

STANDARDS AUSTRALIA

RECONFIRMATION
OF
AS 2122.3—1993
Combustion characteristics of plastics
Part 3: Determination of smoke-release—Cellular polyurethanes and
polyisocyanurates

RECONFIRMATION NOTICE

Technical Committee FP-018 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

Certain documents referenced in the publication may have been amended since the original date of publication. Users are advised to ensure that they are using the latest versions of such documents as appropriate, unless advised otherwise in this Reconfirmation Notice.

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NOTES

Australian Standard®

Combustion characteristics of plastics**Method 3: Determination of smoke-release—
Cellular polyurethanes and polyisocyanurates**

PREFACE

This Standard was prepared by the Standards Australia Committee on Fire Tests for Plastics, under the direction of the Multitechnics Standards Policy Board, to extend the range of Standards dealing with combustion characteristics of plastics. Other Standards in the AS 2122 Series are:

AS

2122 Combustion characteristics of plastics

2122.1 Method 1: Determination of flame propagation—Surface ignition of vertically oriented specimens of cellular plastics

2122.2 Method 2: Determination of minimum oxygen concentration for flame propagation following top surface ignition of vertically oriented specimens

This Standard is technically identical with AS 2282.15, *Methods for testing flexible cellular polyurethane*, Method 15: *Determination of smoke release*.

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FOREWORD

This test method has been developed to assess the smoke release characteristics of polyurethane foams. It is anticipated that this test would be performed in conjunction with the flame propagation test of AS 2122.1 and would require the use of the test equipment and test specimens used in that test procedure.

The combustion characteristics of a material are complex and a series of tests would be required to specify all combustion characteristics (e.g. ignitability, flame propagation, heat release, smoke release, toxicity, and dripping behaviour).

METHOD

1 SCOPE This Standard describes the method for determining the level of smoke release when a small, vertically oriented specimen of rigid or flexible polyurethane, or rigid polyisocyanurate, cellular plastics of density less than 100 kg/m³ is exposed to a small flame. This test is not suitable for polystyrene and other thermoplastic cellular plastics. Its suitability for other cellular plastics has not been determined.

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

AS

1886 Glossary of terms relating to plastics

2122 Combustion characteristics of plastics

2122.1 Method 1: Determination of flame propagation—Surface ignition of vertically oriented specimens of cellular plastics

2282 Methods for testing flexible cellular polyurethane

2282.1 Method 1: Sampling and conditioning of test specimens

2484 Fire—Glossary of terms

2484.1 Part 1: Fire tests

3 DEFINITIONS For the purpose of this Standard the definitions of AS 1886 and AS 2484.1 apply.

4 PRINCIPLE The test specimen is positioned in a vertical orientation in a test chimney and ignited by a burner operating for a set time.

The chimney is located beneath a smoke chamber intake, and the smoke from the test is collected. The reduction in transmission of a vertical light beam passing through the chamber is recorded.

NOTE: This test would normally be performed in conjunction with flame propagation testing conducted in accordance with AS 2122.1.

5 APPLICATION TO FIRE HAZARD ASSESSMENT

5.1 General On their own, these test results do not indicate the fire hazard of the material or product under actual fire conditions and consequently should not be applied to the assessment of fire hazard without taking into account additional supportive information.

5.2 Application of test results This test may be used to compare the smoke release from various cellular polyurethane and polyisocyanurate materials, however it must be stressed that this test will not indicate the fire hazard of a material in actual use. It is the manner in which the material is used and modified during fabrication which determines the fire hazard of the final product. This test may be used to specify the smoke evolution of a raw material in a product Standard.

5.3 References This method is based on work carried out at the CSIRO, Division of Building, Construction and Engineering, by N A McArthur.

6 APPARATUS AND REAGENTS

6.1 Smoke chamber—fabricated from galvanized iron of 0.61 mm nominal thickness, conforming to the dimensions in Figure 1.

6.2 Smoke measurement system—consisting of the following significant items:

- (a) Stabilized low voltage power source.
- (b) Mounted light source and photocell.
- (c) Photocell signal attenuator.
- (d) Potentiometric recorder capable of measuring 2 V full scale.

Figure 2 shows a suitable arrangement of the above components, which are mounted independently from the smoke chamber to eliminate vibration and allow simplified setting up of the apparatus.

6.3 Test chimney and subsidiary equipment—in accordance with the apparatus of AS 2122.1, including the following significant items (see also Figures 2, 3, 4 and 5):

- (a) Test chimney.
- (b) Burner.
- (c) Ignition controller.
- (d) Specimen holders suitable for the material being tested (see Figure 3).
 - (i) Flexible cellular polyurethane—Holder A.
 - (ii) Rigid polyisocyanurate—Holder B.
 - (iii) Rigid cellular polyurethane—Holder C.
- (e) Aluminium foil.
- (f) Balance.
- (g) Test chamber.

6.4 Reagents—propane gas (at least 95 percent purity) and a compressed air supply.

7 TEST SPECIMENS The test specimens shall be $255 \times 20 \times 20$ mm, cut from a sample of material of uniform density. The specimens shall be free of all dust and the cut edges shall be smooth.

At least ten specimens are required.

8 CONDITIONING All test specimens shall be conditioned in accordance with AS 2282.1.

9 PROCEDURE The procedure shall be as follows:

- (a) Determine the density of each specimen in accordance with AS 2122.1. If the density of any specimen varies by more than 5 percent from the average density of all the specimens, discard that specimen and replace it by a specimen complying with the density requirement. Record the mass, m , of each of the retained specimens to the nearest 0.01 g.

- (b) Line the back and sides of the chimney with aluminium foil, with the more highly reflective surface facing the specimen. Replace the lining when it becomes visibly soiled.
- (c) Locate the burner in position 1 (see Figure 4) if using holders A or C, and position 2 if using holder B.
- (d) Let the air/gas mixture run through the burner without ignition for a period sufficient to adjust the gas pressure to 1225 ± 30 Pa and the air line pressure to 1910 ± 50 Pa. Check the pressures for compliance with these requirements before testing specimens of a new sample.
- (e) Set a 10 s interval on the ignition controller.
- (f) Determine the mass, m_i , of a piece of aluminium foil, approximately 50 mm $\times$ 80 mm, to the nearest 0.1 g and place it at the base of the chimney to catch drips of material formed during the test.
- (g) Cover the front surface of the appropriate holder (see Figure 3) with aluminium foil, with the more highly reflective surface facing outwards. Use new foil for each test.
- (h) Determine the mass, m_h , of the (wrapped) specimen holder to the nearest 0.01 g.
- (i) Impale the specimen on the pins of the holder in such a way that the bottom of the specimen is in line with the bottom of the holder, and there is no gap between the specimen and the holder.
- (j) Attach the loaded specimen holder to the back of the chimney, and position it centrally.

NOTE: Steps (a) through (j) replicate the procedures of AS 2122.1.

- (k) Open the inlet port (D) and the cold air displacement vent (E) on the smoke chamber (see Figure 1). Close the exhaust panel (A) and ensure that any exhaust blower to a fume hood is switched off.
- (l) Start the potentiometric recorder and set the zero and 100 percent light transmission levels by using the attenuator, and masking the photocell with a piece of card.
- (m) Slide the loaded chimney apparatus under the open inlet, allowing about 25 mm clearance.
- (n) Ignite the burner and the test specimen.

WARNING: CARE SHOULD BE TAKEN AS THE PRODUCTS OF THERMAL DECOMPOSITION OF POLYURETHANE FOAM ARE TOXIC.

- (o) Close the cold air vent when smoke first begins to pass out of it (usually 10 s to 15 s after the start of the test).
- (p) Close the inlet port when the specimen ceases to smoke.
- (q) When the recorder trace has stabilized (usually about 30 s after closing the inlet port), open the exhaust panel and turn on the exhaust blower until the recorder trace indicates that the chamber is clear.
- (r) Record the minimum stable percentage light transmission as T percent.
- (s) Allow the apparatus to cool to ambient temperature. Determine and record the combined mass of the specimen holder and specimen residue, m_r , and the combined mass of the drip tray and drips, m_d , if any, to the nearest 0.01 g.
- (t) On completion of the test immediately turn on the exhaust fan to remove products of combustion, which in some cases may be toxic.
- (u) Clean the specimen holder and then repeat the procedure from Step (f) on the remainder of the specimens.