Australian Standard™

Fire hazard testing

Part 7.51: Toxicity of fire effluent—Estimation of toxic potency—Calculation and interpretation of test results



This Australian Standard® was prepared by Committee EL-053, Fire hazard testing—Electrotechnical equipment. It was approved on behalf of the Council of Standards Australia on 23 May 2006.
This Standard was published on 23 June 2006.

The following are represented on Committee EL-053:

- Australian Electrical and Electronic Manufacturers Association
- Australian Information Industry Association
- Electrical Compliance Testing Association
- Electrical Regulatory Authorities Council
- Energy Networks Association

This Standard was issued in draft form for comment as DR 06189.

Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through public comment period.

Keeping Standards up-to-date

Australian Standards® are living documents that reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued.

Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments that may have been published since the Standard was published.

Detailed information about Australian Standards, drafts, amendments and new projects can be found by visiting **www.standards.org.au**

Standards Australia welcomes suggestions for improvements, and encourages readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at **mail@standards.org.au**, or write to Standards Australia, GPO Box 476, Sydney, NSW 2001.

Australian Standard™

Fire hazard testing

Part 7.51: Toxicity of fire effluent—Estimation of toxic potency—Calculation and interpretation of test results

First published as AS 60695.7.51—2006.

COPYRIGHT

© Standards Australia

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher.

Published by Standards Australia GPO Box 476, Sydney, NSW 2001, Australia

ISBN 0 7337 7549 7

PREFACE

This Standard was prepared by the Standards Australia Committee EL-053, Fire hazard testing—Electrotechnical equipment.

The objective of this series of standards is to provide the electrotechnology industry and standards writing committees with a series of standards which give guidance on assessing the fire hazard of electrotechnical products.

This Standard is identical with, and has been reproduced from IEC/TR 60695-7-51, Ed 1.0 (2002), *Fire hazard testing - Part 7-51: Toxicity of fire effluent - Estimation of toxic potency - Calculation and interpretation of test results.*

As this Standard is reproduced from an International Standard, the following applies:

(a) Its number does not appear on each page of text and its identity is shown only on the cover and title page.

(b) In the source text ‘IEC/TS 60695-7-51’ should read ‘AS 60695.7.51’.

(c) A full point should be substituted for a comma when referring to a decimal marker.

(d) Any French text on figures should be ignored.

The terms ‘normative’ and ‘informative’ are used to define the application of the annex to which they apply. A normative annex is an integral part of a standard, whereas an informative annex is only for information and guidance.

Any International Standard referenced should be replaced by an equivalent Australian Standard where one is available. The availability of equivalent Australian Standards can be determined either from the Standards Web Shop at www.standards.com.au or from the annual printed catalogue of Australian Standards.

CONTENTS

Page

INTRODUCTION iv

1 Scope 1

2 Normative references 1

3 Definitions 2

4 Principle of the method 2

5 Method 3

5.1 General 3

5.2 Calculation of predicted toxic potency of effluent using FED principles 4

Annex A (informative) Illustrative example 5

Annex B (informative) Illustrative example: Calculation of FLD in a hypothetical fire, based on data from a tube furnace interlaboratory round-robin test 6

B.1 Assumptions 6

B.2 Known reference data: toxic potency of component toxic gases 6

B.3 Calculations 6

B.3.1 Mass loss integral, D_m 6

B.3.2 Volume yields calculated from tube furnace test data 7

B.3.3 Calculation of FLD 7

Annex C (informative) Nomenclature 8

INTRODUCTION

Over the past ten years, ISO TC92 SC3 has been tasked with examining methodologies for reducing the toxic hazard from fire. This work has resulted in the ISO/TR 9122 series of guidance documents. Similarly, IEC TC89 WG7 is tasked with applying the guidance of ISO TC92 SC3 in the field of electrotechnical products, and has produced the IEC 60695-7 series of standards.

Specifiers, legislators and purchasers of electrotechnical products have tried to ensure a reduction in toxic hazard from fires by utilising the results of small scale decomposition tests on materials, allied with chemical analysis of selected products. These analytical results are often used in calculations, frequently allied with the lethal exposure dose (LCt_{50}) as an indicator of toxic potency, to calculate toxicity indices which are then used either to rank products, or to provide go/no go decisions on their suitability for particular applications.

Because the *material* based toxic potency value must be multiplied by the mass loss rate of the *product* when exposed to heat/fire, it is not possible to infer that a material with a high toxic potency equates to a higher toxic hazard, or vice versa.

For example, it is quite possible that a product made from a material with a low toxic potency could pose a greater toxic hazard than the same product made from a material of higher toxic potency, if the latter is more resistant to ignition, and/or, when ignited, burns (i.e. loses mass) more slowly than the former.

In the light of the information given above, requirements for toxic potency based on data generated by the test method IEC 60695-7-50 (or any other) test method should not be included in specifications for materials or products unless it is supported by complementary tests to measure the mass loss rate under an appropriate scenario, or unless it is part of a documented hazard assessment that considers mass loss, exposure concentrations, time to escape, time to tenability, etc. The approach taken is consistent with the latest agreed-upon methodology as advanced by ISO TC92 SC3 and is based on the formalism that death from the effects of fire will occur if and when those exposed have accumulated a lethal dose of the toxic combustion products in the fire effluent. It is recognised that a lethal outcome is often expected once those exposed have encountered an incapacitating dose of such products and that the magnitude of this dose is often less than that required to cause death. Nevertheless, since a detailed methodology for dealing with incapacitation is still under development and not yet complete within ISO TC 92, incapacitation is not specifically addressed in this technical specification.

STANDARDS AUSTRALIA

Australian Standard

Fire hazard testing
Part 7.51: Toxicity of fire effluent—Estimation of toxic potency—Calculation and interpretation of test results

1 Scope

This technical specification describes the calculation procedure for converting the data generated by chemical analysis in IEC 60695-7-50 into predicted toxic potency data for material tested under defined conditions. This is in order to estimate the contribution of the fire effluent of an end-product or material to the toxic threat to life of the total fire effluent resulting from a fire scenario in which the end-product or material is involved.

This method may also be suitable for converting data from other relevant test methods into predicted toxic potency, provided that the form and format of the data is compatible with that of IEC 60695-7-50.

One of the responsibilities of a technical committee is, wherever applicable, to make use of basic safety publications in the preparation of its publications.

This method is intended to be consistent with the principles advanced in IEC 60695-7-3, and ISO/TR 9122-5. It is designed specifically to make use of results in the form expressed in the laboratory test method described in IEC 60695-7-50.

Toxic potency values are only of use in toxic hazard estimations, and must not be used in isolation.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60695-7-1:1993, *Fire hazard testing – Part 7-1: Guidance on the minimization of toxic hazards due to fires involving electrotechnical products – General*

IEC 60695-7-3:1998, *Fire hazard testing – Part 7-3: Toxicity of fire effluent – Use and interpretation of test results*

IEC 60695-7-50:—, *Fire hazard testing – Part 7-50: Toxicity of fire effluent – Estimation of toxic potency: Apparatus and test method* [1]

IEC Guide 104:1997, *The preparation of safety publications and the use of basic safety publications and group safety publications*

ISO/TR 9122-1:1989, *Toxicity testing of fire effluents – Part 1: General*

ISO/TR 9122-5:1993, *Toxicity testing of fire effluents – Part 5: Prediction of toxic effects of fire effluents*

ISO 13344:1996, *Determination of the lethal toxic potency of fire effluents*

[1] To be published

© Standards Australia