AS 4391—1999

Australian Standard™

Smoke management systems—Hot smoke test

This Australian Standard was prepared by Committee ME/62, Ventilation and Air-conditioning. It was approved on behalf of the Council of Standards Australia on 13 November 1998 and published on 5 January 1999.

The following interests are represented on Committee ME/62:

Air Conditioning and Mechanical Contractors Association of Australia

Air-Conditioning and Refrigeration Equipment Manufacturers Association of Australia

Australasian Fire Authorities Council

Australian Building Codes Board

Australian Institute of Building Surveyors

Australian Institute of Environmental Health

Australian Institute of Refrigeration Air Conditioning and Heating

Chartered Institution of Building Services Engineers

Department of Contract and Management Services W.A.

Fire Protection Association Australia

Institution of Refrigeration Heating and Airconditioning Engineers New Zealand

Metal Trades Industry Association of Australia

Plastics and Chemicals Industries Association

Property Council of Australia

Thermal Insulation Contractors Association of Australia

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee ME/62, Ventilation and Airconditioning, to supersede AS/NZS 4391(Int)—1996.

This Standard is the result of a consensus among Australian and New Zealand representatives on the Joint committee to produce it as an Australian Standard.

The objective of this Standard is to provide a standardized methodology for the subjection of smoke management systems to a safe hot smoke test to be used by system designers, installers and regulators.

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.

This Standard incorporates a Commentary on some of the clauses. The Commentary, directly following the relevant clause, is designated by 'C' preceding the clause number and is printed in italics in a panel. The Commentary is for information only and does not need to be followed for compliance with the Standard.

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FOREWORD

This Standard has been written to ensure that safe tests can be undertaken without threat to the building occupants or damage to property.

The hot smoke test described in this Standard is based on research and development work carried out by the Adelaide Fire Safety Research Unit (Adelaide University) in association with the South Australian Metropolitan Fire Service and CSIRO, over the period from 1986 to 1995. During this time over 150 tests were carried out in a wide range of building types and compartment geometry.

This Standard details the safety procedures and equipment necessary to carry out a hot smoke test. It indicates the size of apparatus and quantity of fuel required for a given compartment geometry which is consistent with the safe practical application of the test. The dimensions of the equipment described should be strictly adhered to.

The assumption is made that the smoke control system under test has been designed within the scope of current Australian legislation and will operate under anticipated interior fire conditions determined by compartment geometry, acceptable design fire size, fire load, active fire suppression system and fire growth rate.

Because of their special geometry and sufficiently complex smoke control systems, buildings to which the hot smoke test is ideally applicable include: atriums, factories, warehouses, department stores, shopping and other complexes, multistorey office buildings or sporting and entertainment centres. The hot smoke test provides a means by which a specified quantity of smoke is generated by a test fire to assist in the assessment of the performance characteristics of a building’s smoke management system. The test fire provides a dynamic buoyant flow of smoke representative of real fire plumes.

The hot smoke test, suitably instrumented, can be used to validate computer-based software and its application to simulate or model movement of smoke in one or more building compartments.

Standards Australia would be pleased to receive any feedback on the usage of this test and request that full details of test methodology and results achieved be forwarded for analysis by the Committee.

STANDARDS AUSTRALIA

Australian Standard
Smoke management systems—Hot smoke test

S E C T I O N 1 S C O P E A N D G E N E R A L

1.1 SCOPE

This Standard sets out the means by which a specified quantity of smoke may be generated, at a safe temperature, within a building. It details test apparatus, procedures and safety requirements for the hot smoke testing of smoke management systems. The size of test fire is selected to generate the required quantity of smoke at a safe temperature.

C1.1 *The size of test fires specified in this Standard varies from areas of 0.03 m^2 to 2 m^2. It is, therefore, possible to apply a hot plume in a compartment of any size without causing damage. It is recommended that a hot smoke test be utilized whenever a smoke test is considered necessary.*

1.2 APPLICATION

This test method is intended for use as a tool in the commissioning process of a building's smoke management system to verify that the operation of the system, under simulated test fire conditions, is as approved by the regulatory authority. It is not intended that carrying out a hot smoke test be a mandatory requirement for every installed smoke management system.

C1.2 *This test is intended to verify the correct performance of a smoke management system including operation, sequence of control and, where practical, specified smoke layer depths. It is not intended as a means of establishing smoke obscuration levels or system integrity under real fire conditions. It is not intended that this test be mandatory for all systems, rather, it provides a tool to resolve uncertainties in some smoke management systems.*

1.3 PRINCIPLE

A pool of methylated spirit is ignited to create a plume of hot air which is then charged with a tracer smoke. This plume activates the smoke control system, the performance of which is monitored to compare with the system as approved by the regulatory authority.

C1.3 *It is intended that the fire size used in the hot smoke test is of such a magnitude that damage to the building finishes and structure or activation of the fire protection system will not occur. The test fire size may not be equal to the design fire size.*

1.4 NEW DESIGNS AND INNOVATIONS

Any alternative materials, designs, methods of assembly and procedures that do not comply with specific requirements of this Standard, or are not mentioned in it, but give equivalent results to those specified, are not necessarily prohibited.