

INCH-POUND

MIL-DTL-52525F  
12 November 2008  
SUPERSEDING  
MIL-DTL-52525E  
30 June 1998

## DETAIL SPECIFICATION

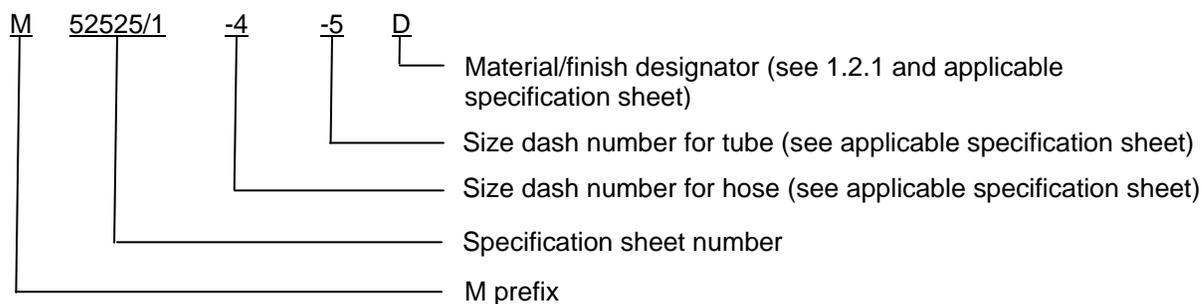
### FITTINGS, HOSE, HYDRAULIC, REUSABLE, FIELD-ATTACHABLE AND CLAMP-HALVES, TO MATE WITH SAE-J517 TYPE HOSES, GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments and  
Agencies of the Department of Defense.

#### 1. SCOPE

1.1 Scope. This specification covers fittings, hose, reusable, field attachable and clamp-halves, to mate with SAE-J517 type hoses, general specification for. The connectors are reusable, field-attachable, hydraulic, 37° flare and 4-bolt split-flange hose fittings, and 4-bolt split-flange clamp-halves, for use with wire reinforced hydraulic hose in accordance with MIL-DTL-52471.

1.2 Part or Identifying Number (PIN). The PIN consists of the letter "M" the specification sheet number, a dash, a number for hose size, a dash, a number for tube size, and a material finish designator.



1.2.1 Plating options. To the users of this document, it is recommended that the use of carbon steel material with cadmium plating be used only when the other materials and finishes specified in this document cannot meet performance requirements.

1.2.2 Clamp-halves. Clamp-halves have the following working pressure rating:

3000 psi (21 MPa) - MIL-DTL-52525/16.

Comments, suggestions, or questions on this document should be addressed to: Commander, Defense Supply Center Columbus, Attn: VAI, P.O. Box 3990, Columbus, Ohio, 43218-3990 or email: to [FluidFlow@dla.mil](mailto:FluidFlow@dla.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

1.2.3 Classification (see 6.7). Fittings are of the following types:

- |             |   |   |
|-------------|---|---|
| Type 100R1  | - | For use with 100R1 single wire braid reinforcement hose.        |
| Type 100R2  | - | For use with 100R2 double wire braid reinforcement hose.        |
| Type 100R10 | - | Discontinued by SAE. See MIL-DTL-52471/6 for replacement hoses. |
| Type 100RE  | - | For use with 4-spiral-wrap reinforcement hose. <sup>1/</sup>    |
| Type 100R12 | - | For use with 4-spiral-wrap reinforcement hose.                  |

<sup>1/</sup> The letter "E" used in type 100RE is not related to SAE J517, but is used in this standard to match hose assembly operating pressures and other performance data called out in this specification and MIL-DTL-52471 and the associated slash sheets for hose and fitting selection.

## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

## FEDERAL STANDARDS

- |               |   |  |
|---------------|---|--|
| FED-STD-H28/8 | - | Screw-Thread Standards For Federal Services Section 8 Dryseal Pipe Threads |
| FED-STD-162   | - | Hose, Rubber, Visual Inspection Guide For                                  |

## DEPARTMENT OF DEFENSE SPECIFICATIONS

- |                 |   |   |
|-----------------|---|---|
| MIL-A-8625      | - | Anodic Coatings for Aluminum And Aluminum Alloys  |
| MIL-DTL-16232   | - | Phosphate Coatings, Heavy, Manganese or Zinc Base (For Ferrous Metals)  |
| MIL-DTL-52471   | - | Hose and Hose Assemblies, Rubber, Hydraulic Pressure Type, General Specification for  |
| MIL-DTL-52471/3 | - | Hose Assemblies, Rubber, Hydraulic Pressure-Type, Type 100RE, Four-Wire Braid Reinforcement or Multiple Wire Braid Steel Wire Reinforced Hose |
| MIL-DTL-52471/6 | - | Hose, Rubber, Hydraulic Pressure-Type, Type 100R10 Four-Spiral-Wrap Reinforcement Hose  |
| MIL-DTL-81706   | - | Chemical Conversion Materials For Coating Aluminum and Aluminum Alloys  |
| MIL-PRF-2104    | - | Lubricating Oil, Internal Combustion Engine, Combat/Tactical Service  |
| QQ-N-281        | - | Nickel-Copper Alloy Bar, Rod, Plate, Sheet, Strip, Wire, Forgings, and Structural and Special Shaped Sections                                 |

(See supplement 1 for list of specification sheets.)

## DEPARTMENT OF DEFENSE STANDARD

MIL-STD-889 - Dissimilar Metals

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

## ASME INTERNATIONAL

ASME B1.1 - Unified Inch Screw Threads (UN and UNR Thread Form)  
 ASME B46.1 - Surface Texture (Surface Roughness, Waviness, and Lay)

(Copies of these documents are available online at <http://www.asme.org> or from the ASME International, Three Park Avenue, New York, NY 10016-5990.)

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes  
 ASTM A564/A564M - Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes  
 ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus  
 ASTM B164 - Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire  
 ASTM B166 - Standard Specification for Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, and N06045)\* and Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS N06617) Rod, Bar, and Wire  
 ASTM B487 - Standard Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of a Cross Section  
 ASTM B499 - Standard Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals  
 ASTM B564 - Standard Specification for Nickel Alloy Forgings  
 ASTM B567 - Standard Test Method for Measurement of Coating Thickness by the Beta Backscatter Method  
 ASTM B568 - Standard Test Method for Measurement of Coating Thickness by X-Ray Spectrometry  
 ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel  
 ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel  
 ASTM B748 - Standard Test Method for Measurement of Thickness of Metallic Coatings by Measurement of Cross Section with a Scanning Electron Microscope  
 ASTM F1136 - Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners

(Copies of these documents are available online at <http://www.astm.org> or from the ASTM International, P.O. Box C700, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

MIL-DTL-52525F

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

- ISO 17025 - General requirements for the competence of testing and calibration laboratories

(Copies of these documents are available online at <http://www.iso.ch> or from the International Organization for Standardization American National Standards Institute, 11 West 42<sup>nd</sup> Street, 13<sup>th</sup> Floor, New York, NY 10036.)

NCSL INTERNATIONAL

- NCSL Z540.3 - Requirements for the Calibration of Measuring and Test Equipment

(Copies of these documents are available online at <http://www.ncsli.org> or from NCSL International 2995 Wilderness Place, Suite 107 Boulder, Colorado 80301-5404)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

- SAE-AMS-A-22771 - Aluminum Alloy Forgings, Heat Treated
- SAE-AMS-QQ-A-200/8- - Aluminum Alloy 6061, Bar, Rod, Shapes, Tube, and Wire, Extruded
- SAE-AMS-QQ-A-225/8- - Aluminum Alloy 6061, Bar, Rod, and Wire, and Special Shapes; Rolled, Drawn, or Cold Finished
- SAE-AMS-QQ-A-225/9- - Aluminum Alloy 7075, Bar, Rod, Wire, and Special Shapes; Rolled, Drawn, or Cold Finished
- SAE-AMS-QQ-A-367 - Aluminum Alloy Forgings
- SAE-AMS-QQ-P-416 - Plating, Cadmium (Electrodeposited)
- SAE-AMS2417 - Plating, Zinc-Nickel Alloy
- SAE-AMS4124 - Aluminum Alloy, Rolled or Cold Finished Bars, Rods, and Wire 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7075-T7351) Solution Heat Treated, Stress Relieved by Stretching, and Overaged
- SAE-AMS4127 - Aluminum Alloy, Forgings and Rolled or Forged Rings (6061-T6) Solution and Precipitation Heat Treated
- SAE-AMS2451/5 - Plating, Brush, Chromium Hard Deposit, Trivalent
- SAE-AMS2451/9 - Plating, Brush, Zinc-Nickel Low Hydrogen Embrittlement
- SAE-AMS2486 - Conversion Coating of Titanium Alloys Fluoride-Phosphate Type
- SAE-AMS2488 - Anodic Treatment - Titanium and Titanium Alloys Solution pH 13 or Higher
- SAE-AMS2700 - Passivation of Corrosion Resistant Steels
- SAE-AMS4141 - Aluminum Alloy Die Forgings 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7075-T73) Solution and Precipitation Heat Treated
- SAE-AMS4928 - Titanium Alloy Bars, Wire, Forgings, Rings, and Drawn Shapes 6Al - 4V Annealed
- SAE-AMS5639 - Steel, Corrosion-Resistant, Bars, Wire, Forgings, Tubing, and Rings 19Cr - 10Ni Solution Heat Treated
- SAE-AMS5643 - Steel, Corrosion-Resistant, Bars, Wire, Forgings, Tubing, and Rings 16Cr - 4.0Ni - 0.30Cb - 4.0Cu Solution Heat Treated, Precipitation Hardenable
- SAE-AMS5645 - Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing, and Rings 18Cr - 10Ni - 0.40Ti (SAE 30321) Solution Heat Treated
- SAE-AMS5647 - Steel, Corrosion-Resistant, Bars, Wire, Forgings, Tubing, And Rings 19Cr - 9.5Ni Solution Heat Treated
- SAE-AMS5743 - Steel, Corrosion and Heat-Resistant, Bars and Forgings 15.5CR - 4.5NI - 2.9MO - 0.10N Solution Heat Treated, Sub-Zero Cooled, Equalized, and Over-Tempered

MIL-DTL-52525F

SAE-AMS6370	-	Steel, Bars, Forgings, and Rings 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)
SAE-AMS6382	-	Steel, Bars, Forgings, and Rings 0.95Cr - 0.20Mo (0.38 - 0.43C) (SAE 4140) Annealed
SAE-AS4841	-	Fittings, 37 Degree Flared, Fluid Connection
SAE-AS28775	-	Packing, Preformed, Hydraulic, +275 Degrees F ("O"Ring)
SAE-J343	-	Test and Test Procedures for SAE 100R Hydraulic Hose and Hose Assemblies, Standard
SAE-J403	-	Chemical Compositions of SAE Carbon Steels
SAE-J514	-	Hydraulic Tube Fittings
SAE-J515	-	Specification for Hydraulic O-Ring Materials, Properties, and Sizes for Metric and Inch Stud Ends, Face Seal Fitting and Four-Screw Flange Tube Connections
SAE-J516	-	Hydraulic Hose Fittings
SAE-J517	-	Hydraulic Hose
SAE-J518	-	Hydraulic Flanged Tube, Pipe, and Hose Connections, 4-Bolt Split-Flange Type

(Copies of these documents are available online at <http://www.sae.org> or from the SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between requirements of this specification and the specification sheets, the latter shall govern.

3.2 Qualification. Hose connectors and assemblies furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable Qualified Products List (QPL) before contract award (see 4.3 and 6.3).

3.3 Materials. Materials shall be as specified herein and as referenced in other specifications, standards, or other referenced documents. Materials not specified shall be selected by the contractor and shall be free of defects, which adversely affect performance of the finished product.

3.3.1 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials shall be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3.1.1 Used, rebuilt or remanufactured components. Used, rebuilt or remanufactured components, pieces and parts shall not be used in the fittings.

3.3.2 Fitting materials. Fitting materials shall be as specified in table I.

TABLE I. Materials. 1/

Material	Form	Specification	Alloy
Aluminum alloy	Bar	SAE-AMS-QQ-A-200/8	6061-T651
		SAE-AMS-QQ-A-225/8	6061-T6
		SAE-AMS-QQ-A-225/9	7075- T73, T7351
		SAE-AMS4124	7075-T7351
	Forgings	SAE-AMS4127	6061-T6
		SAE-AMS-A-22771	7075-T73, T6, T62, or T651
		SAE-AMS-QQ-A-367	7075-T73
Carbon steel	Bar	SAE-J403	1110, 1120, or 1140
	Forgings		
Chrome-molybdenum steel	Bars	SAE-AMS6370	Alloy 4130
	Forgings	SAE-AMS6382	
		SAE-AMS6370	
Corrosion resistant steel	Bars and forgings	ASTM A276	304, 316, or 321
		ASTM A564/A564M	XM-12 (15-5 PH) UNS S15500 or 603 (17-4 PH) UNS S17400
		SAE-AMS5639	SAE 30304; UNS S30400
		SAE-AMS5645	SAE 30321; UNS S32100
		SAE-AMS5647	304L; UNS S30403
		SAE-AMS5643	17-4PH
		SAE-AMS5743	AM-355
Nickel-copper alloy	Bar	ASTM B164 QQ-N-281	UNS N04400
High-chromium nickel alloy	Bar	ASTM B166	UNS N06690
	Forgings	ASTM B564	
Titanium	Bars	SAE-AMS4928	6Al-4V annealed
	Forgings		

1/ If fittings are to be used on an oxygen hose see 6.5.

3.3.3 Finish. All platings shall be capable of meeting the 96 hour salt spray test in accordance with 4.6.8. Fluid passages, other openings, and internal threads shall not be subject to the plating thickness requirement and may have bare areas provided they are protected with a light film of oil.

3.3.3.1 Steel fitting finish (except corrosion resistant steel).

- a. Cadmium plating. Cadmium plating shall be in accordance with SAE-AMS-QQ-P-416, type and class optional.
- b. Zinc platings.
  - (1) Zinc plating with chromate conversion in accordance with ASTM B633; type II or III, Fe/Zn 5, or ASTM B695, type II, class 5.
  - (2) Zinc plating with colorless passivate in accordance with ASTM B633, type VI, Fe/Zn 5.
  - (3) Zinc plating with colorless passivate in accordance with ASTM B633, type V, Fe/Zn 25.

- (4) Zinc phosphate in accordance with MIL-DTL-16232, type Z and shall be hexavalent chromium free.
- (5) Zinc nickel in accordance with SAE-AMS2417, type 1.
- (6) Zinc aluminum in accordance with ASTM F1136, grade 3, NC.

c. Chemical film. NAVAIR trivalent chromate pretreatment (TCP) in accordance with MIL-DTL-81706, type 2, class A, material form (1 through 6), application method A, B, or C. Example of a PIN: M817062A3C. NAVAIR TCP may be used on a wide variety of metals, including: bare aluminum, anodized aluminum, zinc and zinc alloys, cadmium, corrosion resistant steel, and steel alloys. Aluminum connectors shall not be exposed to any type of heat which may alter the temper.

3.3.3.2 Corrosion resistant steel. Corrosion resistant steel shall be passivated in accordance with SAE-AMS2700, method 1.

3.3.3.3 Aluminum. Aluminum shall be anodized in accordance with MIL-A-8625, type II, class 2.

3.3.3.4 Titanium. Titanium shall be anodized in accordance with SAE-AMS2488, type 2 or fluoride phosphated in accordance with SAE-AMS2486.

3.3.3.5 Nickel-copper alloy. No additional finish.

3.3.3.6 High-chromium nickel alloy. No additional finish.

3.3.3.7 Trivalent Wrenchability. When the finish has been damaged due to poor wrenchability, the surface of the connector shall be touched up using the brush plating process below. The term "trivalent wrenchability" is used to evaluate the ability of the finish to withstand abrasion from an excessive amount of wrenching

- a. Brush plating of hard chromium by electrodeposition shall be in accordance with SAE-AMS2451/5.
- b. Brush plating of medium-hardness, low stress nickel by electrodeposition shall be in accordance with SAE-AMS2451/9.
- c. Brush plating of NAVAIR TCP shall be in accordance with MIL-DTL-81706, type 2, class A, material form 1 through 6, application method B. Example of a PIN: M817062A6B.

3.3.3.8 Cadmium is not recommended. Carbon steel material with cadmium plating shall only be used when other materials and finishes specified in this document cannot meet performance requirements.

3.3.3.9 Plating thickness verification (cadmium and zinc platings). Plating thickness shall be measured in accordance with 4.6.9 and shall meet the requirements of 3.3.3.

3.3.4 Silver solder. Silver solder shall not be used; however, welding or brazing is permitted.

3.3.5 Material deterioration prevention and control. The fittings shall be fabricated from compatible corrosion resistant materials, or shall be treated to prevent corrosion and deterioration that may be encountered in operating and storage environments.

3.3.6 Dissimilar metals. Dissimilar metals shall not be used in intimate contact with each other unless protected against galvanic corrosion. Dissimilar metals and methods of protection are defined in MIL-STD-889.

3.3.7 Identification of materials and finishes. The contractor shall identify materials, finishes and treatments used and shall make this information available upon request to the contracting officer or designated representative.

3.3.8 Color identification. Color identification of the hose connectors shall be in accordance with SAE-AS4841.

3.3.9 Hose assembly. These fittings are used with hose in accordance with MIL-DTL-52471.

3.3.9.1 Type 100R10 discontinued hose assemblies. Reference MIL-DTL-52471 for replacement SAE J517 hoses. Caution: The type 100R10 conversion to SAE-J517 type 100R is based strictly on pressures. Testing of these replacement hoses shall be in accordance with hose type 100RE (MIL-DTL-52471/6), except impulse testing for clamp-halves shall be in accordance with 3.6.5.1.

3.4 Design and construction. The design and construction of the attachable end fittings shall be in accordance with the individual specification sheets as specified in tables II through VI and this specification as applicable. The end fittings shall be designed for connection with MIL-DTL-52471 hose to form flexible hose assemblies and shall meet all the requirements specified therein.

TABLE II. Type 100R1 fittings for 100R1 single wire braid hose.

Specification sheet	Size range inch	Termination	Style	Configuration
MIL-DTL-52525/5	.250 thru 1.250	37° Flare	Screw-on	Straight
MIL-DTL-52525/6	.250 thru 1.000	37° Flare	Screw-on	45° bent tube
MIL-DTL-52525/7	.250 thru 1.000	37° Flare	Screw-on	90° bent tube short drop
MIL-DTL-52525/8	.250 thru 1.000	37° Flare	Screw-on	90° bent tube long drop

TABLE III. Type 100R2 fittings for 100R2 double wire braid hose.

Specification sheet	Size range inch	Termination	Style	Configuration
MIL-DTL-52525/1	.250 thru 2.000	37° Flare	Screw-on	Straight
MIL-DTL-52525/2	.250 thru 1.000	37° Flare	Screw-on	45° bent tube
MIL-DTL-52525/3	.250 thru 1.000	37° Flare	Screw-on	90° bent tube short drop
MIL-DTL-52525/4	.250 thru 1.000	37° Flare	Screw-on	90° bent tube long drop
MIL-DTL-52525/10	.500 thru 2.000	4-bolt split-flange	Screw-on	Straight
MIL-DTL-52525/11	.500 thru 2.000	4-bolt split-flange	Screw-on	45° bent tube
MIL-DTL-52525/12	.500 thru 2.000	4-bolt split-flange	Screw-on	90° bent tube

MIL-DTL-52525F

TABLE IV. Type 100R10 fittings for 100R10 4-wire spiral hose. 1/

Specification sheet	Size range inch	Termination	Style	Configuration
MIL-DTL-52525/9	.750 thru 1.500	37° Flare	Screw-on	Straight
MIL-DTL-52525/13	.750 thru 1.500	4-bolt split-flange	Screw-on	Straight
MIL-DTL-52525/14	.750 thru 1.500	4-bolt split-flange	Screw-on	45° bent tube
MIL-DTL-52525/15	.750 thru 1-1/2	4-bolt split-flange	Screw-on	90° bent tube
MIL-DTL-52525/43 <u>2/</u>	1.000 thru 2.000	4-bolt split-flange	Crimp-on	Straight
MIL-DTL-52525/44 <u>2/</u>	1.000 thru 2.000	4-bolt split-flange	Crimp -on	45° bent tube
MIL-DTL-52525/45 <u>2/</u>	1.000 thru 2.000	4-bolt split-flange	Crimp -on	90° bent tube short drop

1/ 100R10 has been discontinued by SAE. See MIL-DTL-52471/6 for replacement hoses.

2/ Permanent type hose connector.

TABLE V. Type 100RE fittings for 100RE 4-spiral-wrap reinforcement hose.

Specification sheet	Size range inch	Termination	Style	Configuration
MIL-DTL-52525/31	.750 and 1.000	37° Flare	Screw-on	Straight
MIL-DTL-52525/32	.750 and 1.000	37° Flare	Screw-on	45° bent tube
MIL-DTL-52525/33	.750 and 1.000	37° Flare	Screw-on	90° bent tube
MIL-DTL-52525/34	.750 and 1.000	4-bolt split-flange	Screw-on	Straight
MIL-DTL-52525/35	.750 and 1.000	4-bolt split-flange	Screw-on	45° bent tube
MIL-DTL-52525/36	.750 and 1.000	4-bolt split-flange	Screw-on	90° bent tube

TABLE VI. Type 100R12 fittings for 100R12 4-spiral-wrap reinforcement hose.

Specification sheet	Size range inch	Termination	Style	Configuration
MIL-DTL-52525/37	.750 and 1.000	37° Flare	Screw-on	Straight
MIL-DTL-52525/38	.750 and 1.000	37° Flare	Screw-on	45° bent tube
MIL-DTL-52525/39	.750 and 1.000	37° Flare	Screw-on	90° bent tube
MIL-DTL-52525/40	.750 and 1.000	4-bolt split-flange	Screw-on	Straight
MIL-DTL-52525/41	.750 and 1.000	4-bolt split-flange	Screw-on	45° bent tube
MIL-DTL-52525/42	.750 and 1.000	4-bolt split-flange	Screw-on	90° bent tube

3.4.1 Tools. The fittings shall couple to and uncouple from the hose and shall assemble to and disassemble from mating fittings and surfaces without special tools.

3.4.1.1 Wrenching. Large external sections of the fitting envelope that adjoin relatively smaller sections shall be contoured to provide clearance for commercial automotive-type hand wrenches. The distance across wrench flats (hexagon or other) shall be in multiples of 1/16-inch. Tolerances shall not exceed the tolerances across flats for the regular hexagon head bolt nearest the fitting wrench flat size specified in SAE-J516.

3.4.2 Swivel nuts. Swivel nut shall turn freely by hand after installed.

3.4.3 37° flare female swivel. This is an SAE-J516 mechanical seal design. The female swivel mates with a male 37° flare. SAE-J516 allows an optional swivel design, but they shall meet the mating, sealing, pressure, and mechanical requirements of this specification.

3.4.4 4-bolt split-flange fittings. 4-bolt split-flange fittings shall be furnished with clamp-halves in accordance with MIL-DTL-52525/16, and capscrews, and lockwashers in accordance with MIL-DTL-52525/17. O-rings shall be in accordance with SAE-J515 or SAE-AS28775, see 6.8.

3.4.5 Flange head. The flange head for 4-bolt split-flange fittings shall be in accordance with SAE-J518, standard series, as specified in table VII.

TABLE VII. Flange clamp.

Dash size	SAE-J518 flange clamp <sup>1/</sup>
-3	SAE J518/1-03-0562
-4	SAE J518/1-04-0562
-6	SAE J518/1-06-0562
-8	SAE J518/1-08-0562
-12	SAE J518/1-12-0562
-16	SAE J518/1-16-0562
-20	SAE J518/1-20-0562
-24	SAE J518/1-24-0562
-32	SAE J518/1-32-0562

<sup>1/</sup> Finish designator is omitted.

3.4.6 Clamp-halves. When a fitting terminates in a 4-bolt split-flange head, each fitting shall be accompanied by clamp-halves, capscrews, and lockwashers in accordance with MIL-DTL-52525/17. O-rings shall be in accordance with SAE-J515 or SAE-AS28775, see 6.8. Four-bolt split-flange clamp-halves shall be furnished in pairs.

3.4.7 Threads internal. Threads are class 2B internal threads. The class 2B diameters apply after plating. Internal threads shall be in accordance with SAE-J516, FED-STD-H28/8, and ASME B1.1. Internal threads shall be countersunk as specified in the dimensional tables. The design of the threads that grip the hose are optional.

3.4.7.1 Thread concentricity and pitch mating concentricity. Thread concentricity tolerance and pitch mating concentricity shall be held and gaged in accordance with SAE-J514.

3.5 Examination of product. The fitting shall conform to the design and construction (see 3.3), materials and finishes (see 3.6), identification markings (see 3.7) and workmanship (see 3.9) specified herein and in the applicable specification sheets, when examined as specified in 4.6.1.

### 3.5.1 Surfaces.

3.5.1.1 Machined surfaces. Machined surfaces of fittings and clamp-halves shall be free of burrs and longitudinal tool marks. Unless a finer finish is specified in the applicable specification sheet, sealing surfaces shall be smooth, except that annular tool marks up to 100 $\mu$ in (2.54 $\mu$ m) roughness-height-rating (Ra) as defined in ASME B46.1, will be acceptable. All other machined surfaces shall not exceed 250 $\mu$ in (5.08  $\mu$ m) Ra. The arithmetical average values shall be interpreted in accordance with ASME B46.1.

3.5.1.2 Forgings. Un-machined surfaces such as forging surfaces and bar stock flats shall be free of cracks, laps, and seams except for forging parting lines.

3.5.1.3 Castings. Casting shall be sound and free from blowholes and other visible defects.

3.5.1.4 Welds. Bent angle fittings manufactured by welds shall be free from pits, blisters, blowholes, slivers, and laminations.

3.6 Performance. The fittings shall meet the following performance requirements. When hose assemblies are required for testing, the fittings shall be assembled on hose in accordance with MIL-DTL-52471.

3.6.1 Reusability. The fittings when tested in 4.6.2 shall be capable of withstanding two cycles of assembly to hose, proof pressure, and disassembly without evidence of leakage, rupture, detachment, or deformation that prevents disassembly and reassembly. The fittings shall meet all provisions of this specification when assembled to a third length of hose.

3.6.2 Low temperature. Fittings when low temperature tested in 4.6.3 and while attached to the hose and while at a temperature of -40°F (-40°C), shall withstand bending of the hose to its minimum bend radius, in not less than 8 or more than 12 seconds without evidence of leakage, rupture, slippage, or detachment.

3.6.3 Proof pressure. The hose assembly when proof pressure tested in 4.6.4 shall be capable of withstanding a pressure equal to twice the maximum working pressure specified in the applicable specification sheet without evidence of leakage, slippage, rupture, deformation, or detachment from the hose.

3.6.4 Burst pressure. Hose assemblies when burst pressure tested in 4.6.5 shall be capable of withstanding a pressure equal to four times the maximum working pressure specified in the applicable specification sheet without evidence of leakage, slippage, rupture, deformation, or detachment from the hose.

3.6.4.1 Burst pressure for clamp-halves. Clamp-halves when burst pressure tested in 4.6.5.1 shall be capable of withstanding the applicable burst pressure specified in MIL-DTL-52525/16 without evidence of leakage, rupture, detachment, or deformation.

3.6.5 Impulse. Hose assemblies when impulse tested in 4.6.6 and after being subjected to a temperature of 212°F (100°C) for 24 hours, shall be capable of withstanding an impulse pressure for the number of cycles specified in table VIII without evidence of leakage, rupture, detachment, slippage, or deformation that prevents disassembly or reassembly.

TABLE VIII. Impulse cycles.

Type of fitting	Number of impulse cycles
100R1	150,000
100R2	150,000
100R10 <u>1/</u>	300,000
100RE <u>2/</u>	500,000
100R12	500,000

1/ 100R10 has been discontinued by SAE (see MIL-DTL-52471/3 for replacement hoses).

2/ See [table II](#).

3.6.5.1 Impulse testing for clamp-halves. Clamp-halves when impulse tested in 4.6.6.1 shall be capable of withstanding 300,000 impulse cycles without evidence of leakage, rupture, detachment, or deformation.

3.6.6 Overtightening torque. 37° flare-style fittings when subjected to overtightening torque in 4.6.7 shall be capable of withstanding 15 applications of overtightening torque of the swivel nut to the value shown on the applicable specification sheet. The overtightening torque shall not result in distortion which prevents freely turning the swivel nut by hand. The overtightening torque shall not cause damage to the 37° flare seat that prevents sealing.

3.6.7 Salt spray (steel fittings only). When tested in 4.6.8 the fittings shall show no evidence of corrosion after 96 hours of salt spray.

3.7 Marking. Marking shall include the manufacturer's name, CAGE, or trademark, size, and hose identifier. Marking shall be applied directly to a visible surface of the assembled fitting by laser, metal stamping, forging, casting, or molding. The marking may be applied in any order. Location of marking shall minimize the possibility of removal or defacement of part identification, by normal wear.

<u>Hose identifier marking</u>	<u>Type hose</u>	<u>Hose construction</u>
R1	100R1	Single wire braid reinforcement hose
R2	100R2	Double wire braid reinforcement hose.
RE	100RE	4-spiral-wrap reinforcement hose.
R12	100R12	4-spiral-wrap reinforcement hose

3.8 Instruction sheet. Each fitting and clamp-halves shall be accompanied by an instruction sheet. The instruction sheet shall detail hose end preparation, assembly to and disassembly from hose and mating fittings, and required torques. When 4-bolt split-flange clamp-halves are furnished, the instruction sheet shall include the information required to attach the clamp-half to a port face.

3.9 Workmanship. The fittings and clamp-halves shall be examined for the following defects as specified in table IX.

TABLE IX. Workmanship defects.

Examination	Requirement paragraph
Type, size, termination, style, or configuration not in conformance with the applicable individual specification sheet.	3.1
Machined surfaces	3.5.1.1
Castings	3.5.1.2
Welds	3.5.1.3
Material not as specified	3.3.2
Finish not as specified	3.3.3
Threads not as specified	3.1 and 3.4.7
Materials, when applicable, are not resistant to corrosion and deterioration or treated to be resistant to corrosion and deterioration for the applicable storage and operating environments	3.3.5 and 3.3.6
Dissimilar metals are not treated or effectively insulated from each other	3.3.6
Contractor does not have documentation available for identification of material, material finishes or treatment	3.3.7
Used, rebuilt or remanufactured components, pieces, or parts incorporated in the fittings	3.3.1.1
Silver solder used in fabrication	3.3.3
Weld and braze joints shall be free of pits, blisters, blowholes, slivers, and laminations	3.5.1.4
Flange head not as specified	3.1 and 3.4.5
O-ring, capscrews, or lockwashers missing or not as specified	3.4.4 or 3.4.6
Clamp-halves not furnished in pairs	3.4.6
Marking missing, illegible, or not as specified	3.7
Instruction sheets not complete or missing	3.8
Special tools required for assembly	3.4.2

#### 4. VERIFICATION

4.1 Classification of inspection. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.3).
- b. Conformance inspection (see 4.4).

4.2 Responsibility for compliance. All items shall meet all requirements of sections 3, 4, and 5. The inspections set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2.1 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality and quantity to permit performance of the required inspection shall be used. The establishment and the maintenance of a calibration system to control the accuracy of all test and measuring equipment shall be in accordance with ISO 17025 and NCSL Z540.3 as applicable.

4.3 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government (see 6.3) on sample units produced with equipment and procedures normally used in production. Use of alternate materials, plating, and processes shall be identified in the product test documentation (see 3.3.7).

4.3.1 Inspections. Unless otherwise specified herein, all inspections shall be performed in accordance with the test conditions specified in the SAE-J343.

4.3.1.1 Inspection conditions. Unless otherwise specified (see 6.2), all inspections shall be conducted under the following ambient conditions: 77°F ±15°F (25°C ±8°C), ambient pressure of 28.5 (+2, -3) inches of mercury (95 +7, -10 kilopascal), and 50 ±30% relative humidity.

4.3.1.2 Materials inspection. Materials inspection shall consist of verification that the materials shown in table I are used in fabricating hose connectors and connector assemblies described in this specification.

4.3.2 Test plans. Test plans shall be prepared and submitted in accordance with the requirements of the qualification activity. The method of qualification proposed by the contractor is subject to the approval of the qualifying activity. Manufacturers shall discuss with the qualifying activity the test specimens and test plans. These plans shall state specifically the component requirement to be verified during the test, such as test fixtures, setup, conditions, and identification of the successor failure criteria shall be included as appropriate.

4.3.2.1 Test assembly preparation. Test specimens (hose assemblies) shall be assembled in accordance with the fitting manufacturer's instruction sheet. Test specimens shall be marked with white ink, on the hose, at the skirt of the fitting.

4.3.2.2 Qualification reports. Qualification reports shall be submitted in accordance with requirements of the qualifying activity. As a minimum manufacturers shall submit a report identifying test specimens, and test results.

4.3.2.3 Samples for qualification. Samples for qualification shall be representative of the products proposed to be furnished to the Government. Samples shall be of (applicable phrase example: one type and nominal size of hose and shall be of the quantity and lengths) specified in the applicable test method.

4.3.2.4 Qualification inspection routine. Fittings and 4-bolt split-flange clamp-halves shall be tested as specified in table X in the order shown. Failure of any test shall be cause for rejection (see 6.3).

4.3.2.4.1 Clamp-halves, 4-halves, 4-bolt split-flange. When only 4-bolt split-flange clamp-halves are to be qualified, four clamp-halves shall be burst pressure tested in accordance with 4.6.5 and an additional four clamp-halves shall be impulse tested in accordance with 4.6.6.

4.3.2.5 Qualification by similarity. Qualification by similarity for any size, or any slash sheet, associated with MIL-DTL-52471 may be requested by any manufacturer already listed on QPL-52525. The qualifying activity will review the requests based on similarity of the requested size and slash sheet to those already listed on QPL-52525. Similarity will be evaluated based on criteria such as test data, materials, manufacturing equipment, manufacturing processes, or other relevant criteria.

4.3.2.6 Samples for qualification. Samples for qualification shall be as shown in table X.

TABLE X. Qualification inspection.

Schedule		Test	Requirement paragraph	Test paragraph	Number of specimens
Test number	Sequence				
1	N/A	Visual inspection	3.1, 3.3, 3.3.6, 3.7, and 3.9	4.6.1	All
2	N/A	Verification of plating thickness <u>1/</u>	3.3.3.9	4.6.9	2 minimum
3	1	Reusability	3.6.1	4.6.2	4
	2 <u>2/</u>	Proof pressure	3.6.3	4.6.4	
	3	Low temperature	3.6.2	4.6.3	
	4	Impulse	3.6.5	4.6.6	
4 <u>1/</u>	1	Reusability	3.6.1	4.6.2	4
	2 <u>2/</u>	Burst pressure	3.6.4	4.6.5 and 4.6.5.1 <u>3/</u>	
5	1	Reusability	3.6.1	4.6.2	4
	2	Impulse	3.6.5	4.6.6 and 4.6.6.1	
6 <u>4/</u>	1	Overtightening torque	3.6.6	4.6.7	4
	2	Proof pressure	3.6.3	4.6.4	
7	N/A	Salt spray	3.6.7	4.6.8	2 minimum

1/ Test report may be supplied by plating manufacturer.

2/ The burst pressure test may be performed on the low temperature specimens instead of the proof test, in which case separate burst test specimens will not be required and test no. 4 need not be run.

3/ Applicable when fittings with attached parts are being qualified.

4/ Applicable when 37° flare fittings are to be supplied.

4.3.3 Failures. One or more failures shall be cause for refusal to grant qualification.

4.4 Conformance inspection.

4.4.1 Sampling inspections. For manufacturers that have successfully passed qualification inspections the manufacturer shall perform inspection of the hose connectors and connector assemblies specified in table XI. Sampling shall be in accordance with 4.4.3.

TABLE XI. Sampling inspections.

Type	Requirement paragraph	Test method
Visual inspection	3.1, 3.3, 3.3.6, 3.7, and 3.9	4.6.1
Verification of plating thickness <u>1/</u>	3.3.3.9	4.6.9

1/ Test report may be supplied by plating manufacturer.

4.4.2 Inspection lot. An inspection lot shall consist of all units of one type and PIN from an identifiable production period, from one manufacturer, submitted at the same time for acceptance.

4.4.3 Sampling plan (individual inspections). Table XI tests shall be performed on a production lot basis. Samples shall be selected as specified in table XII. If one or more defects are found, the lot shall be screened for that particular defect and defective parts removed. A new sample of parts shall be selected as specified in table XII and all sampling inspections, table XI, again performed. If one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification.

TABLE XII. Lot and sample size.

Lot size	Sample size
2 to 5	100 percent
6 to 150	5
151 to 1,200	20
1,201 to 10,000	32
10,001 to 35,000	50
35,001 to 500,000	80
500,001 and over	125

4.4.4 Periodic 1 inspections. Periodic 1 testing shall be performed as specified in table XIII.

4.4.4.1 Periodic 1 sampling. Sampling shall be on 3 connector assemblies (6 fittings) each size of each specification at least once per year regardless of the total number of fittings produced, see 4.4.5.2. The only exception is that Periodic 1 tests do not need to be performed for a specific size of a specific specification if there has been no production during the past year for that size and specification. At least three of the six fittings will be of the greatest bend angle produced during the period. The six fittings selected will be as representative as possible of those produced during the period in terms of the fitting materials (example: all steel fittings, combination steel and aluminum fittings, etc.) and joint configurations (one piece, brazed joint, welded joint, mechanical joint, etc.).

TABLE XIII. Periodic 1 inspections. 1/

Test	Requirement paragraph	Test method
Proof pressure	3.6.3	4.6.4
Burst pressure	3.6.4	4.6.5 and 4.6.5.1

1/ If there are no reported failures after two consecutive intervals then periodic testing can be done at 24 months intervals. If there are no reported failures after the next 24 month interval, then periodic testing can be done at 36 months intervals.

4.4.5 Periodic 2 inspections. Periodic 2 testing shall be performed as specified in table XIV.

4.4.5.1 Periodic 2 sampling. Sampling shall be on 2 fittings of each specification at least once per year regardless of the total number of fittings produced, see 4.4.5.2. The only exception is that Periodic 2 tests do not need to be performed for a specific specification if there has been no production during the past year for that specification. The fittings may be of any bend angle and joint configuration. The two fittings selected for each specification shall be as representative as possible of the metals used for the threaded parts if the parts have been produced from more than one type of metal (example: Stainless steel threads, and carbon steel threads, etc.). The size of the two fittings shall be determined based on the size of the fittings produced during the period and based on an engineering decision of the size produced that would be most likely to fail if there was a defect.

4.4.5.2 Reduced test frequencies P1 and P2. If there have been no reported failures after two consecutive intervals, than periodic testing, with the written approval of the Qualifying Activity, can be done at 24 months intervals. If there are no reported failures after the next 24 month interval, than periodic testing, with the written approval of the Qualifying Activity, can be done at 36 months intervals. If the design, material, construction, or processing of the part is changed, or if there are any quality problems or failures, the Qualifying Activity may require resumption of the original test frequency.

TABLE XIV. Periodic 2 inspection. 1/

Test	Requirement paragraph	Test method
Overtightening torque	3.6.6	4.6.7

1/ If there are no reported failures after two consecutive intervals then periodic testing can be done at 24 months intervals. If there are no reported failures after the next 24 month interval, then periodic testing can be done at 36 months intervals.

4.4.6 Nonconformance. If a sample fails to pass any periodic inspection as specified in tables XIII, and XIV, the manufacturer shall immediately notify the qualifying activity of such failure. The manufacturer shall take corrective action on materials or processes or both as warranted, on all units of product which can be corrected and which were manufactured under assembly the same conditions, with essentially the same materials and processes, and which are considered subject to the same failure. Acceptance of the product shall be discontinued until corrective action acceptable to the qualifying activity has been taken. After corrective action has been taken sampling, periodic 1 and 2 testing shall be repeated on additional sample units (all inspections, or the inspection which the original sample failed, at the option of the qualifying activity). Sampling inspection may be reinstated. However, final acceptance and shipment shall be withheld until periodic 1 and 2 inspection shows that the corrective action was successful. In the event of failure after reinspection, Information concerning the failure and corrective action shall be made available to the qualifying activity.

#### 4.5 Additional QPL test and reporting requirements.

4.5.1 Retention of qualification. To retain qualification, the manufacturer shall submit a test report to the qualifying activity at 12 month intervals. The qualifying activity shall establish the initial reporting date. Each report shall consist of a summary of test and inspection results required by this specification that were performed during the 12 month reporting interval. As a minimum, the report shall include the following:

- a. Number of lots produced and tested, including lot and sample sizes for each lot.
- b. Identify which tests were performed.
- c. Quantities passed.
- d. Quantities failed.
- e. All reworked sampling lots shall be accounted for and identified. A summary of corrective action taken shall be included.

#### 4.5.2 Loss of product qualification.

4.5.2.1 Failure to meet test requirements. The manufacturer shall immediately notify the qualifying activity at any time during the 12-month reporting period when the qualified product fails to meet the test and inspection requirements of this specification. The manufacturer shall identify and indicate what corrective action will be taken to correct the problem. Failure to take corrective action acceptable to the qualifying activity may result in removal of the product from the QPL.

4.5.2.2 Failure to submit summary test data report. Failure to submit a test report within 30 days after the end of the 12 month reporting period may result in removal of qualification for the product.

4.5.2.3 Change to manufacturing process, materials or equipment. The manufacturer shall notify the qualifying activity, in writing, of any changes in the manufacturing process, materials, or equipment used to manufacture a QPL product. Subsequently, the qualifying activity will notify the manufacturer, in writing, if a full re-qualification, partial re-qualification, or no additional testing is required as a result of these changes.

4.5.2.4 No production during reporting period. When no production occurs during the reporting period, a report shall be submitted to the qualifying activity certifying that the manufacturer still has the capability and facilities necessary to produce the QPL product. If during two consecutive 12 month reporting periods there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit QPL products to a full qualification inspection in accordance with this specification.

#### 4.6 Test methods.

4.6.1 Visual inspection. Hose fittings shall be examined to ensure conformance with this specification and applicable drawings see 3.1. Visual examination shall be in accordance with FED-STD-162. Continuous examination shall be performed to assure compliance with the following requirements:

- a. Specification sheets (see 3.1).
- b. Design, construction and physical dimensions (see 3.3).
- c. Materials (see 3.3.2) and finishes (see 3.3.3).
- d. Thread concentricity and pitch mating concentricity (see 3.4.7)
- e. Marking (see 3.7).
- f. Workmanship ( see 3.9).

4.6.2 Reusability (see 3.6.1). The fittings when assembled to a hose shall meet the requirements of 3.6.1. The following details shall apply:

- a. Assemble the fittings to 15 inch (38.10 cm) lengths of hose.
- b. The assemblies shall be proof pressure tested in accordance with 4.6.4. If there is evidence of leakage, rupture, slippage, or detachment, discontinue the test.
- c. Disassemble and examine the fitting, and discard the hose. If there is evidence of permanent deformation that prevents disassembly or reassembly, discontinue the test.
- d. Repeat steps a, b, and c, using the same fittings and new 15 inch (381 mm) lengths of hose.
- e. Reassemble the same fittings to new lengths of hose in accordance with 4.3.2.1.
- f. After assembly, the fittings shall be subjected to the low temperature (see 4.6.3) and impulse tests (see 4.6.6).
- g. Evidence of leakage, rupture, detachment, slippage, or permanent deformation that prevents disassembly or reassembly shall constitute failure of this test.

4.6.3 Low temperature (see 3.6.2). Hose assemblies shall be tested as in accordance SAE-J343 and shall meet the requirements of 3.6.2. The following requirements shall apply:

- a. The low temperature test shall be conducted at -40°F (-40°C) in accordance with the cold bend test specified in SAE-J343 except the uncapped hose or hose assembly shall be preconditioned by immersion in oil conforming to MIL-PRF-2104, grade 10, for a minimum of 24 hours at a minimum temperature of 212°F (100°C).
- b. Evidence of splitting or cracking or inability to pass the proof pressure test specified in 4.6.4 shall constitute failure of this test.

4.6.4 Proof pressure (see 3.6.3). Hose assemblies shall be proof pressure tested in accordance with SAE-J343 and shall meet the requirements of 3.6.3. The following details shall apply:

- a. The test pressure shall be a pressure that is equal to twice the maximum operating pressure specified in the applicable specification sheet.
- b. Evidence of leakage, rupture, or detachment of a fitting shall constitute failure of this test.

4.6.5 Burst pressure (see 3.6.4). Hose assemblies shall be subjected to burst pressure in accordance with SAE-J343 and shall meet the requirements of 3.6.4. The following details shall apply:

- a. The test pressure shall be equal to or greater than four times the maximum operating pressure specified in the applicable specification sheet.
- b. Evidence of leakage, rupture, or detachment of a fitting shall constitute failure of this test.

4.6.5.1 Burst pressure test for clamp-halves, 4-bolt split-flange (see 3.6.4). When 4-bolt split-flange clamp-halves are required, the clamp-half burst pressure test shall be conducted as follows:

- a. Attach a flange-head to the burst pressure machine using two 4-bolt split-flange clamp-halves, an O-ring, four cap-screws, and four lockwashers, and torque to the values specified by the manufacturer's instruction sheet.
- b. Apply pressure (through the port face to the flange-head) until failure.
- c. Pressure application shall be at a constant rate so as to attain the pressure listed in the applicable specification sheet within a period of not less than 15 seconds and not more than 30 seconds.
- d. Nonconformance to 3.6.4 shall constitute failure of this test.

4.6.6 Impulse (see 3.6.5). Hose assemblies shall be impulse tested in accordance with SAE-J343 and shall meet the requirements of 3.6.5. The following details shall apply:

- a. The free length of hose measured between fittings shall be determined in accordance with SAE-J343. Minimum bend radius "r" is specified in SAE-J517 for 100R type hoses. 100R10 hoses have been discontinued by SAE. See MIL-DTL-52471/6 for replacement hoses.
- b. The uncapped test specimens shall be preconditioned by immersion in 10 weight oil conforming to MIL-PRF-2104, grade 10, at a minimum temperature of 212 °F (100°C) for a minimum of 24 hours.
- c. The test pressure shall be as specified in table XV.
- d. The number of impulse cycles shall be as specified in table XVI.
- e. The impulse test oil temperature shall be 200°F (93.3°C) minimum.
- f. Evidence of leakage, rupture, detachment or slippage of a fitting shall constitute failure of a test specimen.
- g. Failure of a test specimen below the minimum number of cycles listed specified in table XV, or failure of the specimens to attain the average number of impulse cycles in table XVI shall constitute failure of this test, see 3.6.5.

TABLE XV. Impulse test pressure.

Fitting type	Test pressure
100R1	125 percent of the maximum operating pressure specified in the applicable specification sheet for hose 1 inch ID and smaller and 100 percent for hoses larger than 1 inch ID.
100R2 100RE 100R12	133 percent of the maximum operating pressure specified in the applicable specification sheet.

TABLE XVI. Impulse cycles and calculation method. 1/ 2/

Hose type	Minimum cycles allowed <u>2/</u>	Minimum average	Maximum cycles for computing
100R1	100,000	150,000	200,000
100R2	100,000	150,000	200,000
100RE	225,000	300,000	375,000
100R12	425,000	500,000	575,000

$$1/ \text{ Average number of cycles} = \frac{N_1 + N_2 + N_3 + N_4}{4}$$

Where:

- $N_1$ = Number of cycles completed by first test assembly.  
 $N_2$ = Number of cycles completed by second test assembly.  
 $N_3$ = Number of cycles completed by third test assembly.  
 $N_4$ = Number of cycles completed by fourth test assembly.

2/ Inability of a test specimen to meet this number shall constitute failure.

4.6.6.1 Four-bolt split-flange clamp-half see [3.6.5](#)). When only 4-bolt split-flange clamp-halves are required, the impulse testing shall be conducted as follows:

- a. Attach a flange-head to the impulse machine using two 4-bolt split-flange clamp-halves, four capscrews, four lockwashers, and an O-ring, and torque to the values specified by the manufacturer's instruction sheet.
- b. Apply 300,000 impulse cycles to the flange-head through the port face.
- c. Impulse cycles and impulse wave shape shall be as specified in SAE-J343.
- d. The impulse oil shall be maintained at 200°F (93°C) minimum.
- e. Impulse pressure shall be 4,000 psi (28 MPa).
- f. Nonconformance to [3.6.5](#) shall constitute failure of this test.

4.6.7 Overtightening torque (see 3.6.6). The 37° flared-style fitting shall be subjected to the overtightening torque test and meet the requirements of 3.6.6. The following details shall apply:

- a. The 37° flared-style fitting shall be assembled to a mating fitting.
- b. The threads of the swivel nut of the fitting shall be lubricated with oil conforming to MIL-PRF-2104, grade 10, prior to this test.
- c. The swivel nut of the fitting shall be tightened on the mating fitting to the appropriate overtightening torque value required in the applicable specification sheet and loosened.
- d. This sequence shall be repeated 15 times.
- e. Evidence of permanent deformation, stripped threads, or failure of the swivel nut to swivel freely by hand after 15 overtightening operations shall constitute failure of this test.
- f. Upon completion of this test, the fittings shall be assembled to a 15 inch (38.10 cm) length of approved hose and proof pressure tested in accordance with 4.6.4.

4.6.8 Salt spray test (see 3.6.7). Fittings when subjected to salt spray testing shall meet the requirements of 3.6.7. Expose test specimens in accordance with ASTM B117.

4.6.9 Verification of fitting plating thickness for aluminum-nickel, cadmium, or zinc (see 3.3.3.9). Verification of under plating and finish plating shall be measured in accordance with ASTM B499, ASTM B567, or ASTM B568. A cross-sectioning method, such as that specified by ASTM B487 or ASTM B748, can also be used as a referee method to confirm the precision when thicknesses of 30 microinches (0.76 µm) or above are used. The zinc plating thickness may also be measured in accordance with ASTM B633 or ASTM B695 as applicable. The plating requirements shall meet the requirements of 3.3.3.9. The following details shall apply:

- a. When applicable a minimum of three points shall be measured on the fitting surface. The fitting may be rotated, but measurement points shall be progressively further from the last point.
- b. Readings shall not be averaged. Measurements shall be as follows:
  - (1) One measurement shall be taken at a point on the front and rear.
  - (2) Three measurements shall be taken in the middle areas.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Controls Point packaging activities within the Military Service or Defense Agency, or within the Military Service system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

6.1 Intended use. The items covered by this specification are military unique hose fittings and clamp halves for land-based, marine-based, and ground support hydraulic powered applications. The hose fittings and 4-bolt clamp halves are used in specialized military hydraulic systems requiring interoperability and compatibility with associated components and equipment. These items are required to withstand temperatures between -40° F to 200° F (-40°C to 93°C). The interoperability and compatibility has been assured through strict adherence to the military detail specification sheet requirements. Manufacturers of these items and users place great reliance on the detailed technical requirements to ensure the products meet the interoperability and compatibility requirements.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. The complete PIN (see 1.2.2).
- d. Level of preservation, packaging, and marking required (see section 5).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No. 52525 whether or not such products have actually been so listed by that date. The attention of contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center Columbus, P.O. Box 3990, ATTN: DSCC-VQ, Columbus, Ohio 43218-3990 or emailed to [vqp.chief@dla.mil](mailto:vqp.chief@dla.mil). An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <http://assist.daps.dla.mil>.

6.3.1 Provisions governing qualification (SD-6). Copies of "Provisions Governing Qualification" are available online at <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.

6.4 Bulk hose and reusable fittings. To insure interchangeability of fittings and hose within the supply system, reusable fittings should be tested with a standard bulk hose of the applicable type and size. The hose is an SAE-J517 type hose.

6.5 Oxygen system restricted materials.

- a. Cadmium: The toxicity and vapor pressure of cadmium restrict its use.
- b. Titanium: Titanium metal should not be used with liquid oxygen at any pressure or with gaseous oxygen or air at oxygen partial pressures above 30 psig. Titanium and its alloys are impact sensitive in oxygen.
- c. Magnesium: Magnesium metal should not be used in oxygen systems. In addition, its alloys are not to be used except in areas with minimal exposure to corrosive environments. Reactivity with halogenated compounds constrains its use with lubricants containing chlorine and fluorine.
- d. Mercury: Mercury should not be used in oxygen systems in any form because it is toxic; in addition, it and its compounds can cause accelerated stress cracking of aluminum and titanium alloys.
- e. Beryllium: Beryllium and its oxides and salts are highly toxic and, therefore, they are not be used in oxygen systems or near oxygen systems where they could be consumed in a fire.

## 6.6 Definitions.

6.6.1 Leakage. Any passage of fluid from the inner portion of the fittings to the outer portion as determined by sight, touch, or pressure loss. Leaks occur through the fitting body, at the junction between the hose and fitting, or at the sealing surface, thread or flange face, of the fitting.

6.6.2 Rupture. A leak which causes visible damage to the fitting or hose adjacent to the fitting as evidenced by the rapid loss of volume of the pressurizing agent, or sharp reduction in pressure.

6.6.3 Slippage of a fitting. Permanent movement of a fitting, measured when the hose is in a relaxed condition.

6.6.4 Detachment. The loss or partial loss of contact between the fitting and the hose to which it is attached or the loss or partial loss of contact between the fitting and a test fixture fitting by virtue of thread stripping or severance of a fitting body.

6.7 Classification changes. Changes in classification of the fittings between this revision of the specification and the previous editions are as follows:

<u>MIL-F-52525C</u>	<u>MIL-F-52525D</u>	<u>MIL-DTL-52525E</u>	<u>MIL-DTL-52525F</u>
Type A	Type 100R1	Type 100R1	Type 100R1
Type B	Type 100R2	Type 100R2	Type 100R2
Type C	Type 100R10	Type 100R10	Type 100R10
Type D	Deleted	Deleted	Deleted
Type E	Deleted	Deleted	Deleted
None	Type 100RE	Type 100RE	Type 100RE
None	Type 100R12	Type 100R12	Type 100R12

6.8 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. As of the dating of this document, the U.S. Environmental Protection Agency (EPA) is focusing efforts on reducing 31 priority chemicals. The list of chemicals and additional information is available on their website <http://www.epa.gov/osw/hazard/wastemin/priority.htm>. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein (see section 3).

6.9 Guidance on use of alternative parts with less hazardous or nonhazardous materials. This specification provides for a number of alternative plating materials via the PIN. Users should select the PIN with the least hazardous material that meets the form, fit and function requirements of their application.

6.10 Subject term (key word) listing.

Cadmium  
Connection  
Female nut, swivel  
Female threads  
Ground support vehicles  
High pressure  
Land based vehicles  
Low pressure  
Marine based vehicles  
Medium pressure  
Nickel  
Phosphate  
Pipe connection  
Power application  
Split-flange  
Straight threads  
Zinc hexavalent chromate plating  
4-bolt flange  
37° flared  
37° flared tubing

6.11 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

CONCLUDING MATERIAL

Custodians:

Army - AT  
Navy - SH  
Air Force - 99  
DLA - CC

Preparing activity:  
DLA - CC

(Project 4730-2007-067)

Review activities:

Army - CR4  
Navy - CG, MC, SA, YD

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.daps.dla.mil>.