

Australian Standard™

**Hose and hose assemblies for
distribution of petroleum and petroleum
products (excepting LPG)**



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Australian Standard™

Hose and hose assemblies for distribution of petroleum and petroleum products (excepting LPG)

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PREFACE

This Standard was prepared by the Joint Standards Australia Committee RU/1, Industrial Hose, to supersede AS 2683—1989.

This Standard is the result of a consensus among the representatives on the Joint Committee to produce it as an Australian Standard.

The objective of this Standard is to provide a hose that is safe to use with petroleum and petroleum products.

This Standard differs from the 1989 edition in the following respects:

- (a) Adhesion properties—not applicable to composite hose.
- (b) Inclusion of dynamic bend radius for aircraft hose.
- (c) Twisting aspects.
- (d) Requirements for proof pressure and crush recovery have been included.

This Standard differs from ISO 1825:1996, *Rubber hoses and hose assemblies for aircraft ground fuelling and defuelling—Specification*, and ISO 2929:1991, *Rubber hoses for bulk fuel truck delivery—Specification*, in the following respects:

- (i) The Standard has dilation requirements where metered pumps are used.
- (ii) The Standard has a grade of hose suitable for an aromatic hydrocarbon content greater than 50 percent.
- (iii) The Standard specifies an ambient range of temperature of -20°C to $+55^{\circ}\text{C}$ which is more suitable for Australia, compared with the extra low temperature requirement of -40°C specified in both ISO Standards.
- (iv) ISO 2929 cannot be adopted as it is not intended for aviation fuel, and is also not suitable for metered pumps. Also, the Types of hose are only pressure regulated, and the full range of electrical kinds are not covered.
- (v) ISO 1825 cannot be adopted because the aromatic hydrocarbon content cannot exceed 30 percent by volume. Also, it does not cover the use of hose with metered pumps.

Appendix H, Method for determining crush recovery of aircraft hose, has been adopted from ISO 1825:1996.

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

Australian Standard

Hose and hose assemblies for distribution of petroleum and petroleum products (excepting LPG)

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for hose and hose assemblies for conveying petroleum and petroleum products, except for liquefied petroleum gas, at product temperatures up to 65°C in ambient temperatures ranging from –20°C to 55°C.

The Standard is intended for hose applications involving road and rail tankers, metered pumps, farm tanks, reeling, aviation and general plant operations.

NOTES:

- 1 A separate Standard, AS 2117, provides for hoses used for transferring liquid petroleum products to and from marine tankers or bunkering vessels or for similar duties ashore.
- 2 For product temperatures above 65°C, the manufacturer should be consulted for special conditions applicable to the use of the hose.
- 3 Guidelines and advice on information to be supplied at the time of placing an enquiry or an order are set out in Appendix A.
- 4 A guide to the user of hose assemblies for continued in-service performance has been included as Appendix G.

1.2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard.

AS

1180	Methods of test for hose made from elastomeric materials
1180.1	Method 1: Dimensions
1180.3	Method 3: Accelerated ageing
1180.4B	Method 4B: Ply adhesion—Autographic method
1180.5	Method 5: Hydrostatic pressure
1180.7A	Method 7A: Resistance of hose lining and cover to liquids
1180.7B	Method 7B: Resistance to liquids—Physical
1180.7J	Method 7J: Resistance to vacuum
1180.11	Method 11: Hose and coupling compatibility—Tensile method
1180.13A	Method 13A: Determination of electrical resistance of hose and hose components
1180.13B	Method 13B: Determination of electrical resistance of hose assembly
1180.13C	Method 13C: Determination of electrical continuity of hose assembly with reinforcing wire(s)
1257	Bore sizes, test pressures and tolerances on lengths of elastomeric hose
1683	Methods of test for elastomers
1683.20	Method 20: Standard temperatures, humidities and times for conditioning and testing test pieces
1683.24	Method 24: Rubber—Vulcanized—Determination of resistance to ozone cracking—Static strain test
2117	Hose and hose assemblies for petroleum and petroleum products—Marine suction and discharge

1.3 CLASSIFICATION AND DESIGNATION

1.3.1 General

Hose shall be classified in terms of its type and its maximum working pressure as detailed in Clauses 1.3.2 and 1.3.3 in conjunction with the grade of its internal surface according to its intended use as detailed in Clause 1.3.4 and its electrical kind as detailed in Clause 1.3.5.

1.3.2 Type

The type of hose, on the basis of description shall be as follows:

<i>Type</i>	<i>Description</i>
1	Suction and discharge, non-collapsible
2	Discharge only, non-collapsible under normal use
3	Lightweight, discharge only, collapsible
4	Controlled dilation, discharge only, non-collapsible under normal use

1.3.3 Working pressure

The maximum working pressure (WP) in kilopascals, i.e. pressure above ambient, shall be selected from the following:

150 kPa, 250 kPa, 400 kPa, 700 kPa, 1000 kPa, 1500 kPa, and 2000 kPa.

1.3.4 Grade

Material for the internal surface of the hose shall be selected in accordance with its use, designated by a grade number as follows:

<i>Grade</i>	<i>Use</i>
1	For grades of petroleum and petroleum products having an aromatic hydrocarbon content of not greater than 30 percent, including aviation fuels
2	For grades of petroleum and petroleum products having an aromatic hydrocarbon content of not greater than 50 percent.
3	For grades of petroleum and petroleum products, having an aromatic hydrocarbon content of greater than 50 percent.

1.3.5 Electrical kind

Hose shall be categorized in accordance with its electrical characteristics as follows:

<i>Kind</i>	<i>Characteristics</i>
1	Conducting. The integral conductor(s) is the conducting medium. This conductor(s) may also provide reinforcement. (See Clause 2.5.1.)
2	Intrinsically conducting. The compounded material is the conducting medium. (See Clause 2.5.2.) NOTE: This kind does not preclude the use of an embedded conductor not fastened to the couplings.
3	Anti-static. The conductance of the external surface is sufficient to prevent accumulation of static charges. (See Clause 2.5.3.)
4	Insulating. (See Clause 2.5.4).

NOTES:

- For each kind, the hose may or may not embody signalling cable(s).
- Appendix A gives a recommended classification of hoses in common use for petroleum and petroleum products.

1.3.6 Designation

The designation of the hose shall be by the number of this Standard followed by the type, working pressure, grade and electrical kind (see also, Clause 1.5.1(b)).

1.4 MATERIALS AND CONSTRUCTION

1.4.1 General

The internal and external surfaces of the hose shall be uniform and concentric, and the materials of construction shall be free from defects.

NOTE: Defects referred to in this Clause cannot be completely quantified. Where the presence, size or frequency of any defect is considered to be of concern, arrangements should be made between the purchaser and the supplier. This may be achieved by acceptable type samples or methods of test.

1.4.2 Materials

1.4.2.1 Hose

The internal surface of the hose shall be fabricated of material which is resistant to petroleum and petroleum products according to grade (see Clause 1.3.4).

Any reinforcing and armouring wire shall be of corrosion-resistant material, e.g. galvanized steel.

Any earthing wire shall be resistant to corrosion and shall be constructed of non-work-hardening material.

The external surface of the hose shall be resistant to intermittent exposure to the fluids conveyed.

1.4.2.2 Couplings

Coupling used on hose assemblies shall be designed, constructed and fitted so that an assembly will comply with the minimum burst pressure and tensile force requirements set out in Section 2 without showing signs of failure or leakage.

Care shall be taken to ensure that couplings are properly fitted so as not to damage the reinforcement or other vital parts of the hose.

NOTE: For hose used for aviation purposes, swaged, 'one-time' couplings are preferred (see Appendix A).

1.4.3 Dimensions and tolerances

1.4.3.1 Internal diameter

When determined in accordance with AS 1180.1, the nominal internal diameter of hose shall conform to the appropriate value given in Table 1.1.

1.4.3.2 Length

Hose lengths shall be measured from sealing face to sealing face when supplied with couplings and from end to end when supplied without couplings.

The actual length of an assembled hose, as defined above, shall not differ from the nominal length by more than +2.5, -1.5 percent. For this purpose, the hose shall be measured before being subjected to the specified tests.

The tolerance on a cut length of hose without couplings shall be in accordance with AS 1257.

1.4.3.3 Bore

The bore shall be concentric with the outer cover. The bore shall be such that a steel ball having a diameter equal to the minimum allowable internal diameter less one-half of the minus tolerance listed in Table 1.1 can pass easily through the hose while subjected to an internal pressure of 70 kPa.

TABLE 1.1
INTERNAL DIAMETERS AND THEIR TOLERANCES

millimetres	
Internal diameter	Tolerance
12.5	±0.75
16.0	±0.75
20.0 (19)	±0.75
25.0	±1.25
31.5	±1.25
40.0 (38)	±1.50
50.0	±1.50
63.0	±1.50
80.0 (76)	±2.00
100.0	±2.00

NOTES:

- 1 The above values are in accordance with AS 1257. The values in parentheses provide a concession for existing manufacturing conditions. They also accommodate existing fittings.
- 2 Outside diameters and their tolerances are intentionally omitted from this Table to allow for new developments. However, the outside dimension may be critical for compliance with Clause 2.10, (see also Appendix A, Paragraph A3.1(b)) and hence may need to be specified.

1.4.4 Construction

Reinforcing wire and electrical conductors shall minimize straining by flexing.

With the exception of signalling cables, Kind 1 hose conductors shall be permanently fastened, directly or indirectly, to couplings so that electrical resistance per connection shall not exceed 0.1 Ω at all times. Where included, signalling cables shall be fully embedded in the hose wall.

NOTE: In some hose constructions, it is not possible to check each individual electrical connection, e.g. where wire is embedded in hose. In such instances, an increase in the overall resistance of the hose will indicate a faulty electrical connection between the embedded wiring and the flange.

1.4.5 Dynamic bend radius (For aircraft hose)

The dynamic bend radius of the hose shall be as specified in Table 1.2.

1.4.6 Cleanliness

The hose shall be thoroughly cleaned, flushed and dried before despatch.

1.4.7 Protection for despatch (For aircraft hose)

In order to protect the couplings and to prevent damage to the lining, corrosion-resistant protective end caps shall be fitted to hoses and hose assemblies at the manufacturer's works after testing is completed.

TABLE 1.2
DYNAMIC BEND RADIUS

Nominal internal diameter of hose	millimetres
	Dynamic bend radius
19.0	225
25.0	300
31.5	375
40.0 (38.0)	450
50.0	550
63.0	600
80.0 (76.0)	600
100.0	900
101.5	900

NOTES: The above values are in accordance with AS 1257. The values in parentheses provide a concession for existing manufacturing conditions. They also accommodate existing fittings.

1.5 MARKING

1.5.1 Hose

Hose, other than composite hose, shall be clearly and permanently marked at intervals of not greater than 2 m with the following information:

- (a) Manufacturer's or supplier's name or identification.
- (b) The designation (see Clause 1.3), including type, working pressure, grade and electrical kind.

Example: AS 2683/Type 1/WP 1500 kPa/Grade 1/Kind 4.

- (c) Month and year of manufacture.

1.5.2 Couplings

Couplings shall be marked with the manufacturer's or supplier's name or identification and the maximum working pressure.

1.5.3 Hose assembly

Hose assemblies shall be permanently marked with the following information:

- (a) Assembler's name or identification.
- (b) Working pressure of the assembly.

NOTE: Where the hose and coupling working pressures differ, the maximum working pressure of the assembly is the lesser value.

- (c) Date of test.

Composite hose assemblies that cannot be permanently marked shall be tagged with the information required in Clause 1.5.1.

NOTES:

- 1 These requirements also apply to field assembled hose.
- 2 Manufacturers making a statement of compliance with this Australian Standard on a product, packaging, or promotional material related to that product are advised to ensure that such compliance is capable of being verified.

SECTION 2 PERFORMANCE REQUIREMENTS

2.1 HYDROSTATIC TESTS

2.1.1 General

Hydrostatic tests shall be conducted for determining the change in length, twisting and burst pressure of the hose.

2.1.2 Change in length and twisting

When hose is tested at its rated working pressure in accordance with AS 1180.5, the change in length shall not exceed +10, -5 percent, and the amount of twisting shall not exceed 20°/m.

NOTE: A sudden pressure drop during use could present a hazardous situation due to sudden contraction of the hose.

2.1.3 Burst pressure

When tested in accordance with AS 1180.5 at ambient temperature, hose and hose assemblies shall not burst or show any other indication of failure below a pressure of 4 times the maximum working pressure (specified in Clause 1.3.3) for hose other than composite hose. For composite hose*, the burst pressure shall be 6 times the maximum working pressure.

2.1.4 Proof pressure

When tested in accordance with AS 1180.5, hose and hose assemblies shall show no signs of leakage or any other indication of failure at a pressure of 2 times the maximum working pressure (see Clause 1.3.3).

2.2 RESISTANCE TO VACUUM (Type 1 only)

When tested in accordance with AS 1180.7J, modified by waiving the use of the ball for the assessment of bore, each product length of Type 1 hose shall not show any signs of collapse or failure and the lining shall not show any sagging or imperfection.

2.3 RESISTANCE OF LINING TO LIQUIDS

2.3.1 Non-composite hose

When tested in accordance with AS 1180.7A for hose other than composite hose, for 7 days, but at 40°C, in a liquid comprising toluene (1-degree nitration grade) and 2,2,4 trimethyl-pentane (*iso*-octane), the lining shall not suffer percentage increase in volume in excess of—

- (a) sixty percent for Grade 1 lining when using 30 parts by volume of toluene and 70 parts by volume of *iso*-octane;
- (b) sixty percent for Grade 2 lining when using 50 parts by volume of toluene and 50 parts by volume of *iso*-octane; and
- (c) ten percent for Grade 3 lining using 50 parts by volume of toluene and 50 parts by volume of *iso*-octane.

In addition, when tested in accordance with AS 1180.7A, there should be no shrinkage in volume of the lining of the hose.

* Hose incorporating thermoplastic film layers, fabric and wire reinforcing.