MATERIAL SELECTION LIST FOR PLASTIC FILMS, FOAMS, AND ADHESIVE TAPES

APPROVED: _____
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1. INTRODUCTION

This Kennedy Technical Instruction (KTI) was developed to provide users with test results on materials that were tested for flammability, electrostatic discharge, and hypergolic ignition/breakthrough characteristics in accordance with NASA-STD-6001 (Flammability, Odor, Offgassing, and Compatibility Requirements and Test Procedures for Materials in Environments That Support Combustion), KSC/MMA-1985-79 (Standard Test Method for Evaluating Triboelectric Charge Generation and Decay), and KSC/MTB-175-88 (Procedure for Casual Exposure of Materials to Hypergolic Fluids), respectively.

Cleanroom operational requirements were not taken into consideration; therefore, if such an application is anticipated, the user should ensure the material meets the facility cleanroom requirements.

These listings do not take into account the effects of unknown formulation and/or process changes that could be performed by a manufacturer, which could result in a material performing differently than these test results would indicate. It is the responsibility of the user to ensure that the material to be used is representative of the materials as tested. To assist the user in this determination, the manufacturing date of the material tested is listed, where available.

Those materials that require lot testing prior to use are identified in the tables. These lot tests are required for flammability characteristics only.

The following legend applies:

Brand Name:	Material name and/or part number
CL:	Clear
F:	Fail
MFG DATE:	Manufacturing date of the tested material
MMH:	Monomethylhydrazine

N_2H_4:	Hydrazine
N_2O_4:	Nitrogen Tetroxide
N/A:	Not Applicable/Not Available
NT:	Not Tested
OP:	Opaque
Optic:	Optical Characteristic
P:	Pass
Test No.:	KSC Test Report Number (year – sequence)
THK:	Thickness
TL:	Translucent
TP:	Transparent but Tinted

2. PLASTIC FILMS LISTINGS

These plastic films listings are composed of various plastic films that were submitted for testing and subsequently grouped in several categories based on their ability to meet the acceptance criteria for flammability resistance, electrostatic discharge, and hypergolic ignition and breakthrough resistance. The test methods used in these evaluations include the following:

a) Flammability. NASA-STD-6001, Test 1, Needle Rake Method

b) Electrostatic Discharge. KSC/MMA-1985-79

c) Hypergolic Ignition/Breakthrough. KSC/MTB-175-88, Exothermic Reaction Method and Penetration Method

2.1 PLASTICS FILMS CATEGORIES AND TEST RESULTS.

With the exception of electrostatic results, all results are applicable only for the particular film thickness shown on the list. Prior to specifying a film material for procurement, the user should take into account the manufacturing tolerances regarding thickness. Some color variations affect test results, and these were identified where applicable.

2.1.1 GROUP I. These plastic films met all the acceptance criteria for flammability resistance, electrostatic discharge for an environment that has a relative humidity of not less than 30%, and hypergolic ignition and breakthrough resistance. See table 1.

Table 1. Plastic Films Listings, Group I

Brand Name	Require Lot Test?	Manufacturer	Mfg. Date	Optic	Thk (in)	Test No.
Saf-T-Vu M1083	Yes	Frommelt Safety Products	N/A	CL	0.010	00-0434
Herculite 80, White	Yes	Herculite Products	N/A	OP	0.025	99-0927
Eslon G-406AS	Yes	Sekisui America Corp.	N/A	CL	0.012	00-0009
AN-108	No	Orcon Corp.	N/A	OP	0.011	00-0050
Lectrolite Duotone, Green/Black	Yes	Herculite Products	N/A	OP	0.012	00-0540
LF8900-C	No	LF&P Inc.	N/A	TL	0.005	00-0678
Herculite 80, Yellow	No	Herculite Products	N/A	OP	0.023	01-0238

2.1.2 GROUP II, Subgroup A. These plastic films met the acceptance criteria for flammability resistance and electrostatic discharge for an environment that has a relative humidity (RH) of not less than 30%. They may or may not be suitable for hypergolic exposure. See table 2.

Table 2. Plastic Films Listings, Group II, Subgroup A

Brand Name	Require Lot Test?	Manufacturer	Mfg. Date	Optic	Thk (in)	MMH	N_2H_4	N_2O_4	Test No.
LF8900-A	No	LF&P Inc.	N/A	TL	0.004	NT	NT	NT	00-0166
NMD-FR, 190NPA1-NN	No	National Metalliz-ing	3/00	TL	0.0015	P	F	P	01-0188
NMD-FR, 100NPA1-N	No	National Metalliz-ing	N/A	TL	0.001	P	P	F	02-0086
Llumalloy 50% HSC, 100GA	No	CP Films, Inc.	N/A	TP	0.001	P	P	F	01-0480

2.1.3 GROUP II, Subgroup B. These plastic films met the acceptance criteria for flammability resistance and electrostatic discharge for an environment that has a relative humidity of not less than 45%. They may or may not be suitable for hypergolic exposure. See table 3.

Table 3. Plastic Films Listings, Group II, Subgroup B

Brand Name	Require Lot Test?	Manufacturer	Mfg. Date	Optic	Thk (in)	MMH	N_2H_4	N_2O_4	Test No.
IPPLON KM 1300	No	Airtech Interna-tional Inc.	N/A	TP	0.0005	NT	NT	NT	99-0249

2.1.4 GROUP II, Subgroup C. These plastic films met the acceptance criteria for flammability resistance but not for electrostatic discharge. They may or may not be suitable for hypergolic exposure. See table 4.

Table 4. Plastic Films Listings, Group II, Subgroup C

Brand Name	Require Lot Test?	Manufacturer	Mfg. Date	Optic	Thk (in)	MMH	N_2H_4	N_2O_4	Test No.
LF8900	No	LF&P Inc.	N/A	TL	0.0035	P	P	P	00-0011

3. FOAMS LISTINGS

These foams listings are composed of various foams (rubber, silicone, or composite construction) that were submitted for testing and subsequently grouped in several categories based on their ability to meet the acceptance criteria for flammability resistance, electrostatic discharge, and hypergolic ignition resistance. The test methods used in these evaluations include the following:

a) Flammability. NASA-STD-6001, Test 1, Needle Rake Method

b) Electrostatic Discharge. KSC/MMA-1985-79

c) Hypergolic Ignition. KSC/MTB-175-88, Exothermic Reaction Method and Reactivity Method

3.1 FOAMS CATEGORIES AND TEST RESULTS.

Flammability results are applicable only for the particular foam thickness shown on the tables. Prior to specifying a foam material for procurement, the user should take into account the manufacturing tolerances regarding thickness. Some color variations affect test results, and these were identified where applicable.

3.1.1 Group I. These foams met all of the acceptance criteria for flammability resistance, electrostatic discharge for an environment that has a relative humidity of not less than 30%, and hypergolic ignition resistance. See table 5.

Table 5. Foams Listings, Group I

Brand Name	Require Lot Test?	Manufacturer	Mfg. Date	Thk (in)	Test No.
Kaimannflex ST, Black	No	Kaimann	N/A	0.78	99-0495
Econo Stat AFS175, Charcoal Gray	No	Sno White Floor Mat Systems	N/A	0.38	99-0601
285 LDC, Black	No	Z-MAR Technology	N/A	0.37	99-0916
285 HDC, Black	No	Z-MAR Technology	N/A	1.00	99-0916

3.1.2 Group II, Subgroup A. These foams met the acceptance criteria for flammability resistance and electrostatic discharge for an environment that has a relative humidity of not less than 30%. They may or may not be suitable for hypergolic exposure. See table 6.

Table 6. Foams Listings, Group II, Subgroup A

Brand Name	Require Lot Test?	Manufacturer	Mfg. Date	Thk (in)	MMH	N_2H_4	N_2O_4	Test No.
Pyrell 4.0, Dark Grey	No	Stephenson & Lawyer	N/A	1.00	P	F	P	99-0747
CR Safguard Medium, Blue	No	Chestnut Ridge Foam	N/A	1.00	P	F	P	99-0541

3.1.3 Group II, Subgroup B. These foams met the acceptance criteria for flammability resistance and electrostatic discharge for an environment that has a relative humidity of not less than 45%. They may or may not be suitable for hypergolic exposure. See table 7.

Table 7. Foams Listings, Group II, Subgroup B

Brand Name	Require Lot Test?	Manufacturer	Mfg. Date	Thk (in)	MMH	N_2H_4	N_2O_4	Test No.
None			N/A					

3.1.4 Group II, Subgroup C. These foams met the acceptance criteria for flammability resistance but not for electrostatic discharge. They may or may not be suitable for hypergolic exposure. See table 8.

Table 8. Foams Listings, Group II, Subgroup C

Brand Name	Require Lot Test?	Manufacturer	Mfg. Date	Thk (in)	MMH	N_2H_4	N_2O_4	Test No.
Poron BF-1000, White	No	Rogers Corp.	N/A	1.00	NT	NT	NT	99-0495
Pyrell 2.0, Light Grey	No	Stephenson & Lawyer	N/A	1.00	NT	NT	NT	99-0747

4. ADHESIVE TAPES LISTINGS

The adhesive tapes listings are composed of various adhesive tapes (plastic, rubber, fabric, or composite construction) that were submitted for testing and subsequently grouped in several categories based on their ability to meet the acceptance criteria for flammability resistance, electrostatic discharge, and hypergolic ignition resistance. The test methods used in these evaluations include the following:

a) Flammability. NASA-STD-6001, Test 1, Needle Rake Method, with the specimen mounted on an aluminum foil substrate

b) Electrostatic Discharge. KSC/MMA-1985-79

c) Hypergolic Ignition. KSC/MTB-175-88, Exothermic Reaction Method and Reactivity Method applied on both sides of the tape material

4.1 ADHESIVE TAPES CATEGORIES AND TEST RESULTS.

Flammability results are applicable only for the particular tape thickness shown on the list. Prior to specifying an adhesive tape material for procurement, the user should take into account the manufacturing tolerances regarding thickness. Some color variations affect test results, and these were identified where applicable.

4.1.1 Group I. These adhesive tapes met all of the acceptance criteria for flammability resistance, electrostatic discharge for an environment that has a relative humidity of not less than 30%, and hypergolic ignition resistance. See table 9.

Table 9. Adhesive Tapes Listings, Group I

Brand Name	Require Lot Test?	Manufacturer	Mfg. Date	Optic	Thk (in)	Test No.
Scotch 363LC	No	3M	N/A	OP	0.006	00-0182
Orcotape OT-16	Yes	Orcon Corporation	N/A	OP	0.005	99-0858
Orcotape OT-16A	No	Orcon Corporation	12/02	OP	0.003	03-0051

4.1.2 Group II, Subgroup A. These adhesive tapes met the acceptance criteria for flammability resistance and electrostatic discharge for an environment that has a relative humidity of not less than 30%. They may or may not be suitable for hypergolic exposure. See table 10.

Table 10. Adhesive Tapes Listings, Group II, Subgroup A

Brand Name	Require Lot Test?	Manufacturer	Mfg. Date	Optic	Thk (in)	MMH	N_2H_4	N_20_4	Test No.
None			N/A						

4.1.3 Group II, Subgroup B. These adhesive tapes met the acceptance criteria for flammability resistance and electrostatic discharge for an environment that has a relative humidity of not less than 45%. They may or may not be suitable for hypergolic exposure. See table 11.

Table 11. Adhesive Tapes Listings, Group II, Subgroup B

Brand Name	Require Lot Test?	Manufacturer	Mfg. Date	Optic	Thk (in)	MMH	N_2H_4	N_20_4	Test No.
Solder Mask Tape 42	No	3M	N/A	TL	0.003	NT	NT	NT	00-0371

4.1.4 Group II, Subgroup C. These adhesive tapes met the acceptance criteria for flammability resistance but not for electrostatic discharge. They may or may not be suitable for hypergolic exposure. See table 12.

Table 12. Adhesive Tapes Listings, Group II, Subgroup C

Brand Name	Require Lot Test?	Manufacturer	Mfg. Date	Optic	Thk (in)	MMH	N_2H_4	N_20_4	Test No.
Temp-R-Tape Kapton K102	No	Furon/CHR Industries	N/A	TP	0.002	NT	NT	NT	99-0452
Scotch 364	No	3M	N/A	OP	0.009	P	F	P	00-0300