

Australian/New Zealand Standard™

**Method of test for heat and smoke
release rates for materials and
products using an oxygen
consumption calorimeter**

AS/NZS 3837:1998

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee BD/18, Fire Safety. It was approved on behalf of the Council of Standards Australia on 24 July 1998 and on behalf of the Council of Standards New Zealand on 17 July 1998. It was published on 5 November 1998.

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Australian Building Codes Board
Australian Chamber of Commerce and Industry
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Aeronautical and Maritime Research Laboratory
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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee BD/18, Fire Safety.

This Standard is based on ISO 5660-1:1993, *Fire tests—Reaction to fire—Rate of heat release from building products*, except that the ISO test method excludes smoke measurement, and the test method and test apparatus are based on ASTM E 1354, *Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter*.

It is envisaged that in the future, applications Standards for specific materials will be prepared by appropriate committees. These applications Standards will call up this test method and will set parameters such as irradiance levels and specimen construction or any other relevant parameters.

Specifications for particular materials and products will need to state the irradiance level and specimen construction for each acceptance level.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

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FOREWORD

Fire is a complex phenomenon. Its behaviour and effects depend upon a variety of factors which are inter-related in an intricate way. The behaviour of materials and products in a fire will depend on the characteristics of the particular fire, the way the materials are used and the environment in which they are exposed.

A test such as the one described in this Standard deals only with a simple representation of a particular aspect of the potential fire typified by a radiant heat source and a spark. It cannot, by itself, provide direct guidance on the behaviour or safety of a material in a fire. A test of this type may, however, be used for comparative purposes or to ensure a certain level of performance. The test basically measures heat release rates which have a bearing on fire performance generally.

The term heat release rate is defined in AS 2484.1, *Fire—Glossary of terms, Part 1: Fire tests*, as the amount of calorific energy released per unit time by a material during combustion under specified test conditions. It is one of the fundamental properties of fire and should almost always be taken into account in any assessment of fire hazard since it significantly affects the development of the fire.

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**Method of test for heat and smoke release rates for materials and products using an oxygen consumption calorimeter**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

1.1.1 General This Standard specifies a test method for measuring the response of materials exposed to controlled levels of radiant heating with or without an external igniter. The test method is used to determine the ignitability, heat release rates, mass loss rates, effective heat of combustion, and smoke release of materials and products.

Properties are determined as follows:

- (a) Rate of heat release, by measurement of the oxygen consumption, as determined by the oxygen concentration and the flow rate in the exhaust product stream.
- (b) Effective heat of combustion from a concomitant measurement of specimen mass loss rate, in combination with the heat release rate.
- (c) Smoke release, by obscuration of light by the combustion product stream.
- (d) Ignitability, as a measurement of time from initial exposure to time of sustained flaming.

1.1.2 Objectives The purpose of this Standard is to establish a test method for material and product evaluations, mathematical modelling, design purposes or development and research. The material may comprise specimens from an end-use product or the various components used in the end-use product.

1.1.3 Test parameters Specimens may be exposed to heating fluxes ranging from 0 to 100 kW/m². External ignition, when used, is by electric spark. The value of the heating flux and the use of external ignition are to be as specified in the relevant material or performance standard. The normal specimen testing orientation is horizontal, independent of whether the end-use application involves a horizontal or a vertical orientation. Provisions are also made for vertical orientation testing; this is intended for exploratory or diagnostic studies only.

NOTES:

- 1 The test method does not prescribe the irradiance levels nor whether external ignition is to be used. For an insight into the development of the test method, the features of the apparatus and the use of the data, see Appendix A.
- 2 See Appendix B for a list of papers that provide additional technical background.

1.2 PRINCIPLE OF TEST METHOD

1.2.1 General This test method is based on the observation (Ref. 1) that, generally, the net heat of combustion is directly related to the amount of oxygen required for combustion. The relationship is that approximately 13.1 × 10³ kJ of heat are released per 1 kg of oxygen consumed. Specimens in the test are burned in ambient air conditions, while being subjected to a predetermined external heat flux, which can be set from 0 to 100 kW/m². Burning may be either with or without a spark ignition. The primary measurements are oxygen concentrations and exhaust gas flow rate. Additional measurements include the mass-loss rate of the specimen, the time to sustained flaming and smoke obscuration, or as required by the relevant material or performance Standard.



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