"Where Quality Is Measured and Certified"

TEMPERATURE UNIFORMITY SURVEY REPORT

performed on

Wisconsin Oven, ID# 1

TUS Date

prepared for

ABC COMPANY

"Where Quality Is Measured and Certified"

Industrial Calibration & Service Co., Inc.
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Report Date

TEMPERATURE UNIFORMITY SURVEY

To: Ms. Jane Doe
ABC COMPANY
Any Street
Anywhere

OVEN DETAILS

Description	*Working Zone (LxWxH)*	*Serial Number*	*Temperature Range*
Oven, ID# 1	72” x 72” x 72”	0123456	(0 to 700) ºF

TERMS

This report was specifically prepared for **ABC COMPANY** and completed on *TUS Date*. This report may not be reproduced, disclosed, distributed or used in any form or by any means except in full without the prior written consent of Industrial Calibration and Service Company, Inc.

SCOPE

TUS Specification

The Temperature Uniformity Survey (TUS) was performed to the specifications detailed in AMS-2750E by *IN-CAL* employing trained engineers and/or technicians, as described in our Quality System Manual.

Purpose

The purpose of this study was to observe the temperature uniformity of Oven, ID# 1 in the manufacturing facility located on any street, anywhere on *TUS Date*.

One TUS was performed:

1. Empty Chamber at 400 ºF

The expectation was to qualify Oven, ID# 1 to AMS-2750E specification, specifically Class 5 (± 25 ºF).

PROCEDURE

Setup

The temperature scanning device (*Agilent 34972A*) was programmed to record the thermocouple sensor values electronically at fifteen (15) second intervals.

Ten (10) type K thermocouples were used to study the temperature uniformity of the oven. Thermocouples were calibrated by the manufacturer in accordance with the "Thermocouple Harness Reference Table(s) on the page three (3). The test temperature set point and correction factors {*where plus (+) indicates the value was added to the thermocouple reading and a minus indicates the value was subtracted from the thermocouple reading*} are included.

Thermocouple Layout

The ten (10) thermocouples were arranged in the empty Oven in accordance with the Thermocouple Lay-Out diagram on pages four (4) and five (5), with the tenth thermocouple coinciding with the control thermocouple.

To assist with interpreting the thermocouple locations, we have included a page to help visualize the different planes referenced in the graphs. Please refer to page six (6) – 'Interpreting Visual Space'.

THERMOCOUPLE HARNESS REFERENCE TABLE

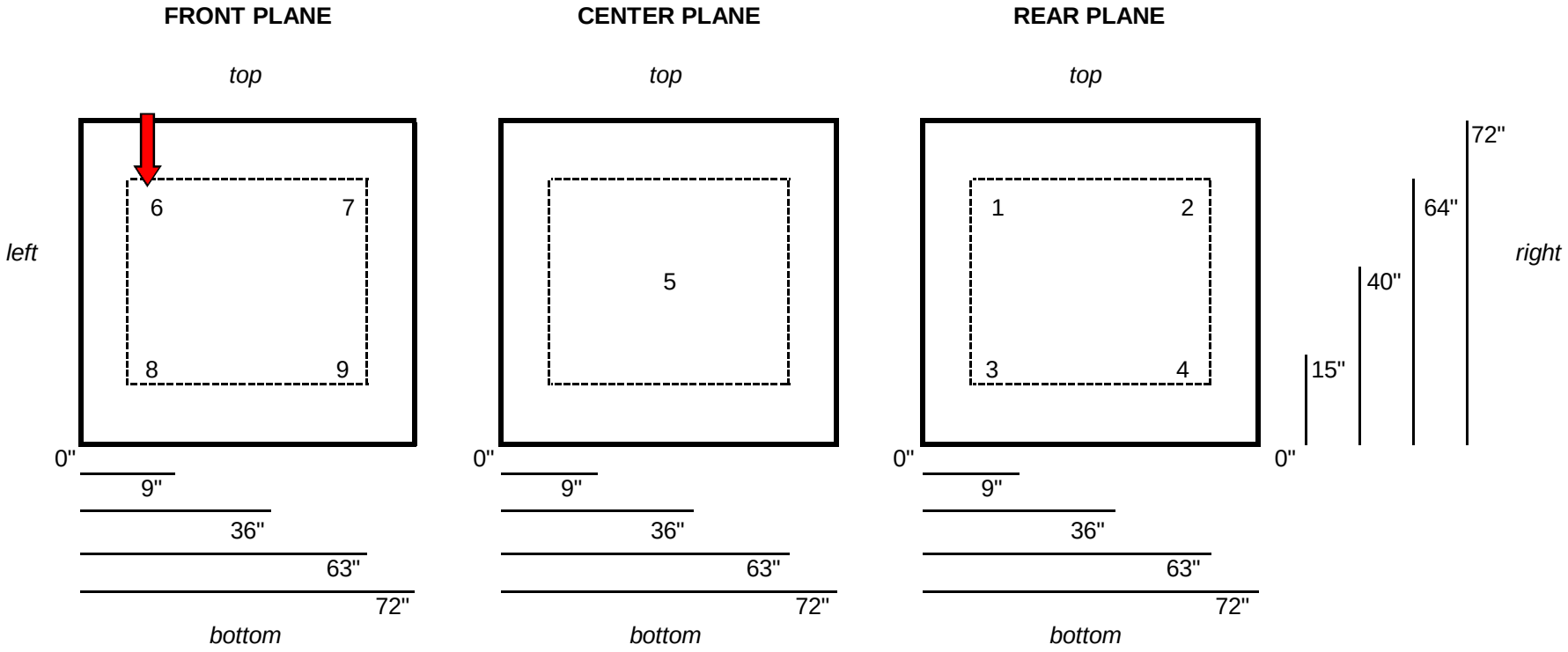
Thermocouple ID	*Thermocouple Type*	*Spool ID*	*Channel ID*	**Calibration Date*	*Temperature Set Point (ºF)*	*ASTM E29 Avg Correction (ºF)*
IC-1086-00845	Type K	W41101-1	101	11/01/14	400	0.10
IC-1086-00846	Type K	W41101-1	102	11/01/14	400	0.10
IC-1086-00847	Type K	W41101-1	103	11/01/14	400	0.10
IC-1086-00848	Type K	W41101-1	104	11/01/14	400	0.10
IC-1086-00849	Type K	W41101-1	105	11/01/14	400	0.10
IC-1086-00850	Type K	W41101-1	106	11/01/14	400	0.10
IC-1086-00851	Type K	W41101-1	107	11/01/14	400	0.10
IC-1086-00852	Type K	W41101-1	108	11/01/14	400	0.10
IC-1086-00853	Type K	W41101-1	109	11/01/14	400	0.10
IC-1086-00854	Type K	W41101-1	110	11/01/14	400	0.10

**Thermocouple wire calibration meets ASTM E230 for special limits: ±1.1ºC or 0.4%.*

THERMOCOUPLE LAY-OUT

WISCONSIN OVEN, ID# OVEN 1

Front View



Plane — *Front Plane is 12" in from front of oven*

Center Plane is 36" in from front of oven

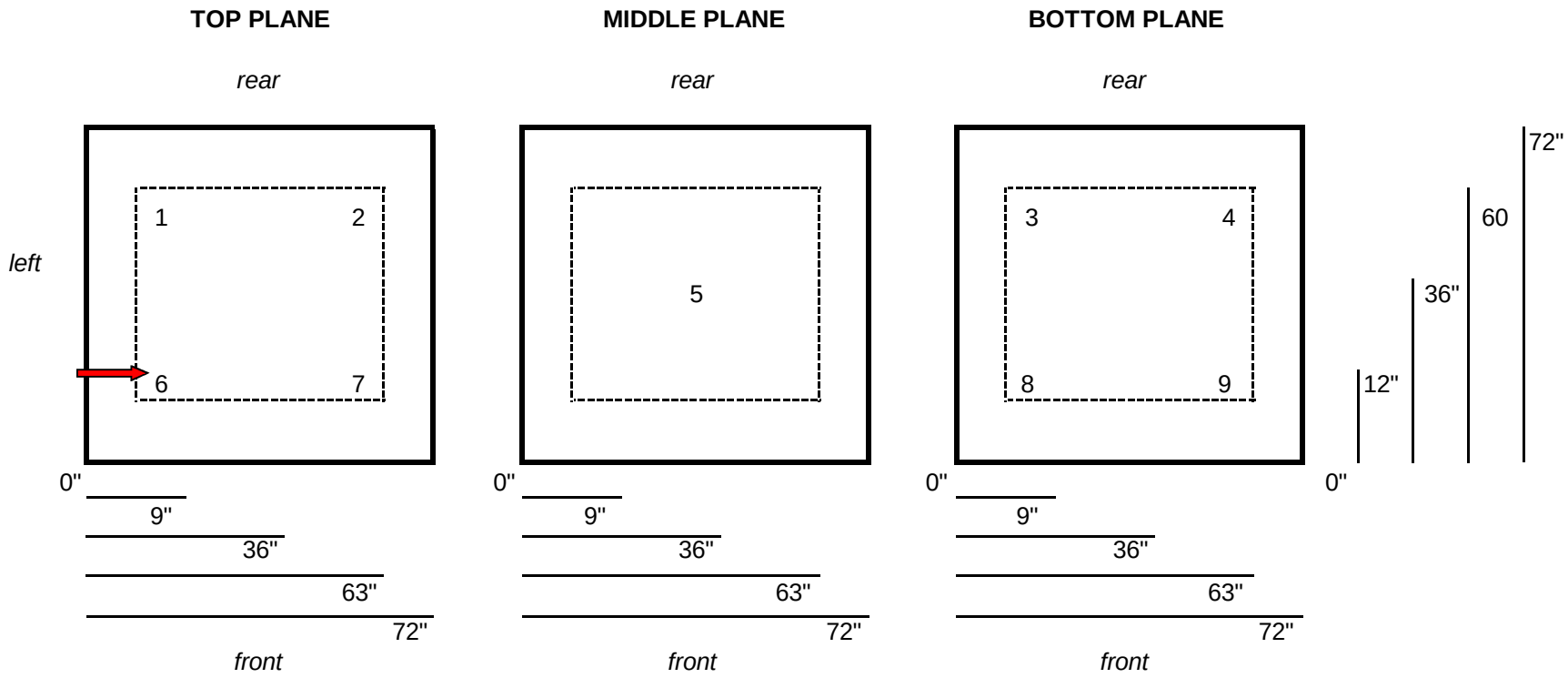
Oven — ***Control T/C***

Rear Plane is 60" in from front of oven

THERMOCOUPLE LAY-OUT

WISCONSIN OVEN, ID# OVEN 1

Top View



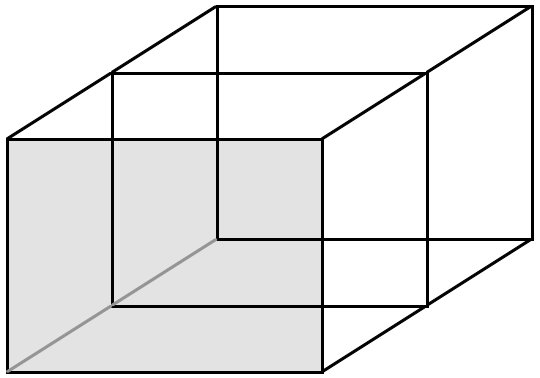
Plane *Top Plane is 8" down from top of oven*

Middle Plane is 32" down from top of oven

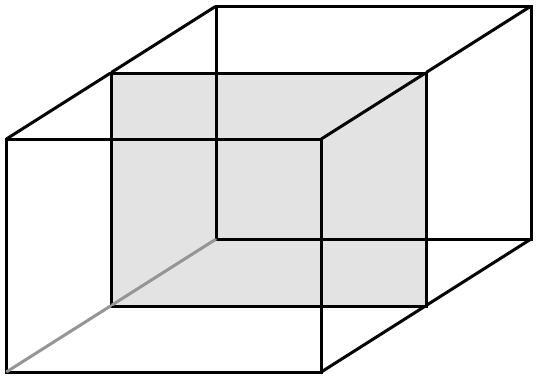
Oven ***Control T/C***

Bottom Plane is 15" up from bottom of oven

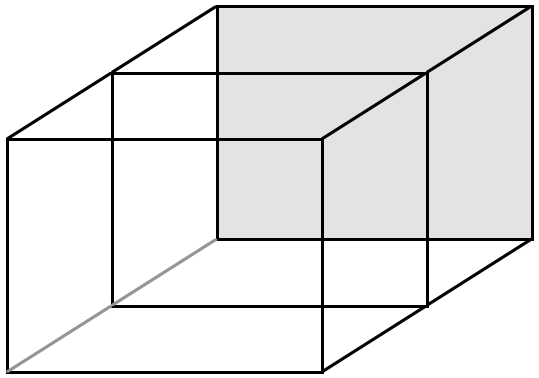
Front Oven View



FRONT PLANE

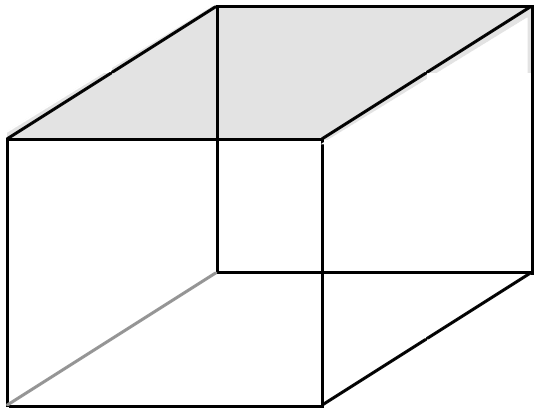


CENTER PLANE

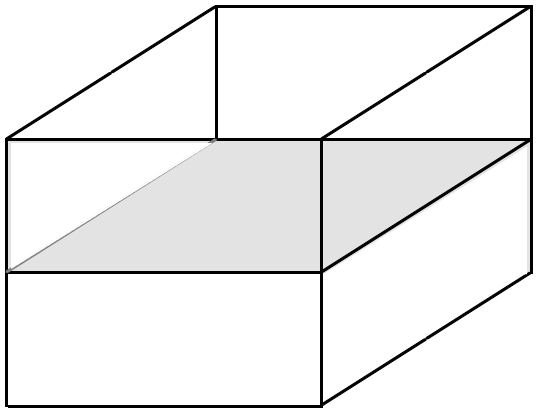


REAR PLANE

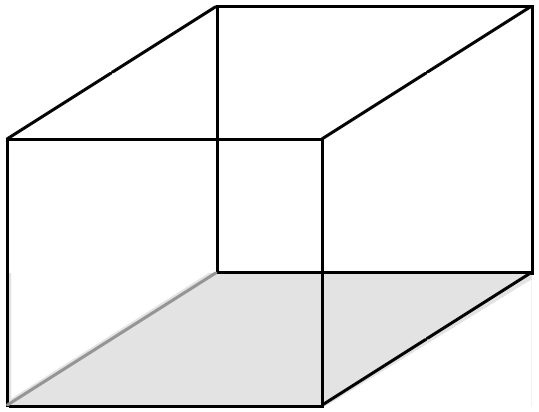
Top Oven View



TOP PLANE



MIDDLE PLANE



BOTTOM PLANE

RESULTS

1.0 Oven, ID# 1, Empty Chamber TUS performed at 400 ºF

Pertinent Data

The survey began at 10:09 am with a set point of 400 ºF and concluded at 11:17 am on TUS Date.

Thermocouples were distributed within the work zone in accordance with the Thermocouple Lay-Out diagram on page four (4) and five (5).

The corrected data can be found on page eight (8), in addition to general statistics (*average, low and high temperatures, as well as the temperature spread*).

The average process temperature of the oven after temperature stabilization was 400.3 ºF.

The lowest and highest temperatures recorded after temperature stabilization were 388.8 ºF and 411.9 ºF, respectively.

Trends

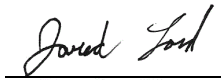
The trend of temperature points after stabilization can be found on page nine (9).

Conclusion

The results from the study demonstrate that Oven, ID# 1 is capable of maintaining a temperature uniformity of ± 25 ºF within the specified thermocouple locations (*work zone*) at a temperature set point equal to 400 ºF, during the empty chamber study. Thus, the oven meets the Class 5 requirements of AMS-2750E at a set point equal to 400 ºF.

Compliance

IN-CAL attests that all procedures and test methods utilized for this Temperature Uniformity Survey comply with the requirements stated in AMS-2750E and were performed by trained *IN-CAL* employees.

TUS was performed by  on *TUS Date*.

Jared Ford

TUS was reviewed by  on *Report Date*.

James Spears

Relative	Corrected Data										Corrected Summary Data			
time (min)	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	Avg	Min	Max	Spread
0:00	404.7	405.0	411.9	405.7	400.0	395.2	392.3	398.8	393.8	399.8	400.8	392.3	411.9	19.6
1:00	404.7	404.6	411.9	405.7	401.4	395.2	392.9	398.3	388.8	399.9	400.4	388.8	411.9	23.1
2:00	405.0	404.7	411.9	405.7	400.6	395.3	392.5	398.8	396.3	400.3	401.2	392.5	411.9	19.4
3:00	404.3	404.5	411.2	405.4	400.3	395.5	393.1	399.4	394.3	400.1	400.9	393.1	411.2	18.1
4:00	404.2	404.9	411.1	405.0	400.2	394.7	392.7	397.3	395.7	399.8	400.6	392.7	411.1	18.3
5:00	404.2	404.3	410.7	404.8	400.4	394.9	392.9	397.6	393.7	399.9	400.4	392.9	410.7	17.7
6:00	403.7	403.8	410.8	405.1	400.0	394.5	392.5	398.5	396.8	399.7	400.6	392.5	410.8	18.3
7:00	404.1	404.0	410.6	404.9	399.7	394.7	392.7	396.5	393.1	399.3	400.0	392.7	410.6	17.9
8:00	403.5	403.6	410.4	404.7	399.8	394.5	392.1	396.9	398.7	399.4	400.5	392.1	410.4	18.4
9:00	404.7	404.2	410.7	405.3	399.4	395.8	393.0	398.3	393.1	399.5	400.5	393.0	410.7	17.8
10:00	403.7	403.9	410.2	404.9	400.2	394.1	392.1	399.0	389.7	399.7	399.7	389.7	410.2	20.5
11:00	403.5	403.6	410.1	404.6	399.3	394.3	392.2	397.6	395.7	399.1	400.1	392.2	410.1	17.9
12:00	403.8	403.6	410.3	405.0	400.4	394.5	392.2	398.9	394.0	399.8	400.3	392.2	410.3	18.1
13:00	404.2	404.1	410.4	404.8	400.3	395.2	391.9	398.6	393.7	399.4	400.3	391.9	410.4	18.5
14:00	403.6	403.9	410.3	405.0	400.0	394.0	392.7	398.0	394.1	399.2	400.2	392.7	410.3	17.6
15:00	404.0	403.7	410.4	404.8	400.1	394.9	393.2	398.0	390.4	399.4	400.0	390.4	410.4	20.0
16:00	403.8	403.6	410.0	404.6	399.8	395.3	392.3	396.9	397.2	399.2	400.4	392.3	410.0	17.7
17:00	403.8	403.5	409.9	404.7	399.6	395.2	393.1	396.8	397.2	400.0	400.4	393.1	409.9	16.8
18:00	404.1	403.8	410.3	405.0	399.7	394.6	393.0	398.8	394.3	399.1	400.4	393.0	410.3	17.3
19:00	403.3	403.6	410.0	404.5	400.1	395.0	392.9	399.2	394.1	399.5	400.3	392.9	410.0	17.1
20:00	403.8	403.9	410.1	405.2	400.1	393.8	392.8	398.0	392.7	399.2	400.0	392.7	410.1	17.4
21:00	403.3	403.6	409.7	404.5	399.5	394.0	393.2	397.8	394.5	399.8	400.0	393.2	409.7	16.4
22:00	403.6	403.5	409.8	404.7	399.8	395.1	393.1	398.5	392.9	399.5	400.1	392.9	409.8	16.9
23:00	403.4	403.1	409.7	404.7	399.3	395.1	392.8	398.3	394.3	399.4	400.1	392.8	409.7	16.9
24:00	403.6	403.5	410.0	404.9	400.0	395.1	392.8	398.0	394.4	399.2	400.3	392.8	410.0	17.1
25:00	403.5	404.0	410.0	404.8	400.3	394.3	392.9	397.3	392.9	399.7	400.0	392.9	410.0	17.1
26:00	403.2	403.5	409.3	404.4	399.5	394.8	392.3	397.1	394.9	399.6	399.9	392.3	409.3	17.1
27:00	403.2	403.4	409.6	404.4	399.5	395.1	392.0	398.6	395.3	399.3	400.1	392.0	409.6	17.5
28:00	403.4	403.5	409.5	404.3	399.7	394.7	392.8	398.6	392.5	399.3	399.9	392.5	409.5	16.9
29:00	403.2	403.2	409.5	404.6	399.8	393.8	391.9	398.3	396.0	398.7	400.0	391.9	409.5	17.6
30:00	403.6	403.9	409.8	404.6	399.1	396.2	393.8	399.4	395.1	400.1	400.6	393.8	409.8	16.0

Empty Chamber TUS for Oven, ID# 1
30 minute Corrected Data Stabilization Trend, SP = 400 ºF