

Australian Standard[®]

Hydraulic hose

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The following interests are represented on Committee RU/1:

Australian Gas Association
Australian Institute of Petroleum
Confederation of Australian Industry
Department of Administrative Services, N.S.W.
Department of Minerals and Energy, N.S.W.
Plastics and Rubber Institute
Plastics Industry Association
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Australian Standard[®]

Hydraulic hose

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PREFACE

This Standard was prepared by the Standards Australia Committee on Industrial Hose under the direction of Committee RU/—Standards for the Rubber Industry, to supersede AS B226—1972, *Hydraulic hose*.

This edition is based on the Society of Automotive Engineers (SAE) Standard J517—Jun 1987, *Hydraulic hose* and includes seven new classes of hose which did not appear in the previous edition. Suitable test procedures from SAE J343—Jun 1987, *Tests and procedures for SAE 100R series hydraulic hose and hose assemblies* have been incorporated.

Values are indicated in both imperial and SI units. This reflects the status of mandrel sizes and fittings currently in use in industry.

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STANDARDS AUSTRALIA

Australian Standard

Hydraulic hose

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard specifies 14 classes for hydraulic hose having burst pressures up to 345 MPa and operating temperatures from -55°C to +205°C when used under normal operating conditions.

The Standard covers hose manufactured from elastomeric materials, reinforced with braided or spirally wound steel wire, or with braided textile or a combination of these materials.

The Standard sets out dimensional and performance requirements, together with the methods for testing the performance requirements stated.

The Standard does not cover requirements for hydraulic hose for use in underground mines.

NOTE: Operating temperatures and pressures in excess of that specified for the appropriate class may materially reduce the life of the hose.

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
- 1180.5A Method 5A:Hydrostatic pressure—Burst test
- 1180.5B Method 5B:Hydrostatic pressure—Proof test
- 1180.5C Method 5C:Hydrostatic pressure—Change-in-length test
- 1180.5D Method 5D:Hydrostatic pressure—Leakage test
- 1180.6 Method 6:Impulse test
- 1180.7E Method 7E:Resistance to oil
- 1180.7F Method 7F:Resistance of lining and cover to ozone
- 1180.7J Method 7J:Resistance to vacuum
- 1180.8A Method 8A:Resistance to cold flexing of hose assembly

SAE

- J343 Tests and procedures for SAE 100R series hydraulic hose and hose assemblies

1.3 CLASSIFICATION For the purpose of this Standard, hydraulic hose is classified in 14 classes according to its type of construction, as set out in Table 1.1.

1.4 VISUAL EXAMINATION All bulk hose shall be visually examined for defects and to ascertain that the hose identification has been properly applied. All assemblies shall also be inspected to ascertain that the correct fittings are properly installed.

1.5 CONSIDERATIONS RELATING TO HOSE USAGE

1.5.1 Flexibility Hydraulic hose is designed to be flexible only in bending to the specified minimum bend radius. The purpose of the stripe is to indicate if the hose has been twisted. Hose showing twist should be replaced.

1.5.2 Fittings Fittings for hose may not be interchangeable, and it is recommended that fittings and hose be properly matched, and that fitting and hose manufacturers' recommendations be followed.

1.6 MARKING Except for hose with a wire braided exterior, hose shall be legibly marked along the entire length parallel to the axis with a stripe or stripes. For hose with a wire-braided exterior, the information shall be inscribed on a tag or sleeve securely fixed to each hose assembly. The following information, repeated not more than every 610 mm shall be shown:

- (i) The manufacturer's or supplier's name or registered trade mark.
- (ii) The class of hose, the type of hose (see Section 2) and dash number.
- (iii) The month and year of manufacture.

Example

The following shows a marking scheme in the sequence required:

Bloggs Flexopipe,
100R1,TYPE A,
-8, Feb. 1990

NOTE: Manufacturers making a statement of compliance with this Australian Standard on a product, or on packaging or promotional material related to that product, are advised to ensure that such compliance is capable of being verified. Independent certification is available from Standards Australia under the StandardsMark Product Certification Scheme. The StandardsMark, shown below, is a registered certification trade mark owned by Standards Australia and granted under licence to manufacturers whose products comply with the requirements of suitable Australian Standards and who operated sound quality assurance programs to ensure consistent product quality.

Further information on product certification and the suitability of this Standard for certification is available from Standards Australia's Quality Assurance Services, 1 The Crescent, Homebush, NSW 2140.



TABLE 1.1
CLASSES OF HYDRAULIC HOSE ACCORDING TO TYPE OF CONSTRUCTION AND APPLICATION

Class	Type of construction	Application
100R1	Steel wire-reinforced, rubber-covered hydraulic hose: Type A—thick outer cover. Type AT—thin outer cover.	For use with petroleum and water-based hydraulic fluids within a temperature range of -40°C to +93°C.
100R2	High pressure, steel wire-reinforced, rubber-covered hydraulic hose: Type A—two braided wire reinforcement. Type B—a combination of two spiral wire plies and one braid of wire reinforcement. Type AT—similar to Type A, except for a thin outer cover. Type BT—similar to Type B, except for a thin outer cover.	For use with petroleum and water-based hydraulic fluids within a temperature range of -40°C to +93°C.
100R3	Double (non-metallic) fibre braid reinforced, rubber-covered hydraulic hose	For use with petroleum and water-based hydraulic fluids within a temperature range of -40°C to +93°C.
100R4	Wire-inserted hydraulic suction hose	For use in low-pressure and vacuum applications with petroleum and water-based hydraulic fluids within a temperature range of -40°C to +93°C.
100R5	Single wire braid reinforced textile-covered hydraulic hose	For use with petroleum and water-based hydraulic fluids within a temperature range of -40°C to +93°C.
100R6	Single (non-metallic), fibre braid reinforced, rubber-covered hydraulic hose	For use with petroleum and water-based hydraulic fluids within a temperature range of -40°C to +93°C.
100R7	Thermoplastic, synthetic fibre-reinforced, hydraulic hose	For use with petroleum, water-based and synthetic hydraulic fluids within a temperature range of -40°C to +93°C.
100R8	High pressure, thermoplastic hydraulic hose	For use with petroleum, water-based and synthetic hydraulic fluids within a temperature range of -40°C to +93°C.
100R9	High pressure, four-spiral steel wire-reinforced, rubber-covered hydraulic hose	For use with petroleum and water-based hydraulic fluids within a temperature range of -40°C to +93°C.
100R10	Heavy duty, four-spiral steel wire-reinforced, rubber-covered hydraulic hose	For use with petroleum and water-based hydraulic fluids within a temperature range of -40°C to +93°C.
100R11	Heavy duty, six-spiral steel wire-reinforced, rubber-covered hydraulic hose	For use with petroleum and water-based hydraulic fluids within a temperature range of -40°C to +93°C.
100R12	Heavy duty, high-impulse, four-spiral wire-reinforced, rubber-covered hydraulic hose	For use with petroleum and water-based fluids within a temperature range of -40°C to +121°C.
100R13	Heavy duty, high-impulse, multiple spiral wire-reinforced, rubber-covered hydraulic hose	For use with petroleum and water-based hydraulic fluids within a temperature range of -40°C to +121°C.
100R14	Polytetrafluoroethylene (PTFE)-lined hydraulic hose: Type A—inner tube of PTFE reinforced with a single braid of stainless steel. Type B—similar to Type A, except for an electrically conductive inner surface.	For use with petroleum, water-based and synthetic hydraulic fluids within a temperature range of -55°C to +205°C.

NOTES:

- Operating temperatures in excess of +93°C in the case of Classed 100R1 to 100R11, and in excess of +121°C in the case of Class 100R12, may materially reduce the life of the hose.
- Particular classes of hose should be used for applications in the accordance with their designed use.

SECTION 2 CONSTRUCTION, DIMENSIONS, PROPERTIES AND TEST REQUIREMENTS

2.1 STEEL WIRE-REINFORCED, RUBBER-COVERED HYDRAULIC HOSE (100R1)

2.1.1 Concentricity The inside diameter of the hose, the outside diameter of the hose and the reinforcement diameter shall be concentric within the tolerances given in Table 2.1.

TABLE 2.1
CONCENTRICITY TOLERANCES
millimetres

Nominal internal diameter of bore	ID to OD	ID to reinforcement
≤ 6.3	0.8	0.4
> 6.3 ≤ 22.2	1.0	0.6
> 22.2	1.3	0.8

2.1.2 Hose construction

2.1.2.1 Type A hose Type A hose shall consist of an inner tube of oil-resistant synthetic rubber, a single wire braid reinforcement, and an oil- and weather-resistant synthetic rubber cover. A ply or braid of suitable material may be used over the inner tube or over the wire reinforcement, or both, to anchor the synthetic rubber to the wire.

2.1.2.2 Type AT hose Type AT hose shall be of the same construction as Type A hose, except that it has a cover designed to assemble with fittings which do not require removal of the cover or a portion thereof.

2.1.3 Maximum operating pressure The maximum operating pressure of the hose shall be as given in Table 2.2 for the size of hose, as appropriate.

2.1.4 Minimum bend radius The minimum bend radius of the hose shall be as given in Table 2.2 for the size of hose, as appropriate.

2.1.5 Test requirements

2.1.5.1 Dimensions When tested in accordance with AS 1180.1, the hose shall conform to the appropriate dimensions for internal diameter, reinforcement diameter and outside diameter, and the applicable tolerances, specified in Table 2.2.

2.1.5.2 Proof pressure When tested in accordance with AS 1180.5B, the hose shall not leak at the proof pressure specified in Table 2.2 for the size of hose, as appropriate.

2.1.5.3 Change in length When tested in accordance with AS 1180.5C, the change in length of the hose specimen shall not exceed the range +2% to -4% when pressurized to the maximum operating pressure specified in Table 2.2 for the size of hose, as appropriate.

2.1.5.4 Burst pressure When a 460 mm test assembly is tested in accordance with AS 1180.5A, the assembly shall not leak or fail below the minimum burst pressure specified in Table 2.2 for the size of hose, as appropriate.

2.1.5.5 Leakage When a 460 mm test assembly is tested in accordance with AS 1180.5D, the assembly shall not leak or fail at a pressure of 70% of the minimum burst pressure specified in Table 2.2 for the size of hose, as appropriate.

2.1.5.6 Cold bend When tested in accordance with AS 1180.8A, the test assembly shall not exhibit any cover cracks or leakage after exposure at $-40 \pm 1^\circ\text{C}$ for 24 ± 1 h.

2.1.5.7 Oil resistance When tested in accordance with AS 1180.7E, the volume change of the inner tube and cover of the hose specimen shall be between 0% and +100% after immersion in ASTM No.3 oil at $100 \pm 2^\circ\text{C}$ for 70 ± 2 h.

2.1.5.8 Ozone resistance When tested in accordance with AS 1180.7F, the hose cover shall not show evidence of cracking or deterioration when viewed under $7 \times$ magnification, while still in a stressed condition, after exposure in an atmosphere comprising 50 parts ozone per 100 million parts by volume of air at an ambient temperature of $38 \pm 1^\circ\text{C}$ for 70 ± 2 h.

2.1.5.9 Impulse test When the unaged assembly is tested in accordance with AS 1180.6, at 125% of maximum operating pressure for hose having a nominal internal diameter equal to or less than 25.4 mm, and 100% of maximum operating pressure for hose having a nominal internal diameter equal to or greater than 31.5 mm, with petroleum base as the test fluid at $93 \pm 5^\circ\text{C}$, it shall withstand a minimum of 150 000 cycles without leakage or other malfunction.

2.1.5.10 Cover thickness When tested in accordance with AS 1180.1, the cover thickness shall conform to the appropriate dimensions and applicable tolerances specified in Table 2.2.

TABLE 2.2
DIMENSIONS AND PERFORMANCE REQUIREMENTS FOR 100R1 HOSE

Nominal internal diameter of hose		Hose dash number (See Note 1)	Hose ID						Reinforcement diameter				Hose OD			
			Actual		Tolerance								Type A			
					Plus		Minus		Max.		Min.		Max.		Min.	
in	mm	—	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
3/16	4.8	3	0.188	4.8	0.023	0.6	0.008	0.2	0.398	10.1	0.352	8.9	0.531	13.5	0.469	11.9
1/4	6.3	4	0.250	6.4	0.023	0.6	0.008	0.2	0.461	11.7	0.416	10.6	0.656	16.7	0.594	15.1
5/16	7.9	5	0.312	7.9	0.023	0.6	0.008	0.2	0.523	13.3	0.477	12.1	0.719	18.3	0.656	16.7
3/8	9.5	6	0.375	9.5	0.023	0.6	0.008	0.2	0.617	15.7	0.571	14.5	0.812	20.6	0.750	19.0
13/32	10.3	6.5	0.406	10.3	0.031	0.8	0.015	0.4	0.648	16.4	0.602	15.3	0.844	21.4	0.781	19.8
1/2	12.5	8	0.500	12.7	0.031	0.8	0.015	0.4	0.750	19.0	0.688	17.5	0.938	23.8	0.875	22.2
5/8	15.9	10	0.625	15.9	0.031	0.8	0.015	0.4	0.875	22.2	0.812	20.6	1.062	27.0	1.000	25.4
3/4	19.1	12	0.750	19.0	0.031	0.8	0.015	0.4	1.031	26.2	0.969	24.6	1.219	31.0	1.156	29.4
7/8	22.2	14	0.875	22.2	0.031	0.8	0.015	0.4	1.156	29.4	1.094	27.8	1.344	34.1	1.281	32.5
1	25.4	16	1.000	25.4	0.040	1.0	0.015	0.4	1.344	34.1	1.281	32.5	1.547	39.3	1.453	36.9
1-1/4	31.5	20	1.250	31.8	0.047	1.2	0.015	0.4	1.641	41.7	1.547	39.3	1.875	47.6	1.750	44.4
1-1/2	38.1	24	1.500	38.1	0.047	1.2	0.015	0.4	1.891	48.0	1.797	45.6	2.125	54.0	2.000	50.8
2	50.8	32	2.000	50.8	0.047	1.2	0.015	0.4	2.438	61.9	2.312	58.7	2.688	68.3	2.562	65.1

Nominal internal diameter of hose		Hose OD		Cover thickness				Minimum burst pressure		Proof pressure		Maximum operating pressure		Minimum bend radius (See Note 2)	
		Type AT		Type AT											
		Max.		Max.		Min.									
in	mm	in	mm	in	mm	in	mm	psi	MPa	psi	MPa	psi	MPa	in	mm
3/16	4.8	0.494	12.5	0.060	1.52	0.030	0.76	12 000	82.7	6 000	41.4	3 000	20.7	3.50	89
1/4	6.3	0.557	14.1	0.060	1.52	0.030	0.76	11 000	75.8	5 500	37.9	2 750	19.0	4.00	102
5/16	7.9	0.619	15.7	0.060	1.52	0.030	0.76	10 000	68.9	5 000	34.5	2 500	17.2	4.50	114
3/8	9.5	0.713	18.1	0.060	1.52	0.030	0.76	9 000	62.0	4 500	31.0	2 250	15.5	5.00	127
13/32	10.3	0.744	18.9	0.060	1.52	0.030	0.76	9 000	62.0	4 500	31.0	2 250	15.5	5.50	140
1/2	12.5	0.846	21.5	0.060	1.52	0.030	0.76	8 000	55.2	4 000	27.6	2 000	13.8	7.00	178
5/8	15.9	0.971	24.7	0.060	1.52	0.030	0.76	6 000	41.4	3 000	20.7	1 500	10.3	8.00	203
3/4	19.1	1.127	28.6	0.060	1.52	0.030	0.76	5 000	34.5	2 500	17.2	1 250	8.6	9.50	241
7/8	22.2	1.252	31.8	0.060	1.52	0.030	0.76	4 500	31.0	2 250	15.5	1 125	7.8	11.00	279
1	25.4	1.440	36.6	0.060	1.52	0.030	0.76	4 000	27.6	2 000	13.8	1 000	6.9	12.00	305
1-1/4	31.5	1.766	44.8	0.080	2.03	0.040	1.02	2 500	17.2	1 250	8.6	625	4.3	16.50	419
1-1/2	38.1	2.047	52.0	0.100	2.54	0.050	1.27	2 000	13.8	1 000	6.9	500	3.4	20.00	508
2	50.8	2.594	65.9	0.100	2.54	0.050	1.27	1 500	10.3	750	5.2	375	2.6	25.00	635

NOTES:

1. An industry convention, the dash number is a hose designation that represents the nominal internal diameter of the hose in increments of sixteenths of an inch.
2. Bend radius measured at inside of bend.

2.2 HIGH PRESSURE, STEEL WIRE-REINFORCED, RUBBER-COVERED HYDRAULIC HOSE (100R2)

2.2.1 Concentricity The inside diameter of the hose, the outside diameter of the hose and the reinforcement diameter shall be concentric within the tolerances given in Table 2.3.

TABLE 2.3
CONCENTRICITY TOLERANCES

Nominal internal diameter of hose	millimetres	
	ID to OD	ID to reinforcement
≤ 6.3	0.8	0.5
> 6.3 ≤ 22.2	1.0	0.7
> 22.2	1.3	0.9

2.2.2 Hose construction

2.2.2.1 General The hose shall consist of an inner tube of oil-resistant synthetic rubber, steel wire reinforcement according to hose type as detailed below, and an oil- and weather-resistant synthetic rubber cover. A ply or braid of suitable material may be used over the inner tube or over the wire reinforcement, or both, to anchor the synthetic rubber to the wire.

2.2.2.2 Type A hose Type A hose shall have two braids of wire reinforcement.

2.2.2.3 Type B hose Type B hose shall have two spiral plies and one braid of wire reinforcement.