Radiant Panel for Insulation

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Federal Aviation Administration

Review of Sample Substrate Boards

- Numerous high temperature boards are used to place the sample on when testing in the radiant panel.
- They include Kaowool M™ board, Superwool ™607, Ceraboard 100, or P, Kaowool™ 1260 board, Fermacell, and others.
- The FAA has called out the Kaowool M™ board since the test was first developed. This material has been used at the Tech Center for many years in many capacities.
- The refractory material used to line the chamber, to line the chimney, and in the calorimeter holder does not impact the test. Boards used to “build up” to the proper height for testing in the sliding platform do not impact the test, except for the board the sample is placed on (top board) and, this is only critical when the board is new.

Superwool® Regulation by Country
(as of June 14, 2012)

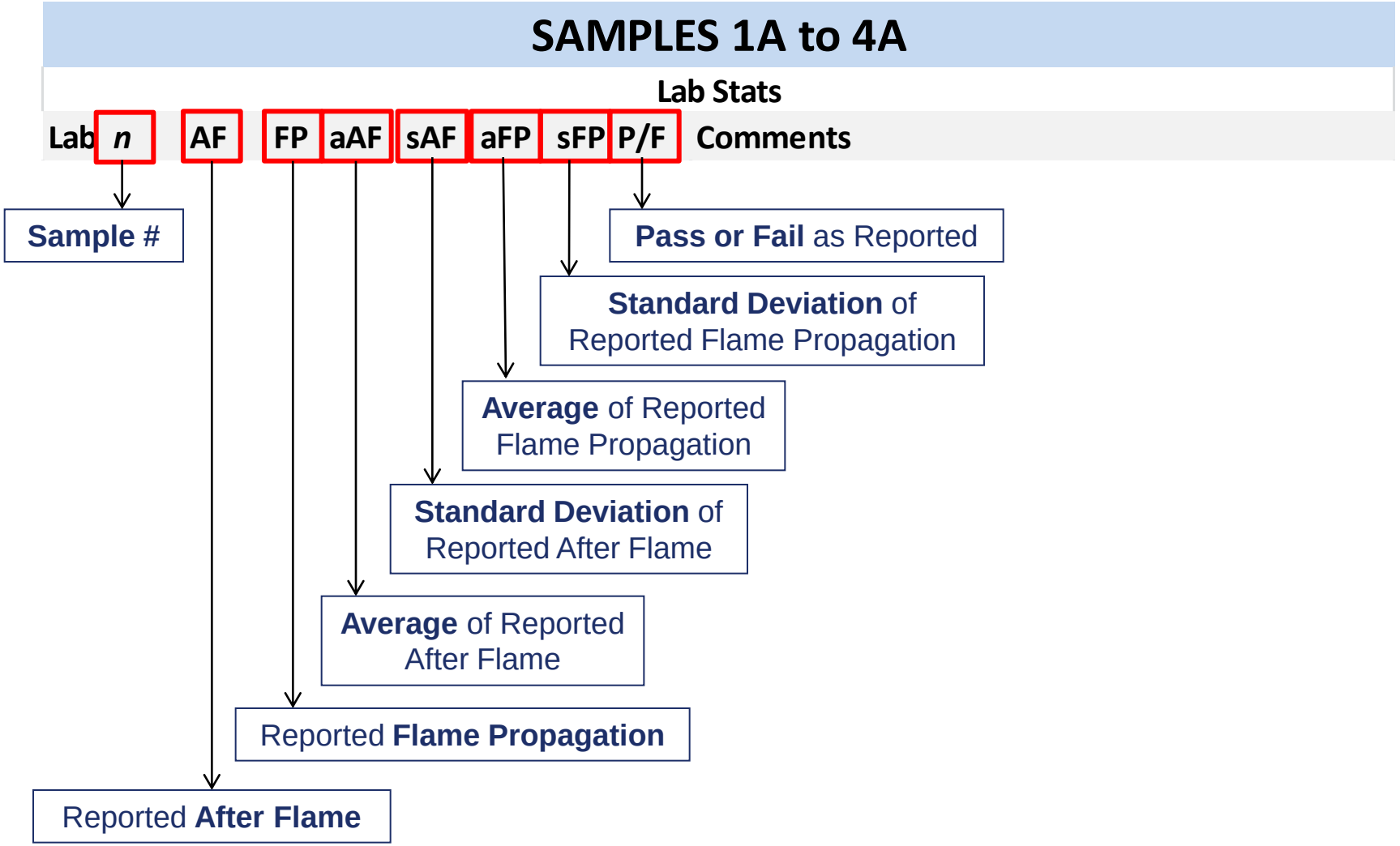
	Stance on Superwool	
	European Union (EU)	**United States and Canada**
Classification of Superwool Family	• Alkaline Earth Silicate (AES) • **Not RCF**	• Alkaline Earth Silicate (AES) • **Not RCF**
Superwool Status	• Fully exonerated from any carcinogen classification in the European Union under the Provisions of Directive 97/69/EC	• Viewed as a nuisance dust • May cause temporary, mild mechanical irritation to the eyes, skin, nose and/or throat
PEL/Regulatory Control	• No PEL • Not Regulated	• No PEL • Not Regulated

The Superwool Family of Products are Alkaline Earth Silicate (AES) fibers; Not RCF

Round Robin Preliminary Results

- 15 of 26 participating labs have reported their results
- This Round Robin will consists of:
  - Film cover and tape (Sample A)
  - Film cover and tape (Sample B)
  - Three different double sided tapes (Samples T, P, and C)

Round Robin Preliminary Results



Round Robin Preliminary Results

SAMPLES 1A to 4A									
Lab Stats									
Lab	***n***	**AF**	**FP**	**aAF**	**sAF**	**aFP**	**sFP**	**P/F**	**Comments**
A	1	0	0.00	0.00	0.00	0.25	0.50	Pass	Film Pulled Away
	2	0	1.00					Pass	? Propagation Minimul
	3	0	0.00					Pass	Film Pulled Away
	4	0	0.00					Pass	Film Pulled Away
B	1	0	0.75	0.00	0.00	0.19	0.38	Pass	
	2	0	0.00					Pass	
	3	0	0.00					Pass	
	4	0	0.00					Pass	
C	1	0	1.20	0.00	0.00	1.11	0.13	Pass	
	2	0	1.25					Pass	
	3	0	1.00					Pass	
	4	0	1.00					Pass	
D	1	0	0.97	0.00	0.00	0.87	0.12	Pass	Specimen shrink
	2	0	0.97					Pass	
	3	0	0.75					Pass	
	4	0	0.77					Pass	
E	1	0	0.75	0.00	0.00	0.75	0.00	Pass	
	2	0	0.75					Pass	
	3	0	0.75					Pass	
	4	0	0.75					Pass	
F	1	0	1.38	0.00	0.00	1.25	0.09	Pass	
	2	0	1.22					Pass	
	3	0	1.18					Pass	
	4	0	1.20					Pass	

Round Robin Preliminary Results

SAMPLES 1A to 4A									
Lab Stats									
Lab	*n*	AF	FP	aAF	sAF	aFP	sFP	P/F	Comments
G	1	6	0.50	1.50	3.00	0.88	0.25	Fail	Film Melt Away and small glob burned after test
	2	0	1.00					Pass	Flim Melt Away
	3	0	1.00					Pass	Film Melt Away
	4	0	1.00					Pass	Film Melt Away
H	1	2.6	1.00	0.65	1.30	0.25	0.50	Pass	
	2	0	0.00					Pass	
	3	0	0.00					Pass	
	4	0	0.00					Pass	
I	1	0	0.50	0.00	0.00	0.50	0.00	Pass	Tape & film completely removed from test surfac
	2	0	0.50					Pass	Tape & film completely removed from test surfac
	3	0	0.50					Pass	Tape & film completely removed from test surfac
	4	0	0.50					Pass	Tape & film completely removed from test surfac
J	1	0	0.00	0.00	0.00	0.00	0.00	Pass	16.7 seconds of afterglow
	2	0	0.00					Pass	11.9 seconds of afterglow
	3	0	0.00					Pass	20.9 seconds of afterglow
	4	0	0.00					Pass	35.7 seconds of afterglow
K	1	0	0.50	0.00	0.00	0.50	0.00	Pass	
	2	0	0.50					Pass	
	3	0	0.50					Pass	
	4	0	0.50					Pass	
L	1	0	0.31	0.00	0.00	0.55	0.18	Pass	
	2	0	0.55					Pass	
	3	0	0.59					Pass	
	4	0	0.75					Pass	

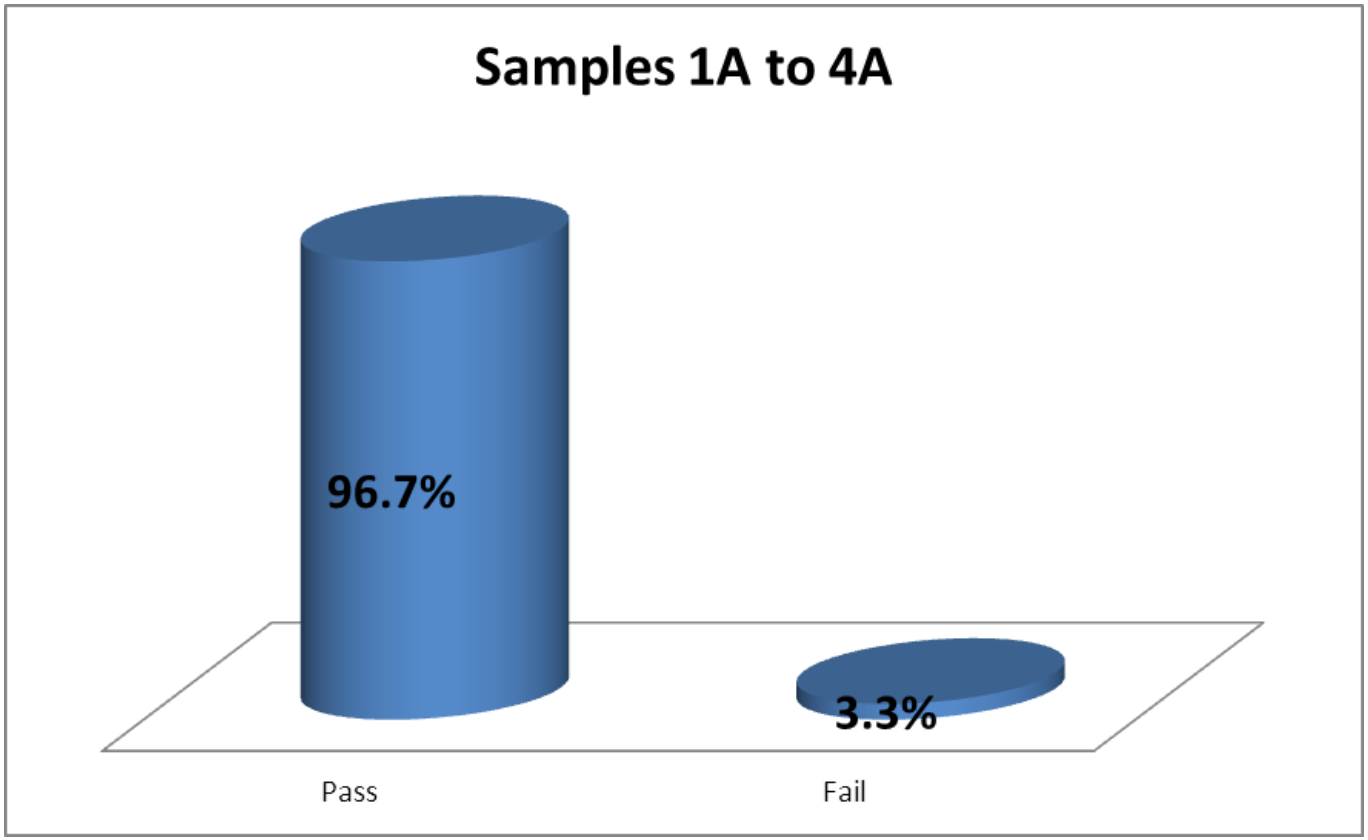
Round Robin Preliminary Results

SAMPLES 1A to 4A									
Lab Stats									
Lab	*n*	AF	FP	aAF	sAF	aFP	sFP	P/F	Comments
M	1	0	1.38	2.00	4.00	1.62	0.21	Pass	
	2	8	1.57					Fail	
	3	0	1.89					Pass	
	4	0	1.65					Pass	
N	1	0	1.10	0.00	0.00	0.90	0.27	Pass	Ingnored the plastic melt back
	2	0	1.00					Pass	Ingnored the plastic melt back
	3	0	1.00					Pass	Ingnored the plastic melt back
	4	0	0.50					Pass	Ingnored the plastic melt back
O	1	0	0.70	0.00	0.00	0.70	0.00	Pass	
	2	0	0.70					Pass	
	3	0	0.70					Pass	
	4	0	0.70					Pass	

ALL LABS

	After Flame	Flame Propagation
Average	0.28	0.69
Std Dev	1.32	0.48

Round Robin Preliminary Results



Round Robin Preliminary Results

SAMPLES 1B to 4B									
Lab Stats									
Lab	***n***	**AF**	**FP**	**aAF**	**sAF**	**aFP**	**sFP**	**P/F**	**Comments**
A	1	4.00	1.25	1.52	1.92	0.91	0.28	Fail	Had to extinguish after 20 sec.+
	2	2.06	1.00					Pass	
	3	0.00	0.75					Pass	
	4	0.00	0.63					Pass	
B	1	52.00	3.50	14.00	25.40	1.25	1.54	Fail	
	2	0.00	0.75					Pass	
	3	4.00	0.00					Fail	To right
	4	0.00	0.75					Pass	
D	1	94.00	4.60	23.50	47.00	1.76	1.89	Fail	After flame more than 3 seconds
	2	0.00	0.80					Pass	
	3	0.00	0.90					Pass	
	4	0.00	0.75					Pass	
E	1	118.00	4.20	30.50	58.36	1.98	1.50	Fail	Flame burned across entire tape section
	2	4.00	1.20					Fail	Small edge of tape cont. to burn
	3	0.00	1.50					Pass	
	4	0.00	1.00					Pass	
F	1	156.00	6.22	39.38	77.75	2.56	2.44	Fail	
	2	0.50	1.36					Pass	
	3	0.50	1.34					Pass	
	4	0.50	1.30					Pass	
G	1	60.00	4.50	16.50	29.14	1.65	1.92	Fail	Put out flame
	2	6.00	1.10					Fail	Small After burn
	3	0.00	0.50					Pass	
	4	0.00	0.50					Pass	

Round Robin Preliminary Results

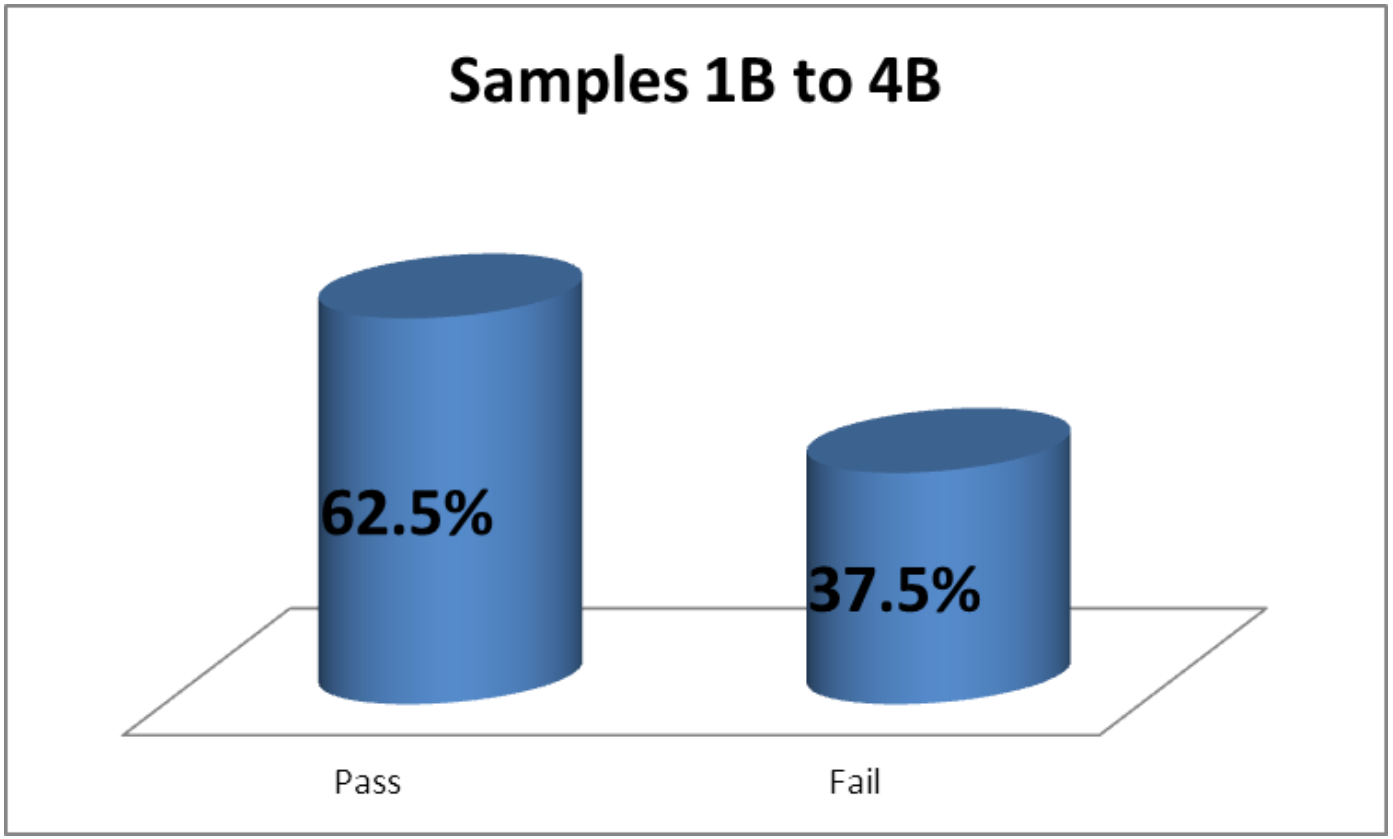
SAMPLES 1B to 4B									
Lab Stats									
Lab	*n*	AF	FP	aAF	sAF	aFP	sFP	P/F	Comments
H	1	108.40	5.10	28.08	53.58	1.28	2.55	Fail	
	2	0.00	0.00					Pass	
	3	0.00	0.00					Pass	
	4	3.90	0.00					Fail	
I	1	146.60	4.50	37.28	72.89	2.00	1.68	Fail	Complete consumption of tape & film in ta
	2	2.50	1.00					Pass	Small flame remained near impingement :
	3	0.00	1.50					Pass	No penetration of backside film for any.
	4	0.00	1.00					Pass	
J	1	83.80	5.00	21.43	41.59	1.25	2.50	Fail	
	2	0.00	0.00					Pass	
	3	0.00	0.00					Pass	
	4	1.90	0.00					Pass	
K	1	35.00	5.00	8.75	17.50	2.00	2.00	Fail	Operator extinguished
	2	0.00	1.00					Pass	
	3	0.00	1.00					Pass	
	4	0.00	1.00					Pass	
L	1	115.00	5.71	28.75	57.50	2.03	2.45	Fail	
	2	0.00	0.79					Pass	
	3	0.00	0.87					Pass	
	4	0.00	0.75					Pass	
M	1	78.00	4.33	24.88	35.44	2.40	1.30	Fail	
	2	9.00	2.05					Fail	
	3	6.50	1.57					Fail	
	4	6.00	1.65					Fail	

Round Robin Preliminary Results

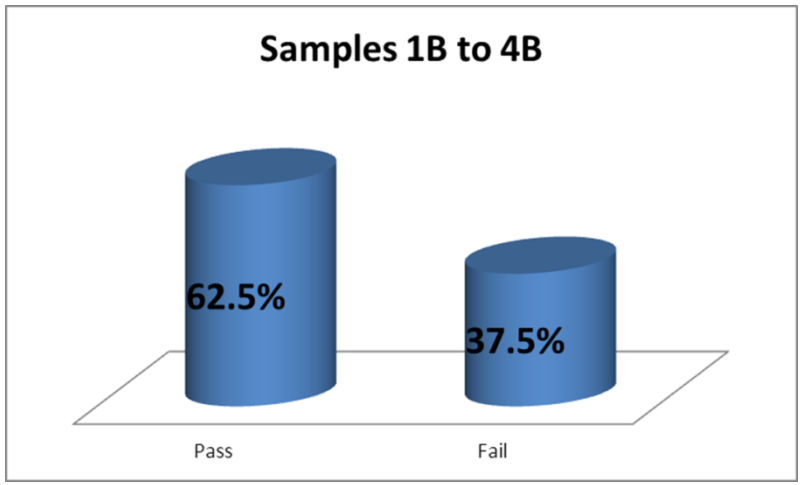
SAMPLES 1B to 4B									
Lab Stats									
Lab	*n*	AF	FP	aAF	sAF	aFP	sFP	P/F	Comments
N	1	135.00	4.00	33.75	67.50	1.60	1.61	Fail	Burned along length of tape
	2	0.00	0.90					Pass	Not counting melting as burning
	3	0.00	0.50					Pass	Measured at flame contact point
	4	0.00	1.00					Pass	
O	1	128.30	5.40	32.70	63.74	2.33	2.05	Fail	
	2	0.00	1.30					Pass	
	3	2.50	1.40					Pass	
	4	0.00	1.20					Pass	

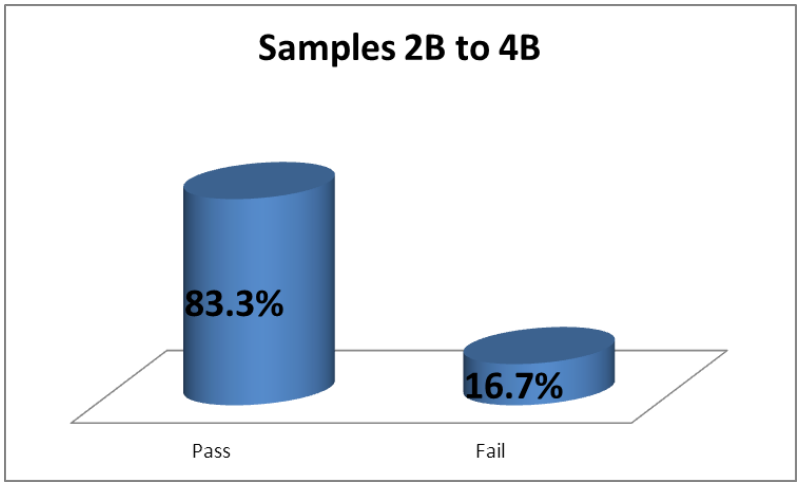
All Labs		
	After Flame	Flame Propagation
Average	24.36	1.78
Std Dev	45.91	1.75

Round Robin Preliminary Results



Round Robin Preliminary Results





All Labs

	After Flame	Flame Propagation
Average	24.36	1.78
Std Dev	45.91	1.75

Eliminate Sample 1B

All Labs

	After Flame	Flame Propagation
Average	1.19	0.87
Std Dev	2.23	0.51

Round Robin Preliminary Results

SAMPLES 1T and 2T									
Lab Stats									
Lab	*n*	AF	FP	aAF	sAF	aFP	sFP	P/F	Comments
A	1	0.00	0.00	0.00	0.00	0.00	0.00	Pass	
	2	0.00	0.00					Pass	
B	1	0.00	2.00	0.00	0.00	2.00	0.00	Pass	
	2	0.00	2.00					Pass	
C	1	0.00	1.00	0.00	0.00	1.15	0.21	Pass	Flared up as the flame bounced off aluminum
	2	0.00	1.30					Pass	Flared up as the flame bounced off aluminum
D	1	0.00	0.95	0.00	0.00	0.99	0.05	Pass	
	2	0.00	1.02					Pass	
E	1	0.00	0.75	0.00	0.00	0.88	0.18	Pass	
	2	0.00	1.00					Pass	
F	1	0.50	1.42	0.50	0.00	1.44	0.03	Pass	
	2	0.50	1.46					Pass	
G	1	0.00	0.75	0.00	0.00	0.68	0.11	Pass	Tape Melted away
	2	0.00	0.60					Pass	Tape Melted away
H	1	0.00	2.90	0.00	0.00	1.45	2.05	Fail	
	2	0.00	0.00					Pass	
I	1	0.00	2.50	0.00	0.00	2.38	0.18	Fail	Edge of tape remained ignited
	2	0.00	2.25					Fail	as it pulled away from impingement zone

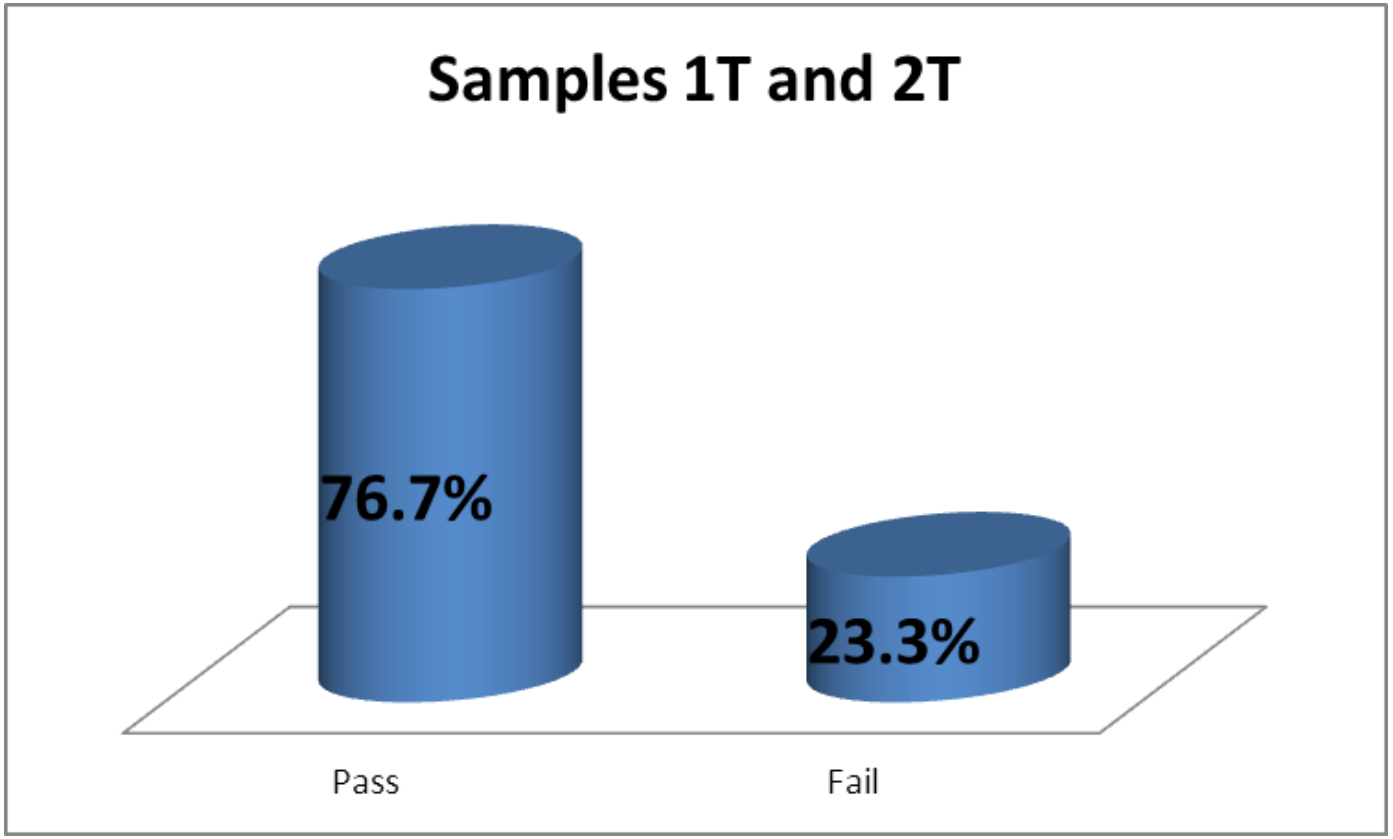
Round Robin Preliminary Results

SAMPLES 1T and 2T									
Lab Stats									
Lab	*n*	AF	FP	aAF	sAF	aFP	sFP	P/F	Comments
J	1	0.00	6.00	0.00	0.00	4.50	2.12	Fail	Flashes
	2	0.00	3.00					Fail	Flashes
K	1	0.00	1.00	0.00	0.00	1.25	0.35	Pass	
	2	0.00	1.50					Pass	
L	1	0.00	1.73	0.00	0.00	1.69	0.06	Pass	Flashing
	2	0.00	1.65					Pass	Flashing
M	1	0.00	2.28	0.00	0.00	2.22	0.08	Fail	
	2	0.00	2.17					Fail	
N	1	0.00	1.00	0.00	0.00	0.90	0.14	Pass	
	2	0.00	0.80					Pass	
O	1	0.00	0.80	0.00	0.00	0.75	0.07	Pass	
	2	0.00	0.70					Pass	

All Labs

	After Flame	Flame Propagation
Average	0.03	1.48
Std Dev	0.13	1.17

Round Robin Preliminary Results



Round Robin Preliminary Results

SAMPLES 1P and 2P									
Lab Stats									
Lab	***n***	**AF**	**FP**	**aAF**	**sAF**	**aFP**	**sFP**	**P/F**	**Comments**
A	1	0.00	1.78	0.00	0.00	1.52	0.37	Pass	
	2	0.00	1.25					Pass	
B	1	0.00	2.50	0.90	1.27	2.50	0.00	Fail	
	2	1.80	2.50					Fail	
C	1	0.00	1.70	0.00	0.00	1.75	0.07	Pass	Flared up as the flame bounced off aluminum
	2	0.00	1.80					Pass	Flared up as the flame bounced off aluminum
D	1	0.00	1.50	0.00	0.00	1.38	0.18	Pass	
	2	0.00	1.25					Pass	
E	1	0.00	3.00	0.00	0.00	2.75	0.35	Fail	
	2	0.00	2.50					Fail	
F	1	0.50	1.64	0.50	0.00	1.62	0.03	Pass	Big flame but no afterflame
	2	0.50	1.60					Pass	Big flame but no afterflame
G	1	0.00	2.00	0.00	0.00	1.88	0.18	Pass	Tape only bunt during 15sec
	2	0.00	1.75					Pass	Tape only bunt during 15sec
H	1	0.00	1.80	0.00	0.00	1.95	0.21	Pass	
	2	0.00	2.10					Fail	
I	1	0.00	2.75	0.85	1.20	2.88	0.18	Fail	Tape did not shrink away from flame, but flame flashed to left as tape melted.
	2	1.70	3.00					Fail	

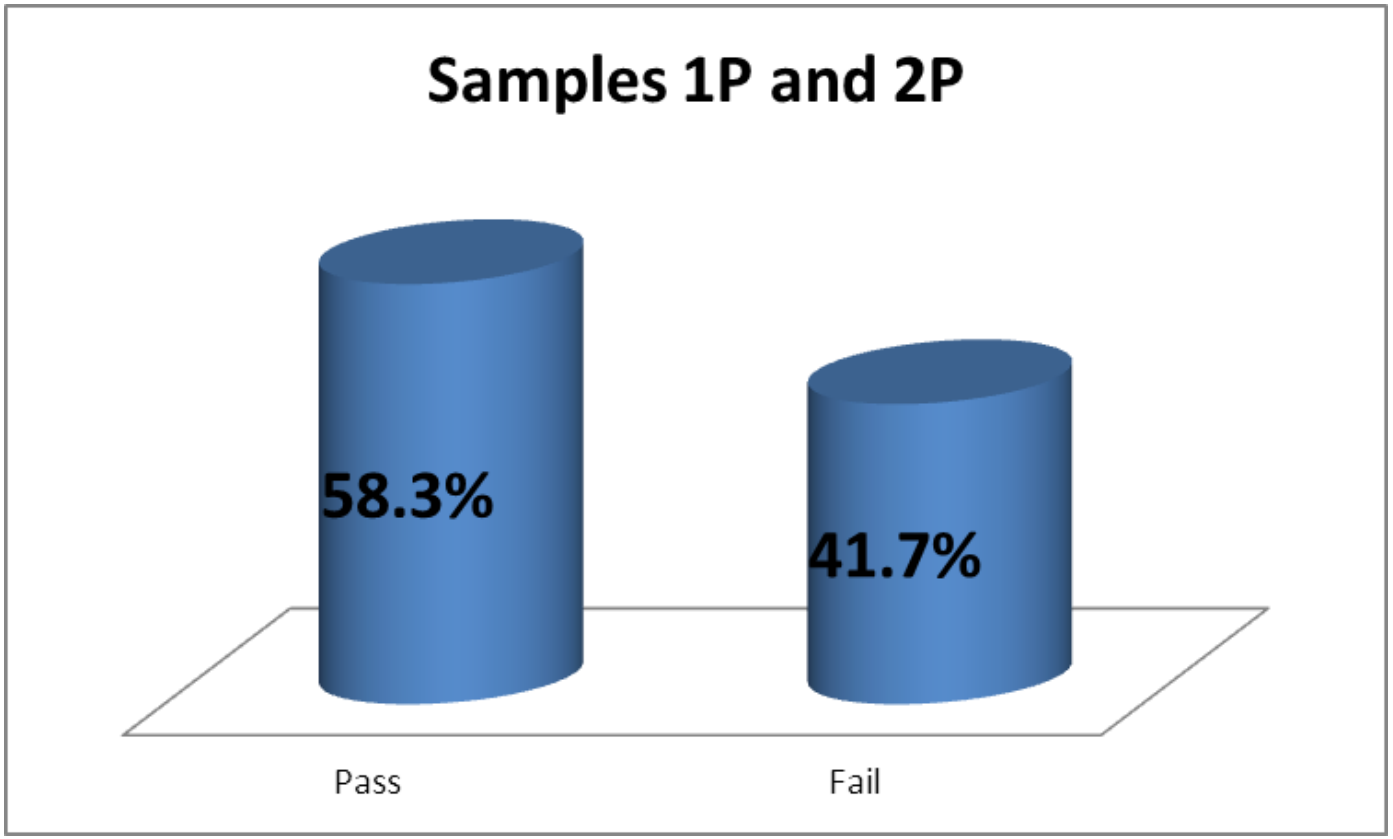
Round Robin Preliminary Results

SAMPLES 1P and 2P									
Lab Stats									
Lab	*n*	AF	FP	aAF	sAF	aFP	sFP	P/F	Comments
J	1	18.10	9.25	12.45	7.99	8.63	0.88	Fail	AF + flashes
	2	6.80	8.00					Fail	AF + flashes
K	1	1.30	1.50	1.40	0.14	1.50	0.00	Pass	
	2	1.50	1.50					Pass	
L	1	0.00	1.65	0.00	0.00	1.63	0.03	Pass	
	2	0.00	1.61					Pass	
M	1	15.00	8.46	8.00	9.90	6.79	2.37	Fail	
	2	1.00	5.12					Fail	
N	1	1.00	0.60	0.50	0.71	0.60	0.00	Pass	16.5 second flame exposure
	2	0.00	0.60					Pass	
O	1	5.30	3.40	2.65	3.75	2.60	1.13	Fail	
	2	0.00	1.80					Pass	

All Labs

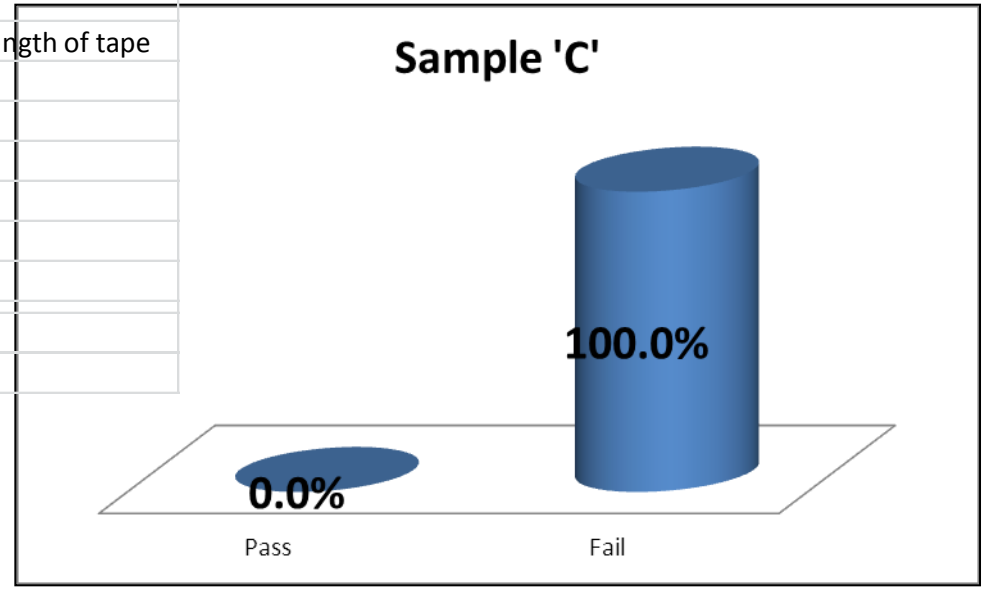
	After Flame	Flame Propagation
Average	4.17	3.63
Std Dev	6.21	3.23

Round Robin Preliminary Results



Round Robin Preliminary Results

SAMPLE 'C'				
Lab	**AF**	**FP**	**P/F**	**Comments**
A	4.00	2.75	Fail	Had to extinguish after 20 sec.+
B	96.00	13.00	Fail	
C	60.00	17.00	Fail	Sheet was crinkled and did not lay flat
D	64.00	0.48	Fail	After flame more than 3 seconds
E	135.00	10.00	Fail	Tape burned length of sample
F	151.00	15.50	Fail	Tape burnt
G	61.00	20.00	Fail	Put Out
H	91.80	13.30	Fail	
I	84.60	12.50	Fail	Flame continued to track down length of tape
J	90.10	16.00	Fail	AF + Flashes
K	35.00	10.00	Fail	Operator extinguished
L	124.00	12.99	Fail	
M	64.00	13.39	Fail	
N	74.00	6.50	Fail	
O	93.40	14.00	Fail	
Average	81.86	11.83		
Std Dev	37.57	5.23		



Round Robin Preliminary Results

	Heat Flux (BTUs/ft^2 sec)		Chamber Temperature (°F)		Controller	Stabilization
Lab	PreTest	PostTest	PreTest	PostTest	Setpoint (°F)	Time (min)
A	1.496	1.496	420	418	892	40
B	1.498	1.472	323	330	1,074	30
C	1.500	1.491	416	420	999	26
D	1.465	1.465	479	458	1,190	5
E	1.478	1.461			1,138	45
F	1.507	1.507	419	419	1,030	75
G	1.511	1.475	493	549	1,084	60
H	1.500	1.500	535	535	1,149	45
I	1.487	1.487	472	473	1,030	
J	1.496	1.496	457	460	1,119	52
K	1.496	1.505			1,104	60
L	1.496	1.461	446	455	1,157	90
M	1.496	1.496	566	543	1,213	110
N	1.478		398	385	1,060	60
O	1.496	1.496	482	476	1,237	65
Avg	1.493	1.486	454.28	455.44	1,098.40	54.50
Std Dev	0.012	0.016	62.25	63.34	89.79	

Round Robin Preliminary Results

- The remaining labs will be included in these results once data is received.
- Finalized data will be presented at the next Working Group Meeting in February.
- There will be further discussion of this data at the task group meeting.