



National Aeronautics and  
Space Administration

# Marshall Space Flight Center

MSFC, AL 35812

Materials and Processes Laboratory

DATE: 11.19.97

Antifire, Inc.

FIRE RETARDANT PAINT

BROWN

<b>NASA JSC TEST REQUEST</b>		<b>OFFICE USE ONLY</b>	
Note to test facility: A copy of this request should be returned with the test report		TEST FACILITY I. D. NUMBER <b>97-31478</b>	
NAME <b>E. Orndoff/Rajib Dasgupta</b>	ORGANIZATION <b>NASA/JSC - EC2 Lockheed Martin - C71</b>	COORDINATOR <b>lpg</b>	
ADDRESS <b>NASA/JSC 2101 NASA Road 1 Houston, TX 77058</b>	<b>Lockheed Martin 2400 NASA Road 1 Houston, TX 77058</b>	REQUEST NO. <b>11414 E</b>	
DATE <b>September 11, 1997</b>	PHONE <b>(281) 483-0389      (281) 483-0117</b>	TEST FACILITY <b>WSTF</b>	
1. MANUFACTURER'S IDENTIFICATION (Item Description) <b>FIRE RETARDANT PAINT BRAUN</b>	2. MANUFACTURER'S NAME <b>ANTI FIRE INCORPORATED 276 FIFTH AVENUE SUITE 301 NEW YORK, NY 10001</b>		
3. SPECIFICATION	4. CHEMICAL CLASS <b>SEE ATTACHED MSDS</b>	5. GENERIC USE <b>INSULATION LAYER FORMER/FIRE RETARDANT PAINT</b>	
6. CHECK CATEGORY NBS 8085.1 <input type="checkbox"/> A <input type="checkbox"/> B <input checked="" type="checkbox"/> C	7. TEST REQUIRED NBS 8085.1 <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11 <input type="checkbox"/> 12 <input type="checkbox"/> 13 <input type="checkbox"/> 14 <input type="checkbox"/> 15 <input type="checkbox"/> 16 <input checked="" type="checkbox"/> 17 <input type="checkbox"/> 18 <input type="checkbox"/> 19 <input type="checkbox"/> 20 <small>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 VCM TCOM SPECIAL VAC BAKE</small>		
8. VEHICLE <b>SHUTTLE</b>	9. PART NUMBER & SERIAL NO.	10. PROJECT <b>SHUTTLE</b>	11. USE TEMPERATURE
12. USE ATMOSPHERE/FLUID	13. HEATER TYPE	14. USE PRESSURE	15. USE THICKNESS
16. INTENDED APPLICATION		17. QUANTITY IN HABITABLE AREA/HAZARDOUS FLUID/VACUUM	
18. CURE TIME	19. CURE TEMPERATURE	20. CURE PRESSURE	
21. TEST ARTICLE WEIGHT	22. TEST ARTICLE AREA	23. NUMBER ITEMS TESTED	24. NUMBER OF ITEMS TO BE FLOWN
25. TEST CHAMBER VOLUME	26. TEST CHAMBER ATMOSPHERE	27. TEST CHAMBER PRESSURE	28. TEST CHAMBER TEMPERATURE
29. TEST CHAMBER DURATION	30. CLEANING SPEC	31. MATERIAL CODE	32. PHOTOGRAPHIC COVERAGE <input type="checkbox"/> Video <input type="checkbox"/> 8Slide <input checked="" type="checkbox"/> None
33. SPECIAL INSTRUCTIONS  <b>FLAMMABILITY TEST: 30% O<sub>2</sub> AT 10.2 PSI</b>			

AUTHORIZATIONS, SPECIAL INSTRUCTIONS, AND NOTES

<u>FROM</u>	<u>DATE</u>	<u>INSTRUCTIONS</u>
Gibson, Mrs. Lillian P. Lockheed Martin Engineering & Sciences	09/18/97	Apply the material 0.003- to 0.005-inch thick and cure for 24 hours at room temperature. Still photographic coverage is required for flammability testing.
WSTF	--	A pretest photograph is not included for flammability testing because no additional sample information would be provided.

NASA HANDBOOK 8060.1C  
TEST 1: UPWARD FLAME PROPAGATION

TEST MATERIAL

FIRE RETARDANT PAINT

TEST SAMPLE DESCRIPTION

TABLE 1. SAMPLE MEASUREMENTS

Sample Measurements	Sample 1		Sample 2		Sample 3	
	SI	Cust.	SI	Cust.	SI	Cust.
Length (cm, in.)	30.5	12.0	30.5	12.0	30.5	12.0
Thickness (cm, in.)	0.009	0.004	0.009	0.004	0.009	0.004
Weight (g, g)	1.11	1.11	1.25	1.25	1.31	1.31
Width (cm, in.)	6.4	2.5	6.4	2.5	6.4	2.5

Note(s): Measurements exclude 0.05-cm (0.02-in.) aluminum substrates.

Preparation Information

Cure: 24 Hr at 25 °C (77 °F)  
85.5 kPa (12.4 psia)

A single, uniform brush coat was applied onto tared and abraded substrates.

Mounting Device: Spring Clamp

TEST CONDITIONS

Test Atmosphere: 70.0% Nitrogen  
30.0% Oxygen

Test Pressure: 70.3 kPa (10.2 psia)

Test Chamber Volume: 1.4 m<sup>3</sup> (50 ft<sup>3</sup>)

**TEST RESULTS, OBSERVATIONS, AND COMMENTS**

**TABLE 2. TEST RESULTS**

Results	Sample 1		Sample 2		Sample 3	
	SI	Cust.	SI	Cust.	SI	Cust.
Burn Length (cm, in.)	2.3	0.9	2.3	0.9	2.3	0.9
Weight Loss (g, g)	ND	ND	ND	ND	ND	ND
Relative O <sub>2</sub> Consumption (%, %)	ND	ND	ND	ND	ND	ND

Note(s): Propagation burn time is only reported if the material burns greater than 15.2 cm (6.0 in.).

ND indicates that the results were less than the reporting limit. The reporting limit for weight loss is 0.05 gram. The reporting limit for relative oxygen consumption is 0.5 percent.

**TABLE 3. FLAMMABILITY CHARACTERISTICS  
 (NONE, SMALL, MODERATE, LARGE)**

Characteristics	Sample 1	Sample 2	Sample 3
Quantity of Sparks	None	None	None
Quantity of Cinders	None	None	None
Quantity of Flame Jets	None	None	None
Quantity of Burning Material Transferred	None	None	None
Effect on K-10 paper	No Ignition	No Ignition	No Ignition

Posttest Photograph(s): NASA-WSTF 1097-3044

Video Cassette Number(s): 997-0533-A

**Observations and Comments**

All samples ignited, burned, and self-extinguished.

Soot was deposited beyond the recorded burn lengths; therefore, the posttest photograph does not appear to agree with the recorded burn lengths.

WSTF NO. 97 31478  
FIRE RETARDANT PAINT

30.0% O<sub>2</sub> AT 10.2 PSIA



988A-181F  
987-3044

NASA HANDBOOK 8060.1C  
TEST 6: ODOR TEST  
NON-STANDARD TEST \*

TEST MATERIAL

FIRE RETARDANT PAINT

TEST SAMPLE DESCRIPTION

Weight: 4.438 g

Surface/Liter of Chamber Volume: 300 cm<sup>2</sup>/l

Additional Information

Measurements exclude 0.025-cm (0.010-in.) aluminum substrates.

Preparation Information

Cure: 24 Hr at 25 °C (77 °F)  
85.5 kPa (12.4 psia)

A single, uniform brush coat was applied onto tared and abraded substrates.

TEST CONDITIONS

Test Chamber Volume: 2 liters

Test Atmosphere: 79.1% Nitrogen  
20.9% Oxygen

Test Pressure: 82.0 kPa (11.9 psia)

Test Temperature: 49 °C (120 °F)

Test Duration: 72 Hr

Additional Information

The concentration of nitrogen dioxide in the test matrix gas cannot be verified at the specification limit. \*

TEST RESULTS, OBSERVATIONS, AND COMMENTS

Average Odor Value: 1.6

NASA HANDBOOK 8060.1C  
TEST 7: DETERMINATION OF OFFGASSED PRODUCTS  
NON-STANDARD TEST \*

TEST MATERIAL

FIRE RETARDANT PAINT

TEST SAMPLE DESCRIPTION

Weight: 18.06 g \*

Approximate Surface Area: 3000 cm<sup>2</sup>

Additional Information

Measurements exclude 0.025-cm (0.010-in.) aluminum substrates.

Preparation Information

The required weight to attain  $5.0 \pm 0.25$  grams per liter of test chamber volume could not be met without exceeding the maximum practical quantity of sample for the test chamber volume. \*

Cure: 24 Hr at 25 °C (77 °F)  
85.5 kPa (12.4 psia)

A single, uniform brush coat was applied onto tared and abraded substrates.

TEST CONDITIONS

Test Chamber Volume: 4.2 liters

Test Atmosphere: 79.1% Nitrogen  
20.9% Oxygen

Test Pressure: 82.0 kPa (11.9 psia)

Test Temperature: 49 °C (120 °F)

Test Duration: 72 Hr

Additional Information

The concentration of nitrogen dioxide in the test matrix gas cannot be verified at the specification limit. \*

TEST RESULTS, OBSERVATIONS, AND COMMENTS

TABLE 1. TEST RESULTS

Component	NASA Code	Toxic Limit (micrograms /gram)	Quantity (micrograms /gram)
2-Methyl-2-butenal	022915	0.1	0.04
Acetaldehyde	020300	6	4.2
Acetone	110500	72	0.05
C11-C12 Saturated aliphatic hydrocarbons	099670	7	0.84
C5 Unsaturated aliphatic hydrocarbon	097981	7	0.04
C8-C9 Saturated and unsaturated aliphatic hydrocarbons	098885	7	0.10
Carbon disulfide	121000	4.4	3.9
Carbon monoxide	161000	14	0.14
Carbonyl sulfide	122000	7.0	0.88
Crotonaldehyde	021800	2.4	0.008
Decamethylcyclopentasiloxane	163000	271.6	0.09
Ethyl alcohol	013600	134.00	1.0
Heptanal	027010	33.4	0.01
Hexamethylcyclotrisiloxane	164500	324.0	0.15
Methyl alcohol	014800	13	0.25
n-Hexanal	023400	23.4	0.52
Octamethylcyclotetrasiloxane	165100	217.4	0.21
Pentanal	024000	151.00	0.06
Propionaldehyde	023600	136.01	0.08
Unidentified component	999999	0.1	0.02

Note(s): Toxic Hazard Index (T) 2.523 is based on the use of 100 pounds of the material in a 65-cubic-meter spacecraft.

SP-R-0022A (ASTM E 595)  
TOTAL MASS LOSS AND COLLECTED CONDENSABLE MATERIALS FROM  
OUTGASSING IN A VACUUM ENVIRONMENT (VCM TEST)  
NON-STANDARD TEST \*

TEST MATERIAL

FIRE RETARDANT PAINT

TEST SAMPLE DESCRIPTION

Average Sample Thickness: 0.008 cm (0.003 in.)

Additional Information

Measurements exclude 0.008-cm (0.003-in.) aluminum substrates.

Preparation Information

Because of the low density of the material and substrate limitation,  
sample weight was less than the sample weight requirement of SP-R-0022A. \*

Cure:               24 Hr at 25 °C (77 °F)  
                      85.5 kPa (12.4 psia)

A single, uniform brush coat was applied onto tared and abraded  
substrates.

TEST CONDITIONS

Final Test Pressure:  $3 \times 10^{-4}$  Pa ( $2 \times 10^{-6}$  torr)

Test Sample Temperature: 125 °C (257 °F)

Test Collector Plate Temperature: 25 °C (77 °F)

Test Duration: 24 Hr

**TEST RESULTS, OBSERVATIONS, AND COMMENTS**

**TABLE 1. TEST RESULTS**

<b>Calculated Results</b>	<b>Sample 1</b>	<b>Sample 2</b>	<b>Sample 3</b>	<b>Average Values</b>
<b>Postconditioning * Weight (g)</b>	0.029	0.021	--	--
<b>Weight Loss (%)</b>	13.59	21.68	--	--
<b>Volatile Condensable Material (%)</b>	7.86	12.87	--	--
<b>Water Vapor Recovery (%)</b>	1.38	0.74	--	1.06

**Note(s):** The maximum estimated random deviation observed in the percentage of Volatile Condensable Material with a sample mass of 0.250 gram is 0.02 percent. The random deviation for the percent of Volatile Condensable Material with the sample mass used in this test is estimated to be 0.24 percent.

The test results exceed the precision limits, as stated in ASTM E 595-93, that are required to produce a statistically meaningful average for the following value(s):  
Total Weight Loss  
Volatile Condensable Material