

Australian/New Zealand Standard®

Plastics

Method for exposure to ultraviolet lamps

PREFACE

This Standard was prepared by the Standards Australia Committee on Methods of Testing Plastics, under the direction of the Multitechnics Standards Policy Board, to provide a Joint Australian/New Zealand Standard to supersede the 1981 edition of AS 2433.

This edition has been reformatted and gives revised advice on suitable sunlamps.

FOREWORD

This Standard provides a simple method for exposing the surfaces of plastics to artificial ultraviolet radiation without the need for expensive equipment. It was prepared for use as a comparative quality control test to complement known outdoor exposure performance testing for assessing the durability of plastics materials and products. The use of this test equipment eliminates the need for repeated outdoors testing following minor changes in the formulation or the manufacture of a plastics product.

It needs to be emphasized that where durability data are required in relation to time, e.g. duration of acceptable exposure outdoors, then actual outdoors exposure is necessary or a correlation between natural and artificial weathering needs to be established. Such test methods have been standardized in AS 1745 *Outdoor weathering of plastics in the Australian environment*, Part 1: *Commercial products* and Part 2: *Guide for design purposes*, and ISO 4892, *Plastics—Methods of exposure to laboratory light sources*.

Testing in the development of this method was carried out by CSIRO, Division of Building, Construction and Engineering, and is described in their report *A Quality Control Test for UV Resistance of Sheet Materials* by K. G. Martin and I. Sasnaitis, 1978. Reproducibility, discrimination and assessment repeatability were confirmed in a round-robin series with two industry laboratories.

METHOD

1 SCOPE This Standard sets out a method for exposing plastics to artificial ultraviolet radiation. It is applicable to small plastics end-products, pieces of plastics end-products or specimens prepared from plastics material and is intended as a quality control procedure.

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

AS

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| 1745 | Outdoor weathering of plastics in the Australian environment |
| 1745.1 | Part 1: Commercial products |
| 1745.2 | Part 2: Guide for design purposes |

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3 PRINCIPLE The test specimen is exposed within a defined target area to the irradiation from a prescribed lamp. Any changes in test specimens may be measured in accordance with relevant product specifications.

NOTE: The exposure duration does not relate to any specific duration of outdoor weathering.

4 APPARATUS The following apparatus is required:

- (a) *Two sunlamps and lamp stands*—each sunlamp shall be of the mercury vapour discharge type with tungsten-filament resistive ballast, and an outer glass bulb that effectively absorbs radiation of wavelength less than 280 nm. The electrical power consumption of each lamp shall lie within the range 250 W to 350 W.

NOTES:

- 1 A suitable lamp is the OSRAM (WOTAN) Ultravitalux lamp which has a nominal power consumption of 300 W, and within the wavelength range of 280 nm to 400 nm has an integrated irradiance of 7.1 W/m² measured at a distance of 1 m.
- 2 Ultraviolet radiation can cause conjunctivitis. The lamps should not be viewed directly without protecting the eyes with suitable protective glasses. Screens may be placed about the test assembly during the exposure, but they should not restrict air flow or cause test specimens to overheat.
- 3 The lamps recommended for use in this method do not have a broad spectrum output similar to sunlight but have peaks centred at 303, 313, 334 and 366 nm. The radiation emitted at some of these peaks can exceed the corresponding radiation that is emitted by sunlight, consequently materials that have activation energies that correspond to one or more of these peaks may exhibit a much more rapid change in properties than is experienced under natural weathering. Materials with activation energies that do not coincide with any of these peaks may have property change rates much lower than those that occur under natural weathering. Care should therefore be taken in assessing the results obtained using these lamps and where possible correlations should be obtained with natural weathering in the intended exposure area for each material assessed.

- (b) *Two cylindrical lamp shades*—300 mm diameter, constructed of aluminium foil, and held by the lamp stand 300 mm above an exposure board (see Figure 1).
- (c) *Exposure board*—of non-metallic, thermally stable material, marked with a target area bounded by two half-circles of 100 mm radius (the centre of each circle being directly beneath the centre of each sunlamp) and the parallel lines that join the half-circles (see Figure 1).

NOTE: Fibrous cement sheet of approximately 10 mm thickness has been found suitable.

- (d) *Black panel thermometer*—consisting of a completely blackened metal plate at least 1 mm thick and at least 10 000 mm² in area, with a suitable thermometer or thermocouple making good thermal contact giving the temperature reading. The surface of the plate facing the light source is coated with a flat-back layer which absorbs at least 90 percent of all incident flux to 2500 nm. The temperature of the plate is measured with either a black-coated stem-type bimetallic disc sensor or a resistance bulb sensor centrally positioned and firmly attached to the exposed surface of the black plate.

5 TEST SPECIMENS

5.1 Size and number of test specimens The size and number of test specimens of each material shall be nominated in the relevant product specification, except that at least three replicate test specimens shall be exposed and the minimum size of each test specimen shall be 25 mm × 25 mm (i.e. a minimum area of 625 mm²). The thickness of the test specimen shall be that of the finished product.