

Australian/New Zealand Standard™

**Fuel containers—Portable—
Plastics and metal**



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Australian Institute of Petroleum
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Australian/New Zealand Standard™

Fuel containers—Portable— Plastics and metal

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PREFACE

This Standard was prepared by the Standards Australia/Standards New Zealand Committee ME-045, Fuel Tanks and Containers, to supersede AS/NZS 2906:1999. This revision of the Standard was balloted as Amendment No. 1 to AS/NZS 2906:1999.

The principal changes in this edition involve the following:

- (a) Revised marking requirements.
- (b) Revised test procedures.
- (c) Revised requirements for the Department of Defence.
- (d) The requirements to provide literature regarding fire test results is deleted.

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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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard
Fuel containers—Portable—Plastics and metal

1 SCOPE

This Standard specifies requirements for portable, petroleum-product fuel containers made of metal or plastic, of nominal capacity up to and including 25 L, intended to be refilled, and of the following types:

- (a) Containers for the storage and transport of fuel.
- (b) Fuel tanks for boats.

Containers covered by this Standard are suitable for use with leaded, unleaded and super grades of petrol, two-stroke engine fuel, and kerosene and distillate.

In general, these containers are excluded from use with racing fuels; however, they may be suitable for use with specific racing fuels where the constitution of the fuel has been reviewed by the container manufacturer and subsequent approval given for such usage.

For specific directives regarding the use of this Standard by the Australian Department of Defence, see Appendix A.

This Standard is not intended to cover containers in which fuel is pre-packaged, or cans fitted with dispensing taps and other devices intended for decanting flammable liquids.

WARNING: THE USE OF FUEL CONTAINERS COVERED BY THIS STANDARD MAY INVOLVE HAZARDOUS MATERIALS, OPERATIONS, AND EQUIPMENT. THIS STANDARD DOES NOT PURPORT TO ADDRESS ALL OF THE SAFETY PROBLEMS ASSOCIATED WITH THE USE OF FUEL CONTAINERS. IT IS RECOMMENDED THAT USERS OF THESE CONTAINERS CONSULT WITH REGULATORY AUTHORITIES AND MANUFACTURERS TO DETERMINE APPLICABILITY, AND LIMITATIONS TO THEIR USE, AND TO ESTABLISH APPROPRIATE SAFETY AND HEALTH PRACTICES.

NOTES:

- 1 Other requirements outside the Scope of this Standard may be specified within State and Territory legislation, such as within the Australian code for the transport of dangerous goods by road and rail (ADG Code), NZ 5433, IATA Regulations, IMDG Code and ICAO Rules and may specify a leakproof test for each individual container.
- 2 Similarly, containers that meet ADG Code, NZ 5433, IATA Regulations, IMDG Code and ICAO Rules may not satisfy all the requirements of this Standard.

2 OBJECTIVE

The objective of this Standard is to provide manufacturers with the minimum requirements for portable metal or plastic fuel containers of nominal capacities up to and including 25 L.

3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- 2331 Methods of test for metallic and related coatings
- 2331.3.1 Part 3.1: Corrosion and related property tests—Neutral salt spray (NSS) test
- 2400 Packaging
- 2400.1 Part 1: Glossary of packaging terms
- 2700 Colour Standards for general purposes
- 4142 Fibre ropes
- 4142.2 Part 2: Three-strand hawser-laid and eight-strand plaited

AS/NZS

- 1020 The control of undesirable static electricity
- 2642 Polybutylene pipe systems
- 2642.1 Part 1: Polybutylene (PB) pipe extrusion compounds

NZS

- 5433 Transport of dangerous goods on land

ANSI/ASTM

- D471 Test method for rubber property—Effect of liquids
- D638 Test method for tensile properties of plastics
- ADG Australian code for the transport of dangerous goods by road or rail
- IATA Regulations—Dangerous goods regulations of the International Air Transport Association
- ICAO Rules—Technical instructions for the safe transport of dangerous goods by air
- IMDG Code—International Maritime Dangerous Goods Code

ANSI/AWWA

- B100-96 Filtering material

4 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 2400.1 and those below apply.

4.1 Breathing vent

That part of the fuel tank enabling entry of air to replace the liquid withdrawn from the tank, e.g. during operation of a boat's engine.

4.2 Container

A container or a fuel tank for boats for the storage and transport of fuel (see Clause 4.18).

NOTE: Containers for dangerous goods Class 3 flammable liquids should also meet the packaging requirements of the ADG Code and NZS 5433.

4.3 Distillate (diesel fuels)

Distilled hydrocarbons suitable for use in high-speed, compression-ignition, internal-combustion engines.

4.4 Filling opening

That part of the container enabling entry of fuel to the container.

4.5 Fuel

See Clause 4.8.

4.6 Integrity

The state of being whole or entire. A fuel container is considered to have lost its integrity when it ceases to contain the fuel or its vapour.

4.7 Kerosene

Those grades of kerosene that are readily and commercially available, including lighting and power kerosene.

4.8 Motor spirit or fuel

A liquid (when at standard temperature and pressure) suitable for the operation of a spark-ignition internal-combustion engine.

NOTE: Motor spirit or fuel does not include liquefied petroleum gas (LPG) or compressed natural gas (CNG).

4.9 Nominal capacity

The net liquid capacity of the container indicated by a fillpoint reference mark and nominated by the manufacturer for compliance with this Standard.

4.10 Overflow capacity

The maximum liquid capacity of the container with all closures removed when standing in a normal upright position on a horizontal surface.

4.11 Pouring nozzle

The component through which the contents of the container can be dispensed without spillage.

4.12 Pouring opening

That part of the container enabling exit of fuel from the container.

4.13 Pouring vent

That part of the portable fuel container (other than fuel tanks for boats) enabling entry of air to replace the liquid leaving the container during pouring operations.

4.14 Racing fuel

Motor spirit other than commercially available leaded, unleaded, or super grade petrol, distillate, two-stroke engine fuel, and kerosene.

4.15 Regulatory authority

The authority having statutory powers to control the design and manufacture of containers described in this Standard, in the State or Territory in which the containers are used.

4.16 Shall

Indicates that a statement is mandatory.

4.17 Should

Indicates a recommendation.

4.18 Tank

A portable fuel container, specifically for transporting and supplying fuel for boats, which is directly connected to the motor during its operation, e.g. for outboard motors.

4.19 Two-stroke engine fuel

A blend of motor spirit and engine lubricant suitable for use with spark-ignition, two-stroke, internal-combustion engines.

5 MATERIALS

5.1 General

When conductive and non-conductive materials are used in the construction of a container, they shall be used in such a way that a static charge will not be isolated between conductive and non-conductive materials during the filling and emptying process.

5.2 Plastic

Containers made from plastic materials shall be capable of withstanding exposure to ultraviolet radiation and heat ageing within the temperature range -18°C to $+55^{\circ}\text{C}$.

NOTE: Protection is normally obtained by the addition, to the basic raw materials, of materials that act as ultraviolet light stabilizers or inhibitors.

For polyolefin raw materials, satisfactory protection has been obtained by the addition of—

- (a) a minimum of 0.3% by mass of either a benzotriazole or a benzophenone type compound; or
- (b) $2.5 \pm 0.5\%$ by mass of carbon black of the type and dispersion specified in AS/NZS 2642.1.

For materials other than polyolefins, or for additives other than benzotriazole, benzophenone, or carbon black, it is recommended that the manufacturer demonstrate that the protection provided is not less than that for polyolefins with the additives described above.

In addition, it is recommended that the manufacturer ensure that all materials and additives used are not less compatible with the intended contents as listed in Clause 1 than polyolefins with the additives described above.

6 DESIGN

6.1 Closures and gaskets

Closures and gaskets shall be designed to meet the following requirements, as appropriate:

- (a) All closures shall be designed to allow effective sealing without the use of tools so that the container, other than a tank, will be hermetically sealed in normal use (see Clause 6.5).

Threaded closures shall be designed to seal at a torque not greater than 5 N.m.

- (b) Gaskets, where used, shall be installed with a retaining ring or other means of preventing accidental loss.

6.2 Filling opening

The filling opening shall be designed to allow free entry of common, fuel-dispensing nozzles. The opening shall be not less than 25 mm in diameter nor more than 70 mm in diameter.

6.3 Pouring opening

Each container, except tanks for boats, shall be provided with a pouring opening. The pouring opening shall have an integral pouring nozzle, or shall be designed to accept a pouring nozzle. The supply of a detachable pouring nozzle with the container is optional. Means shall be provided for venting during pouring. The junction of the container and a detachable pouring nozzle, if supplied, shall not leak when liquid is poured from the container.

To reduce hazards due to electrostatic charging of liquids, the diameter of the pouring nozzle, if supplied with the container, shall comply with the following equation (see AS/NZS 1020):

$$d \leq \frac{640}{v^2}$$

where

d = diameter of pouring nozzle, in millimetres

v = flow velocity of liquid, in metres per second

NOTE: It is recommended that the outside diameter of the tip of a pouring nozzle, where supplied, not exceed 21.3 mm to ensure compatibility with the fuel tank opening of an unleaded vehicle.

6.4 Pouring vent

A pouring vent shall be incorporated in portable fuel containers (other than tanks) to provide a smooth pouring action without undue pulsation. The pouring vent shall be a second opening or the pouring nozzle shall be vented.

6.5 Breathing vent

A breathing vent shall be incorporated in demountable fuel tanks for boats to provide a smooth fuel withdrawal without undue pulsation.

6.6 Handle

A handle shall be provided. It shall either be an integral part of the container or be secured permanently to the container. The handle shall be located so that it may be used for both carrying and pouring.

6.7 Nominal capacity fill level

A fuel container shall have an embossed or moulded graduation or other suitable means to accurately indicate its fill level when filled to the nominal capacity. The nominal fill level is the recommended fill level.

NOTE: If more than one fill level is indicated (i.e. to suit overseas markets), then each fill level is to be clearly identified with its capacity.

6.8 Capacity of container

The container shall have an overflow capacity, to the lowest opening, not less than 105% of the nominal capacity.

NOTES:

- 1 Minimum required overflow capacity is calculated using the exact nominal capacity as stated by the manufacturer.
- 2 Where a pouring nozzle is not an integral part of the container, the overflow capacity is measured with the pouring nozzle removed.
- 3 When the container has more than one fill level the overflow capacity should be determined using the maximum indicated fill capacity.

6.9 Fuel indicator

It is recommended that fuel tanks for boats be equipped with a suitable fuel level indicating device.

6.10 Pouring nozzle

Where a separate pouring nozzle is supplied, provision shall be made for securing the nozzle to the container or incorporating it in the container.

6.11 Colour

The external surface of the finished container may be of any colour.

NOTES:

- 1 For petrol or two-stroke fuels, the colour red is recommended for community awareness. Typical colours are R12—Scarlet, R13—Signal Red, R14—Waratah, and R15—Crimson, as defined in AS 2700.
- 2 The colour of the container is usually subject to agreement between the purchaser and the supplier. Authorities may require specific colours, according to the fuel to be transported in the container.
- 3 The colour 'white' or 'clear' plastic should be reserved for water containers.

7 PROVISION OF TEST SAMPLES AND TEST REQUIREMENTS

7.1 Test samples

7.1.1 General

Containers shall be manufactured and tested under a Quality Assurance Program.

Each design of container and its seal or seals shall be subject to type testing in accordance with Clauses 7.3, 7.4 and 7.5 as applicable to determine satisfactory performance.

Samples for type testing shall be chosen from the same manufacturing batch in the quantities set out in Clauses 7.1.2 and 7.1.3.

7.1.2 Containers greater than 5 litres in capacity:

The numbers of containers shall be as follows:

- (a) 3 samples of each type and size of seal or seals; and
- (b) 18 plastic containers; or
- (c) 14 metal containers.

NOTES:

- 1 Only samples of the initial batch of each type of seals needs to be tested to establish the compatibility of the elastomeric components in contact with fuel.
- 2 A hierarchy of tests in the form of an informative flow chart is provided in Appendix O.
- 3 Additional containers may be required for the flame exposure test (see Paragraph F5 of Appendix F) and the drop strength test (see Paragraph E4(d)(ii)).
- 4 Because of the complexity of the testing processes particular care should be taken to identify the samples (and parts thereof) and the tests to which they have been subjected.

The following list summarizes the number of samples required for each test and indicates how some samples can be re-used:

- (i) Three (3) samples from each type and size of seal to be used for the compatibility test in Appendix B.

- (ii) Ten (10) plastic samples to be used for the mass loss test, in Appendix C. The mass loss test need not be conducted on metal specimens.
- (iii) Three (3) samples to be used for the hydrostatic/stability test in Appendix L. Plastic containers are to be taken from the remaining ten (10) tested for mass loss.
- (iv) Six (6) samples are to be used for the drop tests in Appendix E. Plastic containers are to be taken from the remaining ten (10) tested for mass loss.
- (v) Four (4) separate samples are to be used for the flame exposure test in Appendix F.
- (vi) Three (3) samples are to be used for the handle strength test in Appendix G. These are to be taken from the six (6) that were drop tested.
- (vii) Four (4) separate samples are to be used for the stress cracking test in Appendix J. The stress cracking test need not be conducted on metal samples.
- (viii) One (1) separate sample is to be used for the corrosion resistance test including dissection, in Appendix K. The corrosion resistance test is not applicable to plastic containers.

7.1.3 Containers up to and including 5 litres in capacity

The number of samples shall be as follows:

- (a) 3 samples of each type and size of seal or seals; and
- (b) 19 plastic containers; or
- (c) 14 metal containers.

The following list summarizes the number of samples required for each test and indicates how some samples can be re-used.

- (i) Three (3) samples from each type and size of seal to be used for the compatibility test in Appendix B.
- (ii) Ten (10) plastic samples to be used for the mass loss test, in Appendix C. The mass loss test need not be conducted on metal samples.
- (iii) Three (3) separate samples are to be used for the corrosion resistance test in Appendix D. The corrosion resistance test is not applicable to plastic samples.
- (iv) Six (6) samples are to be used for the drop tests in Appendix E. Plastic samples are to be taken from the remaining ten (10) tested for mass loss.
- (v) Four (4) separate samples are to be used for the flame exposure test in Appendix F.
- (vi) Three (3) samples are to be used for the handle strength test in Appendix H. These are to be taken from the six (6) that were drop tested.
- (vii) Four (4) separate samples are to be used for the stress cracking test in Appendix J. The stress cracking test need not be conducted on metal samples.
- (viii) Three (3) samples to be used for hydrostatic/stability test in Appendix L. Plastic samples are to be taken from the remaining ten (10) tested for mass loss. Metal samples are to be taken from the three (3) tested for corrosion.
- (ix) One separate sample is to be used for the external pressure (vacuum) test in Appendix M. The plastic sample is to be taken from the remaining samples tested for mass loss.

7.2 Elastomeric components

When tested in accordance with Appendix B, elastomeric components (e.g. gaskets) likely to be in contact with the fuel contents shall show—

- (a) no evidence of cracking or visible deterioration;
- (b) a change in volume not greater than 40% swelling or 1% shrinkage; and
- (c) a mass loss (extraction) of not greater than 10%.

7.3 Performance requirements

7.3.1 Mass loss 'test'

When a sample is tested in accordance with Appendix C, the mass loss shall not exceed 1% and all surfaces, when examined, shall show no evidence of tackiness, loss of lining adhesion or other obvious defects.

7.3.2 Hydrostatic pressure 'test'

When a sample is tested in accordance with Appendix L, there shall be no evidence of leakage.

7.3.3 Stability 'test'

When tested in accordance with Appendix L, the sample shall remain on its base unsupported.

7.3.4 Drop strength 'test'

When a sample is tested in accordance with Appendix E, it shall show no sign of rupture or leakage after the sample has been vented and left to stand for a period of not less than 5 min.

7.3.5 Integrity under exposure to flame 'test'

When a sample is tested in accordance with Appendix F, it shall have a time to 'loss of integrity' of not less than 30 s and shall not explode in less than 90 s.

7.3.6 Handle strength 'test'

When a sample is tested in accordance with Appendix G or Appendix H, as appropriate there shall be no complete separation of the handle at any point of attachment to the sample, nor shall there be any leakage from the sample. When evidence of partial separation of the handle of the sample is present, the test shall be repeated once more, as specified, on the same handle of that sample. There shall be no further separation after the repeated test.

NOTE:

- 1 Distortion of the handle without evidence of failure of any point of attachment of the handle does not constitute a failure of the test.
- 2 Partial separation includes such events as failure of a spot weld or a rivet where the remaining welds or rivets still retain the handle.

7.3.7 External (vacuum) pressure test

When samples up to and including 5 L capacity are tested in accordance with Appendix M there shall be no evidence of permanent distortion (collapse) or leakage which render them unsuitable for use as refillable containers. The post test brimful capacity shall exceed the nominal capacity.

7.4 Additional performance requirements for plastic containers

7.4.1 General

When tested the plastic samples shall not be less than 48 h old.

7.4.2 Resistance to petroleum test

When tested in accordance with Appendix I, the material shall—

- (a) if exposed for 30 days, retain not less than 85% of its tensile strength and elongation; or
- (b) if exposed for 60 days, retain not less than 60% of its tensile strength and elongation.

7.4.3 Stress cracking test

When a sample moulded of polyethylene is tested in accordance with Appendix J, it shall not crack.

NOTE: This test requirement may be waived by the purchaser if the manufacturer can provide evidence that the polyethylene is stress-crack-resistant grade.

7.5 Additional performance requirements for metal containers

Metal containers shall meet the following additional requirements as appropriate:

- (a) Samples with capacities greater than 5 L shall not exhibit corrosion after being tested in accordance with Appendix K.
- (b) Samples with capacities up to and including 5 L capacity shall not exhibit corrosion after being tested in accordance with Appendix D.

NOTE: Minor or scattered corrosion spots are permitted.

8 MARKING

Each container shall be durably and indelibly marked (e.g. embossed or moulded) with the following, in characters not less than 3 mm in height for capital letters and for lower case letters with an ascender or descender, or not less than 2 mm in height for lower case letters without an ascender or descender:

- (a) Manufacturer's name or registered trademark.
- (b) Nominal capacity, in litres, in conjunction with a mark indicating that level.
- (c) An indication of the year of manufacture of the container and, for plastics containers, also the month of manufacture.

Each container shall display the following:

- (i) A word indicating the hazardous nature of the contents of the container, i.e. 'Warning', 'Danger', or 'Caution'.
- (ii) The warnings, 'Vapour may cause flash fire' or similar, 'Fuel only' or similar, and 'Flammable'.
- (iii) Any phrase indicating appropriate cautionary statements, e.g. 'Keep out of the reach of children', 'Not suitable for racing fuel'.
- (iv) First aid information, which shall include advice on actions to be taken if fuel is swallowed, inhaled, or comes in contact with the skin or eyes, e.g. as required by the National Health and Medical Research Council.

NOTES:

- 1 Figure 8.1 provides an example of a warning and first aid label.
- 2 Manufacturers making a statement of compliance with this Australian/New Zealand Standard on a product, packaging, or promotional material related to that product are advised to ensure that such compliance is capable of being verified.

WARNING: FUEL ONLY—FLAMMABLE

FLAMMABLE—VAPOUR MAY CAUSE FLASH FIRE.

KEEP OUT OF REACH OF CHILDREN.

KEEP CONTAINER AWAY FROM SOURCES OF IGNITION.

DO NOT FILL BEYOND MARKED FILLING LEVEL.

NOT SUITABLE FOR ALL RACING FUELS.

STORE AWAY FROM DIRECT SUNLIGHT.

DO NOT LEAVE IN ENCLOSED UNVENTILATED SPACES.

PLACE CONTAINERS ON GROUND WHEN FILING AND ENSURE FILLING NOZZLE MAINTAINS CONTACT WITH THE CONTAINER.

EXERCISE CAUTION WHEN OPENING CONTAINER—AT ALL TIMES.

FIRST AID

- IF POISONING OCCURS CONTACT A DOCTOR OR POISONS INFORMATION CENTRE.
- IF SWALLOWED, DO NOT INDUCE VOMITING. GIVE A GLASS OF WATER.
- REMOVE VICTIM FROM CONTAMINATED AREA.
- IF NOT BREATHING, APPLY ARTIFICIAL RESPIRATION.

FIGURE 8.1 EXAMPLE LABEL