



SURFACE VEHICLE STANDARD	J1131™	MAY2021
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Superseding J131 AUG1998		
(R) Performance Requirements for SAE J844 Nonmetallic Air Brake Tubing and SAE J246 Compression Fitting Assemblies Used in Vehicular Air Brake Systems		

RATIONALE

The modifications to this document are to harmonize the requirements of SAE J1131 and SAE J2494-3 where applicable.

1. SCOPE

This SAE Standard is intended to establish uniform performance criteria and methods of testing compression tube fittings with SAE J844 air brake tubing as used in vehicular air brake systems.

This document also establishes minimum qualifications for tensile and pressure capabilities, vibration durability under cyclic temperatures, serviceability, and fitting compatibility requirements. The specific tests and performance criteria applicable to the tubing are set forth in SAE J844.

NOTE: The test values contained in this performance standard are for test purposes only. For environmental and usage limitations, refer to SAE J844. For fittings, a type of fitting for use with SAE J844 nonmetallic tubing is included in SAE J246; however, it is not intended to restrict or preclude the use of other designs of fittings that comply with this document.

1.1 General Requirements

- a. Test temperature shall use ± 3 °C as the test tolerance range.
- b. Ambient temperature shall be 24 °C.
- c. All test times are minimum times unless otherwise specified.
- d. Dry air shall be a minimum of -50 °C dew point.
- e. Tubing shall be cut square at 90 degrees \pm 7 degrees.
- f. New specimens shall be used for all tests.

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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 J246 Spherical and Flanged Sleeve (Compression) Tube Fittings

SAE J844 Nonmetallic Air Brake System Tubing

3. TENSILE TESTS (TEN SPECIMENS)

3.1 Description

Both hot and cold tensile tests shall be conducted with different unaged assemblies (fittings attached within 30 days of test date). Tests consist of subjecting the assembly to increasing tensile load in a suitable testing machine until the specified force value or elongation percentage has been obtained.

3.2 Apparatus

A tensile test machine with suitable indicating device shall be used for the tensile test. The fixtures for holding the test specimens shall be arranged so the tubing and fittings have a straight centerline corresponding to the direction of the machine pull. The lower part of the fixture shall be equipped with a container of sufficient dimensions to submerge the required length of tubing in water. A means of heating the water to boiling shall be provided. A cover shall not be used on the container. This allows the steam to dissipate into the environment. If a fan is used in this test, then take precautions to direct the air away from the test specimen.

3.3 Test Specimens

The tubing specimens (a minimum of ten) shall be obtained from current production stock and cut to a length sufficient to obtain 150 mm \pm 6 mm of tubing between end fittings after assembly. Assemble fittings to the tubing using the manufacturer's recommendations.

3.4 Procedure (Ten Specimens)

3.4.1 High Temperature Tensile Test (Five Specimens)

Place the test specimen in the tensile machine with the lower fitting and 102 mm (+6/-0 mm) of tubing submerged below the surface of the boiling distilled water such that the outside diameter is exposed to the water. Continue boiling for 5 minutes (+0.5/-0.0 minutes). Apply load at a rate of pull of 25 mm/min.

3.4.2 Conditioned Tensile Test (Five Specimens)

Condition test specimen at -40 °C for 30 minutes (+0.5/-0.0 minutes), normalize at ambient temperature then submerge in boiling water for 15 minutes. Repeat for a total of four complete cycles. Allow the test specimen to normalize at ambient temperature for 30 minutes. Conduct the tensile test within 30 minutes after the normalizing period while at ambient temperature of 24 °C. Apply load at a rate of 25 mm/min.

3.5 Acceptance Criteria

Requirements: Each specimen shall elongate 50% (minimum) (e.g., 150 mm increased to 225 mm), or shall withstand the load listed in Table 1 without causing separation from the fitting. (Note that the size range has been limited to that which pertains to SAE J246.)

Table 1 - Tensile requirements

Nominal Tubing OD (inch)	Tensile Load (Newtons)
1/4	225
5/16	335
3/8	670
1/2	900
5/8	1450
3/4	1560

4. VIBRATION TEST (FIVE SPECIMENS)

4.1 Description

This test is designed to evaluate the effects of vibration on a tube and fitting assembly under varying internal pressures and ambient temperatures. Leakage rate is used to gauge acceptability.

4.2 Apparatus

Equipment capable of vibrating one end of the test specimen at 600 Hz through a 12 mm displacement in a plane perpendicular to the tube while the other end is held rigid. The distance between the static and vibrating head is to be such that, when the assembly is displaced 12 mm, no parallel pull to the longitudinal axis of the assembly will occur. The equipment must be capable of automatically adjusting the system pressure to compensate for fluctuating temperatures between -40 °C and 104 °C and associated air pressure of 830 kPa (± 70 kPa) dry air during the test process. A mass flow meter capable of determining air leakage shall be provided.

4.3 Test Specimens

Allowing 12 mm slack, cut a minimum of five tubing specimens to a length sufficient to obtain 460 mm between fittings after assembly. Assemble identical fittings to the tubing using the manufacturer's recommendations. Fitting attaching nuts are not permitted to be retightened during the test.

4.4 Procedure

Allowing 12 mm slack, mount the lines straight in the vibration machine. Oscillate one end of the lines at 600 cpm (± 20 cpm) through a total stroke of 12 mm for a total of 1000000 cycles (+50000/-0 cycles), while maintaining an internal pressure of 830 kPa ± 70 kPa using dry air. Starting at 104 °C, vary the ambient air temperature from 104 °C to -40 °C at 250000 vibration cycle intervals, approximately 7 hour intervals as shown in Table 2. Using a mass flow meter, observe for fitting leakage during and after the test. Check nut tightness after completing the test.

Table 2 - Vibration test requirements

Test Cycles	Test Pressure (kPa)	Test Temperature (°C)
0/250000	830	104
250001/500000	830	-40
500001/750000	830	104
750001/1000000	830	-40

4.5 Acceptance Criteria

The test is considered a failure if the leakage on any assembly exceeds 50 cm³/min at -40 °C or 25 cm³/min at ambient temperature.

The fitting is considered a failure if the attaching nut becomes loose. This is defined as follows:

1. Record the initial tightening torque.
2. At the conclusion of the test, attempt to tighten the nut further by applying 20% of the initial tightening torque in the tightening direction. Do not apply a higher torque and do not apply any torque or force in the loosening direction.
3. If the nut moves at all under the 20% torque, it shall be defined as a loose nut and failure of the test. Record the movement in degrees to reach 20%.

5. FITTING SEPARATION PRESSURE TEST REQUIREMENTS (FIVE SPECIMENS)

5.1 Description

This test is intended to evaluate fitting retention at proof pressure of 2760 kPa ± 70 kPa and at minimum separation pressure.

5.2 Apparatus

The test apparatus consists of a suitable source of hydraulic pressure and the necessary gauges and piping.

5.3 Test Specimens

Cut a minimum of five tubing specimens to obtain 300 mm between fittings after assembly. Assemble fittings to the tubing using the manufacturer's recommendations.

5.4 Procedure

Plug one end of the test specimen and mount in the apparatus with the end unrestrained. Apply proof pressure at ambient temperature, to the test specimen and hold for 30 seconds. Increase pressure at a constant rate so as to reach the specified minimum separation pressure within a time period of 3 to 15 seconds.

5.5 Acceptance Criteria

Fittings shall not separate from the tubing nor shall the assembly visibly leak at less than specified minimum separation pressure of 5500 kPa ± 70 kPa.

6. REASSEMBLY TEST (FIVE SPECIMENS)

6.1 Description

This test is intended to evaluate the effects of repeated assembly and disassembly of a tube and fitting. Leakage rate is used to gauge acceptability.

6.2 Apparatus

The test apparatus consists of a suitable source of pneumatic pressure and the necessary gauges and piping. A mass flow meter capable of determining air leakage shall be provided.