Evacuation Slide Test Method

Comparison of Radiant Heaters Used for Revised Evacuation Slide Test Method

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Activities

3 Radiant Heaters were used for the tests

- ***Two with solid coil, part # 68086038000, 1.5-inch coil-to-face distance.***
- ***One with solid coil, part # 68086040400, 1.75-inch coil-to-face distance.***

Calibration Tests

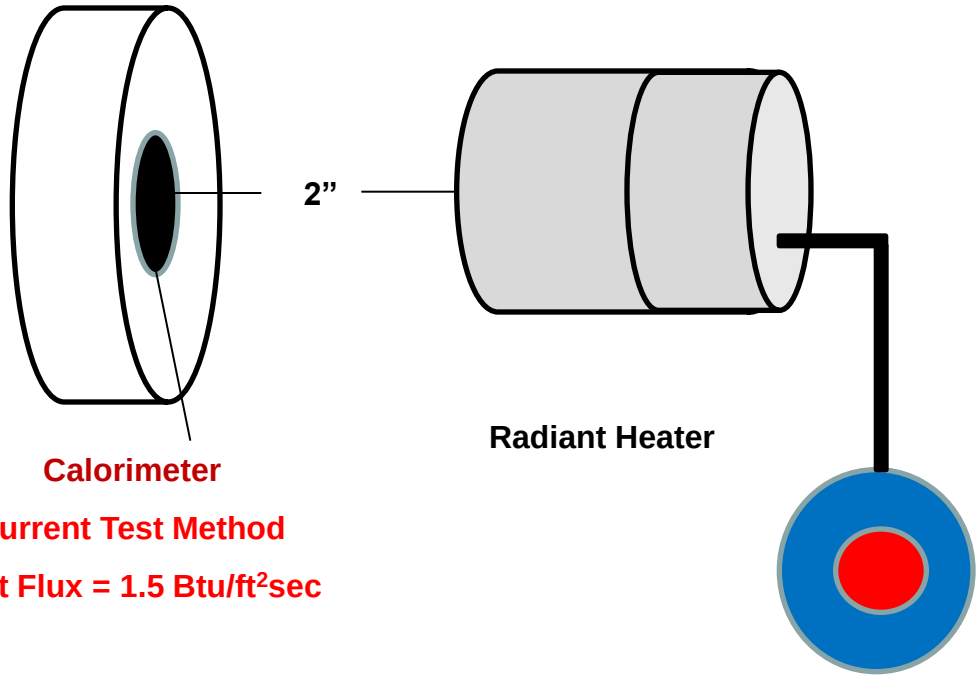
- ***Calorimeter was placed 2 inches in front of the furnace.***
- ***Three calibrations of each radiant heater were conducted.***

Materials Tests

- ***Two different slide materials were tested.***
- ***Three tests were performed on each material.***

Two different heaters were used for the test

Power Input of the Radiant Heater Vs. Heat Flux of the Calorimeter



Current Test Method

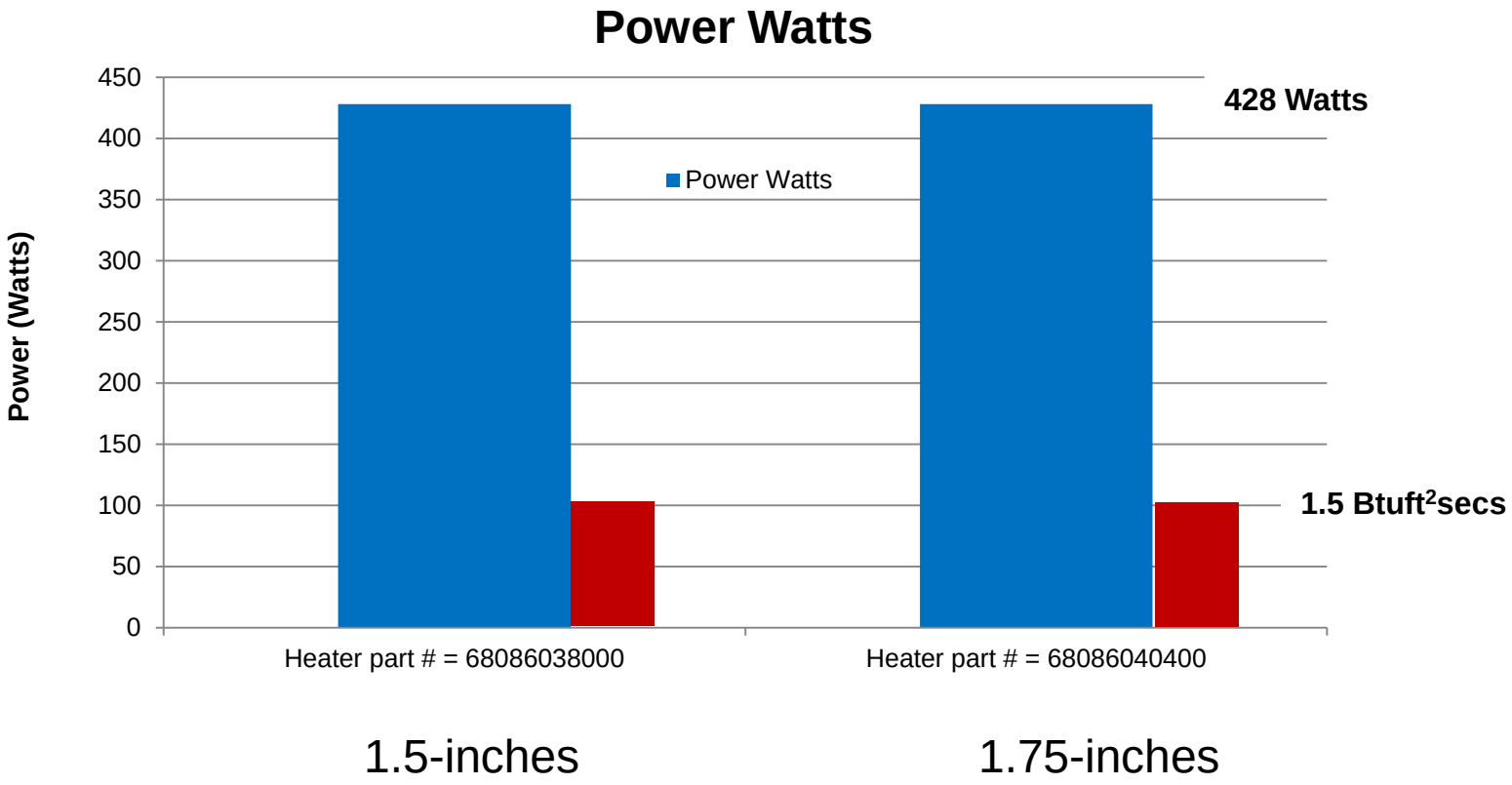
Heat Flux = 1.5 Btu/ft^{2}sec

Power Input = 425 to 433 Watts

Radiant Heater (part #68086038000) with Coil-to-face distance of 1.5 inches

Radiant Heater (part #68086040400) with coil-to-face distance of 1.75 inches

Relationship of Power Input and Heat Flux Output of Two Different Radiant Heaters

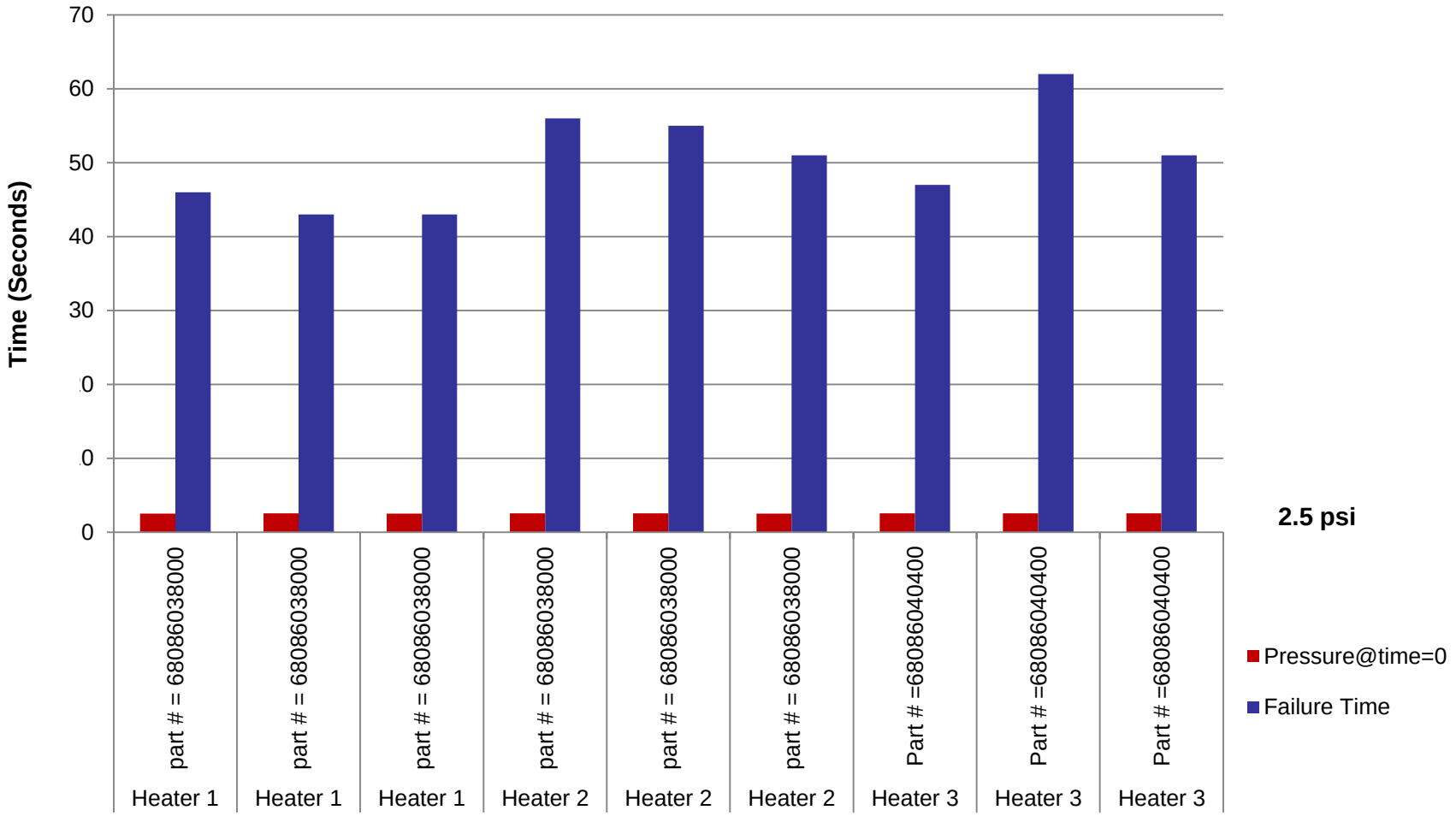


Test Results of Power Input vs. Heat Flux Output of Radiant Heaters

(2 x Part #68086038000) and (1 x Part # 68086040400)

Test #	Radiant Heater #	Heater Type	Power Input (watts)	Heat Flux Output (Btu/ft²sec)	Distance of Calorimeter placed in front of the radiant heater	Coil-to-face distance (inches)
1	FAA Heater 1	Solid Coil Part #68086038000	425 to 432	1.49 - 1.51	2 inches	1.5
2	FAA Heater 1	Solid Coil Part #68086038000	425 to 432	1.48 - 1.52	2 inches	1.5
3	FAA Heater 1	Solid Coil Part #68086038000	425 to 432	1.48 – 1.53	2 inches	1.5
4	FAA Heater 2	Solid Coil Part #68086038000	427 to 435	1.48 – 1.51	2 inches	1.5
5	FAA Heater 2	Solid Coil Part #68086038000	427 to 433	1.48 – 1.5	2 inches	1.5
6	FAA Heater 2	Solid Coil Part #68086038000	427 to 435	1.48 – 1.51	2 inches	1.5
7	FAA Heater 3	Solid Coil Part #68086040400	424 to 426	1.49 - 1.51	2 inches	1.75
8	FAA Heater 3	Solid Coil Part #68086040400	428 to 434	1.48 - 1.52	2 inches	1.75
9	FAA Heater 3	Solid Coil Part #68086040400	427 to 428	1.48 - 1.49	2 inches	1.75

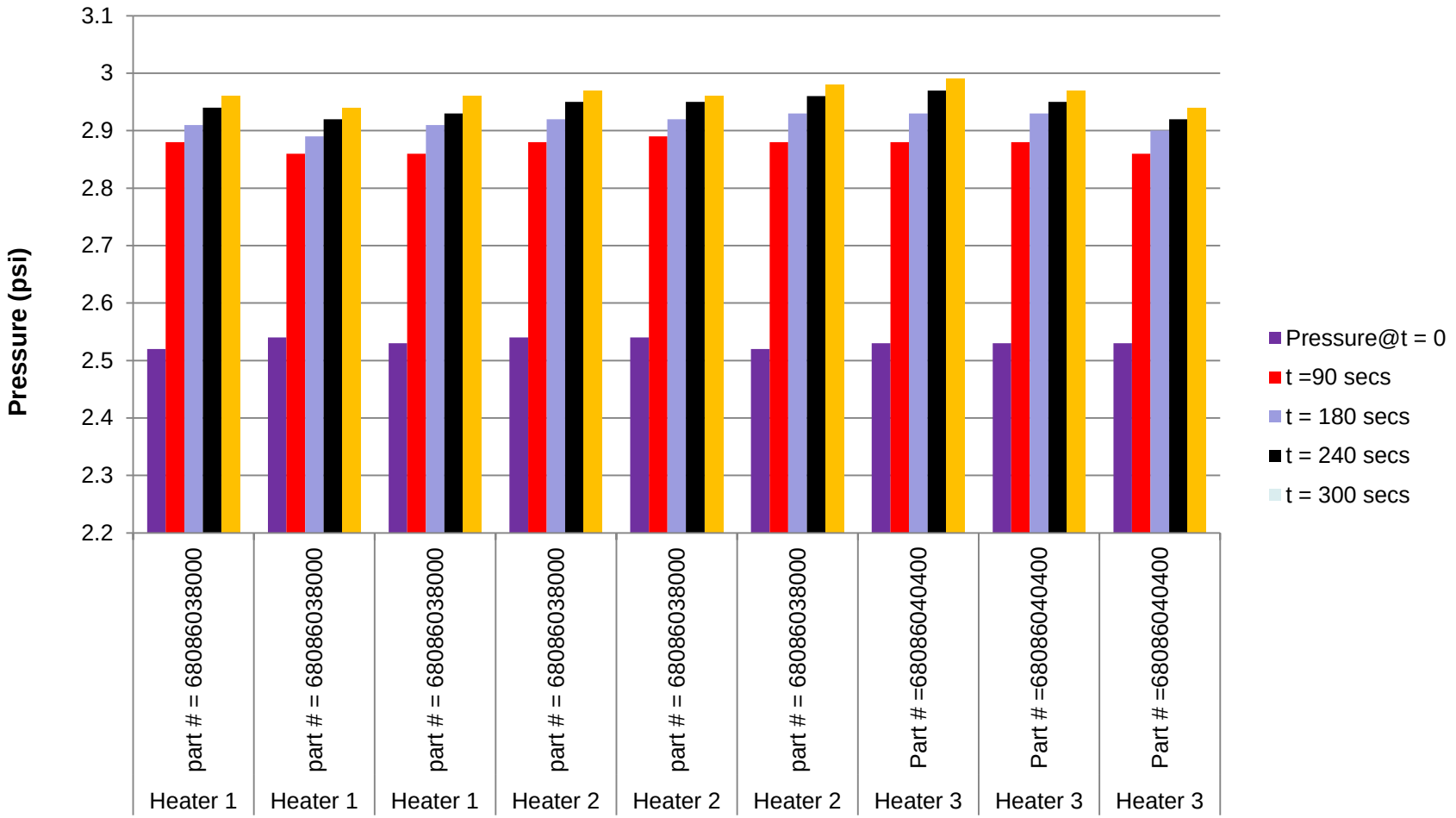
Mustard/Mustard Material Test Results (Gray side facing the radiant heat)



The test results of the Mustard/Mustard material used 2 furnaces with Part Number = *68086038000) and one furnace with Part Number68086040400) were similar*

Test #	Lab #	Furnace type	Coil-to-face distance (inches)	Material	Power input (Watts)	Pressure at 0 sec	Pass / Fail
1	FAA Heater 1	Solid Coil Heater (part # = 68086038000)	1.5	Mustard/ Mustard	430	2.52	46
2	FAA Heater 1	Solid Coil Heater (part # 68086038000)	1.5	Mustard/ Mustard	430	2.53	43
3	FAA Heater 1	Solid Coil Heater (p # 68086038000)	1.5	Mustard/ Mustard	433	2.52	43
4	FAA Heater 2	Solid Coil Heater (part # 68086038000)	1.5	Mustard/ Mustard	433	2.54	56
5	FAA Heater 2	Solid Coil Heater (part # 68086038000)	1.5	Mustard/ Mustard	434	2.53	55
6	FAA Heater 2	Solid Coil Heater (part # = 68086038000)	1.5	Mustard/ Mustard	433	2.52	51
7	FAA Heater 3	Solid Coil Heater (part # = 68086040400)	1.75	Mustard/ Mustard	426	2.54	47
8	FAA Heater 3	Solid Coil Heater (part # 68086040400)	1.75	Mustard/ Mustard	426	2.53	62
9	FAA Heater 3	Solid Coil Heater (part # 68086040400)	1.75	Mustard/ Mustard	427	2.53	51

Yellow/ Gray Material Test Results



The test results of the Yellow/ Gray material used 2 furnaces with Part Number = *68086038000) and one furnace with Part Number68086040400) were similar*

Test #	Lab #	Radiant Heater Type	Material	Power input (Watts)	Pressure at 0 sec	Pressure at 90 sec	Pressure at 180 sec	Pressure at 240 sec	Pressure at 300 sec	Pass/fail
1	FAA Heater 1	Solid Coil Heater (part # 68086038000)	Yellow/Gray	430	2.52	2.88	2.91	2.94	2.96	Pass
2	FAA Heater 1	Solid Coil Heater (part # 68086038000)	Yellow/Gray	424	2.54	2.86	2.89	2.92	2.94	Pass
3	FAA Heater 1	Solid Coil Heater (part # 68086038000)	Yellow/Gray	430	2.53	2.86	2.91	2.93	2.96	Pass
4	FAA Heater 2	Solid Coil Heater (part # 68086038000)	Yellow/Gray	433	2.54	2.88	2.92	2.95	2.97	Pass
5	FAA Heater 2	Solid Coil Heater (part # 68086038000)	Yellow/Gray	434	2.54	2.89	2.92	2.95	2.96	Pass
6	FAA Heater 2	Solid Coil Heater (part # 68086038000)	Yellow/Gray	433	2.52	2.88	2.93	2.96	2.98	Pass
10	FAA Heater 3	Solid Coil Heater (part # 68086040400)	Yellow/Gray	427	2.53	2.88	2.93	2.97	2.99	Pass
11	FAA Heater 3	Solid Coil Heater (part # 68086040400)	Yellow/Gray	426	2.53	2.88	2.93	2.95	2.97	Pass
12	FAA Heater 3	Solid Coil Heater (part # 68086040400)	Yellow/Gray	426	2.53	2.86	2.90	2.92	2.94	Pass

Conclusion

The Mustard/Mustard material failed the test when using two radiant heaters with part #68086038000 and one radiant heater with part #68086040400 for the tests.

The Yellow/Yellow material passed the test when using two radiant heaters with part # 68086038000 and one radiant heater with part #68086040400 for the tests.

The Revised Test Method will specify the use of solid coil heaters with part #s 68086038000 and 68086040400 for testing evacuation slide materials.

Revised Test Method

Calibration:

1. ***Start the radiant heater and other required instrumentation and allow 30 to 45 minutes for warm up***
2. ***Adjust transformer voltage to produce input power to the heater between 425 watts and 433 Watts.***
3. ***Do not turn off the radiant heater. Use this radiant heat setting for the test.***

Test Procedure:

1. ***After the input power is achieved in the calibration,***
2. ***Place the center expanded surface of the test sample 2 inches in front of the center of the heater***
3. ***Pressurize the cylinder with test sample to the normal operating pressure. Ensure that the test sample holds pressure for at least 3 minutes before the test.***
4. ***Check the center expanded surface of the test sample that is 2 inches in front of the center of the heater***
5. ***Recheck to ensure the input power to the furnace between 425 watts and 433 watts in the monitor***
6. ***Rotate the pressure cylinder with the test sample in front of the radiant heater and simultaneously start the timer.***
7. ***Record time (in seconds) to the first observed pressure loss.***
8. ***Each sample must maintain the correct pressure for a minimum of 180 seconds to pass the test.***
9. ***Repeat the complete Calibration and Test Procedure for each test sample.***

Note: 2 solid coil heaters are acceptable for using the Revised Test Method that are:

Heater (part # 68086038000), the distance from the coil to the face of heater must be 1 .5 inches

Heater (part # 68086040400), the distance from the coil to the face of heater must be 1 .75 inches

Comparison of the Current and Revised Evacuation Slide Test Methods

The current test method uses a heat flux transducer to calibrate the radiant heat output impinging on the test sample, as per Technical Standard Order (TSO C69A). This method had several drawbacks:

- ***Different manufactures calibrate transducers differently resulting in different calibration data,***
- ***Dust on surface on the transducer may cause improper heat flux reading,***
- ***Continuous measurement of the heater output is not possible during the test,***
- ***The use of heat flux transducer is time consuming (lengthy time for transducer to reach steady state),***
- ***Heat flux transducer is required to be recalibrated each year due to aging of the black velvet paint on the surface of the device***

Advantages of controlling the output of the heater by controlling electrical power input:

- ***AC voltage and current to the heater will be measured, recorded, and converted to electrical power input using a computerized data system,***
- ***The calculated electrical power input will be monitored and controlled instantaneously during the test***
- ***There is no need to recalibrate the radiant heater,***
- ***Additional time is saved by eliminating the need to calibrate the heat flux output from the heater every test,***
- ***By maintaining 425 to 433 Watts input power to the radiant heater, an output heat flux of 1.5 Btuft^{2}sec will be achieved on the test sample at 2 inches in front of the heater.***

<u>Test results using the Revised test method are the same as those using the Current test method</u>.