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SURFACE VEHICLE RECOMMENDED PRACTICE

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(R) QUICK CONNECTOR SPECIFICATION FOR LIQUID FUEL AND VAPOR/EMISSIONS SYSTEMS

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- 1. Scope**—This SAE Recommended Practice defines the minimum functional requirements for quick connectors used in supply, return, and vapor/emissions lines for flexible tubing systems. This document applies to automotive and light truck gasoline and diesel fuel systems with operating pressures up to 500 kPa, 5 bar, (72 psig) and operating temperatures up to 115 °C (239 °F). These tests apply to new connectors in assembly operations. Connectors must be pushed onto a mating tube end then pulled back to assure complete connection. For service operations, the mating tube should be lubricated with SAE 30 weight oil before re-connecting.

Vehicle OEM fuel system specifications may impose additional requirements beyond the scope of this general SAE document. In those cases, the OEM specification takes precedence over this document.

2. References

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

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

SAE J30—Fuel and Oil Hoses

SAE J1645—Fuel System Electrostatic Charge

SAE J1737—Test Procedure to Determine the Hydrocarbon Losses from Fuel Tubes, Hoses, Fittings, and Fuel Line Assemblies by Recirculation

SAE J1681—Gasoline/Methanol Mixtures for Materials Testing

SAE J2045—Flexible Hose Assemblies for Gasoline Fuel Injection Supply Systems

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

ASTM B 117—Method of Salt Spray (Fog) Testing

- 3. Size Designation**—For this document, the connector size designation consists of two numbers. The first number designates the OD of the mating tube end. The second number designates the tubing size suited for the stem. See Figure 1.

NOTE—On metal or nonmetallic tubing the OD is used to designate size and on rubber hose the ID is used to designate size.

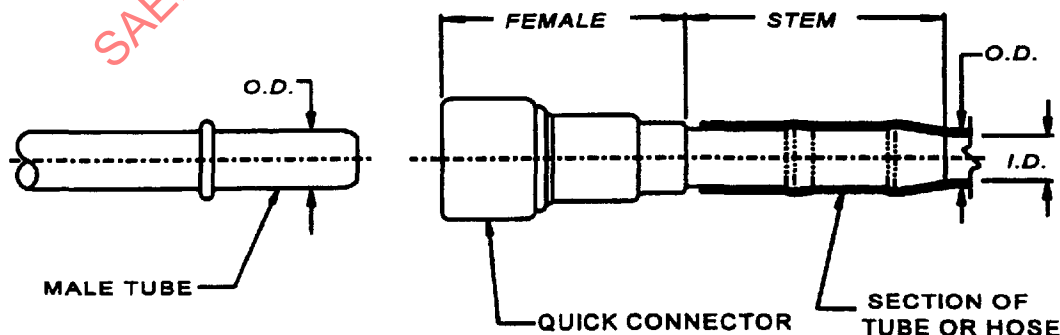


FIGURE 1—CONNECTOR NOMENCLATURE

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4. Test Temperatures—Unless otherwise specified, all tests will be performed at room temperature $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($73.4^{\circ}\text{F} \pm 4^{\circ}\text{F}$).

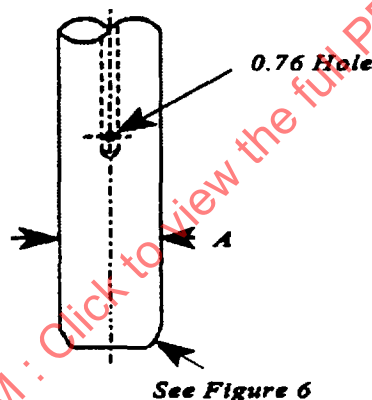
5. Functional Requirements—This section defines the minimum functional requirements for quick connectors used in flexible tubing fuel systems.

5.1 Leak Test—Quick connectors shall meet the leak test requirements of this document. In order to provide a production compatible process, all leak testing should be performed using compressed air to insure the connectors will not leak liquid fuel or vapor.

5.1.1 TEST PROCEDURE (LOW PRESSURE)

- Insert leak test pin, shown in Figure 2, into the connector.
- Pressurize between the seals with suitable air leak test equipment to $69\text{ kPa} \pm 7\text{ kPa}$, $0.69\text{ bar} \pm 0.07\text{ bar}$ ($10\text{ psig} \pm 1\text{ psig}$).

NOTE—For single seal connectors the stem must be capped.



Nominal Size	"A" Maximum	Minimum
8 mm Sized	7.83	7.81
10 mm Sized	9.83	9.81
12 mm Sized	11.70	11.68
16 mm Sized	15.70	15.68
19 mm Sized	18.70	18.68
22 mm Sized	21.55	21.53

SEE APPENDIX A FOR ADDITIONAL SIZES

FIGURE 2—CONNECTOR LEAK TEST PIN

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5.1.2 ACCEPTANCE CRITERIA—Maximum leak rate 2 cc/min at stabilization.

5.1.3 TEST PROCEDURE (HIGH PRESSURE)

- a. Insert leak test pin, shown in Figure 2, into the connector.
- b. For liquid fuel quick connectors pressurize between the seals with suitable air leak test equipment to 1034 kPa $\pm$ 35 kPa, 10.34 bar $\pm$ 0.35 bar (150 psig $\pm$ 5 psig).
- c. For vapor/emission quick connectors pressurize between the seals with suitable air leak test equipment to 345 kPa $\pm$ 10 kPa, 3.45 bar $\pm$ 0.02 bar (50 psig $\pm$ 2 psig).

NOTE—For single seal connectors the stem must be capped.

NOTE—Appropriate safety precautions should be taken when testing with high-pressure air.

5.1.4 ACCEPTANCE CRITERIA—Maximum leak rate 5 cc/min at stabilization.

5.2 Assembly Effort—Quick connector assembly effort is the force required to fully assemble (latch or retain) the mating tube end into the connector. Use a suitable tensile/compression tester to verify conformance to this document.

5.2.1 TEST PROCEDURE (NEW PARTS)

- a. Test the quick connector as supplied. Do not add additional lubrication to the connector or test pin.
- b. Attach quick connector to a suitable test fixture.
- c. Wipe the test pins, before each test, with a clean lint-free cloth to prevent an accumulation of lubrication.
- d. Insert assembly test pin, shown in Figure 3, into the quick connector at a rate of 51 mm/min $\pm$ 5 mm/min (2 in/min $\pm$ 0.2 in/min) and measure assembly effort.

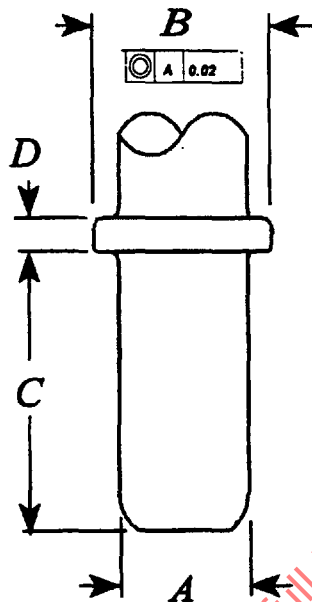
5.2.2 TEST PROCEDURE—(CONNECTORS EXPOSED TO CORROSION (6.1), ZINC CHLORIDE (6.2), CHEMICAL (6.3), FUEL (6.4), OR LIFE CYCLE (6.5))

- a. Allow samples to dry 48 h before insertion testing.
- b. Lubricate test pin with SAE 30 weight oil.
- c. Insert assembly test pin, shown in Figure 3, into the quick connector at a rate of 51 mm/min $\pm$ 5 mm/min (2 in/min $\pm$ 0.2 in/min) and measure assembly effort.

5.2.3 ACCEPTANCE CRITERIA

- a. Maximum first time assembly effort 67 N (15 lb).
- b. Maximum assembly effort after Corrosion Test (6.1), Zinc Chloride (6.2), Chemical (6.3), Life Cycle (6.5), or Fuel Compatibility (6.4): 111 N (25 lb).

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	A	B	C	D
+	0.01	0.01	0.05	0.02
-	0	0	0	0
8 mm Sized	7.95	11.13	19.77	1.93
10 mm Sized	9.95	13.63	22.49	2.75
12 mm Sized	11.90	16.76	24.62	2.75
16 mm Sized	15.90	19.65	24.62	2.75
19 mm Sized	18.90	22.58	24.62	2.75
22 mm Sized	21.85	26.20	27.50	2.75

NOTE—Use nominal radii and fillets shown in Figure 6 for Low-Carbon Steel

SEE APPENDIX B FOR ADDITIONAL SIZES

FIGURE 3—ASSEMBLY TEST PIN

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5.3 Pull-Apart Effort—Quick connector pull-apart effort is the force required to pull the mating tube end out of the quick connector. Use a suitable tensile tester to verify conformance to this document.

5.3.1 TEST PROCEDURE

- a. Attach the quick connector body stem to a fixture suitable for pulling axially through the centerline of the quick connector.
- b. Use the pull-apart test pin shown in Figure 4.
- c. Apply a tensile load, at a rate of 51 mm/min $\pm$ 5 mm/min (2 in/min $\pm$ 0.2 in/min), until complete separation occurs.

5.3.2 ACCEPTANCE CRITERIA

- a. Minimum force required to separate the test pin from the fuel quick connector 450 N (101 lb), or 300 N (67 lb) after Section 6 exposure.
- b. Minimum force required to separate the test pin from the vapor/emissions quick connector is 133 N (30 lb) for 1/4 to 3/8 in and 222 N (50 lb) for larger sizes. After Section 6 exposure, 100 N (23 lb) and 180 N (40 lb).

5.4 Side Load Capability—Quick connector side load capability consists of a side load leak test and a side load fracture test.

5.4.1 TEST PROCEDURE

- a. Insert quick connector into a 500 mm (19.69 in) length of design intent hose with the opposite end sealed.
- b. Attach the quick connector to a suitable fixture, shown in Figure 5.
- c. For liquid fuel quick connectors pressurize the assembly with 1034 kPa $\pm$ 35 kPa, 10.34 bar $\pm$ 0.35 bar (150 psig $\pm$ 5 psig) air pressure.
- d. For vapor/emission quick connectors pressurize the assembly with 69 kPa $\pm$ 2 kPa, 0.69 bar $\pm$ 0.03 bar (10 psig $\pm$ 2 psig) air pressure.
- e. Side load the quick connector, at a rate of 12.7 mm/min $\pm$ 5 mm/min (0.5 in/min $\pm$ 0.2 in/min) to the specified force (see Table 1) and perform the leak test.
- f. Continue to side load quick connector, at a rate of 12.7 mm/min $\pm$ 5 mm/min (0.5 in/min $\pm$ 0.02 in/min), until the specified force (see Table 1) is applied or fracture of the quick connector occurs. Kinking of design intent hose permitted.

5.4.2 TEST REQUIREMENT (SIDE LOAD AIR LEAK TEST)—See Table 1.

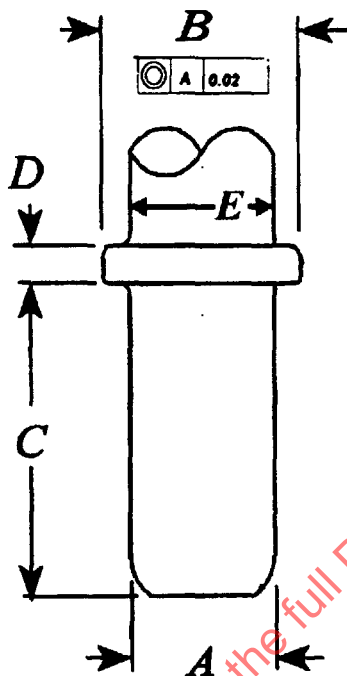
5.4.3 ACCEPTANCE CRITERIA

- a. No fracture or rupture of the quick connector or its components permitted.
- b. Maximum leak rate 8 cc/min at stabilization with 10.34 bar $\pm$ 0.34 bar (150 psig $\pm$ 5 psig).

5.4.4 TEST REQUIREMENT (SIDE LOAD FRACTURE TEST)—See Table 1.

5.4.5 ACCEPTANCE CRITERIA—No fracture or rupture of the quick connector or its components permitted below the minimum force (see Table 1).

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	A	B	C	D	E
+	0	0	0	0	0.02
-	0.01	0.02	0.50	0.50	0
8 mm Sized	7.83	10.83	19.27	1.27	7.95
10 mm Sized	9.83	13.21	21.99	2.25	9.95
12 mm Sized	11.70	16.26	23.62	2.25	11.90
16 mm Sized	15.70	19.15	23.62	2.25	15.90
19 mm Sized	18.70	22.08	23.62	2.25	18.90
22 mm Sized	21.55	25.20	26.50	2.25	21.85

NOTE—Use nominal radii and fillets shown in Figure 6 for Low-Carbon Steel

SEE APPENDIX B FOR ADDITIONAL SIZES

FIGURE 4—PULL-APART TEST PIN

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6.1.1 TEST PROCEDURE

- a. Insert mating tube ends, shown in Figure 6, into the quick connectors.
- b. Cap the mating tube ends and the stem ends of the quick connectors, so internal surfaces remain free of water and corrosion.
- c. Perform salt spray test per ASTM B 117.

6.1.2 ACCEPTANCE CRITERIA—The quick connectors shall be capable of meeting the functional requirements of Section 5 after 500 h salt spray. Appearance is not a functional requirement.

6.2 Zinc Chloride Resistance—The zinc chloride resistance test is performed to assure that the quick connector meets the functional requirements of the fuel system after exposure to zinc chloride.

6.2.1 TEST PROCEDURE

- a. Insert mating tube ends, shown in Figure 6, into the quick connectors.
- b. Cap the mating tube ends and stem ends of the quick connectors, so internal surfaces remain free of water and corrosion.
- c. The quick connector shall be immersed in a 50% aqueous solution (by weight) of zinc chloride for 200 h at 60 °C (140 °F). The solution may change percentage during the exposure.
- d. The quick connectors must then be removed from the zinc chloride solution, do not rinse or clean.
- e. The quick connectors must then be held at room temperature for 24 h.
- f. Quick connectors are to be inspected after each exposure sequence and any evidence of cracking recorded.

6.2.2 ACCEPTANCE CRITERIA

- a. No cracks or fractures of the quick connector or its components permitted.
- b. The quick connectors shall be capable of meeting the functional requirements of Section 5 after exposure to zinc chloride.

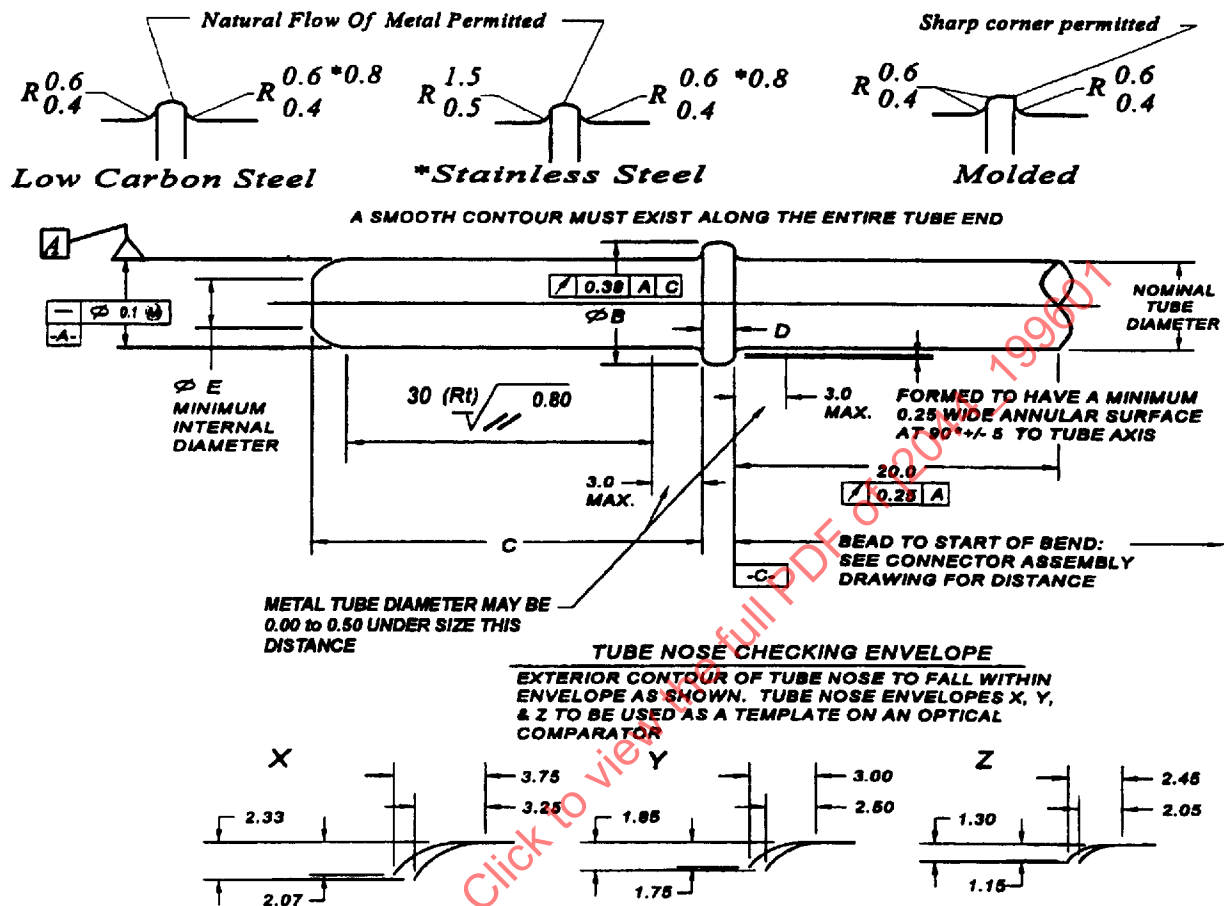
6.3 External Chemical and Environmental Resistance—The chemical resistance test is performed to assure that the quick connector will meet the functional requirements of the fuel system after exposure to typical automotive fluids.

6.3.1 TEST PROCEDURE

- a. Insert mating tube ends, shown in Figure 6, into the quick connectors.
- b. Cap mating tube ends and stem ends of the quick connectors.
- c. The quick connectors shall be immersed in the fluids, specified in 6.3.2, at room temperature, unless otherwise specified.

6.3.2 FLUID OR MEDIUM—(See Table 2.)

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*** Caution, not compatible with all connectors.**

Nominal Tube Dia.	A Seal Dia.	B Bead Dia.	C Length	D Bead Width ¹	E Minimum ID	F Nose
8 mm	7.89 ± 0.06	10.98 ± 0.15	19.52 ± 0.25	1.6 ± 0.33	4.7	Z
10 mm	9.89 ± 0.06	13.42 ± 0.21	22.24 ± 0.25	2.5 ± 0.25	6.6	Z
12 mm	11.80 ± 0.1	16.51 ± 0.25	24.12 ± 0.5	2.5 ± 0.25	7.5	Y
16 mm	15.80 ± 0.1	19.4 ± 0.25	24.12 ± 0.5	2.5 ± 0.25	11.3	Y
19 mm	18.80 ± 0.1	22.33 ± 0.25	24.12 ± 0.5	2.5 ± 0.25	13.2	Y
22 mm	21.70 ± 0.15	25.7 ± 0.5	27 ± 0.5	2.5 ± 0.25	16	X

¹ May be smaller, recommend 2 times wall thickness minimum for metal tube.

SEE APPENDIX D FOR ADDITIONAL SIZES

FIGURE 6—MATING TUBE END CONFIGURATION

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TABLE 2—FLUID OR MEDIUM

Fluid or Medium	Exposure Time	Procedure
Automatic Transmission Fluid	30 Days	Soak
Motor Oil	30 Days	Soak
Brake Fluid (Dot 3)	30 Days	Soak
Ethylene Glycol (50% Water)	30 Days	Soak
Propylene Glycol (50% Water)	30 Days	Soak
Diesel Fuel	30 Days	Soak
Engine Degreaser	30 Days	Soak

NOTE—The fluids in Table 2 shall be considered generic or those that are common to the industry.

6.3.3 ACCEPTANCE CRITERIA—The quick connectors shall be capable of meeting the functional requirements of Section 5 upon completion of the external chemical and environmental testing.

NOTE—New connectors using the same materials as previously tested connectors may use the original results as surrogate data.

6.4 Fuel Compatibility—The fuel compatibility test is performed to assure that the quick connector will meet the functional requirements of the fuel system after exposure to specific fuel blends.

NOTE—Not all materials may be suitable for all fuel types.

6.4.1 TEST PROCEDURE

- Insert mating tube ends, shown in Figure 6, into the connectors.
- The samples shall have fuel contact surfaces exposed to recirculation of the fuels specified in 6.4.2.
- Replace the fuel every 7 days.
- New samples must be used for each test.

6.4.2 TEST FUELS—Reference SAE Gasoline/Methanol Mixtures for Materials Testing CPP-1 SAE J1681 and Table 3.

6.4.3 TEST REQUIREMENT—Half the samples shall be tested immediately after removal from the test fuel and the remaining half shall be tested after a 48 h dry-out period.

6.4.4 ACCEPTANCE CRITERIA—The quick connector shall meet the functional requirements of Section 5 after the completion of the fuel compatibility test.

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TABLE 3—TEST FUELS

Fuel (see SAE J1681)	Exposure Time	Procedure
ASTM Reference Fuel C	30 Days	Soak
SAE CE10 (Fuel C Plus 10% Ethyl Alcohol)	30 Days	Soak
SAE CM30 (Fuel C Plus 30% Methyl Alcohol)	30 Days	Soak
SAE CMTB15 (Gasoline Plus 15% MTBE)	30 Days	Soak
SAE CP (Auto-Oxidized Fuel, Peroxide #50)	30 Days	Soak

6.5 Life Cycle—The life cycle test is performed to assure that the quick connector will meet the functional requirements of the fuel system when exposed to pressure, vibration, and temperature cycles.

6.5.1 TEST PROCEDURE

- Insert a connector in each end of a 500 mm (19.69 in) length of suitable tubing.
- Leak test the assembly per 5.1, except use mating tube end shown in Figure 6.
- Connect the assembly to a test fixture, shown in Figure 7.
- Test fluid (liquid fuel quick connectors)—Mobil Arctic 155 refrigerant oil or equivalent.
- Test fluid (vapor/emission quick connectors)—Air.

NOTE—Use of flammable materials is not recommended.

6.5.2 VIBRATION FREQUENCY—Continuously sweep the frequency from 7 to 200 Hz at a rate of 0.3 Hz/s (approximately 3 sweeps/h).

6.5.3 ACCELERATION—(See Table 4.)

TABLE 4—ACCELERATION

Maintain Acceleration Load	From	To
18 m/s ² (2 G)	7 Hz	25 Hz
90 (10 G)	25	50
182 (20 G)	50	75
163 (18 G)	75	100
145 (16 G)	100	125
127 (14 G)	125	150
109 (12 G)	150	175
90 (10 G)	175	200

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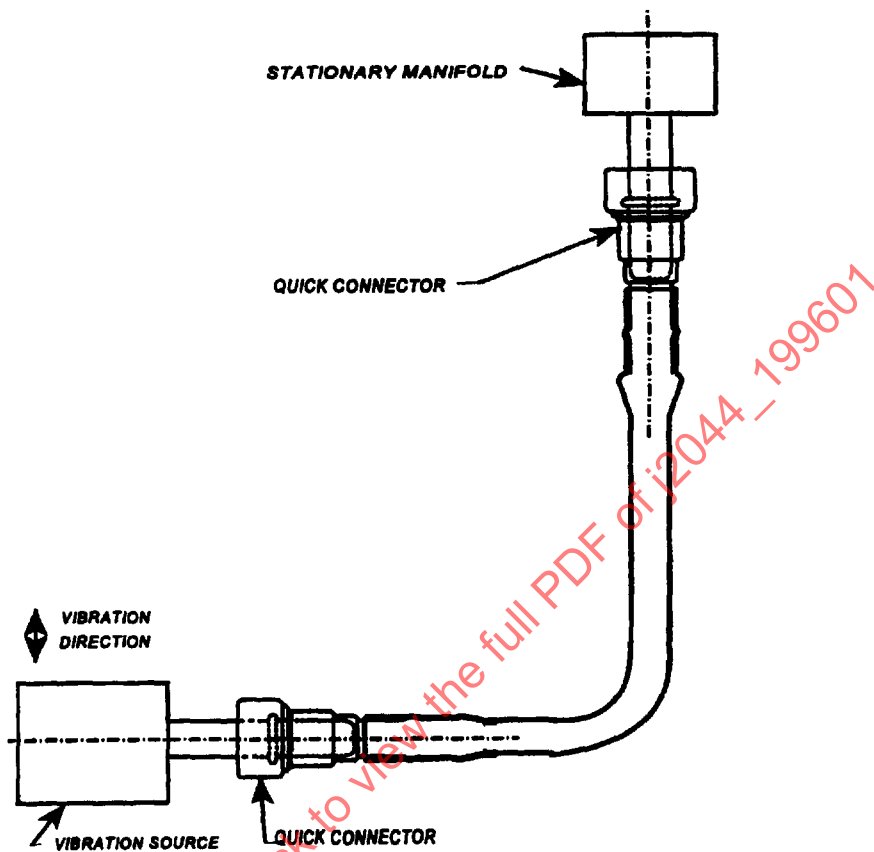


FIGURE 7—LIFE CYCLE FIXTURE

6.5.4 VIBRATION DURATION—Maintain vibration as specified in 6.5.8 (Test Cycle).

6.5.5 FLUID PRESSURE

- For liquid fuel quick connectors during pressure portions of the test, alternate pressure between 0 and $1034 \text{ kPa} \pm 35 \text{ kPa}$, $10.34 \text{ bar} \pm 0.35 \text{ bar}$ ($150 \text{ psig} \pm 5 \text{ psig}$). Alternate pressure one time per minute (i.e., 1 min at each pressure).
- For vapor/emission quick connectors during pressure portions of the test, alternate pressure between 0 and $69 \text{ kPa} \pm 2 \text{ kPa}$, $0.69 \text{ bar} \pm 0.03 \text{ bar}$ ($10 \text{ psig} \pm 2 \text{ psig}$). Alternate pressure one time per minute (i.e., 1 min at each pressure).

6.5.6 FLUID FLOW (LIQUID FUEL QUICK CONNECTORS ONLY)—Flow rate during the specified test cycle is $1.33 \text{ Lpm} \pm 0.2 \text{ Lpm}$ ($0.46 \text{ gpm} \pm 0.07 \text{ gpm}$) per quick connector.

6.5.7 TEST DURATION—336 h (14 test cycles) (14 days)

NOTE—The test may be interrupted or shut down for weekends at the end of 6.5.8.5.

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6.5.8 TEST CYCLE—The test cycle consists of five sections to simulate hot operation, hot soak, hot operation after hot soak, cold soak, and cold operation. See Table 5.

NOTE—Included at the beginning of the hot and cold test sections are temperature transitions times of 1 h maximum.

TABLE 5—LIFE CYCLE TEST SCHEDULE

Section	Hour	Chamber Temperature °C	Fluid Temperature °C	Fluid Pressure	Fluid Flow	Vibration
6.5.8.1	1	125 ¹	125 ¹	Yes	Yes	Yes
	2	125	66	Yes	Yes	Yes
	3	125	66	Yes	Yes	Yes
	4	125	66	Yes	Yes	Yes
	5	125	66	Yes	Yes	Yes
	6	125	66	Yes	Yes	Yes
	7	125	66	Yes	Yes	Yes
6.5.8.2	8	125	125	Yes	No	No
	9	125	125	Yes	No	No
6.5.8.3	10	125	66	Yes	Yes	Yes
	11	125	66	Yes	Yes	Yes
	12	125	66	Yes	Yes	Yes
	13	125	66	Yes	Yes	Yes
	14	125	66	Yes	Yes	Yes
	15	125	66	Yes	Yes	Yes
	16	125	66	Yes	Yes	Yes
6.5.8.4	17	-40	-40	Yes	No	No
	18	-40	-40	Yes	No	No
	19	-40	-40	Yes	No	No
	20	-40	-40	Yes	No	No
	21	-40	-40	Yes	No	No
	22	-40	-40	Yes	No	No
	23	-40	-40	Yes	No	No
6.5.8.5	24	-40	-40	Yes	Yes	Yes

¹ Temperature may be in transition.

6.5.8.1 Hot Operation Test

- Length of Time—7 h
- Chamber Temperature—125 °C ± 5 °C (257 °F ± 9 °F)
- Fluid Temperature (liquid fuel quick connectors only)—66 °C ± 5 °C (151 °F ± 9 °F)
- Fluid Pressure—yes
- Fluid Flow—yes
- Vibration—yes

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6.5.8.2 Hot Soak

- a. Length of Time—2 h
- b. Chamber Temperature— $125^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ($257^{\circ}\text{F} \pm 9^{\circ}\text{F}$)
- c. Fluid Temperature (liquid fuel quick connectors only)—Heat to chamber temperature
- d. Fluid Pressure—yes
- e. Fluid Flow—no
- f. Vibration—no

6.5.8.3 Hot Operation After Hot Soak

- a. Length of Time—7 h
- b. Chamber Temperature— $125^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ($257^{\circ}\text{F} \pm 9^{\circ}\text{F}$)
- c. Fluid Temperature (liquid fuel quick connectors only)— $66^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ($151^{\circ}\text{F} \pm 9^{\circ}\text{F}$)
- d. Fluid Pressure—yes
- e. Fluid Flow—yes
- f. Vibration—yes

6.5.8.4 Cold Soak

- a. Length of Time—7 h
- b. Chamber Temperature— -40°C (-40°F)
- c. Fluid Temperature (liquid fuel quick connectors only)—Cool to chamber temperature
- d. Fluid Pressure—yes
- e. Fluid Flow—no
- f. Vibration—no

6.5.8.5 Cold Operation

- a. Length of Time—1 h
- b. Chamber Temperature— -40°C (-40°F)
- c. Fluid Temperature (liquid fuel quick connectors only)—Cool to chamber temperature
- d. Fluid Pressure—yes
- e. Fluid Flow—yes
- f. Vibration—yes

6.5.9 ACCEPTANCE CRITERIA

- a. No fluid leaks permitted during or at completion of test.
- b. The connector shall meet the functional requirements of Section 5 after the completion of the life cycle test.
- c. Perform visual inspection of connector and its components. No fractures, cracks, or unusual wear permitted.

6.6 Flow Restriction—Connectors shall be designed to provide minimal flow restriction.

6.7 Elevated Temperature Burst—The elevated temperature burst test is performed to assure that the quick connector will withstand the pressure requirements of the fuel system at the maximum operating temperature. This test can be performed as part of the tube and hose assembly requirements of SAE J2045 or as follows.

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6.7.1 TEST PROCEDURE

- Insert a quick connector in each end of a 500 mm (19.69 in) length of reinforced fuel hose. Secure each end with a hose clamp if required.
- Insert male tube ends, shown in Figure 6, into the quick connectors.
- Attach assembly to a suitable, air or hydraulic, burst pressure source.
- Place the assembly in a suitable environmental chamber and soak at 115 °C (239 °F) for 1 h.
- Perform burst by pressurizing the hose assembly at a rate of 3450 kPa/min (500 psig/min) until burst or rupture occurs.

6.7.2 ACCEPTANCE CRITERIA

- Minimum burst pressure for liquid fuel quick connectors 2000 kPa (290 psig).
- Minimum burst pressure for vapor/emission quick connectors 138 kPa (20 psig).

NOTE—The burst test is for the quick connector only. Leakage or rupture of the hose is not a failure. If the hose fails, the test must be rerun with hose capable of higher pressure, if practical.

7. Design Verification/Validation and In-Process Testing Matrix—(See Table 6.) This section describes the minimum In-Process Testing requirements for liquid fuel quick connectors, quick connectors, mating tube ends, and attachment joints.

TABLE 6—DESIGN VERIFICATION/VALIDATION AND IN-PROCESS TESTING MATRIX

Test	Section	Design Verification Minimum Sample Parts	Design Verification Acceptance Criteria	In-Process Minimum Sample Size	In-Process Acceptance Criteria
Leak Test	5.1	50	No Failures	100%	No Failures
Assembly Effort	5.2	50	<67 N	5/lot	<67 N
Pull-Apart	5.3				
Effort - Liquid		50	>450 N	5/lot	>450 N
- Vapor/Emission		50	>223 N	5/lot	>223 N
Side-Load Capability	5.4	50	> Minimum for Size	5/lot	> Minimum for Size
Corrosion	6.1	10	No Failures	10/year	No Failures
Zinc Chloride Resistance	6.2	10	No Failures	10/year	No Failures
External Chemical and Environmental Resistance	6.3	10 each	No Failures	10/year	No Failures
Fuel Compatibility	6.4	10 each	No Failures	10/year	No Failures
Life Cycle	6.5	10	No Failures	10/year	No Failures
Elevated Temperature	6.7				
Burst - Liquid		10	>2000 kPa	10/year	>2000 kPa
- Vapor		10	>138 kPa	10/year	>138 kPa

8. Notes

8.1 Marginal Indicia—The (R) is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.

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