SAE
Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE STANDARD

AS 1055B
Superseding ARP 1055A
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SUPERSEDED

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

1. SCOPE

This 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 Section 8 Appendix.

1.1.2 Class:

	Fire Test Duration
Class A - Fire Resistant	5 minutes
Class B - Fire Proof	15 minutes

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

2. APPLICABLE DOCUMENTS

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

AS 1072 - Firesleeves
AIR 1377 - Fire Test Equipment for Flexible Hose and Tube Assemblies

2.2 Federal Standards: Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

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

3. QUALIFICATION

The component assemblies furnished under this AS 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.

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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 fire sleeves 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 fire sleeves, where used, shall be arranged to approximate the installed condition that gives the least fire protection.

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Note: AS 1072 indicates compatibility of fire sleeves with various fluids.

4. TEST PROCEDURE

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Test Procedure shall conform with the following conditions:

Ø 4.1 Pre-test Conditions:

4.1.1 Flame Temperature and Size: The flame temperature shall be 2000° F ± 150° F (1090° C ± 66° C) along centerline of the flame for a minimum distance of 7 in. (178 mm).

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4.1.2 Flame Intensity: The flame heat content shall be 4500 +200/-100 Btu/hr (1320 +60/-30 watts) input to a 15 in. (380 mm) exposed length of 1/2 x .032 in. (13 x 0.8 mm) refrigeration type copper tubing with a water flow rate of approximately 1 gallon per min. (3.8 L/m). For "Referee Heat Content" equipment, refer to AIR 1377. [1]

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4.1.3 Air Velocity: Air velocity over the test assembly shall be 400 ft per min. (2.03 m/s) with assembly mounted in a 25 x 25 in. (635 x 635 mm) hood equipped with a downstream exhaust fan. Air temperature shall be maintained within the range 40° - 100° F (4.4° - 37.8° C).

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Ø 4.2 Test Conditions:

4.2.1 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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4.2.2 Oil Temperature: 200° - 230° F (93° - 110° C).

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

4.2.3 Oil Flow: The flow rate, using SAE No. 20 oil, shall be as given below. 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 millimetre). Flow rate tolerance shall be ±3%.

4.2.3.1 Flow Rate for Fuel and Oil Systems (Type a)

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

4.2.3.2 Flow Rate for Hydraulic Systems (Type b)

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

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

4.2.5 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 para. 4. For purposes of "referee" testing, the equipment shall be in accordance with AIR 1377.

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

5 min. to be rated Class A - Fire Resistant
15 min. to be rated Class B - Fire Proof

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

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.:

AS 1055 Type Ia Class A -S,
Type Ib Class A -P
Type IIb Class A -S/P

6. (Continued)

Applicable Specification: (AS 1055).

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

8. NOTES

8.1 Marginal Indicia: The phi (Ø) symbol is used to indicate technical changes from the previous issue of this document (ARP 1055A).

PREPARED BY:

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