

(R) Hose Assemblies, Rubber, Hydraulic, Steel Wire Reinforced—Part 1: Procurement Document

1. **Scope**—This SAE Standard covers steel wire reinforced rubber hose assemblies using connectors specified in SAE J516 for use in hydraulic systems using petroleum based hydraulic fluids with maximum working pressures of 1.7 to 42 MPa. See SAE J1754-2, Table 8 for hose operating temperature ranges and identification codes.

NOTE— Working pressure is defined as maximum system pressure.

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.

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

SAE J343—Test and Procedures Hydraulic Hose Assemblies and Hose
SAE J516—Hydraulic Hose Fittings
SAE J517—Hydraulic Hose
SAE J1176—External Leakage Classifications for Hydraulic Systems
SAE J1273—Recommended Practices for Hydraulic Hose Assemblies
SAE J1405—Optional Impulse Test Procedures for Hydraulic Hose Assemblies
SAE J1754-2—Hose Assemblies, Rubber, Hydraulic, Steel Wire Reinforced—Part 2: Ordering Information

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

ASTM B 117—Standard Test Method of Salt Spray (Fog) Testing
ASTM D 380—Methods of Testing Rubber Hose
ASTM D 471—Test Method for Rubber Property - Effect of Liquids

- 2.1.3 ISO PUBLICATIONS—Available from ANSI, 11 West 42nd Street, New York, NY 10036.

ISO4397—Fluid power systems and components—Connectors and associated components—Nominal outside diameters of tubes and nominal inside diameters of hoses
ISO 4406—Hydraulic fluid power—Fluids—Method of coding level of contamination by solid particles

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SAE J1754-1 Revised DEC2001

2.2 Related Publications—The following publications are for information purposes only and are not a required part of this document.

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

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

2.2.2 ISO PUBLICATION—Available from ANSI, 11 West 42nd Street, New York, NY 10036.

ISO3448—Industrial liquid lubricants—ISO viscosity classification

ISO12151-1—Connections for hydraulic fluid power and general use—Hose fittings—Part 1: Hose fittings with ISO 8434-3 o-ring face seal ends

ISO12151-2—Connections for hydraulic fluid power and general use—Hose fittings—Part 2: Hose fittings with ISO 8434-1 24° cone ends

ISO12151-3—Connections for hydraulic fluid power and general use—Hose fittings—Part 3: Hose fittings with ISO 6162 flange ends

ISO12151-4—Connections for hydraulic fluid power and general use—Hose fittings—Part 4: Hose fittings with ISO 6149 metric stud ends

ISO12151-5—Connections for hydraulic fluid power and general use—Hose fittings—Part 5: Hose fittings with ISO 8434-2 37° flare ends

ISO12151-6—Connections for hydraulic fluid power and general use—Hose fittings—Part 6: Hose fittings with ISO 8434-6 60° cone ends

3. Requirements

3.1 Hose Assembly Construction—Hose used in assemblies shall have an elastomeric, oil resistant tube; wire reinforcement; and an elastomeric oil and weather resistant black cover, unless otherwise specified by the purchaser. Connectors shall be permanent and shall be capable of meeting the performance requirements of this standard. For connector material, see SAE J1754-2.

3.2 Dimensions—Hose shall conform to all the dimensions in Tables 1 to 10. Hose concentricity shall be in accordance with Table 11. Connector dimensions shall be per SAE J516. Hose assemblies shall conform to the applicable part standard or engineering drawing. Double bent tube (double elbow) assemblies are not recommended and are considered non-standard due to the detrimental effects of twist on the hose.

TABLE 1—1.7 MPa PRESSURE RATING

Metric Size ⁽¹⁾	SAE Dash Size ⁽²⁾	Maximum Hose Outside Diameter ⁽³⁾ mm	Minimum Burst Pressure (MPa)	Proof Pressure (MPa)	Maximum Working Pressure (MPa)	Minimum Bend Radius ⁽⁴⁾ mm
19	-12	31	6.8	3.4	1.7	240
25	-16	40	6.8	3.4	1.7	305
51	-32	72	6.8	3.4	1.7	635
63	-40	98	6.8	3.4	1.7	760

1. Metric hose size in mm per ISO 4397.

2. SAE hose dash size is equal to hose ID expressed in 1/16's of an inch.

3. Hose OD listed is largest OD of the approved hose materials. If the OD is critical (hose clamping), the OD shall be specified.

4. If a smaller bend radius is required, the bend radius shall be specified.

See Appendix A for rationalized pressure ratings and SAE J1754-2, Table 1 for maximum working pressure identification codes.

SAE J1754-1 Revised DEC2001

TABLE 2—2.8 MPa PRESSURE RATING

Metric Size ⁽¹⁾	SAE Dash Size ⁽²⁾	Maximum Hose Outside Diameter ⁽³⁾ mm	Minimum Burst Pressure MPa	Proof Pressure MPa	Maximum Working Pressure MPa	Minimum Bend Radius ⁽⁴⁾ mm
6.3	-04	17	11.2	5.6	2.8	75
10	-06	21	11.2	5.6	2.8	100
12.5	-08	25	11.2	5.6	2.8	125
19	-12	33	11.2	5.6	2.8	240
25	-16	40	11.2	5.6	2.8	305
31.5	-20	48	11.2	5.6	2.8	420
38	-24	54	11.2	5.6	2.8	510
51	-32	69	11.2	5.6	2.8	635

- Metric hose size in mm per ISO 4397.
 - SAE hose dash size is equal to hose ID expressed in 1/16's of an inch.
 - Hose OD listed is largest OD of the approved hose materials. If the OD is critical (hose clamping), the OD shall be specified.
 - If a smaller bend radius is required, the bend radius shall be specified.
- See Appendix A for rationalized pressure ratings and SAE J1754-2 Table 1 for maximum working pressure identification codes.

TABLE 3—7 MPa PRESSURE RATING

Metric Size ⁽¹⁾	SAE Dash Size ⁽²⁾	Maximum Hose Outside Diameter ⁽³⁾ mm	Minimum Burst Pressure MPa	Proof Pressure MPa	Maximum Working Pressure MPa	Minimum Bend Radius ⁽⁴⁾ mm
12.5	-08	24	28	14	7	180
16	-10	27	28	14	7	200
19	-12	31	28	14	7	240
25	-16	40	28	14	7	305
31.5	-20	53	28	14	7	420
38	-24	59	28	14	7	510
51	-32	72	28	14	7	635
63	-40	98	28	14	7	760

- Metric hose size in mm per ISO 4397.
 - SAE hose dash size is equal to hose ID expressed in 1/16's of an inch.
 - Hose OD listed is largest OD of the approved hose materials. If the OD is critical (hose clamping), the OD shall be specified.
 - If a smaller bend radius is required, the bend radius shall be specified.
- See Appendix A for rationalized pressure ratings and SAE J1754-2, Table 1 for maximum working pressure identification codes.

TABLE 4—14 MPa PRESSURE RATING

Metric Size ⁽¹⁾	SAE Dash Size ⁽²⁾	Maximum Hose Outside Diameter ⁽³⁾ mm	Minimum Burst Pressure MPa	Proof Pressure MPa	Maximum Working Pressure MPa	Minimum Bend Radius ⁽⁴⁾ mm
10	-06	21	56	28	14	125
12.5	-08	24	56	28	14	180
16	-10	29	56	28	14	200
19	-12	33	56	28	14	240
25	-16	41	56	28	14	305
31.5	-20	53	56	28	14	420
38	-24	59	56	28	14	510
51	-32	74	56	28	14	660

- Metric hose size in mm per ISO 4397.
 - SAE hose dash size is equal to hose ID expressed in 1/16's of an inch.
 - Hose OD listed is largest OD of the approved hose materials. If the OD is critical (hose clamping), the OD shall be specified.
 - If a smaller bend radius is required, the bend radius shall be specified.
- See Appendix A for rationalized pressure ratings and SAE J1754-2, Table 1 for maximum working pressure identification codes.

TABLE 5—17.5 MPa PRESSURE RATING

Metric Size ⁽¹⁾	SAE Dash Size ⁽²⁾	Maximum Hose Outside Diameter ⁽³⁾ mm	Minimum Burst Pressure MPa	Proof Pressure MPa	Maximum Working Pressure MPa	Minimum Bend Radius ⁽⁴⁾ mm
6.3	-04	17	70	35	17.5	100
10	-06	23	70	35	17.5	125
12.5	-08	26	70	35	17.5	180
16	-10	29	70	35	17.5	240
19	-12	33	70	35	17.5	280
25	-16	41	70	35	17.5	360
31.5	-20	54	70	35	17.5	420
38	-24	63	70	35	17.5	560
51	-32	77	70	35	17.5	660

- Metric hose size in mm per ISO 4397.
- SAE hose dash size is equal to hose ID expressed in 1/16's of an inch.
- Hose OD listed is largest OD of the approved hose materials. If the OD is critical (hose clamping), the OD shall be specified.
- If a smaller bend radius is required, the bend radius shall be specified.
See Appendix A for rationalized pressure ratings and SAE J1754-2, Table 1 for maximum working pressure identification codes.

TABLE 6—21 MPa PRESSURE RATING

Metric Size ⁽¹⁾	SAE Dash Size ⁽²⁾	Maximum Hose Outside Diameter ⁽³⁾ mm	Minimum Burst Pressure MPa	Proof Pressure MPa	Maximum Working Pressure MPa	Minimum Bend Radius ⁽⁴⁾ mm
5	-03	14	84	42	21	90
6.3	-04	19	84	42	21	100
10	-06	23	84	42	21	125
12.5	-08	26	84	42	21	180
16	-10	29	84	42	21	240
19	-12	33	84	42	21	300
25	-16	41	84	42	21	420
31.5	-20	57	84	42	21	460
38	-24	63	84	42	21	510
51	-32	75	84	42	21	635

- Metric hose size in mm per ISO 4397.
- SAE hose dash size is equal to hose ID expressed in 1/16's of an inch.
- Hose OD listed is largest OD of the approved hose materials. If the OD is critical (hose clamping), the OD shall be specified.
- If a smaller bend radius is required, the bend radius shall be specified.
See Appendix A for rationalized pressure ratings and SAE J1754-2, Table 1 for maximum working pressure identification codes.

TABLE 7—24.5 MPa PRESSURE RATING

Metric Size ⁽¹⁾	SAE Dash Size ⁽²⁾	Maximum Hose Outside Diameter ⁽³⁾ mm	Minimum Burst Pressure MPa	Proof Pressure MPa	Maximum Working Pressure MPa	Minimum Bend Radius ⁽⁴⁾ mm
5	-03	17	98	49	24.5	90
6.3	-04	19	98	49	24.5	100
10	-06	23	98	49	24.5	125
12.5	-08	26	98	49	24.5	180
16	-10	29	98	49	24.5	240
19	-12	38	98	49	24.5	280
25	-16	50	98	49	24.5	360
31.5	-20	52	98	49	24.5	420
38	-24	59	98	49	24.5	510
51	-32	73	98	49	24.5	700

- Metric hose size in mm per ISO 4397.
- SAE hose dash size is equal to hose ID expressed in 1/16's of an inch.
- Hose OD listed is largest OD of the approved hose materials. If the OD is critical (hose clamping), the OD shall be specified.
- If a smaller bend radius is required, the bend radius shall be specified.
See Appendix A for rationalized pressure ratings and SAE J1754-2, Table 1 for maximum working pressure identification codes.

TABLE 8—28 MPa PRESSURE RATING

Metric Size ⁽¹⁾	SAE Dash Size ⁽²⁾	Maximum Hose Outside Diameter ⁽³⁾ mm	Minimum Burst Pressure MPa	Proof Pressure MPa	Maximum Working Pressure MPa	Minimum Bend Radius ⁽⁴⁾ mm
5	-03	17	112	56	28	90
6.3	-04	19	112	56	28	100
10	-06	23	112	56	28	125
12.5	-08	26	112	56	28	180
16	-10	29	112	56	28	240
19	-12	38	112	56	28	280
25	-16	50	112	56	28	360
31.5	-20	52	112	56	28	460
38	-24	59	112	56	28	560
51	-32	73	112	56	28	635

- Metric hose size in mm per ISO 4397.
- SAE hose dash size is equal to hose ID expressed in 1/16's of an inch.
- Hose OD listed is largest OD of the approved hose materials. If the OD is critical (hose clamping), the OD shall be specified.
- If a smaller bend radius is required, the bend radius shall be specified.
See Appendix A for rationalized pressure ratings and SAE J1754-2, Table 1 for maximum working pressure identification codes.

SAE J1754-1 Revised DEC2001

TABLE 9—35 MPa PRESSURE RATING

Metric Size ⁽¹⁾	SAE Dash Size ⁽²⁾	Maximum Hose Outside Diameter ⁽³⁾ mm	Minimum Burst Pressure MPa	Proof Pressure MPa	Maximum Working Pressure MPa	Minimum Bend Radius ⁽⁴⁾ mm
5	-03	17	140	70	35	90
6.3	-04	19	140	70	35	150
10	-06	22	140	70	35	180
12.5	-08	25	140	70	35	230
16	-10	29	140	70	35	250
19	-12	38	140	70	35	310
25	-16	50	140	70	35	360
31.5	-20	52	140	70	35	420
38	-24	59	140	70	35	510
51	-32	73	140	70	35	635

- Metric hose size in mm per ISO 4397.
- SAE hose dash size is equal to hose ID expressed in 1/16's of an inch.
- Hose OD listed is largest OD of the approved hose materials. If the OD is critical (hose clamping), the OD shall be specified.
- If a smaller bend radius is required, the bend radius shall be specified.
See Appendix A for rationalized pressure ratings and SAE J1754-2, Table 1 for maximum working pressure identification codes.

TABLE 10—42 MPa PRESSURE RATING

Metric Size ⁽¹⁾	SAE Dash Size ⁽²⁾	Maximum Hose Outside Diameter ⁽³⁾ mm	Minimum Burst Pressure MPa	Proof Pressure MPa	Maximum Working Pressure MPa	Minimum Bend Radius ⁽⁴⁾ mm
10	-06	26	168	84	42	180
12.5	-08	32	168	84	42	230
16	-10	29	168	84	42	240
19	-12	41	168	84	42	280
25	-16	50	168	84	42	360
31.5	-20	52	168	84	42	445
38	-24	59	168	84	42	530

- Metric hose size in mm per ISO 4397.
- SAE hose dash size is equal to hose ID expressed in 1/16's of an inch.
- Hose OD listed is largest OD of the approved hose materials. If the OD is critical (hose clamping), the OD shall be specified.
- If a smaller bend radius is required, the bend radius shall be specified.
See Appendix A for rationalized pressure ratings and SAE J1754-2, Table 1 for maximum working pressure identification codes.

TABLE 11—HOSE CONCENTRICITY

Metric Size ⁽¹⁾	SAE Dash Size ⁽²⁾	I.D. to Reinforcement Concentricity, FIR (mm)	I.D. to O.D. Concentricity, FIR (mm)
Up to 6.3 included	Up to -04 included	0.5	0.8
Over 6.3 through 19 included	Over -04 through -12 included	0.7	1.0
Over 19	Over -12	0.9	1.3

- Metric hose size in mm per ISO 4397.
- SAE hose dash size is equal to hose ID expressed in 1/16's of an inch.

3.3 Hose Classifications—Two classifications of hose are established: Class A and Class B. See Table 12.

Class of hose is determined by type of application, duty cycle, working pressure, pressure surges (spikes) above nominal system pressure, flow velocity, flexing and/or the environment in which it is used. If the hose classification is not obvious (i.e., Class A or Class B) select Class A. See SAE J1273 for more details and consult hose assembly manufacturer for specific applications.

3.3.1 CLASS A—High frequency or severity of flexing and/or pressure impulse cycles. See 4.3.7 for details.

3.3.2 CLASS B—Low frequency or severity of flexing and/or pressure impulse cycles. See 4.3.7 for details.

3.4 Performance—Hose assemblies shall satisfy the performance requirements in 4.3.

3.5 Application Factors—Hydraulic hose assemblies have a finite life. Only careful selection, installation and maintenance will insure the desired service life. Always design hydraulic systems to match hose capabilities (pressure, flow, temperature, flex, etc.) and do not specify unique hose materials unless needed for very special applications. See SAE J1273 Recommended Practices for Hydraulic Hose Assemblies for additional information on application factors.

Among factors to be avoided shall be:

- a. Flexing the hose tighter than the specified minimum bend radius.
- b. Not to be used for vacuum applications.
- c. Twisting, pulling, kinking, or crushing the hose.
- d. Operating above maximum and below minimum temperature.
- e. Exposing the hose to surge pressures above the maximum working pressure.
- f. High fluid velocity in pressure lines generates heat, turbulence, pressure loss, noise, and inner tube erosion. There are no physical benefits from high fluid velocities.
- g. Intermixing hose, connectors or assembly equipment not recommended by the manufacturer or not following the manufacturer's instructions for fabricating hose assemblies.

NOTE— Surge pressures are rapid and transient rises in pressure, and the hose working pressure should allow for these pressure surges (spikes). Surge pressures will not be indicated on many common pressure gages and can best be identified on electronic measuring instruments with a high-frequency response.

3.6 First Time Suppliers—When required by the purchaser, first time suppliers of each hose assembly size may need to supply documentation that products meet the requirements of 4.3.1 through 4.3.9 of this document.

3.7 Age Control—Shelf life of rubber hose in bulk form or in hose assemblies passing visual inspection and proof test is forty quarters (ten years) from the date of vulcanization. Bulk hose and hose assemblies shall be protected from the detrimental effects of ozone, heat, ultra-violet light, moisture or swelling agents such as fuel, solvents or corrosive vapors. Suppliers who assemble from bulk hose and connectors and do not manufacture from raw products shall show proof of compliance to the requirements of this paragraph. Refer to SAE J517 and SAE J1273 for additional information on age control.

3.8 Marking

3.8.1 Each hose assembly shall have the following information permanently and clearly marked on the connector or on a tag permanently attached to the assembly:

- a. Hose assembly manufacturer's name or trademark
- b. Maximum working pressure of the hose assembly
- c. Date of manufacture of the hose assembly.

SAE J1754-1 Revised DEC2001

- 3.8.2 The following information shall be permanently marked on the hose lay line of each assembly per SAE J517 Section 8, if applicable:
- Manufacturer's name or trademark
 - Manufacturer's hose part number
 - Manufacturer's maximum working pressure of the hose
 - Date of hose manufacture (as a minimum must identify the quarter and the year that the hose was manufactured)

NOTE— No mention of the burst pressure or design factor shall be marked on the hose.

3.9 Workmanship—Workmanship shall be of the quality necessary to produce hose assemblies free from all defects that will affect proper form, fit and function in service.

3.10 Cleanliness—Hose assemblies shall meet the cleanliness ISO 4406 Code Number 19 / 16 requirement or cleanliness requirement specified by the purchaser.

4. Tests—SAE J343 unless otherwise specified.

4.1 Responsibility for Tests—Unless otherwise specified in the contract or purchase order, the supplier of the hose assembly is responsible for the performance of all test requirements as specified herein. The supplier of the hose assembly may use his own or any other facilities suitable for the performance of the test requirements unless disapproved by the customer. The customer reserves the right to perform any of the tests specified to assure supplies and services conform to the standard requirements.

4.2 Classification of Tests—Requirements are classified as follows:

- Qualification Tests. Consist of the tests in 4.3.
- Quality Conformance Tests. Consist of the tests in 4.4.

4.2.1 Unless otherwise stated, test quantities shall be in accordance with Table 13 or as specified in the contract or order.

4.2.2 After completion of qualification in accordance with 4.3, subsequent production of hose assemblies of the same dash size produced of the same materials and procedures shall be tested in accordance with 4.4. It is recommended that a complete qualification be accomplished at 3 year intervals.

4.3 Qualification Tests—When specified (see Section 7) the qualification tests within this standard are mandatory.

4.3.1 **PROOF TEST**—All unaged hose assemblies to be used for qualification tests shall be proof tested in accordance with SAE J343 at the specified proof pressure in Tables 1 to 10. There shall be no indication of failure or leakage.

4.3.2 **CHANGE IN LENGTH TEST**—Two unaged hose assemblies of at least 500 mm in length of free hose between hose connectors shall be tested for change in length in accordance with SAE J343 at the specified maximum working pressure in Tables 1 to 10. The hose assembly shall not exceed +2% to -4% change in length for braided hoses and $\pm 2\%$ for spiral hoses.

4.3.3 **BURST TEST**—Two unaged hose assemblies of at least 500 mm in length of free hose between hose connectors shall be burst tested in accordance with SAE J343. There shall be no leakage, hose burst or other indication of failure below the specified minimum burst pressure in Tables 1 to 10.

NOTE— Burst Test is a destructive test. Assemblies which have been subjected to this test shall be destroyed.

SAE J1754-1 Revised DEC2001

4.3.4 COLD BEND TEST—Two unaged hose assemblies shall be cold bend tested in accordance with SAE J343 at –40°C or colder, when specified. Reject any samples with visible cracks or leakage.

NOTE— Cold Bend Test is a destructive test. Assemblies which have been subjected to this test shall be destroyed.

4.3.5 OIL RESISTANCE TEST—The tube and cover shall be tested in accordance with ASTM D 471. Immersions shall be for 70 h in IRM 903 oil at the maximum working temperature of the hose. The volume change of specimens taken from the hose inner tube and cover shall be between 0 and 100%.

4.3.6 OZONE RESISTANCE TEST—Hose shall be tested for resistance of the cover compound to ozone in accordance with the latest issue of ASTM D 380, except that the mandrel shall be a diameter twice the minimum bend radius specified in Tables 1 to 10 and the cover shall be examined at the completion of the test under 7X magnification. Reject any samples with visible cracks.

4.3.7 IMPULSE TEST—Four unaged hose assemblies shall be impulse tested in accordance with SAE J343, and at the percentage stated in Table 12 of the maximum working (operating) pressure in Tables 1 to 10.

TABLE 12—HOSE CLASSIFICATIONS

Hose Classifications	Class A	Class B ⁽¹⁾
Test Pressure	150% of maximum working pressure	133% of maximum working pressure
Impulse Cycles	300 000 without failures or leakage	200 000 without failures or leakage

1. Class B classification is the most commonly used for industry hose assembly duty cycles, but if hose classification is not obvious select Class A.

4.3.7.1 Class A—A cool down test shall also be conducted during the impulse test on Class A hose assemblies in accordance with SAE J1405 Option III. SAE J1176 Class 0 leakage shall be required for Class A hose assemblies.

NOTE— Impulse Test is a destructive test. Assemblies which have been subjected to this test shall be destroyed.

4.3.8 LEAKAGE TEST—Two unaged hose assemblies of at least 500 mm in length of free hose between hose connectors shall be subjected to the leakage test in accordance with SAE J343. There shall be no leakage or evidence of failure.

NOTE— Leakage Test is a destructive test. Assemblies which have been subjected to this test shall be destroyed.

4.3.9 CORROSION RESISTANCE TEST—Two hose connector ends shall be subjected to the salt spray test of ASTM B117 for 96 h. Any appearance of red rust during the 96 h salt spray test shall be considered failure, except for the following:

- a. All internal fluid passages.
- b. Edges such as hex points, serration's and crests of threads where there may be mechanical deformation of the plating or coating typical of mass-produced parts or shipping effects.
- c. Areas where there is mechanical deformation of the plating or coating caused by crimping, flaring, bending and other post-plate metal forming operations.
- d. Areas where the parts are suspended or affixed in the test chamber where condensate can accumulate.

NOTE— Parts manufactured to this standard shall not be cadmium plated. Internal fluid passages shall be protected from corrosion during storage and shipping. Changes in plating may affect torque and require re-qualification, when applicable.

4.4 Quality Conformance Tests

4.4.1 EXAMINATION OF PRODUCT—Each hose assembly shall be examined visually to determine conformance to this standard and the appropriate associated standard parts sheet with respect to the following:

- a. Workmanship
- b. Dimensions
- c. Thread Size
- d. Material
- e. Marking

4.4.2 TEST OF PRODUCT—If required by the purchaser, samples shall be selected at random as specified in Table 13.

Manufacturer of the hose assemblies if required by the customer, will provide certification that the testing has been conducted and the product meets the requirements of 4.4.2. Any nonconformance to 4.4.2 or other customer required testing, must be reviewed and the agreed action implemented in compliance with the customer policy.

- a. Proof Test (see 4.3.1)
- b. Change in Length Test (see 4.3.2)
- c. Burst Test (see 4.3.3)

TABLE 13—SAMPLES IF REQUIRED

PRODUCTION SIZE	NUMBER OF SAMPLES
1 to 10	1
11 to 100	2
101 to 500	3
501 to 1000	4
Greater than 1000	One additional sample shall be selected for each additional 1000 hose assemblies manufactured

4.4.3 OVERALL LENGTH—Unless otherwise specified, assembly length shall be the overall length measured from the extreme end of one fitting to the extreme end of the other, except for O-Ring face seal type and four bolt flange connectors which shall be measured from 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 SAE J517 Figure 3). Tolerances on assembly length shall be as in Table 14.

TABLE 14—TOLERANCES ON ASSEMBLY LENGTH

HOSE ASSEMBLY LENGTH (mm)	TOLERANCE (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 the nearest whole millimeter.

5. **Product Approval**—See SAEJ1754-2 for agreement between purchaser and supplier.
6. **Packaging**—Packaging shall be as specified in the contract or purchase order, or as agreed upon between the purchaser and supplier.
7. **Ordering Data**—The following data shall be required when ordering per this standard:
 - a. Title and date of this document.
 - b. Applicable design parts standard and/or engineering drawing.
 - c. Connector material.
 - d. Quantity.
 - e. When qualification testing is required per 3.6 and 4.3.
 - f. When performance tests are specified per 4.4.2.
 - g. Type of packaging required.
8. **Notes**
- 8.1 **Marginal Indicia**—The change bar (I) located in the left margin is for the convenience of the user in locating areas where technical 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.

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