International Seat Test Round Robin

Final Results

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Background

- Request from Industry and the Aircraft Certification Offices (ACOs) to review the Aircraft Seat Flammability Test.
- Initially, testing was limited to facilities in the United States.
- Shortly thereafter, a decision was made for worldwide inclusion.
- Three aircraft cushion sets were sent to facilities that perform this testing.
- Representatives from the ACO/Transport Canada were present for the testing done in the US and Canada. Tech Center representatives were also present.
- The majority of labs in Europe and Asia had personnel from their governing bodies present.

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Test Samples:

Fire Hardened Foam 1

Fire Blocking Layer

Fire Hardened Foam 2

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- **8 labs in the United States partipated and reported data:**

Boeing Seattle	**Accufleet**
Starr Aircraft Products	**Custom Products**
Flame Out	**Skandia**
Govmark	**Chestnut Ridge**

- **Samples were shipped to the following organizations in Europe, Asia, and Canada and reported data:**

CEAT	Koito	Sicma Aero/Zodiak
China	Muirhead	Bayer/Antwort
Bodycote	Siemens	Vauth & Sohn
CTA	Lantal	LAPI
Embraer	AWTA/Australia	

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- Data being presented consists of:
  - Average Percent Weight Loss and its Standard Deviation for each Lab.
  - Average Burn Length and its Standard Deviation.
- Test Method and Lab Equipment differences will also be presented.

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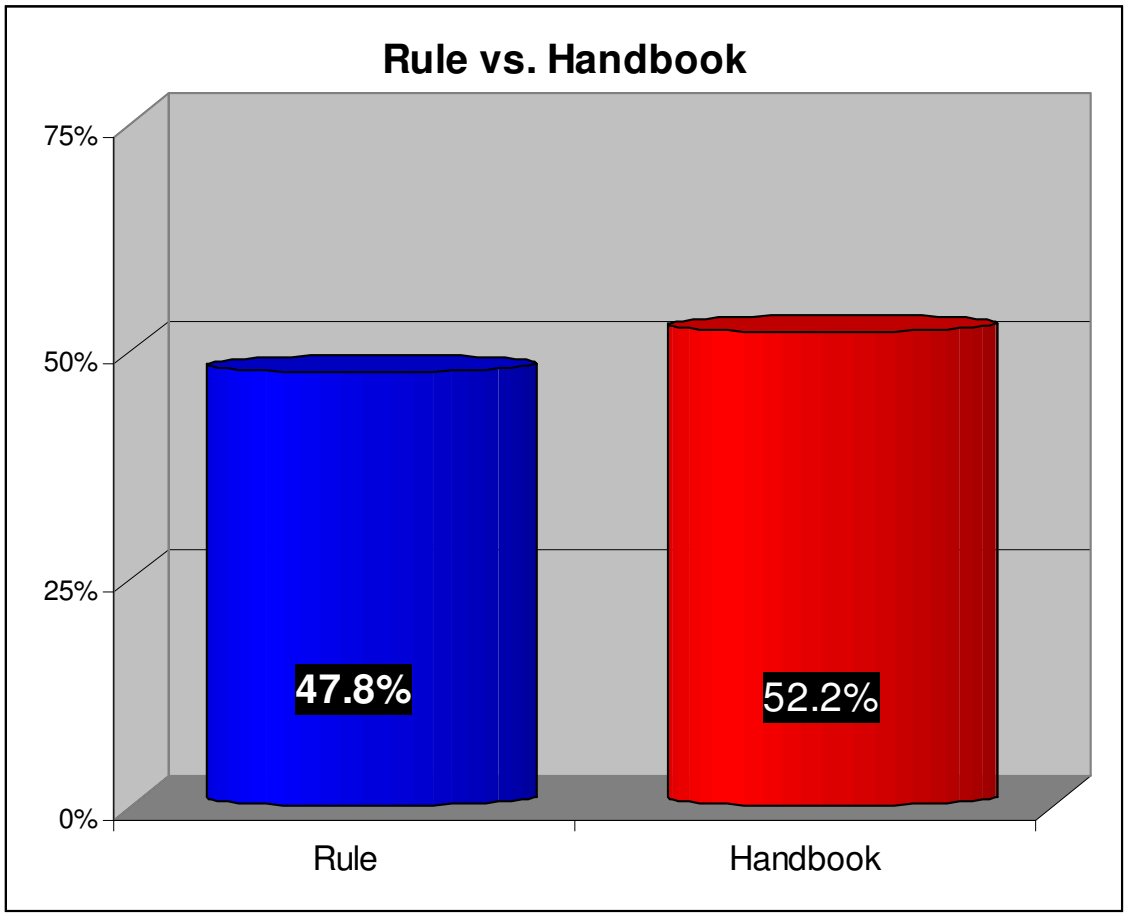
Comparison of Test Methods

Lab	Rule	Handbook
A		Yes
B	Yes	
C	Yes	
D	Yes	
E		Yes
F		Yes
G		Yes
H	Yes	
I	Yes	
J		Yes
K		Yes
L		Yes
M		Yes
N		Yes
O	Yes	
P	Yes	
Q		Yes
R	Yes	
S		Yes
T	Yes	
U	Yes	
V		Yes
W	Yes	



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Test Method, Lab Equipment and Fuel Differences

Lab	Oil Burner Fuel	Nozzle Type	Air Stabilizer
A	JP8	80° CC 2.0 gph*	Tabs
B	Jet A	80° AR 2.25 gph	No
C	No. 2 fuel oil	80° PLP 2.25 gph	Static Disk
D	No. 2 diesel	Unknown	Unknown
E	No.2 home heating oil	80° CC 2.0 gph	Tabs and Static Disk
F	Jet A	80° CC 2.0 gph	No
G	Jet A	80° AR 2.25 gph	No
H	No. 2 home heating oil	80° CC 2.25 gph	Tabs
I	No. 2 Kerosene	80° AR 2.25 gph	Static Disk
J	JP8	80° AR 2.25 gph	No
K	Jet A	80° AR 2.25 gph	Tabs
L	No. 2 diesel	60° 2.25 gph (Monarch F-20)	No
M	Jet A	80° CC 2.0 gph	Static Disk
N	Kerosene	Unknown	Tabs
O	Kerosene	80° CC 2.0 gph	Static Disk
P	No. 2 diesel	80° PLP 2.25 gph	Unknown
Q	No. 2 diesel	Monarch 80° R	Tabs
R	Jet A	80° PLP 2.25 gph	Static Disk
S	Jet A	80° PLP 2.25 gph	Static Disk
T	Jet A	80° PLP 2.25 gph	Static Disk
U	Kerosene	80° PLP 2.25 gph	Tabs
V	Jet A	80° PLP 2.25 gph	Static Disk
W	Kerosene	80° PLP 2.25 gph	Static Disk

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- Pass/Fail Criteria
  - Weight Loss
    - The pass/fail criteria for weight loss specified in the Rule and Handbook states that:
      - The weight loss of at least two-thirds of the total number of specimen sets tested will not exceed 10 percent.
      - The average weight loss of the total number of specimen sets will not exceed 10 percent.
    - Both criterions must be met in order to pass weight loss.
  - Burn Length
    - The pass/fail criteria specified in the Rule and the Handbook states that:
      - For each of the burn lengths measured, the burn length may not exceed 17 inches on at least two-thirds of the total number of specimen sets tested.
      - The average burn length for each of the measured lengths will not exceed 17 inches.
  - In order for a cushion set to pass, both the weight loss and burn length requirements must be met.

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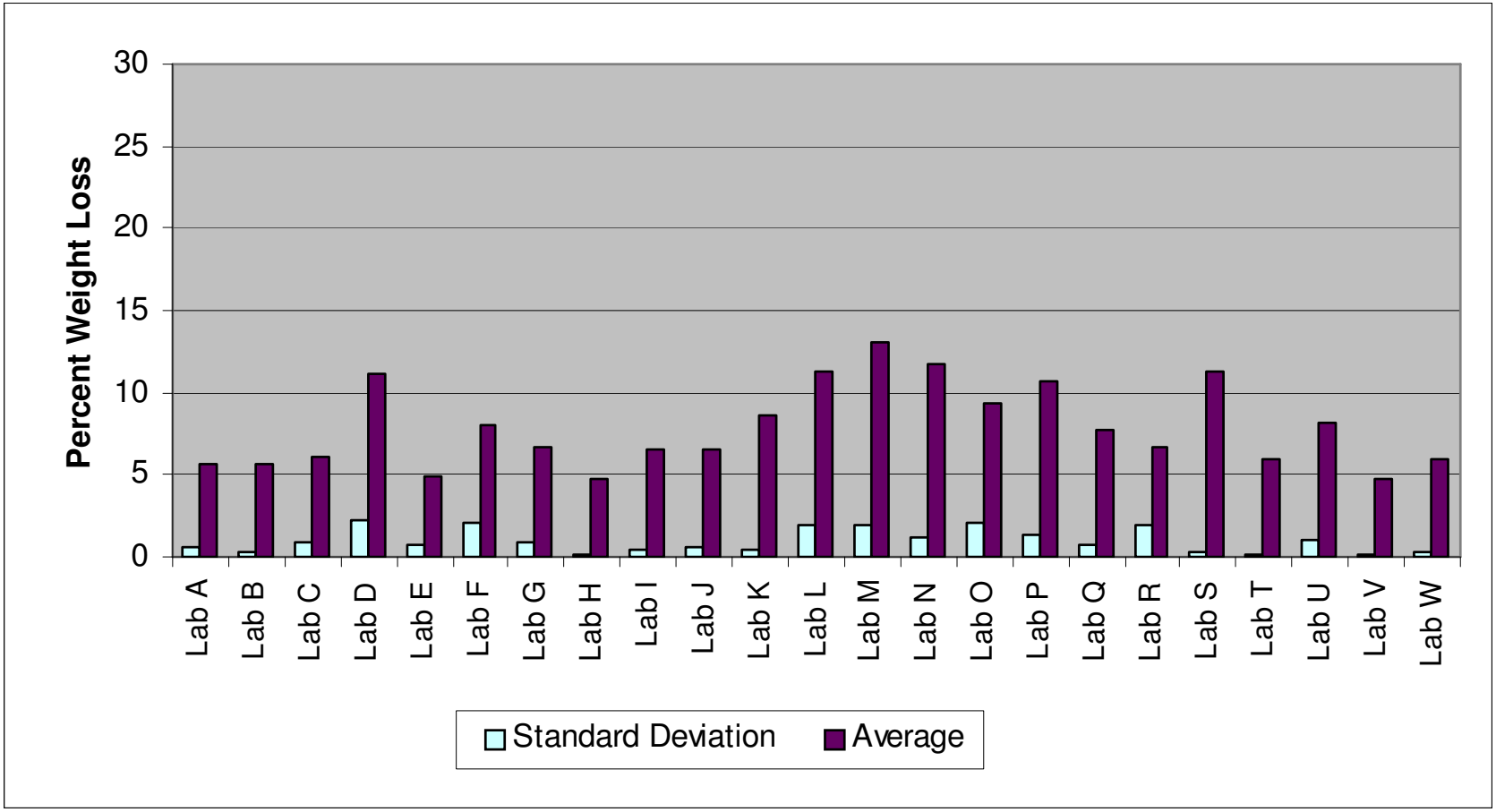
Fire Hardened Foam 1



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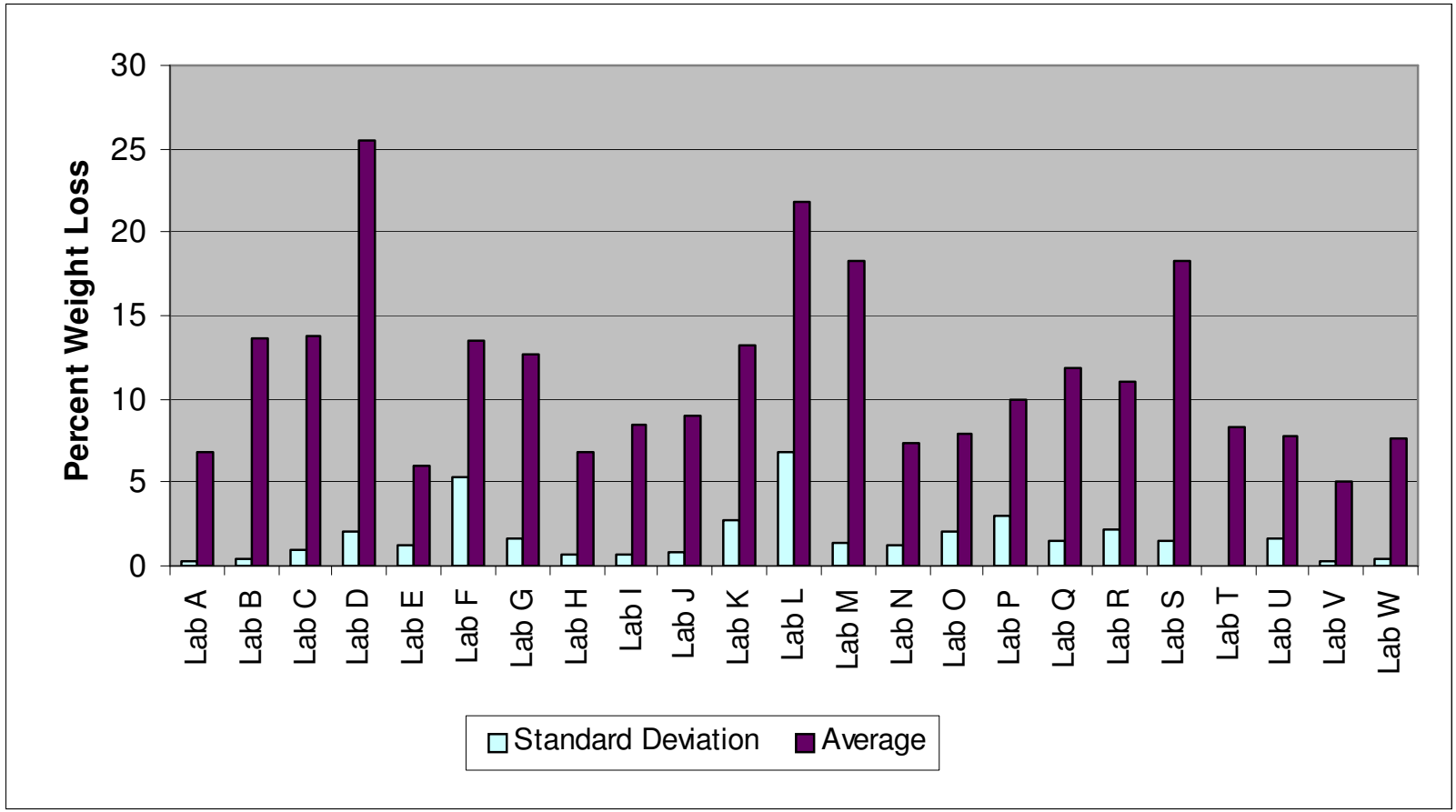
Fire Blocking Layer



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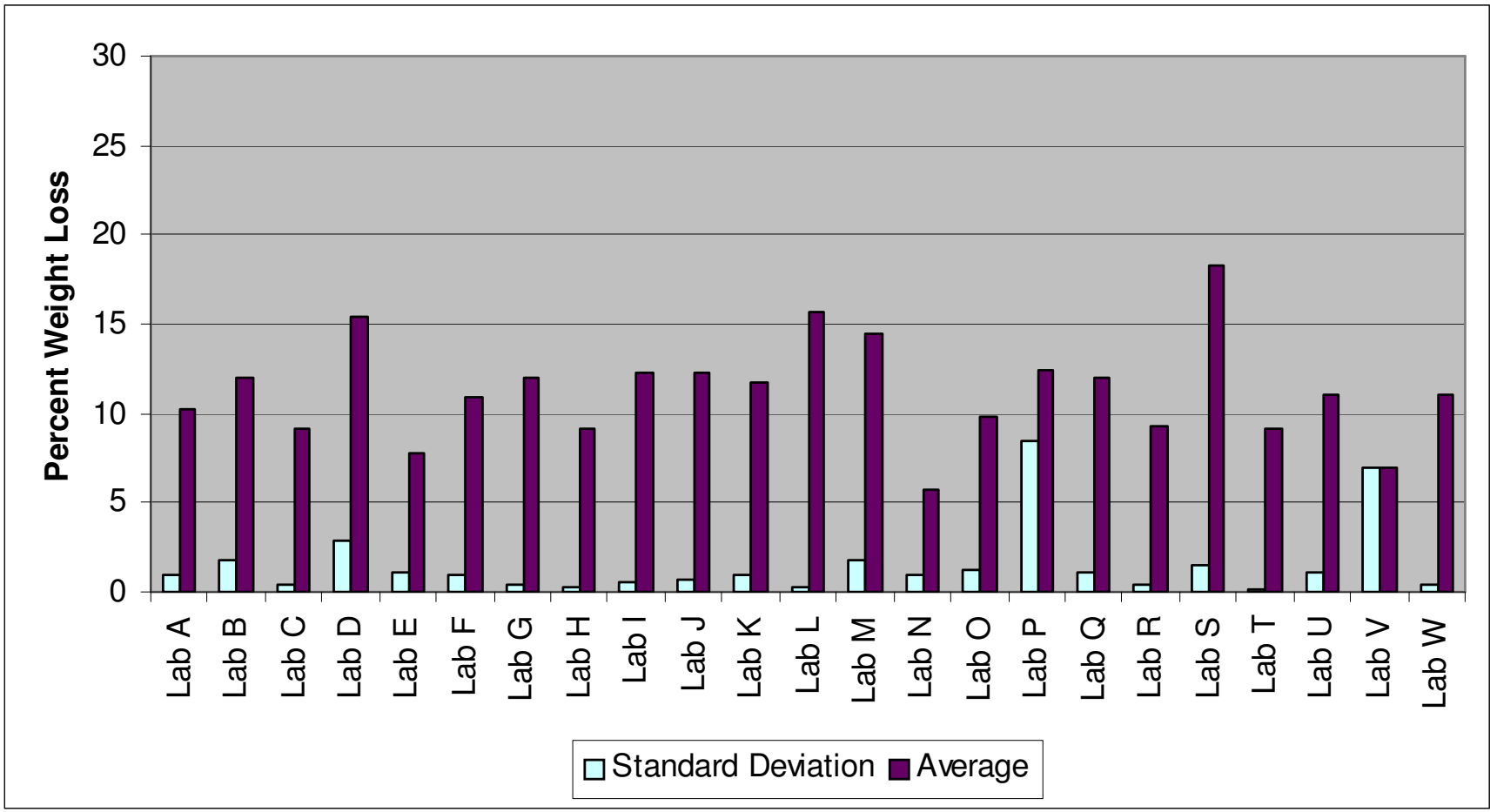
Fire Hardened Foam 2



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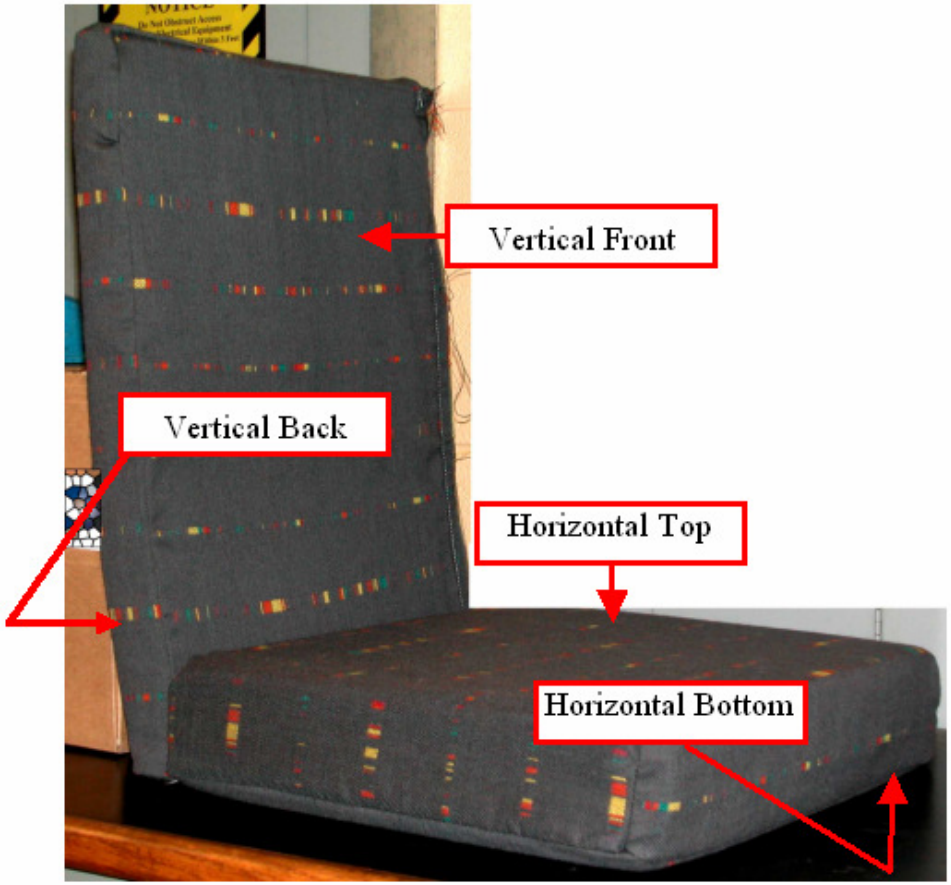
Naming Convention



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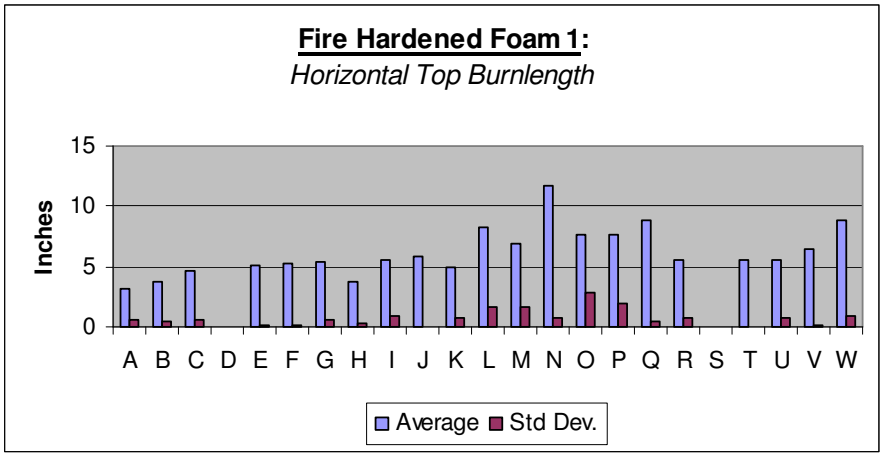

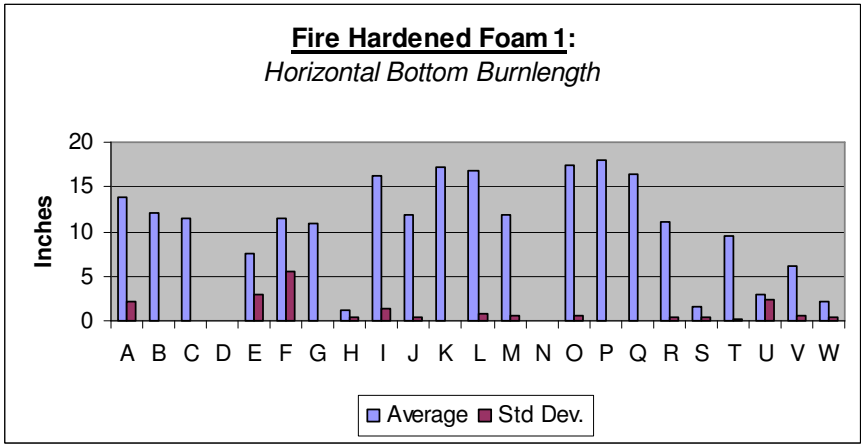

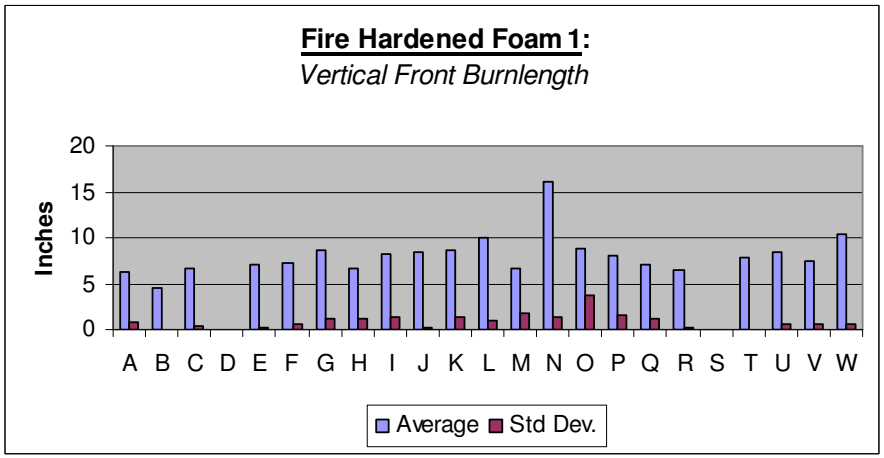

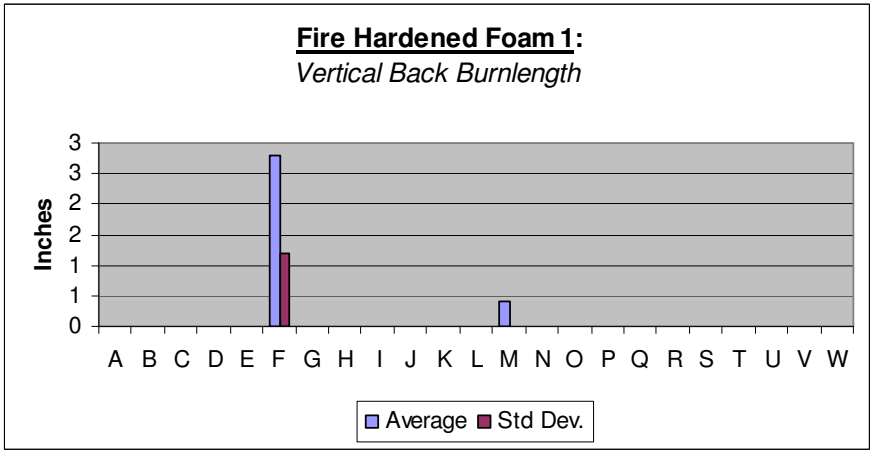

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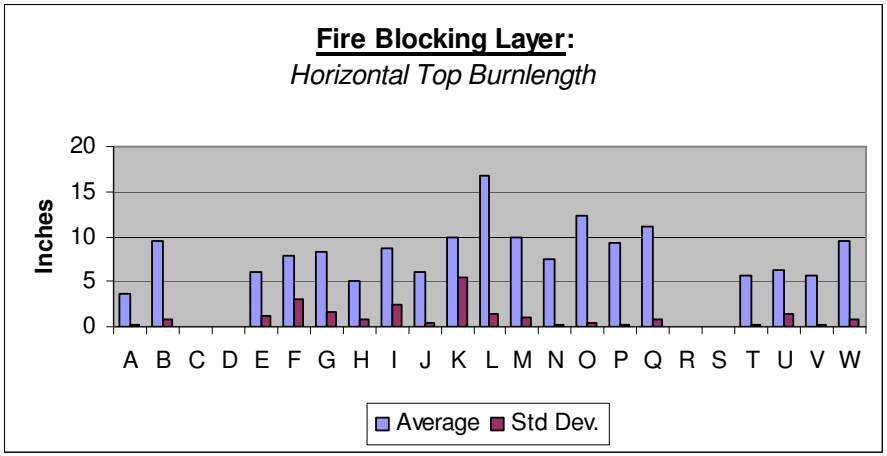

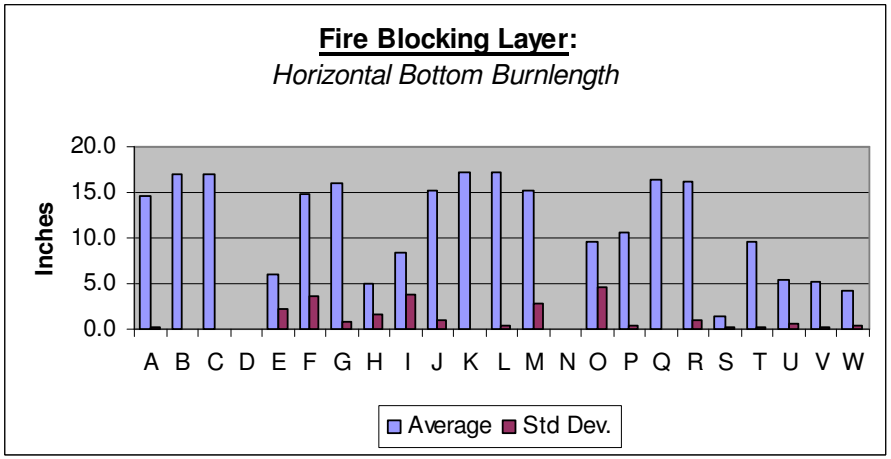

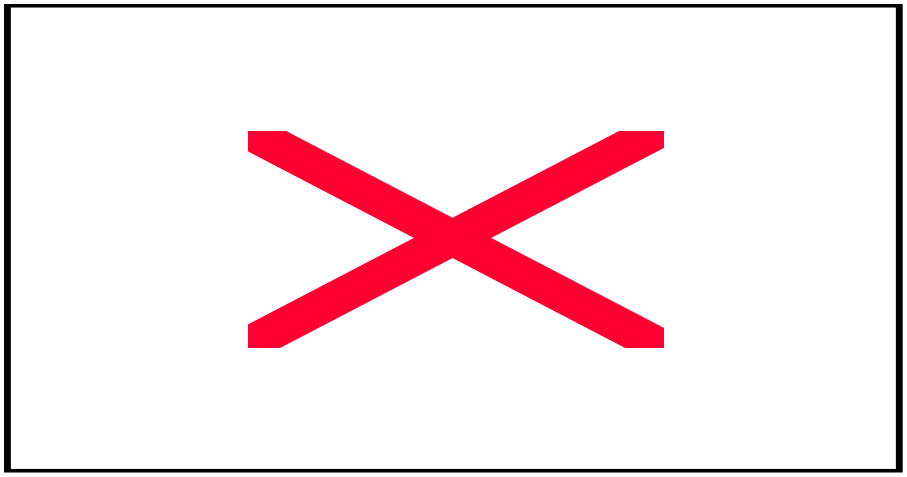

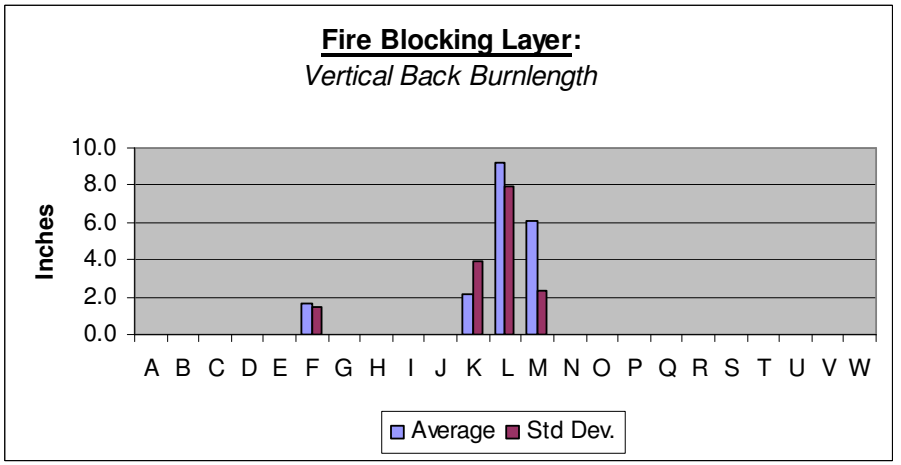

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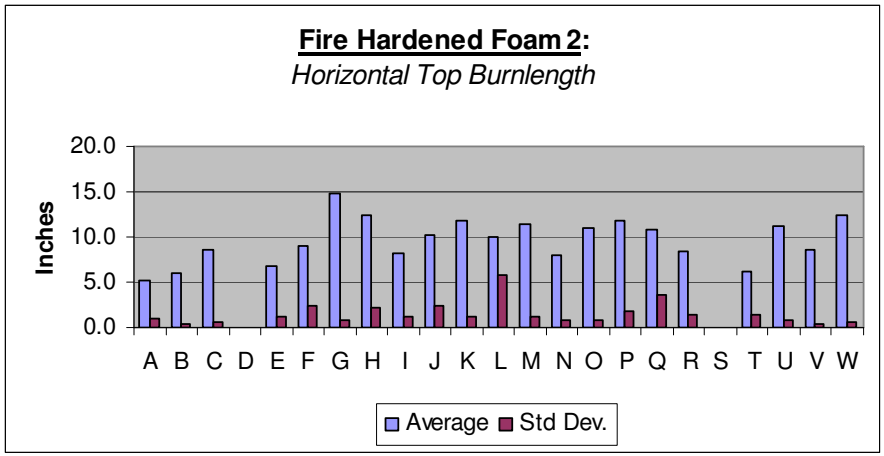

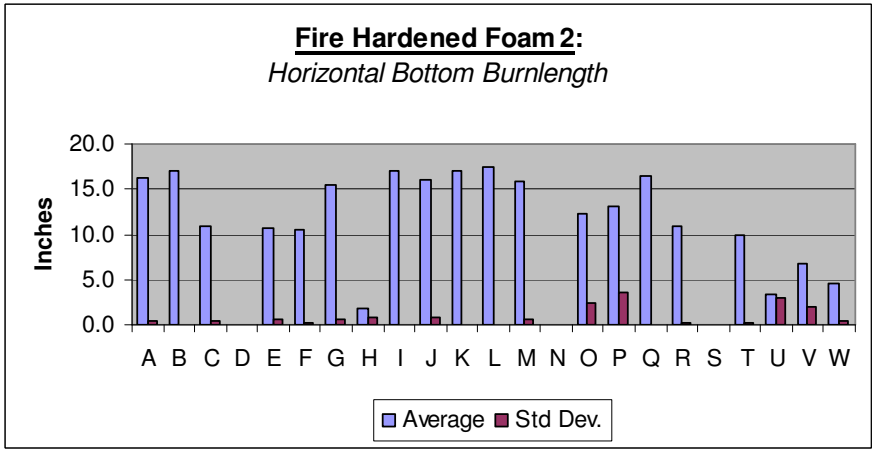

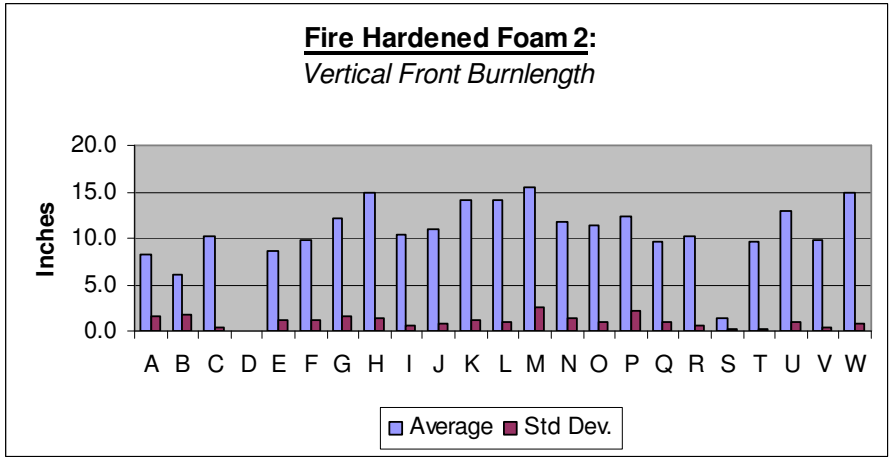

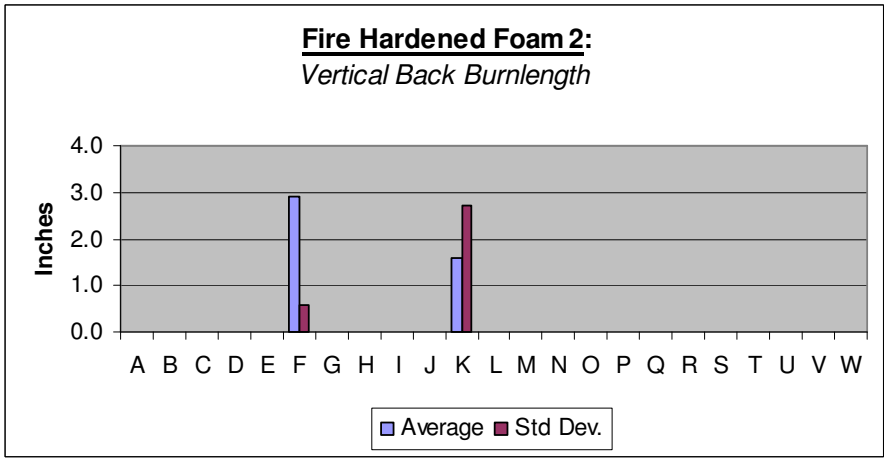

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- Horizontal Fire Blocking Layer Cushions
  - Hook and Loop closure strips and blocking layer were breached leaving the polyurethane foam exposed to the flame.
  - This phenomenon was seen at labs, which passed and failed these samples.
  - At those labs, which failed these samples, the burner flame breached the hook and loop closure and blocking layer in less time than those labs, which passed these samples.
  - This resulted in deeper flame penetration into the polyurethane foam, which would account for greater weight loss.

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Horizontal Fire Blocking Layer Cushions

International Seat Test Round Robin *Facts*

- Percentage Weight Loss
  - 6 Labs failed Fire Hardened Foam 1
  - 11 Labs failed Fire Blocking Layer
  - 15 Labs failed Fire Hardened Foam 2
- Burn Length
  - The majority of all labs had longer burn lengths on the horizontal bottom than the horizontal top.
- Labs D, L, M, and S failed all samples.

International Seat Test Round Robin *Conclusions*

- There is no correlation in the pass/fail data among those labs that run according to the Rule or Handbook.
- The majority failures reported by all of the labs were due to weight loss.
- The air velocity through the burner may be one of the reasons that cause the rapid breaching of the hook and loop closures and blocking layer into the polyurethane foam, resulting in failures of those test samples.
- The use of tabs and or a static disk may influence test results.