ADOPTION NOTICE

SAE-AS1055, "HOSE, FLEXIBLE, TUBE ASSEMBLIES, COILS, FITTINGS, AND SIMILAR SYSTEM COMPONENTS, FIRE TESTING OF", was adopted on 20-JUN-86 for use by the Department of Defense (DoD). Proposed changes by DoD activities must be submitted to the DoD Adopting Activity: HQ CASC/POA, Specs and Standards Office, 74 N. Washington Avenue, Battle Creek, MI 49017-3094. Copies of this document may be purchased from the Society of Automotive Engineers 400 Commonwealth Drive Warrendale, Pennsylvania, United States, 15096-0001. http://www.sae.org/

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AEROSPACE STANDARD

SAE AS1055

REV. D

Issued 1969-02
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Submitted for recognition as an American National Standard

Superseding AS1055C

FIRE TESTING OF FLEXIBLE HOSE, TUBE ASSEMBLIES, COILS, FITTINGS, AND SIMILAR SYSTEM COMPONENTS

1. SCOPE:

This SAE Aerospace Standard (AS) establishes uniform requirements and procedures for the fire testing of flexible hose assemblies and rigid tube assemblies (including coiled tubes) to be used in aircraft or aerospace vehicle fluid systems. These procedures may also be followed for fire tests on other piping components as specified by the customer. It also refers to standard fire test equipment to be used in conducting “referee” fire tests.

1.1 Classification:

Component assemblies shall be designated by Type and Class according to fire test duration and usage. Flame test apparatus and temperature shall be the same for each Type and Class.

1.1.1 Types:

Type Ia - Hose Assembly, Rubber - Fuel and Oil Systems
Type Ib - Hose Assembly, Rubber - Hydraulic Systems
Type IIa - Hose Assembly, Polytetrafluoroethylene - Fuel and Oil Systems
Type IIb - Hose Assembly, Polytetrafluoroethylene - Hydraulic Systems
Type IIIa - Rigid Tubing Assembly - Fuel and Oil Systems
Type IIIb - Rigid Tubing Assembly - Hydraulic Systems

NOTES: 1. The Types listed above, when tested to higher pressures, temperatures, and lower flow rates do not have to be retested to qualify to lower pressures, low temperatures, and/or higher flow rates.

2. An index of the types of assembly by specification is contained in Appendix A.

1.1.2 a. Class A - Fire Resistant: 5 min
b. Class B - Fireproof: 15 min

NOTE: The user of this document is cautioned that the class designation relates only to assemblies tested under flow conditions.

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2. APPLICABLE DOCUMENTS:

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications:

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

AS150	Hose Assembly, Type Classification of, Basic Performance and Fire Resistance
AS1072	Firesleeves
AIR1377	Fire Test Equipment for Flexible Hose and Tube Assemblies

2.2 Federal Standards:

Available from Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591.

Federal Air Regulation (FAR) Code of Federal Regulations Volume 14, Airworthiness Standard

Powerplant Engineering Report No. 3A

3. QUALIFICATION:

The component assemblies furnished under this document shall be products which have been tested and passed the fire test requirements listed herein. These products shall also have been tested and passed the performance requirements of the latest applicable specifications, or other applicable specifications designated by the purchaser.

Test report(s) proving qualification of products to this specification shall be furnished by the supplier to the purchaser and to such cognizant agencies designated by the purchaser, for acceptance of qualification. Qualification by similarity, to assemblies or parts previously tested and qualified, shall be acceptable.

3.1 Materials:

The component materials shall be uniform in quality, free from defects, consistent with good manufacturing practices and shall conform to the applicable specifications listed in 2.1 and 2.2, or other applicable specifications designated by the purchaser.

3.1.1 When firesleeves are employed to meet the fire test requirements, they shall be compatible with fluid and ambient environments encountered and be free of corrosive additives and free from wicking action. Wrapped type firesleeves, where used, shall be arranged to approximate the installed condition that gives the least fire protection.

NOTE: AS1072 indicates compatibility of firesleeves with various fluids.

4. TEST PROCEDURE:

Test procedure shall conform with the following conditions:

4.1 Pretest Conditions:

4.1.1 Flame Temperature and Size: The flame temperature shall be 2000 °F ± 150 °F (1090 °C ± 83 °C) along centerline of the flame for a minimum distance of 7 in (178 mm).

4.1.2 Flame Intensity: The flame heat content shall be 4500 +200/-100 Btu/h (1320 +60/-30 watts) input to a 15 in (380 mm) exposed length of 1/2 in x .032 in (13 mm x 0.8 mm) refrigeration type copper tubing with a water flow rate of approximately 1 gal/min (3.8 L/m). For “Referee Heat Content” equipment, refer to AIR1377.[1]

4.1.3 Air Velocity: Air velocity over the test assembly shall be 400 ft/min (2.03 m/s) with assembly mounted in a 25 in x 25 in (635 mm x 635 mm) hood equipped with a downstream exhaust fan. Air temperature should not exceed the range 40 to 100 °F (4.4 to 37.8 °C).

4.2 Test Conditions:

4.2.1 (R) The assembly under test shall be not less than 24 inches in length. The assembly shall be mounted horizontally with hose assembly(ies) to include a 90° bend. The assembly shall be mounted within the hood except when limited by physical characteristics such as minimum bend radius, etc. The vibrated fitting shall be within the flame.

4.2.2 Vibration: Vibration shall be lateral or longitudinal with an amplitude of ±.062 in (1.59 mm) at 2000 cpm (33 Hz). Amplitude and frequency tolerance shall be ±2%.

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[1] It is desirable that a calorimeter reading of 10 Btu/ft^2-s ± 1 Btu/ft^2-s (113 500 w/m^2 ± 11 350 w/m^2) be obtained over the fire area of 10 in x 6 in (254 mm x 152 mm) in the plane of the component. Along the 7 in (178 mm) hose centerline, a calorimeter reading of 12 Btu/ft^2-s ± 1 Btu/ft^2-s (136 200 w/m^2 ± 11 350 w/m^2) is desirable.

4.2.3 Oil Temperature: 200 to 230 °F (93 to 110 °C).

4.2.4 Oil Flow: The flow rate, using SAE No. 20 oil, shall be as given. Where specified, the system working fluid may be substituted for SAE No. 20 oil. The ID shall be taken as that of the majority of the component (i.e., the hose for a hose assembly and the tube for a tube assembly) expressed to the next higher 16th of an inch (next higher full millimeter). Flow rate tolerance shall be ±3%.

4.2.4.1 Flow Rate for Fuel and Oil Systems (Type a):

$$(GPM) = 5.0 \times ID^2\ (in^2) \text{ or } (L/min) = 0.03 \times ID^2\ (mm^2) \qquad \text{(Eq.1)}$$

4.2.4.2 Flow Rate for Hydraulic Systems (Type b):

$$(GPM) = 1.0 \times ID^2\ (in^2) \text{ or } (L/min) = 0.006 \times ID^2\ (mm^2) \qquad \text{(Eq.2)}$$

4.2.5 Pressure: The pressure shall be the working pressure of the component or, where specified, the system pressure may be substituted during the test.

4.2.6 Burner Position: The burner shall be positioned such that the distance to the side of the component is equal to the distance to the plane where the requirements of 4.1.1 and 4.1.2 are met.

In the case of testing a hose or tube assembly, a minimum of 5 in (127 mm) of the hose or tubing plus the fitting must be exposed to the fire.

5. REQUIREMENTS:

5.1 Test Equipment:

The equipment used for this fire test shall be capable of providing the test conditions of Section 4. For purposes of “referee” testing, the equipment shall be in accordance with AIR1377.

5.2 Failure:

Assemblies shall not fail by rupture or leakage before a test duration of:

a. 5 min to be rated Class A - Fire Resistant
b. 15 min to be rated Class B - Fireproof

Rupture or leakage shall be detected visually from a distance of 5 ft (1.5 m) or automatically with a photoelectric cell located 3.5 to 4 ft (1.1 to 1.2 m) downstream of test specimen.

5.2.1 (R) Three successfully tested samples are required for compliance to AC 23-2, AS150 and similar FAA TSO test.

6. IDENTIFICATION:

Assemblies shall be permanently and legibly identified with the following information using a permanently attached corrosion resistant steel band or permanent marking on component, unless otherwise specified by the purchaser.

a. Manufacturer’s name or trademark.
b. Size, type, and maximum operating pressure of component assembly.
c. Manufacturer's part number.
d. Date of manufacture (month and year).
e. Component assemblies suitable for use with synthetic base fluids shall be marked with the letter “S” immediately following the Type and Class designation and the letter “P” for petroleum base fluids. If suitable for both synthetic and petroleum base fluids, mark with letters “S/P”, i.e.:

AS1055 Type la Class A-S
Type lb Class A-P
Type llb Class A-S/P

Applicable Specification: (AS1055)
Type of Assembly shall be as designated in 1.1.1
Class of Assembly shall be as designated in 1.1.2

7. INTENDED USE:

This document is intended to set forth requirements and test criteria for approval of piping components for use in designated fire zones where fire resistant assembly (5 min exposure - Class A) or fireproof assembly (15 min exposure - Class B) is necessary and required per Federal Air Regulation 23, 25, 27, or 29.

8. NOTES:

8.1 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.

PREPARED BY SAE COMMITTEE G-3, AEROSPACE COUPLINGS,
FITTINGS, HOSE, AND TUBING ASSEMBLIES

APPENDIX A

For cross-reference purposes, and to permit continued usage of the superseded ARP1055 designations, Table A1 compares the Type of assembly in AS1055 with ARP1055A.

TABLE A1

Nominal System Pressure (psi)/ Temperature (°F)	AS1055 Type	ARP1055A Type
Rubber Hose Assemblies		
3000/160 (MIL-H-8790)	Ib	Ia
1500/160 (MIL-H-8795)	Ib*	Ib
1000/160 (MIL-H-8795)	Ia	Ic or id
1000/250 (MIL-H-58089)	Ia	Ic
Polytetrafluoroethylene Hose Assemblies		
	IIb	IIj
4000/400 (ARP614)	IIb	IIa
3000/400 (MIL-H-38360)***	IIb	IIb
1500/450 (MIL-H-25579)	IIb	IIc
1500/275 (MIL-H-25579)**	IIa	IId
1500/450 (MIL-H-25579)	IIa	IIe
1500/275 (MIL-H-25579)**	IIb	IIf
1000/400 (ARP620)	IIb	IIg
300/400 (ARP1227)	IIb	IIh
300/275 (ARP1227)**		
Rigid Tube Assemblies (Per MIL-F-18280/5509)		
3000/400	IIIb	IIIa
3000/275**	IIIb	IIId
1500/400	IIIb	IIIb
1500/275	IIIb	IIIc
	None	IIIe
	None	IIIf

NOTES:
*Requalification required due to change in oil flow requirements
**Aluminum end fitting components permitted for lower temperature applications.
***MIL-H-38360 is superseded by AS1339 and AS604 (DODISS).