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Superseding J517 FEB2003

Hydraulic Hose

- 1. Scope**—This SAE Standard provides general, dimensional and performance specifications for the most common hoses used in hydraulic systems on mobile and stationary equipment.

The general specifications contained in Sections 1 through 12 are applicable to all hydraulic hoses and supplement the detailed specifications for the 100R-series hoses contained in the later sections of this document. (See Tables 1A and 1B).

This document shall be utilized as a procurement document only to the extent as agreed upon by the manufacturer and user.

The maximum working pressure of a hose assembly comprising SAE J517 hose and hose connectors per SAE J516, J518, J1453, etc., shall not exceed the lower of the respective SAE maximum working pressure values.

When using SAE J517 hose for marine applications, see SAE J1475, J1942 and J1942-1.

The SAE J517 100R9, 100R10 and 100R11 hoses will be discontinued beginning with the year 2005, due to lack of demand.

The SAE J517 100R1A, 100R2A, 100R2B and 100R2BT will be discontinued beginning with the year 2005 due to lack of demand. For DOD orders after 2004, use 100R1AT and 100R2AT to replace 100R1A and 100R2A.

The SAE J517 100R2AT maximum working pressures will be replaced by the type S maximum working pressures beginning with the year 2006, eliminating the need to label 100R2 as type S.

The SAE J517 100R16 maximum working pressures will be replaced by the type S maximum working pressures with the year 2008, eliminating the need to label 100R16 as type S.

2. References

- 2.1 Applicable Publications**—The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of the publications shall apply.

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

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2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J343—Test and Test Procedures for SAE 100R Series Hydraulic Hose and Hose Assemblies
SAE J516—Hydraulic Hose Fittings
SAE J518—Hydraulic Flanged Tube, Pipe and Hose Connections, Four-Bolt Split Flange Type
SAE J846—Coding Systems for Identification of Fluid Conductors and Connectors
SAE J1273—Recommended Practices for Hydraulic Hose Assemblies
SAE J1401—Road Vehicle—Hydraulic Brake Hose Assemblies for Use with Nonpetroleum-Base Hydraulic Fluids (Appendix A, Table A1, Hose Manufacturers Identification Code—Colored Yarn Assignments)
SAE J1453—Fitting—O-Ring Face Seal
SAE J1475—Hydraulic Hose Fittings for Marine Applications
SAE J1942—Hose and Hose Assemblies for Marine Applications
SAE J1942-1—Qualified Hoses for Marine Applications

2.1.2 ASTM PUBLICATIONS—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 380—Standard Test Methods for Rubber Hose
ASTM D 471—Standard Test Method for Rubber Property-Effects on Liquids
ASTM D 792—Test Method for Specific Gravity (Relative Density) and Density of Plastics by Displacement

2.1.3 FEDERAL STANDARD—Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

Federal Standard 595—Colors Used in Government Procurement

2.1.4 MILITARY PUBLICATIONS—Available from Naval Publications and Forms Center, 700 Robbins Avenue, Philadelphia, PA 19111.

MIL-PRF-83282—Hydraulic Fluid, Fire Resistant Synthetic Hydrocarbon Base, NATO Code Number H-537
MIL-H-8446—Hydraulic Fluid, Nonpetroleum Base, Aircraft
MIL-PRF-7808—Lubricating Oil, Aircraft Turbine Engine, Synthetic Base

2.1.5 ISO PUBLICATIONS—Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002.

ISO 4397—Fluid power systems and components—Connectors and associated components—Nominal outside diameters of tubes and nominal inside diameters of hoses

2.2 Related Publications—The following documents contain provisions which, through reference in this text, constitute provisions of this document. All standards are subject to revision, and parties to agreements based on this document are encouraged to investigate the possibility of applying the most recent edition of the document indicated as follows. Members of IEC and ISO maintain registers of currently valid International Standards.

2.2.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1176—External Leakage Classifications for Hydraulic Systems
SAE J1927—Cumulative Damage Analysis for Hydraulic Hose Assemblies

2.2.2 ISO PUBLICATIONS—Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002.

ISO 1402—Rubber and plastics hoses and hose assemblies—Hydrostatic testing
ISO 1436-1—Rubber hoses and hose assemblies—Wire reinforced hydraulic type—Specification
ISO 1817—Rubber vulcanized—Determination of the effect of liquids
ISO 3862-1—Rubber hoses and hose assemblies—Rubber-covered, spiral wire reinforced, hydraulic type—Specification
ISO 3949—Plastics hoses and hose assemblies—Thermoplastics, textile-reinforced, hydraulic type—Specification
ISO 4079—Rubber hoses and hose assemblies—Textile-reinforced hydraulic type—Specification
ISO 4671—Rubber and plastic hoses and hose assemblies—Methods of measurement of dimensions
ISO 6803—Rubber or plastic hoses and hose assemblies—Hydraulic pressure impulse test without flexing
ISO 6945—Rubber hoses—Determination of abrasion resistance of the outer cover
ISO 11237-1—Rubber hoses and hose assemblies—Rubber covered, wire braid compact design, hydraulic type specification

3. **Age Control**—Age control of rubber hose is a method for designating a period of time, following manufacture, during which it is reasonable to expect that this product retains full capabilities for rendering the intended service, provided it has been stored as prescribed in SAE J1273.

Hose and hose assemblies are affected by exposure to ozone, oxygen, heat, sunlight, rain, and other similar environmental factors. Storage of bulk hose and hose assemblies should be in such a manner that exposure to these environmental factors is controlled as much as possible. (See SAE J1273 for selection, installation and maintenance of hose and hose assemblies).

Hose and hose assemblies should be stored, handled, shipped and used in such a manner as to facilitate first-in first-out usages based on manufacturing date on hose or hose assembly.

Hose, in bulk form or in hose assemblies passing visual inspection and proof test, shall be acceptable for use up to and including 40 quarters (10 years) from the date of manufacture. Shelf life of thermoplastic and polytetrafluoroethylene hose is considered to be unlimited.

TABLE 1A—SUMMARY OF SAE J517 100R-SERIES HOSE MAXIMUM WORKING PRESSURES (MPa)⁽¹⁾
Metric Size⁽²⁾ (SAE Dash Size)

Hose Type	5 (-3)	6.3 (-4)	8 (-5)	10 (-6)	12.5 (-8)	16 (-10)	19 (-12)	25 (16)	31.5 (-20)	38 (-24)	51 (-32)	63 (-40)	78 (-48)	89 (-56)	102 (-64)
100R1	21	19.2	17.5	15.7	14	10.5	8.7	7	4.3	3.5	2.6				
100R1S ⁽³⁾	25	22.5	21.5	18	16	13	10.5	8.8	6.3	5	4				
100R2	35	35	29.7	28	24.5	19.2	15.7	14	11.3	8.7	7.8	7			
100R2S ⁽³⁾	41.5	40	35	33	27.5	25	21.5	16.5	12.5	9	8	7			
100R3	10.5	8.7	8.4	7.8	7	6.1	5.2	3.9	2.6						
100R4							2.1	1.7	1.4	1.05	0.7	0.4	0.4	0.3	0.25
100R6	3.5	2.8	2.8	2.8	2.8	2.4	2.1								
100R7	21	19.2	17.5	15.7	14	10.5	8.7	7							
100R8	35	35		28	24.5	19.2	15.7	14							
100R9				31.5	28		21	21	17.5	14	14				
100R10	70	61		52.5	43.5		35	28	21	17.5	17.5				
100R11	87	78		70	52.5		43.5	35	24.5	21	21	17.5			
100R12				28	28	28	28	28	21	17.5	17.5				
100R13							35	35	35	35	35				
100R15				42	42		42	42	42	42					
100R16		35	29.7	28	24.5	19.2	15.7	14	11.3						
100R16S ⁽⁴⁾	41.5	40	35	33	27.5	25	21.5	16.5	12.5						
100R17		21	21	21	21	21	21	21							
100R18	21	21	21	21	21	21	21	21							

NOTE—Minimum burst pressure of 100R hoses is at least 4 times maximum working pressure.

1. See Appendix A for conversion table from MPa to psi.
2. Metric Size is in mm (Ref. ISO 4397).
3. Type S pressures match ISO 1436 for types 1SN, 2SN.
4. Type S pressures match ISO 11237 for type 2SC.

TABLE 1B—SUMMARY OF SAE J517 100R-SERIES HOSE MAXIMUM WORKING PRESSURES (MPa)⁽¹⁾
Metric Size⁽²⁾ (SAE Dash Size)

Hose Type	3.2 (-3)	5 (-4)	6.3 (-5)	8 (-6)	10 (-7)	11 (-8)	12.5 (-10)	16 (-12)	19 (-14)	22 (-16)	25 (-18)	29 (-20)	35 (-24)	46 (-32)	60 (-40)	76 (-48)
100R5		21	21	15.7		14	12.2	10.5		5.6		4.3	3.5	2.4	2.4	1.4
100R14	10.5	10.5	10.5	10.5	10.5	7	5.6	5.6	5.6	5.6	5.6	4.2				

NOTE—Minimum burst pressure of 100R hoses is at least 4 times maximum working pressure.

1. See Appendix A for conversion table from MPa to psi.
2. Metric Size is in mm (Ref. ISO 4397).

4. **Hose Connectors**—Hydraulic hose is rarely used without connectors. Hose with connectors attached are commonly referred to as hose assemblies. The general and dimensional standards for hydraulic hose connectors are contained in SAE J516. SAE J516 connectors are identified by a code system as specified in SAE J846. The hose code, in accordance with SAE J846, for use with their respective connectors is shown in Appendix B.

SAE J1475 covers general and performance specifications for hydraulic hose connectors when used in marine applications.

5. **Hose Assemblies**—Hose assemblies may be fabricated by the manufacturer, an agent for or customer of the manufacturer, or by the user. Fabrication of permanently attached connectors to hydraulic hose requires specialized assembly equipment. Field attachable connectors (screw style and segment clamp style) can usually be assembled without specialized equipment although many manufacturers provide equipment to assist in this operation.

SAE J517 hose from one manufacturer is usually not compatible with SAE J516 connectors supplied by another manufacturer. It is the responsibility of the fabricator to consult the manufacturer's written assembly instructions or the manufacturers directly before intermixing hose and connectors from two manufacturers. Similarly, assembly equipment from one manufacturer is usually not interchangeable with that of another manufacturer. It is the responsibility of the fabricator to consult the manufacturer's written instructions or the manufacturer directly for proper assembly equipment. Always follow the manufacturer's instructions for proper preparation and fabrication of hose assemblies.

6. **Application Factors**—Hydraulic hose assemblies have a finite life and factors which will reduce life include:
- a. Flexing the hose to less than the specified minimum bend radius
 - b. Twisting, pulling, kinking, crushing, or abrading the hose
 - c. Operating above maximum and below minimum temperature
 - d. Exposing the hose to surge pressures above the maximum working pressure
 - e. Intermixing hose, connectors, or assembly equipment not recommended by the manufacturer or not following the manufacturer's instructions for fabricating hose assemblies

Surge pressures, noted in item d, are rapid and transient rises in pressure. Surge pressures will not be indicated on many common pressure gauges and can best be identified on electronic measuring instruments with a high-frequency response.

Refer to SAE J1273 for additional information on application factors.

The test requirements for each 100R-series hose is detailed in this document. Specific procedures for conducting each test are contained in SAE J343. The specified tests provide a baseline for performance capability of a hose assembly under controlled laboratory conditions. It is recognized that hydraulic systems will seldom duplicate these test parameters precisely. The hydraulic designer must consider the system demands on the hose assembly and correlate those demands with the specified requirements, with particular concern for the frequency and amplitude of pressure fluctuations. Rapid pressure cycling with a return to zero accelerates fatigue failures.

7. **Size Designations**—Hose sizes are normally designated by the nominal hose inside diameter expressed in millimeters (mm) or by the SAE dash size which, except for SAE 100R5 and 100R14, represents the number of sixteenth inch increments in the hose inside diameter. For these exceptions, the SAE dash size represents the number of sixteenth inch increments in the outside diameter of tubing having approximately the same inside diameter as that of the hose. See dimensional tables for the respective hoses.

8. **Hose Identification**—Except for hose with a wire braided exterior, the entire length of hose shall be legibly marked with one or more stripes parallel to the longitudinal axis. Marking shall include, but is not limited to, the SAE hose specification number, including type designation where applicable, the hose dash size number, the fractional (in) nominal hose inside diameter, the maximum working pressure of the hose and the date of manufacture, repeated with the first letter of each repeat not more than 760 mm from the first letter of that preceding.

No mention of the burst pressure or the design factor is allowed on the hose. This information could be misinterpreted and result in a hose being used above its maximum working pressure.

Working pressures may be shown on a hose in numerous ways and is not limited to the following examples:

EXAMPLES: XXXX MAX. W.P.
XXXX Maximum W.P.
XXXX Max. Working Pressure

Electrically nonconductive 100R7, 100R8 and 100R18 thermoplastic hoses shall have an orange-colored cover. (Reference color, chip #22510, Federal Standard 595). Also, in addition to the information required previously, the word nonconductive or electrically nonconductive shall appear in each marking repeat.

The date of manufacture may be expressed as month, day, and year (2/19/88), month and year (2/88), or quarter and year (1Q88) at the option of the manufacturer.

Date of manufacture is optional with the manufacturer on SAE 100R7, 100R8 and 100R18.

SAE J517 hoses are referenced by listing, in sequence, the 100R number (100R1, 100R7, etc.), the hose type letters (A, AT, B, or BT) where applicable, and the hose dash size number (–4, –16, –24, etc.).

EXAMPLES: 100R2AT-8 12.5 mm ID, 2 Wire, Type AT
100R2S-8 12.5 mm I.D., 2 Wire, Type S thin cover, ISO working pressure
100R4-32 51 mm ID, Suction Hose
100R14B-16 22 mm ID, Electrically Conductive PTFE Hose

For hose with a wire braided exterior, information shall be incorporated on a tag or tape applied to each coil or length of bulk hose. Additionally, except for 100R14, a colored yarn shall be incorporated into the wall of the hose, identifying the manufacturer. The color shall be as designated by the Rubber Manufacturers Association. (See SAE J1401, Appendix A, Table A1).

9. **Orientation of Offset Elbow Ends in a Hose Assembly**—For double elbow assemblies, it is imperative that the method of description and measurement provide the desired displacement rather than its mirror image. To achieve this, either end may be selected as the reference point, provided angle displacement is determined appropriately (clockwise or counterclockwise) for the reference selected.

As shown in Figure 1, with the centerline of the near end as a base reference, angular displacement is measured counterclockwise to the centerline of the far end.

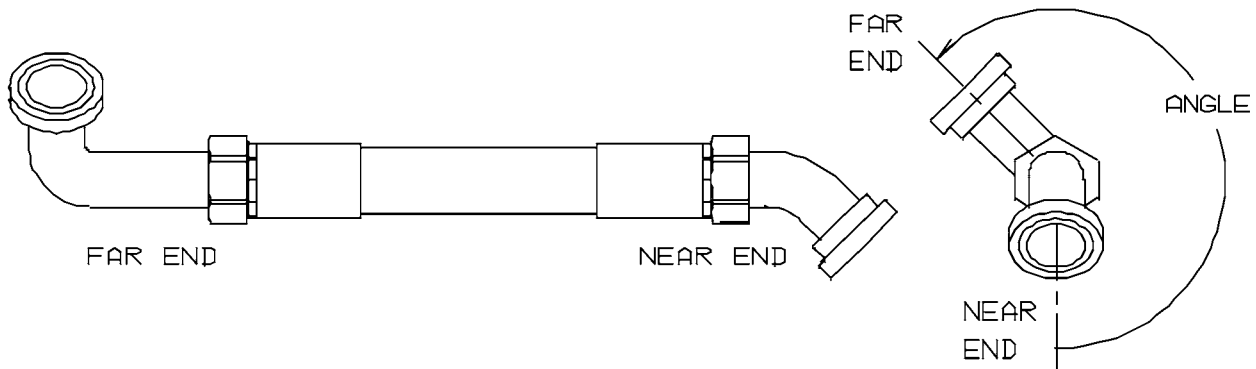


FIGURE 1—NEAR END REFERENCE—MEASURED COUNTER-CLOCKWISE

As shown in Figure 2, with the centerline of the far end as a base reference, angular displacement is measured clockwise to the centerline of the near end.

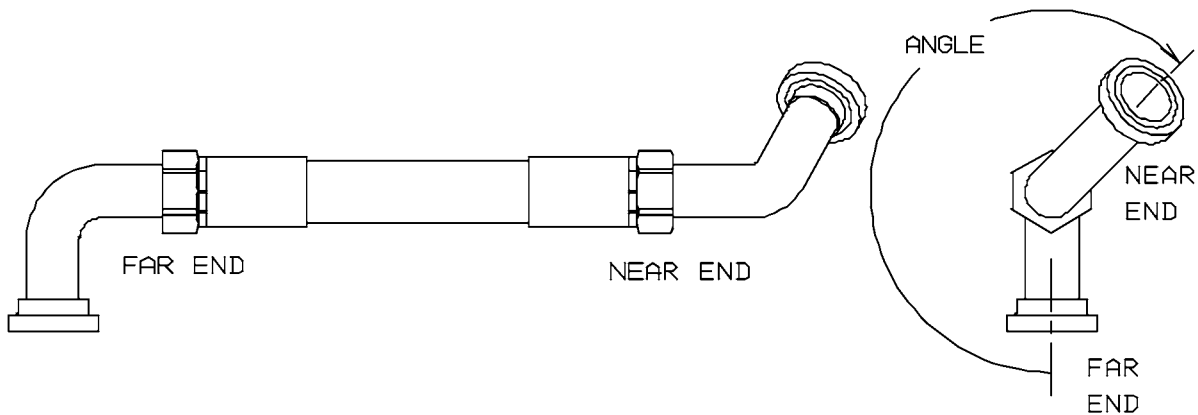


FIGURE 2—FAR END REFERENCE—MEASURED CLOCKWISE

Displacement angle may have any value up to 360 degrees. Please note that making the angle determination in the wrong direction will result in an unacceptable part.

Unless otherwise specified, a tolerance of ± 3 degrees is acceptable for assembly lengths up to 610 mm inclusive, and ± 5 degrees for assembly lengths over 610 mm.

Try to avoid use of double elbow hose assemblies. Twisting of the hose during installation may occur. The relative location of the natural curvature in the hose may induce a twist during pressure cycling. Twisted hose may reduce the life of the hose assembly.

10. **Assembly Length**—Unless otherwise specified, assembly length shall be the overall length measured from the extreme end of one connector to the extreme end of the other, except for O-ring face seal type connectors which shall be measured from the sealing face. Where elbow connectors are used, measurement shall be to the centerline of the sealing surface of the elbow end (The sealing surface of female flared elbow connectors shall be the centerline of the outer end of the cone seat). See Figure 3.

Method of measurement should be specified. Tolerances on assembly length shall be as in Table 2.

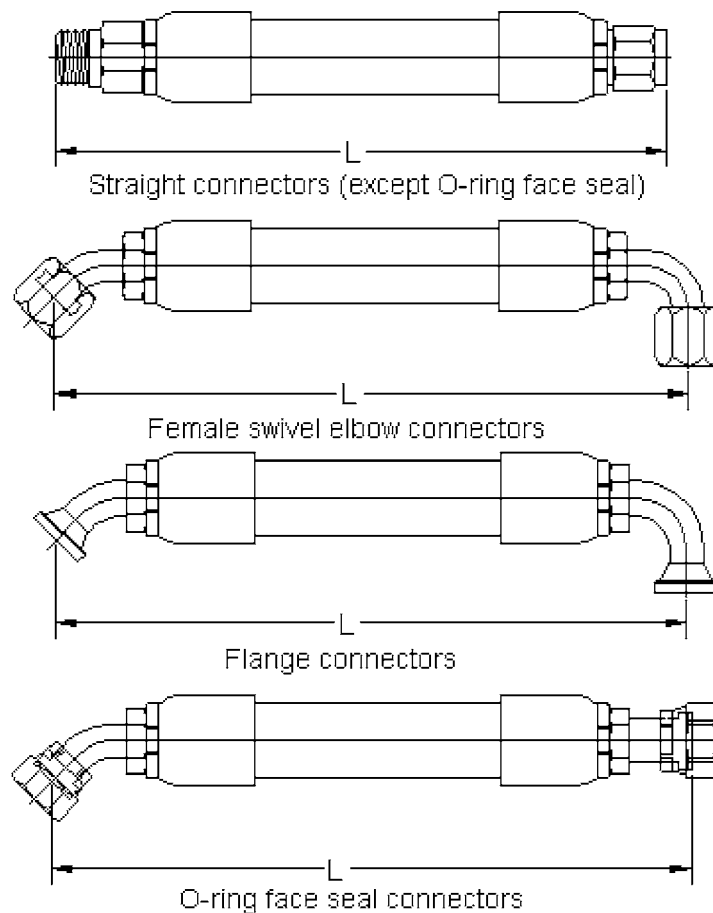


FIGURE 3—ASSEMBLY LENGTH MEASUREMENT

TABLE 2—TOLERANCES ON ASSEMBLY LENGTH

Length	Tolerance (Plus or Minus) mm
Up to 300 mm, included	3
Over 300 mm through 450 mm, included	5
Over 450 mm through 900 mm, included	7
Over 900 mm	1% ⁽¹⁾

1. Measured to nearest whole millimeter.

11. Tests—Unless otherwise agreed upon between the manufacturer and purchaser, tests for evaluating conformance of product with specifications shall be on the basis of Qualification Tests and Inspection Tests set forth in this document. Tests may be conducted by the manufacturer, the purchaser, or both, as decreed by the purchaser. The tests, sampling, and criteria applicable to both test classifications are given in Table 3 and the detailed specifications and tables for each hose. All tests shall be conducted in accordance with the procedures in SAE J343.

11.1 Qualification Tests—The following are tests required for qualification of various 100R-series hoses specified in SAE J517. Some of these tests do not apply to certain 100R-series hose types. See Table 3 to determine which of these qualification tests are specified for each 100R-series hose type. Table 3 also provides specific requirements for each hose type where temperatures, percent length change and impulse requirements vary by hose type. Some hose types like 100R1, R5, R9 and R14 have added special impulse requirements which are specified in J517 immediately after the hose construction for these hose types. For such hose types, Table 3 states “See 100R1” or “See 100R5”, etc., for impulse requirements. Some other hose types like 100R7, R8, R14 and R18 have specialized conductivity tests and Table 3 again states “See 100R7” or “See 100R8”, etc. for the specific test requirements.

11.1.1 DIMENSIONAL CHECK TEST (ALL SAMPLES)—Shall conform to the dimensions in the respective table for that 100R-series hose type and these detailed specifications.

11.1.2 PROOF TEST (ALL SAMPLES)—Shall not leak at a proof pressure equal to 2X the maximum working pressure for that type and size of hose. The exception is 100R14, use the proof pressure listed for the hose type and size.

11.1.3 CHANGE IN LENGTH TEST (ONE SAMPLE)—When pressurized to the maximum working pressure, shall not exceed the percentage change listed in Table 3 for that 100R-series type of hose.

11.1.4 BURST TEST (ONE 460 mm FREE HOSE LENGTH ASSEMBLY)—Shall not leak or fail below the minimum burst pressure equal to 4X the maximum working pressure for that type and size of hose. The exception is 100R14, use the minimum burst pressure listed for the hose type and size.

11.1.5 LEAKAGE TEST (TWO 300 mm FREE HOSE LENGTH ASSEMBLIES)—Shall not leak or fail at the leakage pressure stipulated in SAE J343 for that type and size of hose.

11.1.6 COLD BEND TEST (ONE ASSEMBLY)—Shall exhibit no cover cracks or leakage. Exposure shall be at the temperature listed in Table 3 for that 100R-series type of hose.

11.1.7 OIL RESISTANCE TEST (ONE SAMPLE EACH OF HOSE INNER TUBE AND COVER)—Tube and cover samples shall be prepared in accordance with ASTM D 380, and tested in accordance with ASTM D 471. After 70 h immersion in ASTM IRM 903 oil at the temperature specified in Table 3 for that type of hose, the volume change of the inner tube and cover shall be between the limits listed for that type of hose in Table 3.

11.1.8 OZONE RESISTANCE TEST (TWO SAMPLES)—Specimens shall be subjected to an atmosphere comprised of air and ozone with an ozone partial pressure of 50 mPa (50 parts of ozone per 100 million parts of air) at standard atmospheric conditions at an ambient temperature of 40 °C. After 70 h exposure, specimens shall not show evidence of cracking or deterioration when viewed with seven-power magnification while still in a stressed condition.

11.1.9 IMPULSE TEST (FOUR UNAGED ASSEMBLIES)—When tested with circulating petroleum-base hydraulic fluid at the percentage of maximum working pressure and temperature listed in Table 3, hose assemblies shall withstand the minimum number of cycles specified in Table 3 for that type of hose, without leakage or other malfunction.

TABLE 3—SAE J517 QUALIFICATION TEST REQUIREMENTS

Type of Test	100R1	100R2	100R3	100R4	100R5	100R6	100R7	100R8	100R9	100R10	100R11	100R12	100R13	100R14	100R15	100R16	100R17	100R18
Dimensional Check	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Proof	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Change in Length (%)	+2 / -4	+2 / -4	+2 / -4	+2 / -4	+2 / -4	+2 / -4	+3 / -3	+3 / -3	+2 / -4	+2 / -4	+2 / -4	+2 / -2	+2 / -2	+2 / -4	+2 / -2	+2 / -4	+2 / -4	+3 / -3
Burst	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Leakage	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cold Bend (°C)	-40	-40	-40	-40	-40	-40	-40	-40	-40	-40	-40	-40	-40	-54	-40	-40	-40	-40
Volume Change at +100 °C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Tube and Cover -0 / 100%							X	X										X
Volume Change at +100 °C												X	X		X			
Tube and Cover -15 / 35%																		
Volume Change at +121 °C																		
Tube -0 / 100%																		
Volume Change at +121 °C																		
Cover -0 / 125%																		
Ozone Resistance	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
70 Hours at +40 °C																		
Impulse Test	+100	+100	+100		+100		+93	+93	+100	+100	+100	+121	+121	+204	+121	+100	+100	+93
Temperature (°C)	See 100R1	133	133		See 100R5		125	133	133	133	133	133	120	See 100R14	120	133	133	133
% of Working Pressure	See 100R1	200 000	200 000		See 100R5		150 000	200 000	See 100R9	400 000	400 000	500 000	500 000	150 000	500 000	200 000	200 000	200 000
Impulse Test	See 100R1	200 000	200 000		See 100R5		150 000	200 000	See 100R9	400 000	400 000	500 000	500 000	150 000	500 000	200 000	200 000	200 000
Minimum Cycles																		
Vacuum Resistance																		
at Absolute Pressure																		
Electrical Conductivity																		
(For Thermoplastic Only)																		
Electrical Conductivity																		
(For PTFE Only)																		
Specific Gravity																		
(PTFE Tube)																		
Visual Examination	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

11.1.10 RESISTANCE TO VACUUM TEST (ONE SAMPLE)—After 5 min at the absolute pressure specified in Table 3 for that type of hose, there shall be no evidence of hose blistering or collapse.

11.1.11 VISUAL EXAMINATION (ALL SAMPLES)

11.2 Inspection Tests—Inspection tests listed as follows shall be performed on two samples representing each lot of 150 to 3000 m of bulk hose. Lots of less than 150 m of hose need not be subjected to these tests if a lot has been tested and met the requirements within the previous 12-month period. Requirements shall be same as for corresponding Qualification Tests (see 11.1):

- a. Dimensional Check Test
- b. Proof Test
- c. Change in Length Test
- d. Burst Test

Visual Examination is required for all hose and/or hose assemblies.

Hose manufacturing facilities that are ISO 9000 or ISO/TS 16949 certified with a quality management system, which undergoes routine assessments by an accredited third party registrar, may use their documented inspection test procedures in lieu of the inspection test requirements listed above.

12. Inspection Retests and Rejection—In the event of failure of one or more samples to meet any of the Inspection Tests specified, the product shall be resampled and retested for the test or tests in which it failed. Twice the number of samples designated under the initial test procedure shall be selected from the lot in question for such retests, and failure of any of the retested samples shall be cause for rejection of the entire lot.

13. Steel Wire Reinforced, Rubber Covered Hydraulic Hose (SAE 100R1)—This section covers hose for use with petroleum base hydraulic fluids within a temperature range of -40 to $+100$ °C and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of $+100$ °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 4.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

13.1 Dimensions—Dimensions and tolerances applicable to this hose are given in Table 4. The inside diameter of the hose shall be concentric with the outside diameter of the hose and the outer surface of the reinforcement within the limits in Table 5.

13.2 Hose Construction

13.2.1 TYPE A—This hose shall consist of an inner tube of oil resistant synthetic rubber, a single steel 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 and/or over the wire reinforcement to anchor the synthetic rubber to the wire.

13.2.2 TYPE AT—This hose shall be of the same construction as Type A, except having a cover designed to assemble with fittings which do not require removal of the cover or a portion thereof.

13.2.3 TYPE S—This hose shall have the same construction as Type AT and working pressures of ISO 1436-1, Type 1SN.

13.3 Qualification—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the following test and the tests specified in Table 3, and conform to the requirements of 11.1.

13.3.1 IMPULSE TEST (FOUR UNAGED ASSEMBLIES)—Hose assemblies, when tested at 125% of the maximum working pressure for hose sizes 25 mm (–16) and smaller and 100% of the maximum working pressure for hose sizes 31.5 mm (–20) and larger, with 100 °C circulating petroleum-base test fluid, shall withstand a minimum of 150 000 cycles without leakage or other malfunction.

13.4 Inspection Tests—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 4—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R1 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	Reinforcement Dia Min	Reinforcement Dia Max	OD Type A Min	OD Type A Max	OD Type AT Max	Cover Thickness ⁽³⁾ Type AT Min	Cover Thickness ⁽³⁾ Type AT Max	Max Working Pressure MPa	Max Working Pressure Type S ⁽⁴⁾ MPa	Min Burst and Proof Pressure have	Min Bend Radius (5)
5	–3	4.6	5.4	8.9	10.1	11.9	13.5	12.5	0.8	1.5	21	25.0	been	90
6.3	–4	6.2	7.0	10.6	11.7	15.1	16.7	14.1	0.8	1.5	19.2	22.5	deleted	100
8	–5	7.7	8.5	12.1	13.3	16.7	18.3	15.7	0.8	1.5	17.5	21.5	from	115
10	–6	9.3	10.1	14.5	15.7	19.0	20.6	18.1	0.8	1.5	15.7	18.0	this table	125
12.5	–8	12.3	13.5	17.5	19.0	22.2	23.8	21.5	0.8	1.5	14	16.0	See para	180
16	–10	15.5	16.7	20.6	22.2	25.4	27.0	24.7	0.8	1.5	10.5	13.0	11.1.2,	205
19	–12	18.6	19.8	24.6	26.2	29.4	31.0	28.6	0.8	1.5	8.7	10.5	11.1.4	240
25	–16	25.0	26.4	32.5	34.1	36.9	39.3	36.6	0.8	1.5	7	8.7		300
31.5	–20	31.4	33.0	39.3	41.7	44.4	47.6	44.8	1.0	2.0	4.3	6.2		420
38	–24	37.7	39.3	45.6	48.0	50.8	54.0	52.0	1.3	2.5	3.5	5.0		500
51	–32	50.4	52.0	58.7	61.9	65.1	68.3	65.9	1.3	2.5	2.6	4.0		630

1. Metric Size is in mm (Ref. ISO 4397).

2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.

3. Cover thickness shall be measured by means of a dial indicator depth gage having a rounded foot placed parallel to the hose, bridging a groove obtained by stripping a 12.5 to 25 mm width of cover from the hose. A mandrel should be placed in the hose bore to insure freedom from misalignment.

4. Type S pressures are the same as ISO 1436-1, 1SN.

5. Bend radius measured at inside of bend.

TABLE 5—HOSE CONCENTRICITY (100R1)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD	Concentricity, FIR ID to Reinforcement
Up to 6.3 mm (–4), included	0.8	0.4
Over 6.3 mm (–4) to 19 mm (–12), included	1.0	0.6
Over 19 mm (–12)	1.3	0.8

- 14. High Pressure, Steel Wire Reinforced, Rubber Covered Hydraulic Hose (SAE 100R2)**—This section covers hose for use with petroleum base hydraulic fluids within a temperature range of -40 to $+100$ °C and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of $+100$ °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 6.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

- 14.1 Dimensions**—Dimensions and tolerances applicable to this hose are given in Table 6. The inside diameter of the hose shall be concentric with the outside diameter of the hose and the outer surface of the reinforcement within the limits in Table 7.

- 14.2 Hose Construction**—This hose shall consist of an inner tube of oil resistant synthetic rubber, steel wire reinforcement according to the hose type detailed in 14.2.1 through 14.2.4 and an oil and weather resistant synthetic rubber cover. A ply or braid of suitable material may be used over the inner tube and/or over the wire reinforcement to anchor the synthetic rubber to the wire.

14.2.1 TYPE A—This hose shall have two braids of steel wire reinforcement.

14.2.2 TYPE B—This hose shall have two spiral plies and one braid of steel wire reinforcement.

14.2.3 TYPE AT—This hose shall be of the same construction as Type A, except having a cover designed to assemble with fittings which do not require removal of the cover or a portion thereof.

14.2.4 TYPE BT—This hose shall be of the same construction as Type B, except having a cover designed to assemble with fittings which do not require removal of the cover or a portion thereof.

14.2.5 TYPE S—This hose is the same construction as Type AT and working pressures of ISO 1436-1 Type 2SN.

- 14.3 Qualification**—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the tests specified in Table 3, and conform to the requirements of 11.1.

- 14.4 Inspection Tests**—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 6—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R2 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	Rein- force- ment Dia Min	Rein- force- ment Dia Max	OD Type A and D Min	OD Type A and D Max	OD Type AT and DT Max	Cover Thick- ness ⁽³⁾ Type AT and DT Min	Cover Thick- ness ⁽³⁾ Type AT and DT Max	Max Working Pres- sure MPa	Max Working Pres- sure Type S ⁽⁴⁾ MPa	Min Burst and Proof Pres- sure have	Min Bend Radius (5)
5	-3	4.6	5.4	10.6	11.7	15.1	16.7	14.1	0.8	1.5	35	41.5	been	90
6.3	-4	6.2	7.0	12.1	13.3	16.7	18.3	15.7	0.8	1.5	35	40.0	deleted	100
8	-5	7.7	8.5	13.7	14.9	18.3	19.8	17.3	0.8	1.5	29.7	35.0	from	115
10	-6	9.3	10.1	16.1	17.3	20.6	22.2	19.7	0.8	1.5	28	33.0	this	125
12.5	-8	12.3	13.5	19.0	20.6	23.8	25.4	23.1	0.8	1.5	24.5	27.5	See	180
16	-10	15.5	16.7	22.2	23.8	27.0	28.6	26.3	0.8	1.5	19.2	25.0	para	205
19	-12	18.6	19.8	26.2	27.8	31.0	32.5	30.2	0.8	1.5	15.7	21.5	11.1.2	240
25	-16	25.0	26.4	34.1	35.7	38.5	40.9	38.9	1.0	2.0	14	16.5	and	300
31.5	-20	31.4	33.0	43.2	45.6	49.2	52.4	49.6	1.3	2.5	11.3	12.5	11.1.4	420
38	-24	37.7	39.3	49.6	52.0	55.6	58.7	56.0	1.3	2.5	8.7	9.0		500
51	-32	50.4	52.0	62.3	64.7	68.3	71.4	68.6	1.3	2.5	7.8	8.0		630
63	-40	63.1	65.1	74.6	77.8	80.9	84.1	—	—	—	7	7.0		760

1. Metric Size is in mm (Ref. ISO 4397).

2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.

3. Cover thickness shall be measured by means of a dial indicator depth gage having a rounded foot placed parallel to the hose, bridging a groove obtained by stripping a 12.5 to 25 mm width of cover from the hose. A mandrel should be placed in the hose bore to insure freedom from misalignment.

4. Type S hose has the same working pressures as ISO 1436-1, 2SN.

5. Bend radius measured at inside of bend.

TABLE 7—HOSE CONCENTRICITY (100R2)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD	Concentricity, FIR ID to Reinforcement
Up to 6.3 mm (-4), included	0.8	0.5
Over 6.3 mm (-4) to 19 mm (-12), included	1.0	0.7
Over 19 mm (-12)	1.3	0.9

- 15. Double Fiber Braid (Nonmetallic), Rubber Covered Hydraulic Hose (SAE 100R3)**—This section covers hose for use with petroleum base hydraulic fluids within a temperature range of -40 to +100 °C and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of +100 °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 8.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

- 15.1 Dimensions**—Dimensions and tolerances applicable to this hose are given in Table 8. The inside diameter and outside diameter of the hose shall be concentric within the limits in Table 9.

15.2 Hose Construction—This hose shall consist of an inner tube of oil resistant synthetic rubber, two braids of suitable fiber, and an oil and weather resistant synthetic rubber cover.

15.3 Qualification—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the tests specified in Table 3, and conform to the requirements of 11.1.

15.4 Inspection Tests—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 8—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R3 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	OD Min	OD Max	Max Working Pressure MPa	Min Burst and Proof	Min Bend Radius (3)
5	−3	4.5	5.4	11.9	13.5	10.5	Pressure	75
6.3	−4	6.1	7.0	13.5	15.1	8.7	have	75
8	−5	7.6	8.5	16.7	18.3	8.4	been	100
10	−6	9.2	10.1	18.3	19.8	7.8	deleted	100
							from	
12.5	−8	12.4	13.5	23.0	24.6	7	this	125
16	−10	15.6	16.7	26.2	27.8	6.1	table	140
19	−12	18.7	19.8	31.0	32.5	5.2	See para	150
25	−16	25.1	26.2	36.9	39.3	3.9	11.1.2	205
31.5	−20	31.4	32.9	42.9	46.0	2.6	and 11.1.4	250

1. Metric Size is in mm (Ref. ISO 4397).
2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.
3. Bend radius measured at inside of bend.

TABLE 9—HOSE CONCENTRICITY (100R3)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD
Up to 6.3 mm (−4), included	0.8
Over 6.3 mm (−4) to 19 mm (−12), included	1.0
Over 19 mm (−12)	1.3

16. Wire Inserted Hydraulic Suction Hose (SAE 100R4)—This section covers hose for use in low pressure and vacuum applications with petroleum base hydraulic fluids within a temperature range of −40 to +100 °C and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of +100 °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure, minimum bend radius and other performance data are specified in Table 10.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

16.1 Dimensions—Dimensions and tolerances applicable to this hose are given in Table 10.

16.2 Hose Construction—This hose shall consist of an inner tube of oil resistant synthetic rubber, a reinforcement consisting of a ply or plies of woven or braided textile fibers with a suitable spiral of body steel wire, and an oil and weather resistant synthetic rubber cover.

16.3 Qualification—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the tests specified in Table 3, and conform to the requirements of 11.1.

16.4 Inspection Tests—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 10—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R4 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	OD Max	Max Working Pressure MPa	Min Burst and Proof	Min Bend Radius (3)
19	–12	18.2	19.8	34.9	2.1	Pressure	125
25	–16	24.6	26.2	41.3	1.7	have	150
31.5	–20	30.6	33.0	50.8	1.4	been	200
38	–24	36.9	39.3	57.2	1.05	deleted	255
						from	
51	–32	49.2	52.4	69.9	0.7	this	300
63	–40	61.9	65.1	82.6	0.4	table	355
76	–48	74.6	77.8	95.3	0.4	See para	460
89	–56	87.3	90.5	107.9	0.3	11.1.2	530
102	–64	100.0	103.2	120.7	0.25	and 11.1.4	610

1. Metric Size is in mm (Ref. ISO 4397).
2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.
3. Bend radius measured at inside of bend.

17. Single Wire Braid, Textile Covered Hydraulic Hose (SAE 100R5)—This section covers hose for use with petroleum base hydraulic fluids within a temperature range of –40 to +100 °C and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of +100 °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 11.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

17.1 Dimensions—Dimensions and tolerances applicable to this hose are given in Table 11. The inside diameter and outside diameter of the hose shall be concentric within the limits in Table 12.

17.2 Hose Construction—This hose shall consist of an inner tube of oil resistant synthetic rubber, a single wire braid reinforcement and a fiber braided cover. A braid or fabric of suitable material may be used over the inner tube to anchor the synthetic rubber to the wire. All braids and fabrics shall be oil and mildew resistant.

17.3 Qualification—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the following test and the tests specified in Table 3, and conform to the requirements of 11.1.

17.3.1 **IMPULSE TEST (FOUR UNAGED ASSEMBLIES)**—Hose assemblies, when tested at 125% of the maximum working pressure for hose sizes 22 mm (–16) and smaller and 100% of the maximum working pressure for hose sizes 29 mm (–20) and larger, with 100 °C circulating petroleum-base test fluid, shall withstand a minimum of 150 000 cycles for hose sizes 22 mm (–16) and smaller and 100 000 cycles for hose sizes 29 mm (–20) and larger, without leakage or other malfunction. Hose sizes 29 mm (–20) and larger shall be tested straight.

17.4 **Inspection Tests**—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 11—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R5 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	OD Min	OD Max	Max Working Pressure MPa	Min Burst and Proof	Min Bend Radius (3)
5	–4	4.8	5.5	12.7	13.7	21	Pressure	75
6.3	–5	6.4	7.2	14.3	15.3	21	have	85
8	–6	7.9	8.7	16.7	17.6	15.7	been	100
11	–8	10.3	11.1	18.9	20.0	14	deleted	115
							from	
12.5	–10	12.7	13.7	22.8	24.0	12.2	this	140
16	–12	15.9	17.0	26.8	28.0	10.5	table	165
22	–16	22.2	23.3	30.6	32.2	5.6	See para	185
29	–20	28.6	29.8	37.3	38.9	4.3	11.1.2	230
							and 11.1.4	
35	–24	34.9	36.1	43.7	45.2	3.5		265
46	–32	46.0	47.2	55.2	57.6	2.4		335
60	–40	60.3	61.9	71.8	74.2	2.4		610
76	–48	76.2	77.8	89.3	91.7	1.4		840

1. Metric Size is in mm (Ref. ISO 4397).
2. SAE Dash Size is the same as the OD of tubing having approximately the same ID as the hose, expressed in 1/16's of an inch.
3. Bend radius measured at inside of bend.

TABLE 12—HOSE CONCENTRICITY (100R5)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD
Up to 11 mm (–8), included	0.6
Over 11 mm (–8)	0.8

- 18. Single Fiber Braid (Nonmetallic), Rubber Covered Hydraulic Hose (SAE 100R6)**—This section covers hose for use with petroleum base hydraulic fluids within a temperature range of -40 to $+100$ °C and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of $+100$ °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 13.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

- 18.1 Dimensions**—Dimensions and tolerances applicable to this hose are given in Table 13. The inside diameter and outside diameter of the hose shall be concentric within the limits in Table 14.
- 18.2 Hose Construction**—This hose shall consist of an inner tube of oil resistant synthetic rubber, one braid of suitable fiber, and an oil and weather resistant synthetic rubber cover.
- 18.3 Qualification**—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the tests specified in Table 3, and conform to the requirements of 11.1.
- 18.4 Inspection Tests**—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 13—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R6 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	OD Min	OD Max	Max Working Pressure MPa	Min Burst and Proof	Min Bend Radius (3)
5	−3	4.5	5.4	10.3	11.9	3.5	Pressure	50
6.3	−4	6.1	7.0	11.9	13.5	2.8	have been	65
8	−5	7.6	8.5	13.5	15.1	2.8	deleted	75
10	−6	9.2	10.1	15.1	16.7	2.8	from this	75
							table	
12.5	−8	12.4	13.5	19.0	20.6	2.8	See para	100
16	−10	15.6	16.7	22.2	23.8	2.4	11.1.2	125
19	−12	18.7	19.8	25.4	27.8	2.1	and 11.1.4	150

1. Metric Size is in mm (Ref. ISO 4397).
2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.
3. Bend radius measured at inside of bend.

TABLE 14—HOSE CONCENTRICITY (100R6)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD
Up to 6.3 mm (−4), included	0.8
Over 6.3 mm (−4)	1.0

- 19. Thermoplastic Hydraulic Hose (SAE 100R7)**—This section covers thermoplastic hose for use with petroleum base and synthetic hydraulic fluids within a temperature range of -40 to $+93$ °C, and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of $+93$ °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 15.

Electrically nonconductive 100R7 hose is available for use in applications where there is potential of contact with high voltage sources. To be classified as nonconductive, a hose must pass the Electrical Conductivity Test described in 19.4.1. Nonconductive hose is identified by its orange cover and layline.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

- 19.1 Dimensions**—Dimensions and tolerances applicable to this hose are given in Table 15. The inside diameter of the hose shall be concentric with the outside diameter of the hose within the limits in Table 16.

- 19.2 Hose Construction**—This hose shall consist of a thermoplastic inner tube resistant to hydraulic fluids with suitable synthetic fiber reinforcement, and a hydraulic fluid and weather resistant thermoplastic cover.

Nonconductive 100R7 hose shall be identified with an orange cover and appropriate layline. (Reference color, orange chip #22510, Federal Standard 595).

- 19.3 Connector Compatibility**—Connectors for thermoplastic hose may not be interchangeable. Therefore, it is recommended that connectors and hose be properly matched. Connector and/or hose manufacturers shall be consulted for recommendations.

- 19.4 Qualification**—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the following test and the tests specified in Table 3, and conform to the requirements of 11.1.

- 19.4.1 ELECTRICAL CONDUCTIVITY TEST (TWO 152 mm FREE HOSE LENGTH CONDITIONED ASSEMBLIES)**—The maximum electrical leakage shall not exceed $50\text{ }\mu\text{A}$ when subjected to 37.5 kV for 5 min. This test shall not be applicable to hose with a pinpricked cover.

- 19.5 Inspection Tests**—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 15—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R7
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	OD Max	Max Working Pressure MPa	Min Burst and Proof	Min Bend Radius (3)
5	−3	4.6	5.4	11.4	21	Pressure	90
6.3	−4	6.2	7.0	13.7	19.2	have been	100
8	−5	7.7	8.5	15.6	17.5	deleted	115
10	−6	9.3	10.3	18.4	15.7	from this table	125
12.5	−8	12.3	13.5	22.5	14	See para	180
16	−10	15.5	16.7	25.8	10.5	11.1.2	205
19	−12	18.6	19.8	28.6	8.7	and 11.1.4	240
25	−16	25.0	26.4	36.7	7		300

1. Metric Size is in mm (Ref. ISO 4397).

2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.

3. Bend radius measured at inside of bend.

TABLE 16—HOSE CONCENTRICITY (100R7)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD
Up to 6.3 mm (–4), included	0.8
Over 6.3 mm (–4) to 19 mm (–12), included	1.0
Over 19 mm (–12)	1.3

- 20. High Pressure Thermoplastic Hydraulic Hose (SAE 100R8)**—This section covers thermoplastic hose for use with petroleum base and synthetic hydraulic fluids within a temperature range of –40 to +93 °C, and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of +93 °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 17.

Electrically nonconductive 100R8 hose is available for use in applications where there is potential of contact with high voltage sources. To be classified as nonconductive, a hose must pass the Electrical Conductivity Test described in 20.4.1. Nonconductive hose is identified by its orange cover and layline.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

- 20.1 Dimensions**—Dimensions and tolerances applicable to this hose are given in Table 17. The inside diameter of the hose shall be concentric with the outside diameter of the hose within the limits in Table 18.

- 20.2 Hose Construction**—This hose shall consist of a thermoplastic inner tube resistant to hydraulic fluids with suitable synthetic fiber reinforcement, and a hydraulic fluid and weather resistant thermoplastic cover.

Nonconductive 100R8 hose shall be identified with an orange cover and appropriate layline. (Reference color, orange chip #22510, Federal Standard 595).

- 20.3 Connector Compatibility**—Connectors for thermoplastic hose may not be interchangeable. Therefore, it is recommended that connectors and hose be properly matched. Connector and/or hose manufacturers shall be consulted for recommendations.

- 20.4 Qualification**—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the following test and the tests specified in Table 3, and conform to the requirements of 11.1.

- 20.4.1 ELECTRICAL CONDUCTIVITY TEST (TWO 152 mm FREE HOSE LENGTH CONDITIONED ASSEMBLIES)**—The maximum electrical leakage shall not exceed 50 µA when subjected to 37.5 kV for 5 min. This test shall not be applicable to hose with a pinpricked cover.

- 20.5 Inspection Tests**—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 17—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R8 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	OD Max	Max Working Pressure MPa	Min Burst and Proof	Min Bend Radius (3)
5	–3	4.6	5.4	14.6	35	Pressure	90
6.3	–4	6.2	7.0	16.8	35	have been	100
10	–6	9.3	10.3	20.3	28	deleted	125
						from this	
12.5	–8	12.3	13.5	24.6	24.5	table	180
16	–10	15.5	16.7	29.8	19.2	See para	205
19	–12	18.6	19.8	33.0	15.7	11.1.2	240
25	–16	25.0	26.4	38.6	14	and 11.1.4	300

1. Metric Size is in mm (Ref. ISO 4397).
2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.
3. Bend radius measured at inside of bend.

TABLE 18—HOSE CONCENTRICITY (100R8)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD
Up to 6.3 mm (–4), included	0.8
Over 6.3 mm (–4) to 19 mm (–12), included	1.0
Over 19 mm (–12)	1.3

- 21. High Pressure, Four Spiral Steel Wire Reinforced, Rubber Covered Hydraulic Hose (SAE 100R9)**—This section covers hose for use with petroleum base hydraulic fluids within a temperature range of –40 to +100 °C and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of +100 °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 19.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

- 21.1 Dimensions**—Dimensions and tolerances applicable to this hose are given in Table 19. The inside diameter of the hose shall be concentric with the outside diameter of the hose and the outer surface of the reinforcement within the limits in Table 20.

21.2 Hose Construction

- 21.2.1 TYPE A**—This hose shall consist of an inner tube of oil resistant synthetic rubber, four spiral plies of steel wire wrapped in alternating directions, and an oil and weather resistant synthetic rubber cover. A ply or braid of suitable material may be used over the inner tube and/or over the wire reinforcement to anchor the synthetic rubber to the wire.
- 21.2.2 TYPE AT**—This hose shall be of the same construction as Type A, except having a cover designed to assemble with fittings which do not require removal of the cover or a portion thereof.

21.3 Qualification—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the following test and the tests specified in Table 3, and conform to the requirements of 11.1.

21.3.1 IMPULSE TEST (FOUR UNAGED ASSEMBLIES)—Hose assemblies, when tested at 133% of the maximum working pressure with 100 °C circulating petroleum-base test fluid, shall withstand a minimum of 200 000 cycles for hose sizes 10 mm (–6) and 12.5 mm (–8) and 300 000 cycles for all other sizes, without leakage or other malfunction.

21.4 Inspection Tests—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 19—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R9 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	Rein- force- ment Dia Min	Rein- force- ment Dia Max	OD Type A Min	OD Type A Max	OD Type AT Max	Cover Thick- ness ⁽³⁾ Type AT Min	Cover Thick- ness ⁽³⁾ Type AT Max	Max Working Pres- sure MPa	Min Burst and Proof Pres- sure have	Min Bend Radius (4)
10	–6	9.3	10.1	16.9	18.0	20.6	22.2	21.1	0.8	1.6	31.5	been	125
12.5	–8	12.3	13.5	19.4	21.0	23.8	25.4	24.3	1.0	2.0	28	deleted	180
19	–12	18.6	19.8	26.6	28.2	30.6	32.2	31.9	1.0	2.0	21	from	240
25	–16	25.0	26.4	34.5	36.1	38.5	40.9	40.5	1.1	2.4	21	this	300
												table	
31.5	–20	31.4	33.0	43.3	45.6	49.2	52.4	50.7	1.3	2.8	17.5	See para	420
38	–24	37.7	39.3	49.6	52.0	55.6	58.7	—	—	—	14	11.1.2	500
51	–32	50.4	52.0	63.9	66.2	69.9	73.0	—	—	—	14	and 11.1.4	660

1. Metric Size is in mm (Ref. ISO 4397).
2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.
3. Cover thickness shall be measured by means of a dial indicator depth gage having a rounded foot placed parallel to the hose, bridging a groove obtained by stripping a 12.5 to 25 mm width of cover from the hose. A mandrel shall be placed in the hose bore to insure freedom from misalignment.
4. Bend radius measured at inside of bend.

TABLE 20—HOSE CONCENTRICITY (100R9)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD	Concentricity, FIR ID to Reinforcement
Up to 19 mm (–12), included	1.0	0.7
Over 19 mm (–12)	1.3	0.9

22. Heavy Duty, Four Spiral Steel Wire Reinforced, Rubber Covered Hydraulic Hose (SAE 100R10)—This section covers hose for use with petroleum base hydraulic fluids within a temperature range of –40 to +100 °C and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of +100 °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 21.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

22.1 Dimensions—Dimensions and tolerances applicable to this hose are given in Table 21. The inside diameter of the hose shall be concentric with the outside diameter of the hose and the outer surface of the reinforcement within the limits in Table 22.

22.2 Hose Construction

22.2.1 TYPE A—This hose shall consist of an inner tube of oil resistant synthetic rubber, four spiral plies of heavy steel wire wrapped in alternating directions, and an oil and weather resistant synthetic rubber cover. A ply or braid of suitable material may be used over the inner tube and/or over the wire reinforcement to anchor the synthetic rubber to the wire.

22.2.2 TYPE AT—This hose shall be of the same construction as Type A, except having a cover designed to assemble with fittings which do not require removal of the cover or a portion thereof.

22.3 Qualification—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the tests specified in Table 3, and conform to the requirements of 11.1.

22.4 Inspection Tests—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 21—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R10 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	Rein- force- ment Dia Min	Rein- force- ment Dia Max	OD Type A Min	OD Type A Max	OD Type AT Max	Cover Thick- ness ⁽³⁾ Type AT Min	Cover Thick- ness ⁽³⁾ Type AT Max	Max Working Pres- sure MPa	Min Burst and Proof Pres- sure have	Min Bend Radius (4)
5	-3	4.6	5.4	14.3	15.9	18.3	19.8	—	—	—	70	been	100
6.3	-4	6.2	7.0	15.8	17.4	19.8	21.4	—	—	—	61	deleted	125
10	-6	9.3	10.1	19.0	20.6	23.0	24.6	—	—	—	52.5	from	150
12.5	-8	12.5	13.7	23.0	24.6	27.0	28.6	—	—	—	43.5	this	200
19	-12	19.0	20.2	30.9	32.5	35.7	37.3	36.8	1.0	2.0	35	table	280
25	-16	25.4	27.0	38.9	40.5	43.3	45.6	45.5	1.2	2.4	28	See para	360
31.5	-20	31.8	33.4	44.8	47.2	49.2	52.4	52.3	1.4	2.8	21	11.1.2 and	460
38	-24	38.1	39.7	51.1	53.6	55.6	58.7	58.7	1.4	2.8	17.5	11.1.4	560
51	-32	50.8	52.6	64.6	67.1	69.1	72.2	72.1	1.4	2.8	17.5		710

1. Metric Size is in mm (Ref. ISO 4397).

2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.

3. Cover thickness shall be measured by means of a dial indicator depth gage having a rounded foot placed parallel to the hose, bridging a groove obtained by stripping a 12.5 to 25 mm width of cover from the hose. A mandrel should be placed in the hose bore to insure freedom from misalignment.

4. Bend radius measured at inside of bend.

TABLE 22—HOSE CONCENTRICITY (100R10)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD	Concentricity, FIR ID to Reinforcement
Up to 6.3 mm (-4), included	0.8	0.5
Over 6.3 mm (-4) to 19 mm (-12), included	1.0	0.7
Over 19 mm (-12)	1.3	0.9

- 23. Heavy Duty, Six Spiral Steel Wire Reinforced, Rubber Covered Hydraulic Hose (SAE 100R11)**—This section covers hose for use with petroleum base hydraulic fluids within a temperature range of -40 to +100 °C and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of +100 °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 23.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

- 23.1 Dimensions**—Dimensions and tolerances applicable to this hose are given in Table 23. The inside diameter of the hose shall be concentric with the outside diameter of the hose and the outer surface of the reinforcement within the limits in Table 24.
- 23.2 Hose Construction**—This hose shall consist of an inner tube of oil resistant synthetic rubber, six spiral plies of steel wire wrapped in alternating directions, and an oil and weather resistant synthetic rubber cover. A ply or braid of suitable material may be used over the inner tube and/or over the wire reinforcement to anchor the synthetic rubber to the wire.
- 23.3 Qualification**—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the tests specified in Table 3, and conform to the requirements of 11.1.
- 23.4 Inspection Tests**—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 23—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R11 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	Rein- force- ment Dia Min	Rein- force- ment Dia Max	OD Min	OD Max	Max Working Pressure MPa	Min Burst and Proof Pressure	Min Bend Radius (3)
5	–3	4.6	5.4	17.5	19.1	21.4	23.0	87	have	100
6.3	–4	6.2	7.0	19.1	20.6	23.0	24.6	78	been	125
10	–6	9.3	10.1	22.2	23.8	26.2	27.8	70	deleted	150
12.5	–8	12.5	13.7	26.2	27.8	30.2	31.8	52.5	from	200
19	–12	19.0	20.2	34.1	35.7	38.9	40.5	43.5	this	280
									table	
25	–16	25.4	27.0	41.7	44.0	47.2	49.6	35	See para	360
31.5	–20	31.8	33.4	48.0	50.4	53.2	56.4	24.5	11.1.2	460
38	–24	38.1	39.7	54.4	56.7	59.5	62.7	21	and	560
51	–32	50.8	52.6	68.6	71.0	73.8	77.0	21	11.1.4	710
63	–40	63.5	65.3	83.5	86.3	89.7	92.9	17.5		920

1. Metric Size is in mm (Ref. ISO 4397).
2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.
3. Bend radius measured at inside of bend.

TABLE 24—HOSE CONCENTRICITY (100R11)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD	Concentricity, FIR ID to Reinforcement
Up to 6.3 mm (–4), included	0.8	0.5
Over 6.3 mm (–4) to 19 mm (–12), included	1.0	0.7
Over 19 mm (–12)	1.3	0.9

- 24. Heavy Duty, High Impulse, Four Spiral Steel Wire Reinforced, Rubber Covered Hydraulic Hose (SAE 100R12)**—This section covers hose for use with petroleum base hydraulic fluids within a temperature range of –40 to +121 °C and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of +121 °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 25.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

- 24.1 Dimensions**—Dimensions and tolerances applicable to this hose are given in Table 25. The inside diameter of the hose shall be concentric with the outside diameter of the hose and the outer surface of the reinforcement within the limits in Table 26.
- 24.2 Hose Construction**—This hose shall consist of an inner tube of oil resistant synthetic rubber, four spiral plies of steel wire wrapped in alternating directions, and an oil and weather resistant synthetic rubber cover. A ply or braid of suitable material may be used over or within the inner tube and/or over the wire reinforcement to anchor the synthetic rubber to the wire.

24.3 Qualification—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the tests specified in Table 3, and conform to the requirements of 11.1.

24.4 Inspection Tests—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 25—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R12 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	Rein- force- ment Dia Min	Rein- force- ment Dia Max	OD Min	OD Max	Max Working Pressure MPa	Min Burst and Proof Pressure	Min Bend Radius (3)
10	-6	9.3	10.1	16.6	17.8	19.5	21.0	28	have	125
12.5	-8	12.3	13.5	19.9	21.5	23.0	24.6	28	been	180
16	-10	15.5	16.7	23.8	25.4	26.6	28.2	28	deleted	200
19	-12	18.6	19.8	26.9	28.7	29.9	31.7	28	from	240
									this	
25	-16	25.0	26.4	34.1	36.0	36.8	39.4	28	table	300
31.5	-20	31.4	33.0	42.7	45.1	45.4	48.6	21	See para	420
38	-24	37.7	39.3	49.2	51.6	51.9	55.0	17.5	11.1.2	500
51	-32	50.8	52.0	62.5	64.8	65.1	68.3	17.5	and 11.1.4	640

1. Metric Size is in mm (Ref. ISO 4397).
2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.
3. Bend radius measured at inside of bend.

TABLE 26—HOSE CONCENTRICITY (100R12)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD	Concentricity, FIR ID to Reinforcement
Up to 19 mm (-12), included	1.0	0.7
Over 19 mm (-12)	1.3	0.9

25. Heavy Duty, High Impulse, Multiple Spiral Steel Wire Reinforced, Rubber Covered Hydraulic Hose (SAE 100R13)—This section covers hose for use with petroleum base hydraulic fluids within a temperature range of -40 to +121 °C and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of +121 °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 27.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

25.1 Dimensions—Dimensions and tolerances applicable to this hose are given in Table 27. The inside diameter of the hose shall be concentric with the outside diameter of the hose and the outer surface of the reinforcement within the limits in Table 28.

25.2 Hose Construction—This hose shall consist of an inner tube of oil resistant synthetic rubber, multiple spiral plies of heavy steel wire wrapped in alternating directions, and an oil and weather resistant synthetic rubber cover. A ply or braid of suitable material may be used over or within the inner tube and/or over the wire reinforcement to anchor the synthetic rubber to the wire.

25.3 Qualification—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the tests specified in Table 3, and conform to the requirements of 11.1.

25.4 Inspection Tests—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 27—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R13 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	Rein- force- ment Dia Min	Rein- force- ment Dia Max	OD Min	OD Max	Max Working Pressure MPa	Min Burst and Proof Pressure have been deleted	Min Bend Radius (3)
19	–12	18.6	19.8	28.2	29.8	31.0	33.2	35	from this	240
25	–16	25.0	26.4	34.9	36.4	37.6	39.8	35	table	300
31.5	–20	31.4	33.0	45.6	48.0	48.3	51.3	35	See para	420
38	–24	37.7	39.3	53.1	55.5	55.8	58.8	35	11.1.2	500
51	–32	50.4	52.0	66.9	69.3	69.5	72.7	35	and 11.1.4	640

1. Metric Size is in mm (Ref. ISO 4397).
2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.
3. Bend radius measured at inside of bend.

TABLE 28—HOSE CONCENTRICITY (100R13)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD	Concentricity, FIR ID to Reinforcement
19 mm (–12)	1.0	0.7
Over 19 mm (–12)	1.3	0.9

- 26. PTFE Lined Hydraulic Hose (SAE 100R14)**—This section covers hose for use with petroleum base and synthetic base hydraulic fluids within a temperature range of -54 to $+204$ °C, and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of $+204$ °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure, minimum bend radius and other performance data are specified in Table 29. This does not exclude utilization of the hose in a multiplicity of applications for which PTFE is suitable. For such applications consult the manufacturer.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

- 26.1 Dimensions**—Dimensions and tolerances applicable to this hose are given in Table 29. Hose tube dimensions and concentricity requirements are given in Table 30.

26.2 Hose Construction

- 26.2.1 TYPE A**—This hose shall consist of an inner tube of polytetrafluoroethylene (PTFE), reinforced with a single braid of 303XX series stainless steel wire.

- 26.2.2 TYPE B**—This hose shall be of the same construction as Type A, but shall have the additional feature of an electrically conductive inner surface so as to preclude buildup of an electrostatic charge.

- 26.3 Connector Compatibility**—Connectors for PTFE lined hose may not be interchangeable. Therefore, it is recommended that connectors and hose be properly matched. Connector and/or hose manufacturers shall be consulted for recommendations.

- 26.4 Qualification**—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the following tests and the tests specified in Table 3, and conform to the requirements of 11.1.

- 26.4.1 IMPULSE TEST (FOUR UNAGED ASSEMBLIES)**—Hose assemblies, when tested at 125% of the maximum working pressure for hose sizes 22 mm (–16) and smaller and 100% of the maximum working pressure for hose sizes 25 mm (–18) and larger, with 204 °C synthetic-base test fluid, shall withstand a minimum of 150 000 cycles without leakage or other malfunction. Test fluid shall conform to MIL-PRF-83282, MIL-H-8446 or MIL-PRF-7808.

- 26.4.2 SPECIFIC GRAVITY TEST (ONE TUBE SAMPLE)**—Shall be within 2.12 and 2.21 at 25 °C $\pm$ 1 °C using ASTM D 792, Method A-1. Two drops of a wetting agent shall be added to the water.

- 26.4.3 CONDUCTIVITY TEST (ONE 330 MM CUT LENGTH SAMPLE)**—Type B hose only. Size 11 mm (–8) and smaller shall be capable of conducting a direct current of 6 μ A or greater, and size 12.5 mm (–10) and larger, 12 μ A or greater, with 1000 V applied between the electrodes (see SAE J343 Figure 3).

- 26.5 Inspection Tests**—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 29—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R14 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	OD Min	OD Max	Max Working Pressure MPa	Proof Pressure MPa	Min Burst Pressure MPa	Min Bend Radius (3)
3.2	−3	2.8	3.8	5.3	6.8	10.5	42	84	40
5	−4	4.4	5.2	7.1	8.2	10.5	35	70	50
6.3	−5	6.0	6.9	8.9	10.1	10.5	31.5	63	75
8	−6	7.5	8.4	10.4	11.6	10.5	28	56	100
10	−7	9.1	10.0	12.2	13.4	10.5	24.5	49	125
11	−8	9.9	10.9	12.9	14.3	7	21	42	135
12.5	−10	12.3	13.3	15.3	16.8	5.6	21	42	165
16	−12	15.3	16.5	18.6	20.1	5.6	17.5	35	200
19	−14	18.4	19.6	21.3	23.3	5.6	14	28	230
22	−16	21.4	23.0	24.6	26.9	5.6	12.2	24.5	230
25	−18	24.6	26.2	27.8	29.8	5.6	12.2	24.5	300
29	−20	27.8	29.4	31.9	33.5	4.2	8.7	17.5	410

1. Metric Size is in mm (Ref. ISO 4397).
2. SAE Dash Size is the same as the OD of tubing having approximately the same ID as the hose, expressed in 1/16's of an inch.
3. Bend radius measured at inside of bend.

TABLE 30—HOSE TUBE DIMENSIONS AND CONCENTRICITY (100R14)
Dimensions are in Millimeters

Hose Size	Tube Thickness Max	Tube Thickness Min	Concentricity, FIR ID to OD
3.2 mm (−3) to 12.7 mm (−10)	0.9	0.7	0.3
16 mm (−12)	1.1	0.7	0.3
19 mm (−14) to 25 mm (−18)	1.2	0.8	0.3
29 mm (−20)	1.3	0.9	0.3

- 27. Heavy Duty, High Impulse, Multiple Spiral Steel Wire Reinforced, Rubber Covered Hydraulic Hose (SAE 100R15)**—This section covers hose for use with petroleum base hydraulic fluids within a temperature range of −40 to +121 °C. Operating temperatures in excess of +121 °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 31.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

- 27.1 Dimensions**—Dimensions and tolerances applicable to this hose are given in Table 31. The inside diameter of the hose shall be concentric with the outside diameter of the hose and the outer surface of the reinforcement within the limits in Table 32.

27.2 Hose Construction—This hose shall consist of an inner tube of oil resistant synthetic rubber, multiple spiral plies of heavy steel wire wrapped in alternating directions, and an oil and weather resistant synthetic rubber cover. A ply or braid of suitable material may be used over or within the inner tube and/or over the wire reinforcement to anchor the synthetic rubber to the wire.

27.3 Qualification—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the tests specified in Table 3, and conform to the requirements of 11.1.

27.4 Inspection Tests—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 31—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R15
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	Rein- force- ment Dia Max	OD Max	Max Working Pressure MPa	Min Burst and Proof Pressure	Min Bend Radius (3)
10	–6	9.3	10.1	20.3	23.3	42	have been	150
12.5	–8	12.3	13.5	24.0	26.8	42	deleted from	200
19	–12	18.6	19.8	32.9	36.1	42	this table	265
25	–16	25.0	26.4	38.9	42.9	42	See para	330
31.5	–20	31.4	33.0	48.4	51.5	42	11.1.2	445
38	–24	37.7	39.3	56.3	59.6	42	and 11.1.4	530

1. Metric Size is in mm (Ref. ISO 4397).
2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.
3. Bend radius measured at inside of bend.

TABLE 32—HOSE CONCENTRICITY (100R15)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD	Concentricity, FIR ID to Reinforcement
Up to 19 mm (–12), included	1.0	0.7
Over 19 mm (–12)	1.3	0.9

28. Compact, High Pressure, One and Two Steel Wire Reinforced, Rubber Covered Hydraulic Hose (SAE 100R16)—This section covers hose for use with petroleum base hydraulic fluids within a temperature range of –40 to +100 °C and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of +100 °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 33.

This hose is not suitable for use with castor oil based and ester based fluids.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

28.1 Foreword—Compact wire braided hydraulic hoses have been increasingly used over the recent years and it is considered that their status in the hydraulic hose field merits the development of an SAE standard.

Hoses of this type are smaller in diameter than two wire braided hoses with similar performance characteristics specified in SAE 100R2, which gives them the ability to operate at smaller bend radii. They are also lighter in weight and their compactness offers advantages when minimal space is available in installations. This hose can be manufactured as either a one wire braid or a two wire braid design and the hose shall be identified as to the number of braids.

28.2 Dimensions—Dimensions and tolerances applicable to this hose are given in Table 33. The inside diameter of the hose shall be concentric with the outside diameter of the hose and the outer surface of the reinforcement within the limits in Table 34.

28.3 Hose Construction—This hose shall consist of an inner tube of oil resistant synthetic rubber, steel wire reinforcement according to hose design (one or two braids), and an oil and weather resistant synthetic rubber cover. A ply or braid of suitable material may be used over the inner tube and/or over the wire reinforcement to anchor the synthetic rubber to the wire.

28.4 Qualification—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the tests specified in Table 3, and conform to the requirements of 11.1.

28.5 Inspection Tests—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 33—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R16 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	Rein- force- ment Dia Max	OD Max	Cover Thickness ⁽³⁾ Min	Cover Thickness ⁽³⁾ Max	Max Working Pressure MPa	Max Working Pres- sure Types S ⁽⁴⁾ MPa	Min Burst and Proof Pressure have	Min Bend Radius (5)
6.3	-4	6.2	7.0	12.3	14.5	0.8	1.5	35	40.0	been	50
8	-5	7.7	8.5	13.3	15.7	0.8	1.5	29.7	35.0	deleted	55
10	-6	9.3	10.1	15.9	18.8	0.8	1.5	28	33.0	from	65
12.5	-8	12.3	13.5	19.0	22.0	0.8	1.5	24.5	27.5	this table	90
16	-10	15.5	16.7	22.5	25.4	0.8	1.5	19.2	25.0	See para	100
19	-12	18.6	19.8	26.3	29.0	0.8	1.5	15.7	21.5	11.1.2	120
25	-16	25.0	26.4	34.0	36.6	0.8	1.5	14	16.5	and 11.1.4	150
31.5	-20	31.4	33.0	41.9	44.3	1.0	2.0	11.3	12.5		210

1. Metric Size is in mm (Ref. ISO 4397).

2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.

3. Cover thickness shall be measured by means of a dial indicator depth gage having a rounded foot placed parallel to the hose, bridging a groove obtained by stripping a 12.5 to 25 mm width of cover from the hose. A mandrel should be placed in the hose bore to insure freedom from misalignment.

4. Type S hose has the same working pressures as ISO 11237-1 Type 2SC.

5. Bend radius measured at inside of bend.

TABLE 34—HOSE CONCENTRICITY (100R16)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD	Concentricity, FIR ID to Reinforcement
Up to 6.3 mm (–4), included	0.8	0.5
Over 6.3 mm (–4) to 19 mm (–12), included	1.0	0.7
Over 19 mm (–12)	1.3	0.9

- 29. Compact, 21 MPa Maximum Working Pressure, One and Two Steel Wire Reinforced, Rubber Covered Hydraulic Hose (SAE 100R17)**—This section covers hose for use with petroleum base hydraulic fluids within a temperature range of –40 to +100 °C and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of +100 °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 35.

This hose is not suitable for use with castor oil based and ester based fluids.

- 29.1 Foreword**—Compact wire braided hydraulic hoses have been increasingly used over the recent years and it is considered that their status in the hydraulic hose field merits the development of an SAE standard.

Hoses of this type are smaller in diameter than one and two wire braided hoses with similar performance characteristics specified in SAE 100R1 and SAE 100R2, which gives them the ability to operate at smaller bend radii. They are also lighter in weight and their compactness offers advantages when minimal space is available in installations. This hose can be manufactured as either a one wire braid or a two wire braid design and the hose shall be identified as to the number of braids.

- 29.2 Dimensions**—Dimensions and tolerances applicable to this hose are given in Table 35. The inside diameter of the hose shall be concentric with the outside diameter of the hose and the outer surface of the reinforcement within the limits in Table 36.

- 29.3 Hose Construction**—This hose shall consist of an inner tube of oil resistant synthetic rubber, steel wire reinforcement according to hose design (one or two braids), and an oil and weather resistant synthetic rubber cover. A ply or braid of suitable material may be used over the inner tube and/or over the wire reinforcement to anchor the synthetic rubber to the wire.

- 29.4 Qualification**—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the tests specified in Table 3, and conform to the requirements of 11.1.

- 29.5 Inspection Tests**—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 35—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R17 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	Rein- force- ment Dia Max	OD Max	Cover Thickness ⁽³⁾ Min	Cover Thickness ⁽³⁾ Max	Max Working Pressure MPa	Min Burst and Proof Pressure	Min Bend Radius (4)
5	-3	4.6	5.4	10.1	11.6	0.8	1.5	21	have been	45
8	-5	7.7	8.5	13.0	15.0	0.8	1.5	21	deleted	55
10	-6	9.3	10.1	15.0	17.0	0.8	1.5	21	from this	65
12.5	-8	12.3	13.5	18.8	21.1	0.8	1.5	21	table	90
									See para	
16	-10	15.5	16.7	23.6	25.9	0.8	1.5	21	11.1.2	100
19	-12	18.6	19.8	27.7	30.3	0.8	1.5	21	and 11.1.4	120
25	-16	25.0	26.4	35.6	38.6	0.8	2.2	21		150

1. Metric Size is in mm (Ref. ISO 4397).

2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.

3. Cover thickness shall be measured by means of a dial indicator depth gage having a rounded foot placed parallel to the hose, bridging a groove obtained by stripping a 12.5 to 25 mm width of cover from the hose. A mandrel should be placed in the hose bore to insure freedom from misalignment.

4. Bend Radius measured at inside of bend.

TABLE 36—HOSE CONCENTRICITY (100R17)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD	Concentricity, FIR ID to Reinforcement
6.3 mm (-4)	0.8	0.4
Over 6.3 mm (-4) to 19 mm (-12), included	1.0	0.7
Over 19 mm (-12)	1.3	0.9

- 30. 21 MPa Thermoplastic Hydraulic Hose (SAE 100R18)**—This section covers thermoplastic hose for use with petroleum base and synthetic hydraulic fluids within a temperature range of -40 to +93 °C, and with water base hydraulic fluids within the temperature ranges agreed upon by the manufacturers of both the hose and the fluid. Operating temperatures in excess of +93 °C with petroleum base hydraulic fluids may materially reduce the life of the hose. Maximum working pressure and minimum bend radius are specified in Table 37.

Electrically nonconductive 100R18 hose is available for use in applications where there is potential of contact with high voltage sources. To be classified as nonconductive, a hose must pass the Electrical Conductivity Test described in 30.4.1. Nonconductive hose is identified by its orange cover and layline.

It should be noted that the detailed specifications which follow shall be supplemented by the general specifications given at the beginning of this document.

- 30.1 Dimensions**—Dimensions and tolerances applicable to this hose are given in Table 37. The inside diameter of the hose shall be concentric with the outside diameter of the hose within the limits in Table 38.

30.2 Hose Construction—This hose shall consist of a thermoplastic inner tube resistant to hydraulic fluids with suitable synthetic fiber reinforcement, and a hydraulic fluid and weather resistant thermoplastic cover.

Nonconductive 100R18 hose shall be identified with an orange cover and appropriate layline. (Reference color, orange chip #22510, Federal Standard 595).

30.3 Connector Compatibility—Connectors for thermoplastic hose may not be interchangeable. Therefore, it is recommended that connectors and hose be properly matched. Connector and/or hose manufacturers shall be consulted for recommendations.

30.4 Qualification—For qualification to this section, hose and/or hose assemblies made therefrom shall comply with the following test and the tests specified in Table 3, and conform to the requirements of 11.1.

30.4.1 ELECTRICAL CONDUCTIVITY TEST (TWO 152 mm FREE HOSE LENGTH CONDITIONED ASSEMBLIES)—The maximum electrical leakage shall not exceed 50 μ A when subjected to 37.5 kV for 5 min. This test shall not be applicable to hose with a pinpricked cover.

30.5 Inspection Tests—Inspection tests specified in 11.2 for bulk hose shall be performed.

TABLE 37—DIMENSIONS AND SPECIFICATIONS FOR SAE 100R18 HOSE
Dimensions are in Millimeters

Metric Size (1)	SAE Dash Size (2)	ID Min	ID Max	OD Max	Max Working Pressure MPa	Min Burst and Proof	Min Bend Radius (3)
5	−3	4.6	5.4	10.8	21	Pressure	30
6.3	−4	6.2	7.0	13.5	21	have been	45
8	−5	7.7	8.5	16.6	21	deleted	50
10	−6	9.3	10.3	18.4	21	from this table	75
12.5	−8	12.3	13.5	22.8	21	See para	90
16	−10	15.5	16.8	27.2	21	11.1.2	125
19	−12	18.6	19.8	31.5	21	and 11.1.4	165
25	−16	25.0	26.4	40.4	21		250

1. Metric Size is in mm (Ref. ISO 4397).
2. SAE Dash Size is equal to the hose ID, expressed in 1/16's of an inch.
3. Bend radius measured at inside of bend.

TABLE 38—HOSE CONCENTRICITY (100R18)
Dimensions are in Millimeters

Hose Size	Concentricity, FIR ID to OD
Up to 6.3 mm (−4), included	0.8
Over 6.3 mm (−4) to 19 mm (−12), included	1.0
Over 19 mm (−12)	1.3

31. Notes

- 31.1 Marginal Indicia**—The change bar (I) located in the left margin is for the convenience of the user in locating areas where revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

PREPARED BY THE SAE FLUID CONDUCTORS AND CONNECTORS TECHNICAL COMMITTEE SC2—
HYDRAULIC HOSE AND HOSE FITTINGS



APPENDIX A

A.1 Table A1 gives rationalized conversion pressures from MPa to psi. These converted equivalent pressures allow for minimum deviation from the mathematically correct conversion, while allowing for the use of the most common available pressures. The conversions were also rationalized to allow the burst pressures to be a minimum of 4 times the maximum working pressures.

TABLE A1—MPa TO PSI CONVERSION TABLE

MPa	psi	MPa	psi	MPa	psi	MPa	psi	MPa	psi
350	50 000	78	11 250	29.7	4 250	9.8	1 400	2.1	300
315	45 000	77	11 000	28	4 000	8.7	1 250	1.7	250
280	40 000	70	10 000	24.5	3 500	8.4	1 200	1.6	225
245	35 000	63	9 000	22.7	3 250	7.8	1 125	1.4	200
210	30 000	61	8 750	22.4	3 200	7	1000	1.25	180
175	25 000	59.5	8 500	21	3 000	6.1	875	1.05	150
168	24 000	56	8 000	20	2 900	5.6	800	1	140
160	23 200	52.5	7 500	19.2	2 750	5.2	750	0.85	125
157	22 500	49	7 000	17.5	2 500	5	725	0.8	112
140	20 000	45.5	6 500	16.8	2 400	4.9	700	0.7	100
122	17 500	43.5	6 250	15.7	2 250	4.3	625	0.6	90
119	17 000	42	6 000	14	2 000	4.2	600	0.5	70
112	16 000	40	5 800	12.2	1 750	3.9	565	0.4	62
98	14 000	38.5	5 500	11.3	1 625	3.5	500	0.4	56
87	12 500	35	5 000	11.2	1 600	2.8	400	0.35	50
84	12 000	33.5	4 800	10.5	1 500	2.6	375	0.3	45
80	11 600	31.5	4 500	10	1 450	2.4	350	0.25	35

APPENDIX B

B.1 Table B1 gives the SAE J517 100R hose codes in accordance with SAE J846.

TABLE B1—HOSE CODES

SAE J517 Hose	Hose Code
100R1 Type A	42
100R1 Type AT	53
100R1 Type S	new
100R2 Type A and B	43
100R2 Type AT and BT	54
100R2 Type S	new
100R3	44
100R4	45
100R5	46
100R6	47
100R7	48
100R8	49
100R9 Type A	50
100R9 Type AT	75
100R10 Type A	51
100R10 Type AT	76
100R11	52
100R12	77
100R13	78
100R14 Type A	79
100R14 Type B	80
100R15	90
100R16	91
100R16 Type S	new
100R17	93
100R18	94

SAE J517 Revised JUL2003

Rationale—In preparation for writing the overdue hard metric rewrite of SAE J517, two fairly new concepts were used that would cause changes to most pages of the standard.

- a. A new method for calculating the equivalent metric conversion to MPa from psi was utilized. This method provides an extremely easy and consistent method of conversion to arrive at rounded metric units using 7 MPa for each 1 000 psi. The resulting MPa pressure is never more than 1.7% higher than the mathematically correct MPa unit when the pressure is higher than 250 psi. All operating pressures of SAE J517 hoses are above 250 psi, except for most sizes of 100R4 and the 76 mm (–48) and larger sizes of 100R5. Therefore all files of previous test results should not be compromised. A new Table 1 showing the new maximum working pressure values in MPa for the SAE J517 hoses was compiled. An Appendix A Table showing the MPa to psi conversion is also provided.
- b. The current SAE J517 standard is 44 pages in length, with at least 12 pages devoted to repeating most of the Qualification Tests and Inspection Tests for each of the SAE 100R hoses. New sections 11.1 and 11.2 have been added to standardize the Qualifications Tests and Inspection Tests at the beginning of the document and thus avoiding the duplication. A new Table 3 was also added which summarizes the Qualification Tests required by each hose type.

This document is the long overdue upgrade of Maximum working pressures in SAE J517, 100R1, 100R2, and 100R16 to match existing ISO standards, 1436 and 11237. A commitment was made in 1999 by the US delegation to TC 45 to match the maximum working pressures of hose types 1SN and 2SN in 1436 by increasing the maximum working pressure of the R1 and R2 and the 2SC hoses in 11237 with the hoses of type R16.

1. The proof and burst pressures are calculated values, to simplify the tables the calculation method has been moved to the beginning of the standard and the specific values removed from the tables. One exception is 100R14 and those values remain in the table.

Relationship of SAE Standard to ISO Standard—Not applicable.

Application—This SAE Standard provides general, dimensional and performance specifications for the most common hoses used in hydraulic systems on mobile and stationary equipment.

The general specifications contained in Section 1 through 12 are applicable to all hydraulic hoses and supplement the detailed specifications for the 100R-series hoses contained in the later sections of this document.

This document shall be utilized as a procurement document only to the extent as agreed upon by the manufacturer and user.

Reference Section

SAE J343—Tests and Procedures for SAE 100R Series Hydraulic Hose and Hose Assemblies

SAE J516—Hydraulic Hose Fittings

SAE J846— Coding Systems for Identification of Fluid Conductors and Connectors

SAE J1176—External Leakage Classifications for Hydraulic Systems

SAE J1273—Recommended Practices for Hydraulic Hose Assemblies

SAE J517 Revised JUL2003

SAE J1401—Road Vehicle—Hydraulic Brake Hose Assemblies for use with Nonpetroleum-Base Hydraulic Fluids (Appendix A, Table A1, Hose Manufacturers Identification Code—Colored Yarn Assignments)

SAE J1475—Hydraulic Hose Fittings for Marine Applications

SAE J1927—Cumulative Damage Analysis for Hydraulic Hose Assemblies

SAE J1942—Hose and Hose Assemblies for Marine Applications

SAE J1942-1—Qualified Hoses for Marine Applications

ASTM D 380—Standard Test Methods for Rubber Hose

ASTM D 471—Standard Test Method for Rubber Property-Effects on Liquids

ASTM D 792—Test Method for Specific Gravity (Relative Density) and Density of Plastics by Displacement

Federal Standard 595—Colors Used in Government Procurement

MIL-H-8446—Hydraulic Fluid, Nonpetroleum Base, Aircraft

MIL-PRF-7808—Lubricating Oil, Aircraft Turbine Engine, Synthetic Base

MIL-PRF-83282—Hydraulic Fluid, Fire Resistant Synthetic Hydrocarbon Base, NATO Code Number H-537

ISO 1402—Rubber and plastics hoses and hose assemblies—Hydrostatic testing

ISO 1436-1—Rubber hoses and hose assemblies—Wire reinforced hydraulic type—Specification

ISO 1817—Rubber vulcanized—Determination of the effect of liquids

ISO 3862-1—Rubber hoses and hose assemblies—Rubber-covered, spiral wire reinforced, hydraulic type—Specification

ISO 3949—Plastics hoses and hose assemblies—Thermoplastics, textile-reinforced, hydraulic type—Specification

ISO 4079—Rubber hoses and hose assemblies—Textile-reinforced hydraulic type—Specification

ISO 4397—Fluid power systems and components—Connectors and associated components—Nominal outside diameters of tubes and nominal inside diameters of hoses

ISO 4671—Rubber and plastic hoses and hose assemblies—Methods of measurement of dimensions

ISO 6803—Rubber or plastic hoses and hose assemblies—Hydraulic pressure impulse test without flexing

ISO 6945—Rubber hoses—Determination of abrasion resistance of the outer cover

ISO 11237-1—Rubber hoses and hose assemblies—Rubber covered, wire braid compact design, hydraulic type specification

Developed by the SAE Fluid Conductor and Connectors Technical Committee SC2—Hydraulic Hose and Hose Fittings

