

Evacuation Slide Test Method

Update on Recent Tests

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Background

- ***FAA determined that the same type of solid coil furnaces used for the evacuation slide test could be configured with the heating coil set at various depths. The coils could be adjusted from 1 ½ to 1 ⅝ inches depth from the face of the furnace.***
- ***Because several labs used the same type of furnaces but with different coil depths, the FAA conducted a series of comparison tests to determine the difference in output.***
- ***3 calibration tests were run using each of three different coil depths.***

Coil Depth Measurement

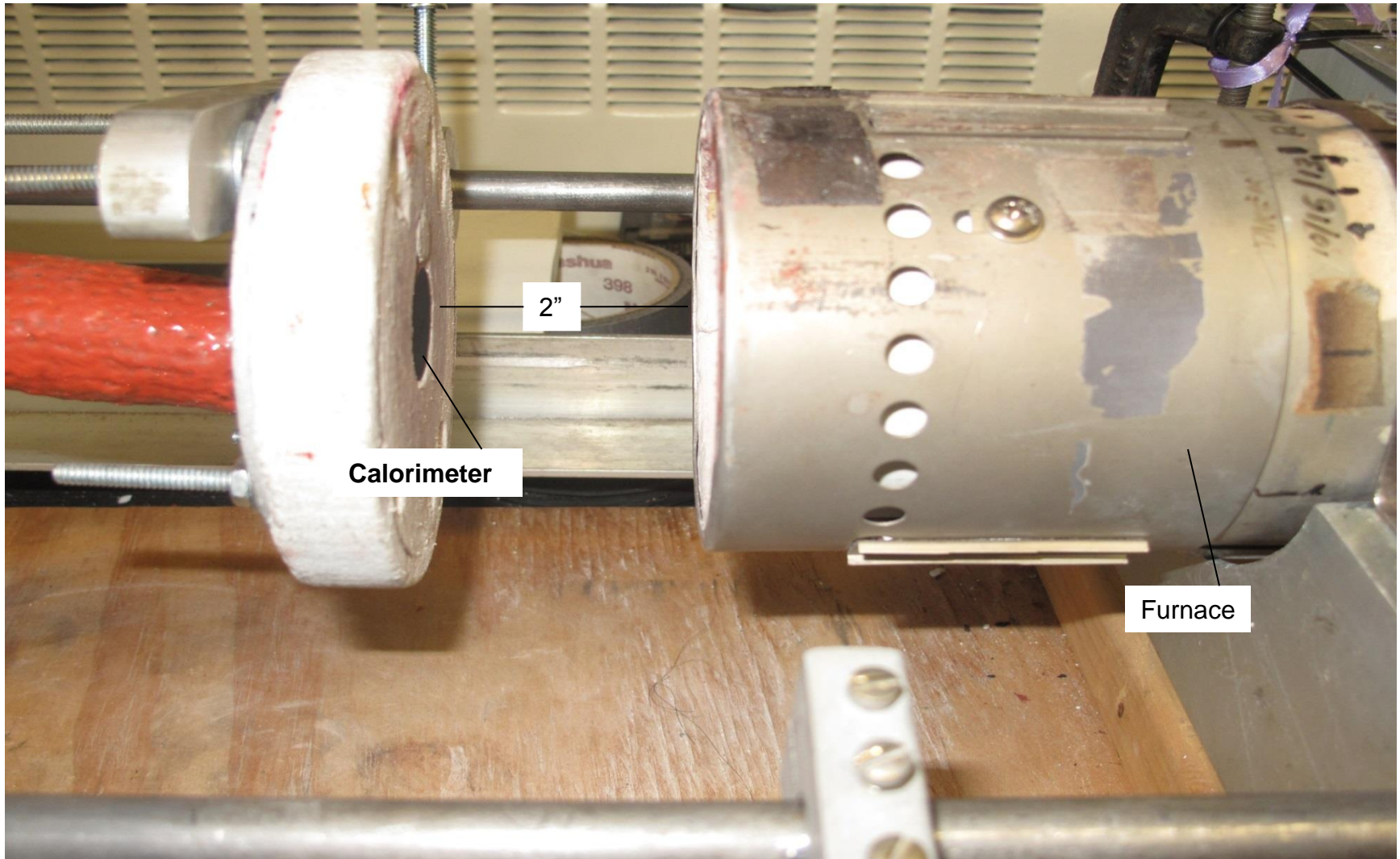


Tests to Determine the Required Power Input to the Furnace to Produce the Correct Heat Flux at Various Coil Depths

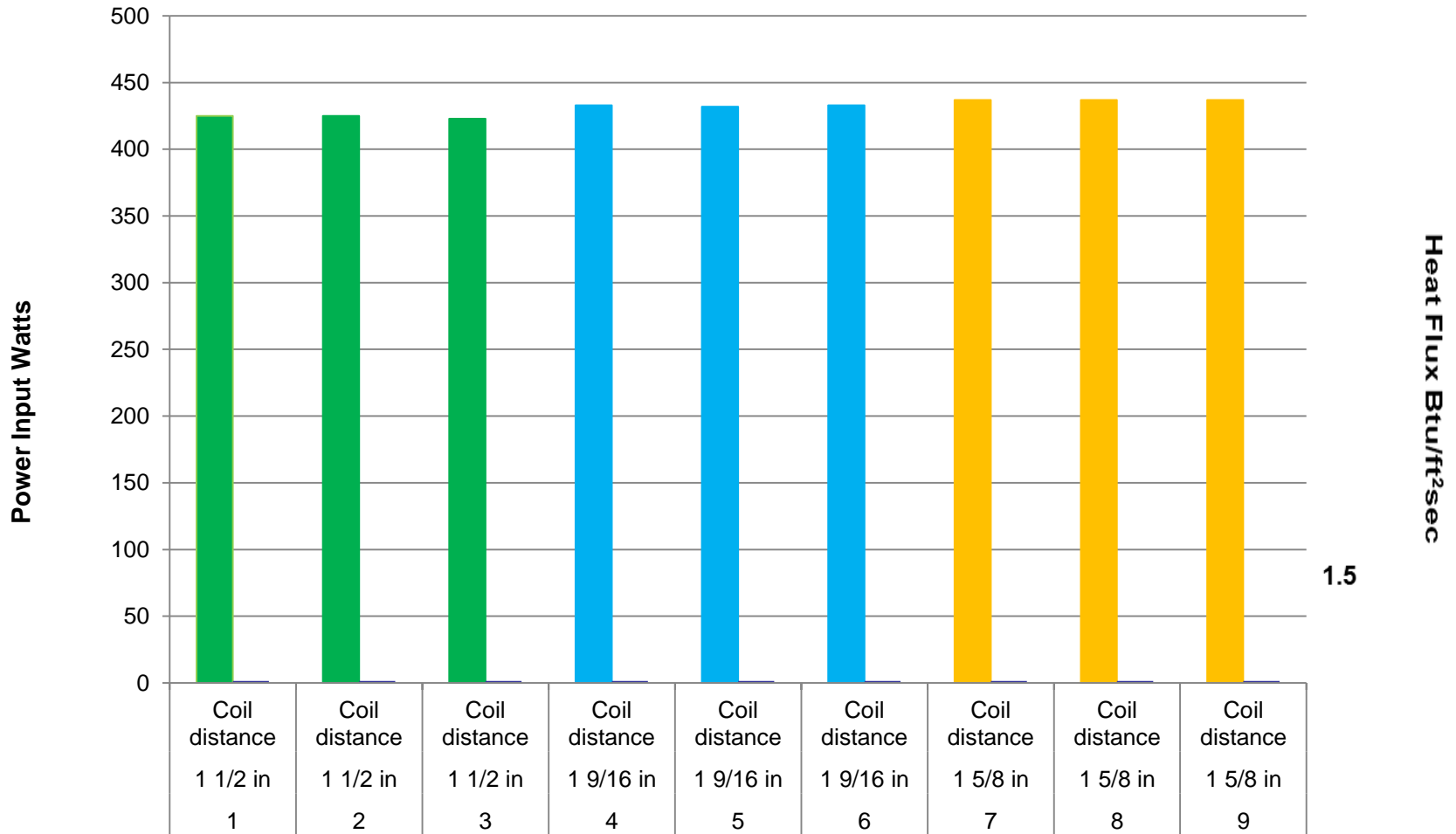
Procedure:

1. Set coil depth (either $1 \frac{1}{2}$, $1 \frac{9}{16}$, or $1 \frac{5}{8}$ inches)
2. Start the radiant heat furnace and other required instrumentation and allow 30 to 45 minutes for warm up.
- 2) Adjust the input power of the furnace to provide an output heat flux of $1.5 \text{ Btu/ft}^2\text{sec}$ at a distance of 2 inches in front of the radiant heat furnace.
- 3) Record the input power setting when the Heat flux is stabilized at the reading of about $1.5 \text{ Btu/ft}^2\text{sec}$.
- 4) *Stop the test*

Test Configuration for Measuring Heat Flux at 2-Inch Distance



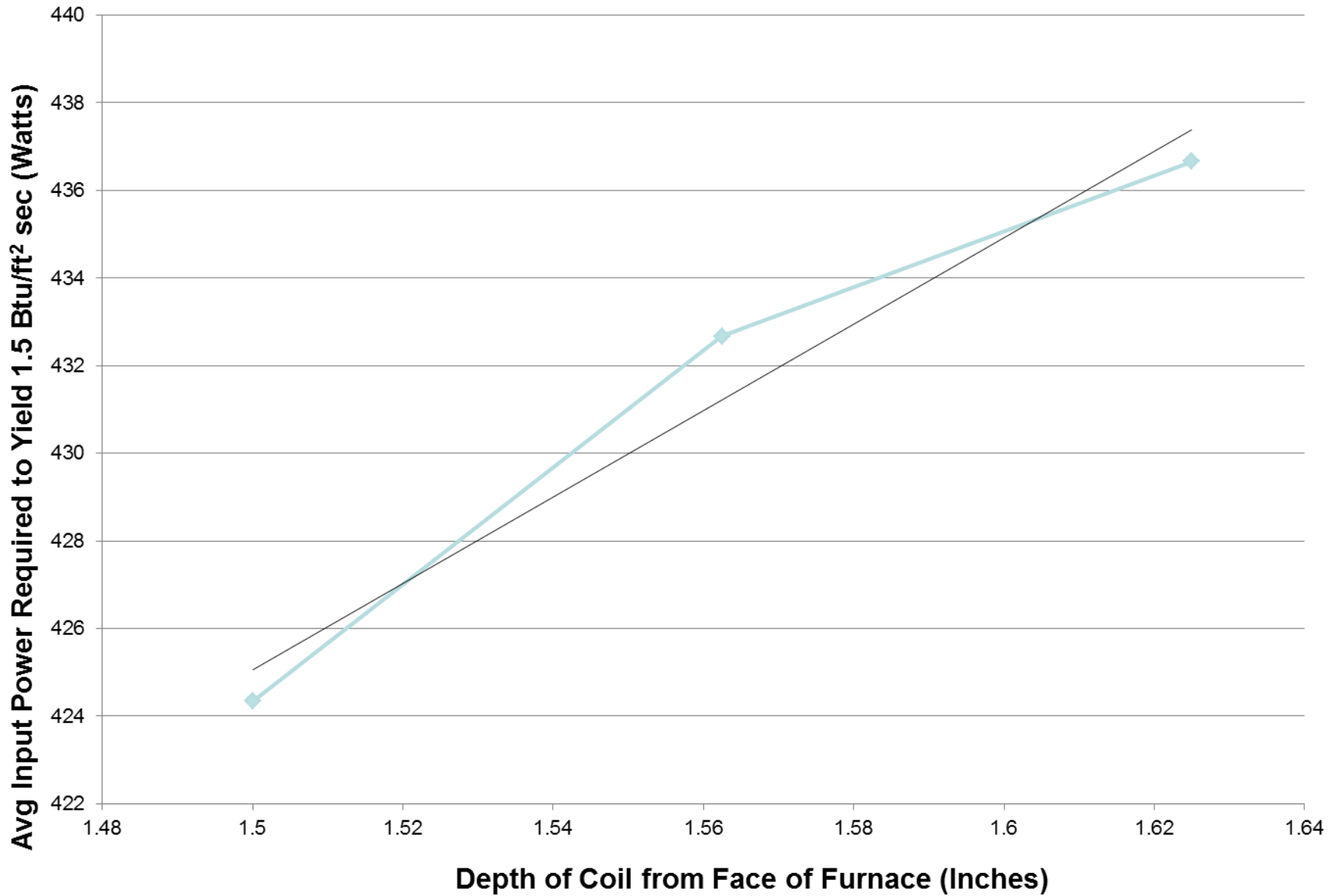
Calibration Tests Conducted by FAA Using Furnace with 3 Different Distances of the Coil from the Face of the Furnace



Calibration Tests Conducted by the FAA

Test #	Voltage (ACV)	Current (Ampere)	Power Input (Watts)	Heat flux of the Calorimeter (Btu/ft²sec)	Distance from the Calorimeter to the Furnace	Distance from the Coil to the opening surface of the Furnace
1	88.52	4.8	425	1.50	2 inches	1 ½ inches
2	88.61	4.8	425	1.51	2 inches	1 ½ inches
3	88.21	4.8	423	1.51	2 inches	1 ½ inches
4	88.52	4.8	433	1.51	2 inches	1 9/16 inches
5	88.61	4.8	432	1.51	2 inches	1 9/16 inches
6	88.21	4.8	433	1.51	2 inches	1 9/16inches
7	89	4.86	437	1.52	2 inches	1 5/8 inches
8	90	4.86	437	1.51-1.52	2 inches	1 5/8 inches
9	90	4.86	436	1.52	2 inches	1 5/8 inches

Relationship of Coil Depth to Required Power Input



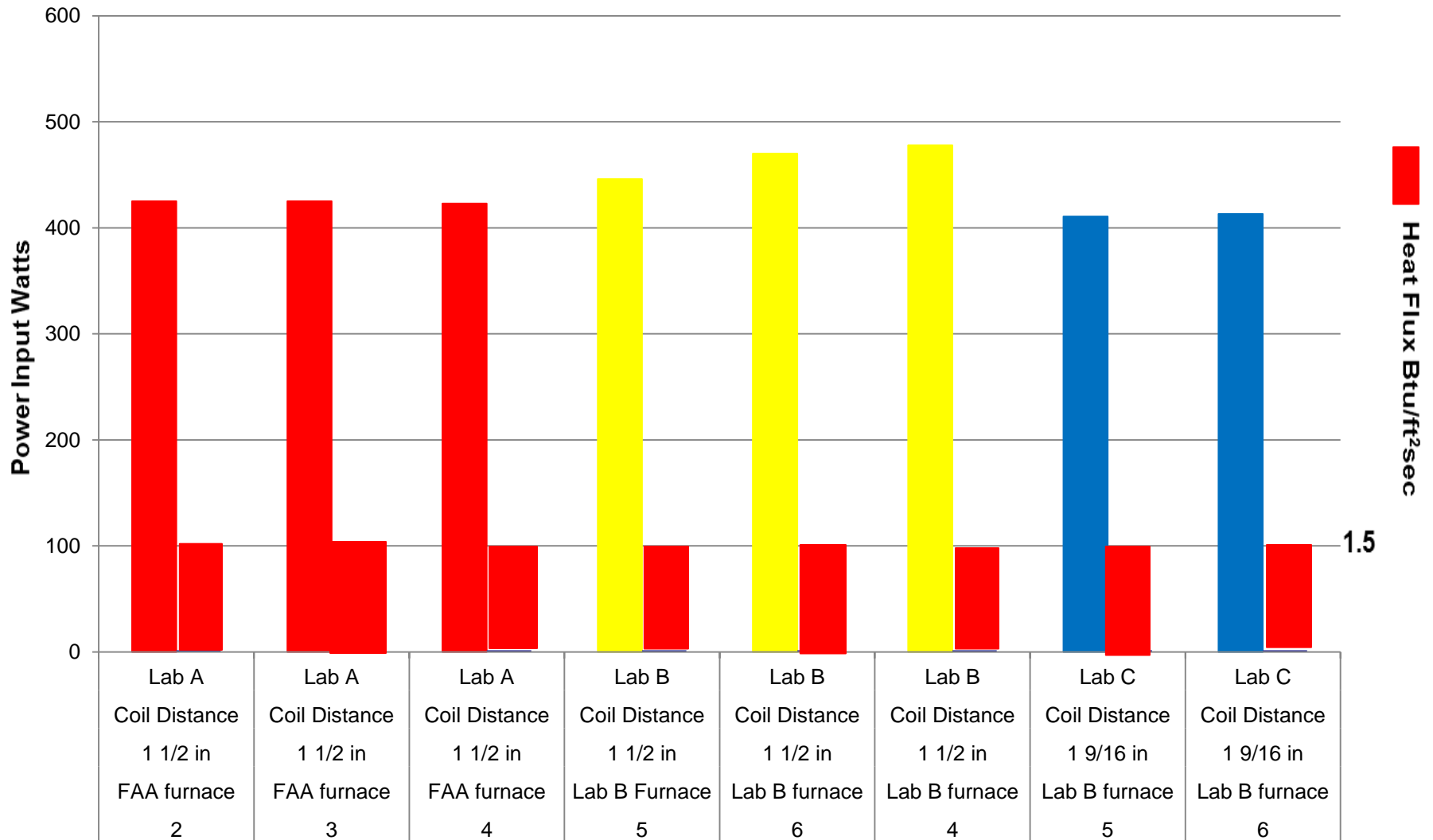
Results

- *The tests showed that the required power to the furnace increased as the distance of the coil (depth) increased from the face of the furnace (to maintain 1.5 Btu²sec at the location of 2 inches in front of the furnace).*
- *The position (depth) of the heating coil in the furnace is critical to providing the correct heat output to the test specimen.*

Recent Activities

- ***At Task Meeting on October 21, 2015, Participants discussed the positioning of the furnace coils in their respective labs' equipment.***
- ***The majority of participants had used a coil depth of 1 ½ Inches from the face of the furnace. This coil depth was selected for the testing.***
- ***A series of comparison tests was conducted to compare the power inputs of the furnaces among labs.***
- ***3 of the 5 labs present at the Task Meeting agreed to participate in the comparison tests.***
- ***2 labs used a coil depth of 1 ½ inches; 1 lab used a coil depth of 1 9/16 inches***
- ***Each Lab ran 3 calibration tests of the furnace; data to FAA***

Comparison Tests Between Labs



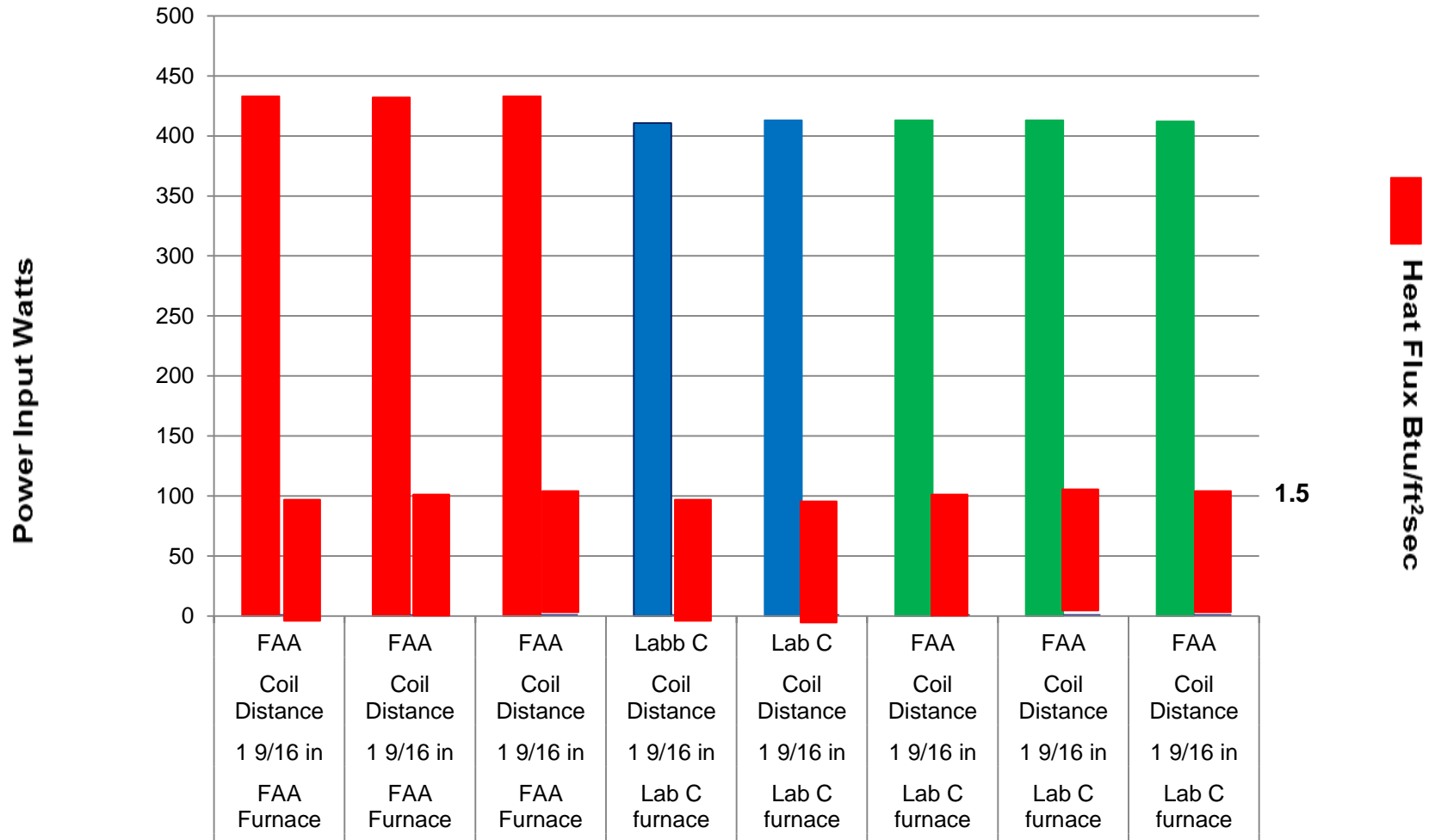
Comparison Tests Between Labs

Test #	Lab	Furnace #	Voltage (ACV)	Current (Ampere)	Power Input (Watts)	Heat flux of the Calorimeter (Btu/ft ² sec)	Distance from the Calorimeter to the Furnace	Distance from the Coil to the opening surface of the Furnace
1	A	Solid Coil Furnace (part # = 68086038000)	88.52	4.8	425	1.50	2 inches	1 ½ inches
2	A	Solid Coil Furnace (part # = 68086038000)	88.61	4.8	425	1.51	2 inches	1 ½ inches
3	A	Solid Coil Furnace (part # = 68086038000)	88.21	4.8	423	1.51	2 inches	1 ½ inches
4	B	Solid Coil Furnace	116.1	5.19	446	1.5	2 inches	1 ½ inches
5	B	Solid Coil Furnace	115.9	5.11	470	1.5	2 inches	1 ½ inches
	B	Solid Coil Furnace	116.2	4.86	478	1.5	2 inches	1 ½ inches
4	C	Solid Coil Furnace (part # = 68086040400)	84.0	4.89	410.76	1.50	2 inches	1 9/16 inches
5	C	Solid Coil Furnace (part # = 68086040400)	84.3	4.90	413.07	1.53	2 inches	1 9/16 inches

Comparison Tests Between Labs

- *Lab B required much higher power inputs compared to those of Lab A and Lab C.*
- *Lab C required much lower power inputs compared to those of Lab A and Lab B.*
- *However, Lab A and Lab C used different furnace part numbers:*
- *Lab A (FAA) used the furnace (part # 68086038000)*
- *Lab B used the furnace (part # 68086040400)*
- *Lab C used the furnace (part # 68086040400)*
- *Part # 68086040400 has a 1/8-inch thermocouple inserted from back side into the furnace (used to measure the temperature of the heating coil).*
- *Lab B and Lab C agreed to send their furnaces to the FAA to be checked against the FAA furnace (only received Lab C furnace so far)*

Calibration Tests Conducted by the FAA and Lab C



part # 68086038000

part # 68086040400



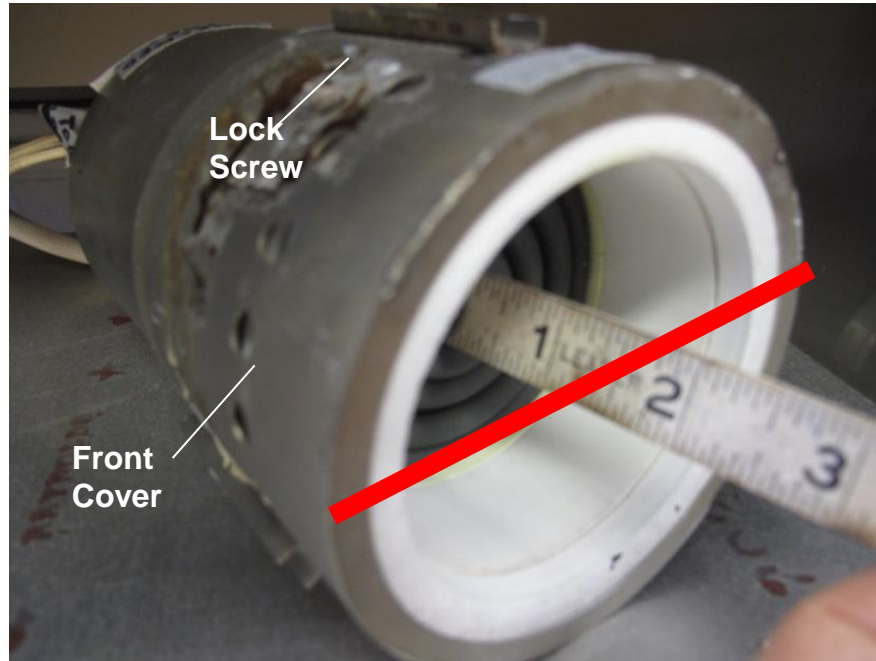
The Results of the Calibration Tests of the Lab A and Lab C

Test #	Lab	Furnace #	Voltage (ACV)	Current (Ampere)	Power Input (Watts)	Heat flux of the Calorimeter (Btu/ft ² sec)	Distance from the Calorimeter to the Furnace	Distance from the Coil to the opening surface of the Furnace
1	FAA	FAA's Solid Coil (part # = 68086038000)	88.52	4.8	433	1.51	2 inches	1 9/16 inches
2	FAA	FAA's Solid Coil (part # = 68086038000)	88.61	4.8	432	1.51	2 inches	1 9/16 inches
3	FAA	FAA's Solid Coil (part # = 68086038000)	88.21	4.8	433	1.51	2 inches	1 9/16 inches
4	C	Lab C's Solid Coil Furnace (part # = 68086040400)	84.0	4.89	410.76	1.50	2 inches	1 9/16 inches
5	C	Lab C's Solid Coil Furnace (part # = 68086040400)	84.3	4.90	413.07	1.53	2 inches	1 9/16 inches
6	FAA	Lab C's Solid Coil sent to FAA (part # = 68086040400)	84.98	4.86	413	1.52	2 inches	1 9/16 inches
7	FAA	Lab C's Solid Coil sent to FAA (part # = 68086040400)	85.16	4.86	413	1.52	2 inches	1 9/16 inches
8	FAA	Lab C's Solid Coil sent to FAA (part # = 68086040400)	84.86	4.86	412	1,52	2 inches	1 9/16 inches

Conclusions

- ***Lab A (FAA) and Lab C results showed excellent correlation when using the Lab C furnace (part # 68086040400).***
- ***FAA furnace required higher input power to produce equivalent results.***
- ***The part number of the FAA furnace is = 68086038000***
- ***The part number of the Lab C furnace is = 68086040400***
- ***These test results were different because the FAA and Lab C furnaces were different (different part numbers)***

Coil Depth Adjustment



The heating coil is located inside the furnace, bolted to the ceramic liner.

To change the coil depth, loosen the lock screw that connects the front cover to the body of the furnace, then adjust the front cover until the required distance of the coil is 1 ½ inches from the face of the furnace as shown the photo above.

Future Work

- *Participants will send their furnaces to the FAA to rerun the calibration tests of their furnaces.*
- *FAA will visit the Working Group Members' labs to assist their test set up. FAA will use the tools to position the center of the pressure cylinder centered with furnace as well as the distance of the expanded surface of test specimen from the face of the furnace.*
- *FAA and labs will conduct the Calibration Tests and Evacuation Slide Tests at their labs.*
- *All labs will rerun the calibration tests.*
- *RR5 will be conducted and presented at the next meeting*