

October 25, 2021

VIA EMAIL: ernest.sandland@whrsd.org

Mr. Ernest Sandland
Facilities Department
Whitman Hanson Regional School District
600 Franklin Street
Whitman, MA 02382

TRC Project No. 455410

**Subject: Final Report
Indoor Air Quality Evaluation
Whitman Hanson Regional High School
600 Franklin Street
Hanson, Massachusetts**

Dear Mr. Sandland:

TRC Environmental, Inc. (TRC) is pleased to present its final report entitled "*Indoor Air Quality Evaluation*" performed at the Whitman/Hanson Regional High School located at 600 Franklin Street in Hanson, MA.

TRC appreciates the opportunity to be of service. If you have any questions or concerns, please contact me at (781) 337-0016.

Very Truly Yours,
TRC ENVIRONMENTAL, INC.



Olivia Smaracko
BSI - Sr. Industrial Hygienist



Gregory Hatch
BSI - Office Practice Leader

Indoor Air Quality
at

**Whitman/Hanson Regional High School
600 Franklin Street
Hanson, Massachusetts**

TRC Project No. 455410
October 25, 2021

Prepared for:

**Whitman Hanson Regional School District
Facilities Department
600 Franklin Street
Whitman, MA 02382**

Prepared by:

**TRC Environmental, Inc.
814 Broad Street
Weymouth, Massachusetts
781.337.0016**

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A DIRECT-READING ENVIRONMENTAL MEASUREMENTS

B. IAQ MONITOR CALIBRATION REPORT

1.0 INTRODUCTION

Mr. Ernest Sandland of the Whitman Hanson Regional School District (WHRSD) authorized TRC Environmental, Inc. (TRC) to perform an indoor air quality evaluation at the Whitman/Hanson Regional High School at 600 Franklin Street, Hanson, MA.

WHRSD requested this evaluation to be conducted in a proactive manner to address potential occupant concerns. TRC Industrial Hygienist, Gregory Hatch, visited the school to perform the evaluation on August 26, 2021. During the evaluation, building access and information was provided by Mr. Ernest Sandland of the WHRSD Facilities Department.

Appendix A presents the results of instantaneous direct-reading environmental measurements. Appendix B presents the monitoring calibration report.

2.0 OBSERVATIONS AND DISCUSSION

TRC's evaluation included evaluating representative occupied spaces at the school building. TRC's observations and discussions were based on the following:

- Inspecting for possible microbiological reservoirs or amplifiers and sources of odor, chemical air contaminants, and combustion products within the survey areas and associated with the heating, ventilating and air conditioning (HVAC) system serving those areas.
- Collecting instantaneous, direct-reading measurements for dry bulb temperature, relative humidity, carbon dioxide and carbon monoxide concentrations indoors in the representative areas and outdoors for comparison.

2.1 OCCUPIED SPACE

The building is typical school building with office space, common areas such as hallways, Cafeteria/Auditorium, Library, Gymnasium, and classroom space. The following was noted:

- School was not in session yet, but a few teachers were present preparing classrooms for opening day. Most of the unit ventilators and individual air conditioners in classrooms were not in operation.
- The outdoor temperatures were measured and ranged from 88.8-92.7 °F during the survey.
- No substantial water leaks or intrusion areas were observed.

2.2 DIRECT-READING ENVIRONMENTAL MEASUREMENTS

TRC performed direct-reading environmental measurements within select classrooms and offices and in the outdoor air, on August 26, 2021. TRC measured for dry bulb temperature, relative humidity, carbon dioxide and carbon monoxide concentrations using a TSI Q-Trak Indoor Air Quality Monitor. This is a direct reading instrument.

Appendix A presents direct-reading environmental measurements and Appendix B provides the updated instrument calibration report.

2.2.1 Dry Bulb Temperature and Relative Humidity

On the day of the survey, TRC measured indoor dry bulb temperatures ranging from 68.4 to 78.1°F. The outdoor dry bulb temperature ranged from 88.8 to 92.7 °F. TRC measured indoor relative humidity in the occupied spaces ranging from 55.0 to 92.4%. The outdoor relative humidity ranged from 59.0 to 62.1%.

Occupant thermal comfort is based on a combination of temperature and relative humidity. The American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc. (ASHRAE) Standard 55-1992, *Thermal Environmental Conditions for Human Occupancy*, and Standard 55a-1995 Amendment, recommends a range and combination of temperature and relative humidity considered as acceptable for general occupant comfort.

The temperatures and relative humidity levels recommended in ASHRAE Standard 55-1992 and Standard 55a-1995 provide for conditions for which 90 percent of occupants will not express discomfort. The range of temperatures and relative humidity prescribed change from summer to winter and assume that occupants dress appropriately for the season. Ranges of temperature include adjustment factors based on occupant activity (metabolic rate) and clothing factor.

For occupants of office space with a metabolic range of 0.8 to 1.2, the recommended comfort ranges for temperature and relative humidity are:

- **Winter**

Temperature - Dry Bulb: 67 to 76 °F at 64 °F Wet Bulb
(85 to 54 Percent Relative Humidity)
and
69 to 76 °F at 36 °F Dew Point
(30 to 23 Percent Relative Humidity)

- **Summer**

Temperature - Dry Bulb: 73 to 79 °F at 68 °F Wet Bulb
(78 to 58 Percent Relative Humidity)

and
74 to 87 °F at 36 °F Dew Point
(28 to 20 Percent Relative Humidity)

If space utilization or clothing factors change, then the temperature range will also change in accordance with:

$T_{\text{active}} = T_{\text{sedentary}} - 5.4 (1 + \text{Clo}) (\text{Met} - 1.2)$

Regardless of the metabolic rate calculation from above;
the minimum temperature permitted is 59 °F

ASHRAE Standard 62:2001, *Ventilation for Acceptable Indoor Air Quality*, recommends that, to avoid fungal amplification in building fabrics, relative humidity in occupied spaces should be maintained below 60 percent.

The measured indoor temperatures were found to be within the acceptable range. A few of the relative humidity readings were above the recommended 78% maximum level. The humidity readings measured outside of the recommended levels are due to the summer like conditions outside in conjunction with the air conditioners not operating on a normal occupied setting as the school was not yet in session.

2.2.2 Carbon Dioxide

On the day of the survey, TRC measured outdoor carbon dioxide concentrations between 448 to 473 parts per million (ppm). Indoor carbon dioxide concentrations ranged from between 439 to 499 ppm.

ASHRAE Standard 62:2001, *Ventilation for Acceptable Indoor Air Quality*, identifies indoor carbon dioxide concentrations as a surrogate determination of ventilation efficiency. For a building under normal occupancy load and operating in its normal conditioning, a comparison of indoor air and outdoor air carbon dioxide concentrations can be used to indicate relative ventilation efficiency for the occupied spaces. Provided the occupant density does not exceed the recommended levels in ASHRAE Standard 62:2001, when the peak indoor carbon dioxide concentration exceeds the outdoor concentration by more than 700 ppm, the ventilation rate for that space is inadequate for the occupant loading.

An indoor carbon dioxide concentration of 700 ppm above the outdoor concentration is not a significant risk to health; however, other bio-effluents from occupants and pollutants from building components may accumulate to irritant levels or result in discomfort for the occupants due to inadequate ventilation.

Of the indoor measurements collected on August 26, 2021, none of the readings exceeded the recommended maximum 1,139 ppm (700+439), the calculated ASHRAE recommended indoor carbon dioxide concentration at the start of the survey.

2.2.3 Carbon Monoxide

Carbon monoxide is an odorless, colorless toxic gas produced by the incomplete combustion of solid, liquid and gaseous fuels. Elevated indoor carbon monoxide concentrations may be a result of combustion sources indoors or the introduction of combustion products from outdoors into the indoor air. In the absence of indoor sources, indoor carbon monoxide concentrations are usually less than, or equal to outdoor concentrations. ASHRAE Standard 62-2001 recommends an upper limit for carbon monoxide of 9 ppm as a 24-hour average, and 35 ppm as a 1-hour average.

The indoor and outdoor carbon monoxide concentrations were less than 1ppm.

3.0 CONCLUSIONS AND RECOMMENDATIONS

TRC's conclusions and recommendations are based on its observations, including visual surveys, sample results and inspections presented in this report.

3.1 CONCLUSIONS

- A. Temperature readings were within normal ranges.
- B. The CO and CO₂ readings were within the recommended comfort levels.
- C. A few of the relative humidity readings were above the recommended limits. This is due to the summer like outdoor conditions coupled with the air conditioners not being in normal occupancy operation the day of the assessment.
- D. The direct read measurements are attached in Appendix A.
- E. No visible suspect mold or water staining was observed.

3.2 RECOMMENDATIONS

TRC presents the following recommendations to assist the WHRSD in improving indoor air quality:

- When school is in session, make sure the central air conditioners are in normal operation to maintain the humidity levels within the recommended ranges when school is in session.

Should you have any questions or if things change within the building please give us a call.



This report prepared by:

Gregory Hatch
BSI - Office Practice Leader



This report reviewed by:

Olivia Smaracko
BSI – Senior Industrial Hygienist

Date: October 25, 2021

APPENDIX A

DIRECT-READING ENVIRONMENTAL MEASUREMENTS

School Name: Whitman/Hanson Regional High School Date: 8/26/21
600 Franklin Street, Hanson, MA

LOCATION	Time	Temp (°F)	CO (ppm)	CO ₂ (ppm)	RH (%)	Comments/ [Number of Occupants]
ACCEPTABLE LIMIT	a.m./p.m.	73 – 79	9	1,148	<60	
Outdoor	10:31 am	88.8	0	439	62.1	Sunny
	2:40 pm	92.7	0	499	59.0	Sunny
Main Office	10:34 am	76.0	0	612	58.9	3 (occupants)/central AC on
	1:36 pm	77.8	0	586	55.0	5/ central AC on
Room 304	10:39 am	76.6	0	553	68.6	0/windows closed central air on
	1:39 pm	78.1	0	498	66.1	0/windows closed central air on
Room 308	10:42 am	74.3	0	538	67.0	0/windows closed central air on
	1:41 pm	75.1	0	489	65.5	0/windows closed central air on
Room 321	10:45 am	75.6	0	457	74.7	0/windows closed central air on
	1:43 pm	75.7	0	459	69.0	0/windows closed central air on
Room 325	10:51 am	77.0	0	461	67.8	0/windows closed central air on
	1:44 pm	75.9	0	439	67.2	0/windows closed central air on
Room 329	10:53 am	74.4	0	458	70.2	0/windows closed central air on
	1:46 pm	74.6	0	439	66.8	0/windows closed central air on
Room 335	10:55 am	75.6	0	458	80.4	1/windows closed central air on
	1:47 pm	74.8	0	469	79.1	0/windows closed central air on
Room 339	10:57 am	76.8	0	456	80.3	0/windows closed central air on
	1:48 pm	76.3	0	455	81.4	0/windows closed central air on

Room 351	11:00 am	74.1	0	589	69.4	1/windows closed central air on
	1:50 pm	75.1	0	467	69.6	0/windows closed central air on
Room 357	11:03 am	72.3	0	488	74.4	0/windows closed central air on
	1:52 pm	73.0	0	458	77.9	0/windows closed central air on
Room 358	11:13 am	74.1	0	474	70.0	0/windows closed central air on
	1:54 pm	73.9	0	451	81.0	0/windows closed central air on
Room 354	11:15 am	74.1	0	479	72.0	0/windows closed central air on
	1:53 pm	73.8	0	456	82.5	0/windows closed central air on
Room 326	11:17 am	74.4	0	462	71.1	0/windows closed central air on
	1:46 pm	74.8	0	439	70.3	0/windows closed central air on
Room 231	11:20 am	75.1	0	503	72.4	0/windows closed central air on
	1:59 pm	74.8	0	527	71.6	0/windows closed central air on
Room 222	11:23 am	72.8	0	538	62.8	1/windows closed central air on
	2:00 pm	74.2	0	457	69.5	0/windows closed central air on
Room 221	11:25 am	72.5	0	516	66.6	1/windows closed central air on
	2:03 pm	73.9	0	435	72.0	0/windows closed central air on
Room 214	11:26 am	72.9	0	530	79.5	0/windows closed central air on
	2:04 pm	73.6	0	505	74.9	1/windows closed central air on
Room 210	11:28 am	72.6	0	494	76.5	0/windows closed central air on
	2:06 pm	72.8	0	486	73.7	0/windows closed central air on
Room 215	11:29 am	71.4	0	503	72.9	0/windows closed central air on
	2:07 pm	70.9	0	481	69.5	0/windows closed central air on

Room 202	11:31 am	71.3	0	499	71.2	0/windows closed central air on
	2:08 pm	70.6	0	479	73.9	0/windows closed central air on
Super Office	11:33 am	72.9	0	588	78.7	5-6/windows closed central air on
	2:08 pm	72.4	0	547	77.3	3-4/windows closed central air on
Room 272	11:36 am	73.1	0	467	67.4	0/windows closed central air on
	2:11 pm	71.5	0	448	73.8	0/windows closed central air on
Room 269	11:38 am	74.1	0	457	79.5	0/windows closed central air on
	2:13 pm	72.7	0	432	82.1	0/windows closed central air on
Auditorium	11:40 am	74.3	0	427	70.2	0/windows closed central air on
	2:14 pm	74.5	0	428	77.2	5/windows closed central air on
Library	11:47 am	71.6	0	561	76.1	0/windows closed central air on
	2:16 pm	71.5	0	546	75.3	1/windows closed central air on
Room 168	11:49 am	69.9	0	461	74.1	0/windows closed central air on
	2:18 pm	70.5	0	441	75.6	0/windows closed central air on
Room 159	11:51 am	68.4	0	457	76.4	0/windows closed central air on
	2:19 pm	69.5	0	430	77.7	0/windows closed central air on
Gym	11:53 am	71.2	0	542	86.4	30/windows closed central air on
	2:20 pm	72.7	0	661	92.0	6/windows closed central air on
Cafeteria	11:56 am	74.9	0	421	69.7	0/windows closed central air on
	2:23 pm	73.6	0	405	75.0	0/windows closed central air on
Room 132	11:58 am	73.5	0	510	71.3	0/windows closed central air on
	2:24 pm	73.3	0	411	76.1	0/windows closed central air on

Room 119	12:00 pm	73.6	0	441	79.7	0/windows closed central air on
	2:28 pm	73.4	0	415	74.2	0/windows closed central air on
Room 120	12:02 pm	71.1	0	468	67.1	0/windows closed central air on
	2:26 pm	71.3	0	445	67.3	0/windows closed central air on
Room 112	12:03 pm	70.9	0	497	73.2	0/windows closed central air on
	2:27 pm	72.7	0	465	72.3	0/windows closed central air on
Room 101	12:05 pm	69.3	0	507	72.8	0/windows closed central air on
	2:29 pm	69.7	0	498	71.9	0/windows closed central air on
Copy Room	12:07 pm	70.7	0	577	70.8	3/windows closed central air on
	2:30 pm	73.5	0	528	75.5	1/windows closed central air on

APPENDIX B

IAQ MONITOR CALIBRATION REPORT



CERTIFICATE OF CALIBRATION AND TESTING

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
 Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 http://www.tsi.com

ENVIRONMENT CONDITIONS			MODEL	7575-X
TEMPERATURE	71.52 (22.0)	°F (°C)	SERIAL NUMBER	7575X1421005
RELATIVE HUMIDITY	50.7	%RH		
BAROMETRIC PRESSURE	29.10 (985.4)	inHg (hPa)		

<input checked="" type="checkbox"/> AS LEFT	<input checked="" type="checkbox"/> IN TOLERANCE
<input type="checkbox"/> AS FOUND	<input type="checkbox"/> OUT OF TOLERANCE

- CALIBRATION VERIFICATION RESULTS -

THERMO COUPLE				SYSTEM PRESSURE01-02				Unit: °F (°C)
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	70.9 (21.6)	70.9 (21.6)	68.9~72.9 (20.5~22.7)					

BAROMETRIC PRESSURE				SYSTEM PRESSURE01-02				Unit: inHg (hPa)
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	29.11 (985.8)	29.11 (985.8)	28.53~29.69 (966.1~1005.4)					

TSI does hereby certify that the above described instrument conforms to the original manufacturer's specification (not applicable to As Found data) and has been calibrated using standards whose accuracies are traceable to the United States National Institute of Standards and Technology (NIST) or has been verified with respect to instrumentation whose accuracy is traceable to NIST, or is derived from accepted values of physical constants. TSI's calibration system is registered to ISO-9001:2015.

<u>Measurement Variable</u>	<u>System ID</u>	<u>Last Cal.</u>	<u>Cal. Due</u>		<u>Measurement Variable</u>	<u>System ID</u>	<u>Last Cal.</u>	<u>Cal. Due</u>
Temperature	E004626	02-14-20	02-28-21		Pressure	E005254	10-10-19	10-31-20
Pressure	E003982	07-21-20	01-31-21		DC Voltage	E003493	06-17-20	06-30-21

ChaoVang

CALIBRATED

July 31, 2020

DATE



CERTIFICATE OF CALIBRATION AND TESTING

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
 Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 http://www.tsi.com

ENVIRONMENT CONDITIONS			MODEL	7575-X
TEMPERATURE	71.55 (22.0)	°F (°C)	SERIAL NUMBER	7575X1421005
RELATIVE HUMIDITY	50.5	%RH		
BAROMETRIC PRESSURE	29.11 (985.8)	inHg (hPa)		

<input type="checkbox"/> AS LEFT	<input checked="" type="checkbox"/> IN TOLERANCE
<input checked="" type="checkbox"/> AS FOUND	<input type="checkbox"/> OUT OF TOLERANCE

- CALIBRATION VERIFICATION RESULTS -

THERMO COUPLE				SYSTEM PRESSURE01-02				Unit: °F (°C)
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	70.8 (21.6)	70.6 (21.4)	68.8~72.8 (20.4~22.7)					

BAROMETRIC PRESSURE				SYSTEM PRESSURE01-02				Unit: inHg (hPa)
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	29.12 (986.1)	29.08 (984.8)	28.54~29.70 (966.5~1005.8)					

TSI does hereby certify that the above described instrument conforms to the original manufacturer's specification (not applicable to As Found data) and has been calibrated using standards whose accuracies are traceable to the United States National Institute of Standards and Technology (NIST) or has been verified with respect to instrumentation whose accuracy is traceable to NIST, or is derived from accepted values of physical constants. TSI's calibration system is registered to ISO-9001:2015.

<u>Measurement Variable</u>	<u>System ID</u>	<u>Last Cal.</u>	<u>Cal. Due</u>	<u>Measurement Variable</u>	<u>System ID</u>	<u>Last Cal.</u>	<u>Cal. Due</u>
Temperature	E004626	02-14-20	02-28-21	Pressure	E005254	10-10-19	10-31-20
Pressure	E003982	07-21-20	01-31-21	DC Voltage	E003493	06-17-20	06-30-21

ChaoVang

VERIFIED

July 31, 2020

DATE



CERTIFICATE OF CALIBRATION AND TESTING

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
 Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 <http://www.tsi.com>

ENVIRONMENT CONDITIONS			MODEL	982
TEMPERATURE	71.50 (21.9)	°F (°C)	SERIAL NUMBER	P14180028
RELATIVE HUMIDITY	47.4	%RH		
BAROMETRIC PRESSURE	29.24 (990.2)	inHg (hPa)		

<input checked="" type="checkbox"/> AS LEFT	<input checked="" type="checkbox"/> IN TOLERANCE
<input type="checkbox"/> AS FOUND	<input type="checkbox"/> OUT OF TOLERANCE

- CALIBRATION VERIFICATION RESULTS -

TEMPERATURE VERIFICATION				SYSTEM T-101				Unit: °F (°C)
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	32.1 (0.0)	32.2 (0.1)	31.1~33.1 (-0.5~0.6)	2	140.0 (60.0)	140.0 (60.0)	139.0~141.0 (59.5~60.6)	

HUMIDITY VERIFICATION				SYSTEM H-102				Unit: %RH
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	10.0	8.9	7.8~12.2	4	70.0	69.7	67.8~72.2	
2	30.0	29.1	27.8~32.2	5	90.0	89.2	87.8~92.2	
3	50.0	49.7	47.8~52.2					

CO2 GAS VERIFICATION				SYSTEM G-101				Unit: ppm
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	0	0	0~50	4	3018	3030	2928~3109	
2	501	502	451~551	5	5031	5035	4880~5182	
3	1005	1019	955~1055					

CO GAS VERIFICATION				SYSTEM G-101				Unit: ppm
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	35	36	32~38	2	101	100	98~104	

TSI does hereby certify that the above described instrument conforms to the original manufacturer's specification (not applicable to As Found data) and has been calibrated using standards whose accuracies are traceable to the United States National Institute of Standards and Technology (NIST) or has been verified with respect to instrumentation whose accuracy is traceable to NIST, or is derived from accepted values of physical constants. TSI's calibration system is registered to ISO-9001:2015.

Measurement Variable	System ID	Last Cal.	Cal. Due	Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E010657	02-14-20	02-28-21	Temperature	E010658	02-14-20	02-28-21
Temperature	E010655	01-21-20	01-31-21	Humidity	E003539	02-26-20	08-31-20
5000 CO2	14a044096	04-06-20	04-06-28	200 CO	149801	03-24-20	03-24-28
N2	13B110153	04-27-20	04-27-28	Air	A79204	05-20-20	05-20-28
Flow	E003341	09-03-19	09-30-20	Flow	E003980	04-22-20	04-30-21
Flow	E003525	01-06-20	01-31-21	Flow	E003342	09-03-19	09-30-20
2000 C4H8	EB0054467	08-13-19	08-12-22	100 C4H8	CC507339	03-24-20	03-24-28

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CALIBRATED

August 3, 2020

DATE



CERTIFICATE OF CALIBRATION AND TESTING

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
 Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 <http://www.tsi.com>

ENVIRONMENT CONDITIONS			MODEL	982
TEMPERATURE	74.3 (23.5)	°F (°C)	SERIAL NUMBER	P14180028
RELATIVE HUMIDITY	48	%RH		
BAROMETRIC PRESSURE	29.07 (984.4)	inHg (hPa)		

<input type="checkbox"/> AS LEFT	<input type="checkbox"/> IN TOLERANCE
<input checked="" type="checkbox"/> AS FOUND	<input checked="" type="checkbox"/> OUT OF TOLERANCE

- CALIBRATION VERIFICATION RESULTS -

GAS CO ₂ AS FOUND				SYSTEM G-101				Unit: ppm
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	0	0	0~50	4	3021	2975	2930~3111	
2	504	484	454~554	5	5031	4900	4880~5182	
3	1007	1002	957~1057					

GAS CO AS FOUND				SYSTEM G-101				Unit: ppm
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	35	34	32~38	2	100.7	* 94.8	97.7~103.7	

TEMPERATURE AS FOUND				SYSTEM T-101				Unit: °F (°C)
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	32.1 (0.0)	32.2 (0.1)	31.1~33.1 (-0.5~0.6)	2	140.0 (60.0)	140.0 (60.0)	139.0~141.0 (59.5~60.6)	

HUMIDITY AS FOUND				SYSTEM H-102				Unit: %RH
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	10.0	9.9	7.0~13.0	4	70.0	67.5	67.0~73.0	
2	30.0	29.1	27.0~33.0	5	90.01	* 86.22	87.01~93.01	
3	50.0	48.5	47.0~53.0					

*Indicates Out-of-Tolerance Condition

TSI does hereby certify that the above described instrument conforms to the original manufacturer's specification (not applicable to As Found data) and has been calibrated using standards whose accuracies are traceable to the United States National Institute of Standards and Technology (NIST) or has been verified with respect to instrumentation whose accuracy is traceable to NIST, or is derived from accepted values of physical constants. TSI's calibration system is registered to ISO-9001:2015.

<u>Measurement Variable</u>	<u>System ID</u>	<u>Last Cal.</u>	<u>Cal. Due</u>	<u>Measurement Variable</u>	<u>System ID</u>	<u>Last Cal.</u>	<u>Cal. Due</u>
5000 CO ₂	14a044096	04-06-20	04-06-28	200 CO	149801	03-24-20	03-24-28
N ₂	13B110153	04-27-20	04-27-28	Air	A79204	05-20-20	05-20-28
Flow	E003341	09-03-19	09-30-20	Flow	E003980	04-22-20	04-30-21
Flow	E003525	01-06-20	01-31-21	Flow	E003342	09-03-19	09-30-20
2000 C ₄ H ₈	EB0054467	08-13-19	08-12-22	100 C ₄ H ₈	CC507339	03-24-20	03-24-28
Temperature	E910657	02-14-20	02-28-21	Temperature	E010658	02-14-20	02-28-21
Temperature	E010655	01-21-20	01-31-21	Humidity	E003539	02-26-20	08-31-20

ChaoVang

VERIFIED

August 3, 2020

DATE

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