



SURFACE VEHICLE RECOMMENDED PRACTICE

J2551™-2

APR2018

Issued 2013-02
Revised 2018-04

Superseding J2551-2 FEB2013

(R) Recommended Practices for Fluid Conductor Carbon, Alloy and High Strength Low Alloy Steel Tubing Applications-Part 2: General Specifications and Performance Requirements

RATIONALE

The verbiage in this document has been modified to clarify the intent of the information presented. Additional information has been provided relating to performance tests and quality assurance.

FOREWORD

The May 2010 edition of SAE J2551 was published as a single document covering the design and fabrication of carbon, alloy and high strength low alloy tube assemblies. SAE J2551 has been organized into three sections as follows:

1. SAE J2551-1 - Recommended Practices for Fluid Conductor Carbon, Alloy and High Strength Low Alloy Steel Tubing Applications-Part 1: Design and Fabrication
2. SAE J2551-2 - Recommended Practices for Fluid Conductor Carbon, Alloy and High Strength Low Alloy Steel Tubing Applications-Part 2: General Specifications and Performance Requirements
3. SAE J2551-3 - Recommended Practices for Fluid Conductor Carbon, Alloy and High Strength Low Alloy Steel Tubing Applications-Part 3: Procurement

This SAE Recommended Practice provides guidelines for performance test and quality assurance methods for carbon, alloy and high strength low alloy steel tube assemblies for fluid power and general applications. Experienced designers and users skilled in achieving proper results, as well as the less experienced, can use this outline as a list of recommendations to consider during the design and fabrication process.

Fluid power systems are complex and require extensive knowledge of both the system requirements and the various types of tube. Therefore, all-inclusive, detailed, step-by-step instructions are not practical and are beyond the scope of this document. Less experienced designers and users who need more information should consult specialists such as experienced tube designers and fabricators. The use and application of this Recommended Practice can improve the quality of the final product as well as the communication process.

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."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2018 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
http://www.sae.org

SAE WEB ADDRESS:

Full document details: SAE J2551_2_201804

SAE values your input. To provide feedback on this Technical Report, please visit http://standards.sae.org/J2551/2_201804

Adherence to the guidelines of this Recommended Practice can assist users to design, manufacture, procure, and install tube assemblies that can be:

- Designed to perform safely and adequately
- Designed and manufactured with common practices and components in accordance with established industry standards
- Easily procured and serviced globally
- Conveniently packaged/shipped
- Proficiently installed on their equipment

Safety Considerations - Improper selection, fabrication, installation, or maintenance of tube assemblies for fluid-power systems can result in serious personal injury or property damage. Adherence to this Recommended Practice can reduce the probability of component or system failure and thereby reduce the risk of injury or damage. Users shall consider the proper selection of components, fabrication of tubes, installation and maintenance procedures to address this potential risk.

TABLE OF CONTENTS

1.	SCOPE.....	4
1.1	Purpose	4
1.2	Field of Application	4
2.	REFERENCES.....	4
2.1	Applicable Documents	4
2.1.1	SAE Publications.....	4
2.1.2	ISO Publications.....	4
2.1.3	ASTM Publications.....	4
2.2	Related Publications	5
2.2.1	SAE Publications.....	5
2.2.2	ISO Publications.....	7
2.2.3	EN Publications.....	9
2.2.4	ASTM Publications.....	9
2.2.5	American Welding Society Publications.....	9
3.	DEFINITIONS	9
4.	GENERAL SPECIFICATIONS.....	10
4.1	Tube Construction.....	10
4.2	Dimensional Requirements.....	10
4.3	Workmanship	10
4.4	Quality Conformance and Assurance	10
4.4.1	Initial Quality Conformance Assurance.....	10
4.4.2	Production Quality Conformance Assurance.....	11
4.4.3	Responsibility for Tests.....	11
4.5	Storage and Identification	11
4.5.1	Marking.....	11
4.5.2	Examination of Product.....	12
4.5.3	Packaging	12
4.5.4	Shelf Life	12
5.	PERFORMANCE REQUIREMENTS.....	12
5.1	Hydraulic Connections and End Attachment Methods	12
5.1.1	Recommended Inspection and Tests for Braze Joints	12
5.1.2	Recommended Inspection and Tests for Weld Joints	14
5.1.3	Recommended Inspection and Tests for Formed Connections.....	15
5.2	Coatings and Corrosion Resistance	16
5.2.1	Coatings	16
5.2.2	Corrosion Resistance Testing.....	16
5.3	Cleanliness.....	16
5.4	Performance Evaluation and Testing.....	17
5.4.1	Performance Evaluation.....	17
5.4.2	Typical Tube Assembly Sample.....	17
6.	NOTES.....	18
6.1	Revision Indicator.....	18
Figure 1	Typical tube assembly sample.....	18
Table 1	Minimum sampling plan	11
Table 2	Performance test recommendations	17

1. SCOPE

1.1 Purpose

These recommended practices provide recommendations for general specifications and performance requirements of carbon, alloy and high strength low alloy steel tube assemblies for fluid power applications utilizing commonly available manufacturing methods and general guidelines for tube selection and application.

1.2 Field of Application

These recommended practices are intended for general application and hydraulic systems on industrial equipment and commercial products. Aircraft and Aerospace applications were not considered during the preparation of this document.

Because many factors influence the pressure at which a hydraulic system will perform satisfactorily, these recommended practices should not be construed as guaranteed minimums. For any application, sufficient testing should be conducted and reviewed by both the customer and supplier to ensure that required performance levels are met.

The fabricator should be consulted for use of these recommended practices and connectors in conditions outside the pressure and temperature of limits specified. Both metric and inch tubing should be considered to accommodate hydraulic system design requirements. In the past, these requirements have been met predominantly with inch tubing; for new designs, metric tubing should be considered.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J426	Liquid Penetrant Test Methods
SAE J1065	Nominal Reference Working Pressures for Steel Hydraulic Tubing
SAE J1475	Hydraulic Hose Fitting for Marine Applications
SAE J2551-1	Recommended Practices for Fluid Conductor Carbon, Alloy and High Strength Low Alloy Steel Tubing Applications-Part 1: Design and Fabrication
SAE J2551-3	Recommended Practices for Fluid Conductor Carbon, Alloy and High Strength Low Alloy Steel Tubing Applications-Part 3: Procurement

2.1.2 ISO Publications

Copies of these documents are available online at <http://webstore.ansi.org/>.

ISO 9227	Corrosion tests in artificial atmospheres - Salt spray tests
ISO 10763	Hydraulic fluid power - Plain-end, seamless and welded steel tubes - Dimensions and nominal working pressures
ISO 17635	Non-destructive testing of welds - General rules for metallic materials
ISO 19879	Metallic tube connections for fluid power and general use - Test methods for hydraulic fluid power connections

2.1.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B117 Operating Salt Spray (Fog) Apparatus

ASTM D2247 Testing Water Resistance of Coatings in 100% Relative Humidity

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J246	Spherical and Flanged Sleeve (Compression) Tube Fittings
SAE J343	Test and Test Procedures for SAE 100R Series Hydraulic Hose and Hose Assemblies
SAE J356	Welded Flash-Controlled Low-Carbon Steel Tubing Normalized for Bending, Double Flaring, and Beading
SAE J426	Liquid Penetrant Test Methods
SAE J512	Automotive Tube Fittings
SAE J514	Hydraulic Tube Fittings
SAE J515	Specification for O-Ring Materials Used with Hydraulic Connectors
SAE J518-1	Hydraulic Flanged Tube, Pipe, and Hose Connections, 4-Screw Flange Connection Part 1: 3.5 MPa to 35 MPa (Code 61)
SAE J518-2	Hydraulic Flanged Tube, Pipe, and Hose Connections, 4-Screw Flange Connection Part 2: 42 MPa (Code 62)
SAE J518-3	Hydraulic Flange Clamps, 2-Screw Flange Connection to be used with SAE J518-1 (Code 61) Connections where Only Low Pressure is Required
SAE J524	Seamless Low-Carbon Steel Tubing Annealed for Bending and Flaring
SAE J525	Welded and Cold Drawn Low-Carbon Steel Tubing Annealed for Bending and Flaring
SAE J526	Welded Low-Carbon Steel Tubing Suitable for Bending, Flaring, Beading, Forming and Brazing
SAE J527	Brazed Double Wall Low-Carbon Steel Tubing
SAE J533	Flares for Tubing
SAE J1065	Nominal Reference Working Pressures for Steel Hydraulic Tubing
SAE J1231	Formed Tube Ends for Hose Connections and Hose Fittings
SAE J1273	Recommended Practices for Hydraulic Hose Assemblies

SAE J1290	Automotive Hydraulic Brake System - Metric Tube Connections
SAE J1453-1	Specification for O-Ring Face Seal Connectors: Part 1 - Tube Connection Details and Common Requirements for Performance and Tests
SAE J1453-2	Specification for O-Ring Face Seal Connectors: Part 2 - Requirements, Dimensions, and Tests for Steel Unions, Bulkheads, Swivels, Braze Sleeves, Braze-on Tube Ends, Caps, and Connectors with ISO 6149-2 Metric Stud Ends and ISO 6162 4-Bolt Flange Heads
SAE J1453-3	Specification for O-Ring Face Seal Connectors: Part 3 - Requirements, Dimensions, and Tests for Steel Unions, Bulkheads, Swivels, Braze Sleeves, Caps, and Connectors with SAE J1926-2 Inch Stud Ends
SAE J1677	Tests and Procedures for Carbon Steel and High Strength Low Alloy Steel Tubing
SAE J1926-1	Connections for General Use and Fluid Power - Ports and Stud Ends with ASME B1.1 Threads and O-Ring Sealing - Part 1: Threaded Port with O-Ring Seal in Truncated Housing
SAE J1926-2	Connections for General Use and Fluid Power - Ports and Stud Ends with ASME B1.1 Threads and O-Ring Sealing - Part 2: Heavy-Duty (S Series) Stud Ends
SAE J1926-3	Connections for General Use and Fluid Power - Ports and Stud Ends with ASME B1.1 Threads and O-Ring Sealing - Part 3: Light-Duty (L-Series) Stud Ends
SAE J2044	Quick Connect Coupling Specification for Liquid Fuel and Vapor/Emissions Systems
SAE J2094	Vehicle and Control Modifications for Drivers with Physical Disabilities Terminology
SAE J2435	Welded Flash Controlled, SAE 1021 Carbon Steel Tubing, Normalized for Cold Forming, Welding and Brazing
SAE J2467	Welded and Cold-Drawn, SAE 1021 Carbon Steel Tubing Normalized for Bending and Flaring
SAE J2592	Carbon Steel Tubing for General Use - Understanding Nondestructive Testing for Carbon Steel Tubing
SAE J2593	Information Report for the Installation of Fluid Conductors and Connectors
SAE J2613	Welded Flash Controlled, High Strength (500 MPa Tensile Strength) Low Alloy Steel Hydraulic Tubing, Sub-Critically Annealed for Bending, Double Flaring, and Bending
SAE J2614	Welded and Cold-Drawn, High Strength (500 MPa Tensile Strength) Low Alloy Steel Hydraulic Tubing, Sub-Critically Annealed for Bending and Flaring
SAE J2682	Connections for General Use and Fluid Power - Test Methods-Threadless Connections
SAE J2832	Welded Flash Controlled, High Strength (690 MPa Tensile Strength) Low Alloy Steel Hydraulic Tubing, Stress Relieved Annealed for Bending and Double Flaring
SAE J2833	Welded and Cold-Drawn, High Strength (690 MPa Tensile Strength) Low Alloy Steel Hydraulic Tubing, Stress Relieved Annealed for Bending and Flaring