thermal transmission properties by means of the guarded hotplate

3742 Mineral wool thermal insulation — batt and blanket

ASTM
C653.
83 Determination of the thermal resistance of low-density blanket-type mineral fibre insulation.

3 PRINCIPLE.

3.1 Determination of thermal resistance. The thermal resistance (R) of insulation is determined in accordance with either AS 2464.5 or AS 2464.6.

NOTE: These two methods both require that the sample be slightly compressed in the measurement apparatus to obtain good contact with the hot and cold plates in order to minimize contact thermal resistance. This compression of the sample reduces the thickness of the specimen and proportionally increases its measurement density. The effect is usually negligible but for low density materials considerable compression is required. Thus the measured thermal resistance would not represent the true value since it would be obtained at a density and thickness different from the density and thickness at which the product would be used. The testing procedure prescribed in this Standard leads to the true value of thermal resistance of the product as actually used.

4 DEFINITIONS. For the purpose of this Standard the definitions given in AS 2352 and the following apply:

4.1 Lot — the minimum number of complete packs of thermal insulation which will provide 100 $\pm 15 m^2$ of insulation.

4.2 Low density mineral wool — mineral wool thermal insulation with a density not greater than 20 kg/m^3.

4.3 Pack — a number of batts or blankets of insulation contained as a unit, usually by plastic wrapping.

5 APPARATUS. The thermal resistance apparatus shall be selected having regard to apparatus limitations with respect to thickness referred to in Clauses 5.2.1 and 5.2.2.

5.2.1 Guarded hotplate. Thickness restrictions on the use of the guarded hotplate apparatus along with its high cost of construction and operation make the apparatus described in AS 2464.6 impracticable. This method is therefore not recommended for thick samples of thermal insulation.

5.2.2 Heat flow meter. A heat flow meter apparatus, the principles of which are given in AS 2464.5, suitable for thick samples of thermal insulation, can be more easily obtained than a guarded hotplate. This method is therefore recommended for the determination of the thermal resistance of low-density mineral wool thermal insulation — batt and blanket.

6 SAMPLING AND PREPARATION OF TEST SPECIMEN.

6.1 Selection of sample. The sample shall be a pack from which the test specimen shall be obtained.

6.2 Preparation of test specimen. Open the pack; if the batts or blanket(s) are furnished with adhered coverings, remove the coverings by a means that provides a surface approximately equivalent to the surface that the material would have prior to the application of the covering.

7 PROCEDURE.

(a) Weigh the contents to the nearest 0.001 kg. Record this mass as m_p in kilograms.