AUTHORIZATION
TO SEND TEST REPORTS
TO EPA

I HEREBY AUTHORIZE MYREN CONSULTING, INC. TO SEND THE APPROPRIATE COPIES OF THE TEST REPORT(S) FOR THE HEAT TECH HTP 26 BAY PELLET STOVE TO THE U.S. EPA.

Signature: Tom Jasset

Printed Name: TOM JASSET

Title: OWNER

Date: 1-15-16

PLEASE RETURN TO MYREN CONSULTING VIA EMAIL OR FAX AFTER SIGNING.

FAX: 509 684 3987
EMAIL: <myren.ben@gmail.com>

Myren Consulting, Inc.

512 Williams Lake Road

Colville, WA 99114

Office: (509) 684-1154 Lab: (509) 685-9458

Fax: (509) 684-3987 email: <myren.ben@gmail.com>

Date: 10 January 2016

To: Tom Bassett, Heat Tech

From: Ben Myren Ben

RE: Heat Tech HTP 26 Bay Pellet Stove Test Report

Please find enclosed your copy of the EPA test report for the HEAT TECH HTP 26 BAY pellet stove. Look over the info that is pertinent to your end, i.e., addresses, phone numbers, blueprints (especially), etc., to make certain that they are correct. If there are any corrections, call me and I will take care of them immediately. As soon as I receiver the signed *Authorization* form, I will send the reports to EPA.

Remember to send in your EPA Wood Heater Certification Application to EPA ASAP. Here I am assuming the old Application still works.

If you have any questions or comments, call.

Regards, Ben

Myren Consulting, Inc.

512 Williams Lake Road

Colville, WA 99114

Office: (509) 684-1154 Lab: (509) 685-9458

Fax: (509) 684-3987 email:<myren.ben@gmail.com>

PE 1.2 Sanchez Letter

10 December 2016

Dr. Rafael Sanchez, PhD.
U.S.EPA
Office of Enforcement and Compliance Assurance
Office of Compliance
William Jefferson Clinton Building, South
Room 7419D
1200 Pennsylvania Ave., N.W.
Washington, DC 20003

Dear Dr. Sanchez:

Please find enclosed the required two (2) copies of the certification test report for HEAT TECH HTP 26 BAY pellet stove. As the test results indicate, the unit's emissions are well below the EPA standard of 4.5 g/hr.

Report is organized in the same way as the previous pellet stove test reports submitted to EPA. While the report is basically organized like the reports submitted under the old NSPS, some parts of the report have been reorganized/ revised to insure compliance with the rules in the new NSPS. Thus look at the relevant pages, e.g., Individual Test Run Page Index, in the Introduction Section to find the required information.

If you or anyone else has any questions about the information or data in this test report, please contact me immediately.

Sincerely,

Ben Myren

Alben T. Myren Jr.
President
ATM/im

Myren Consulting, Inc.

512 Williams Lake Road

Colville, WA 99114

Office: (509) 684-1154 Lab: (509) 685-9458

Fax: (509) 684-3987 email: <myren.ben@gmail.com>

12 January 2010

EPA CBI Office
Attn: Residential Wood Heater Compliance Program Lead
1200 Pennsylvania Ave. NW
Washington, D.C. 20004

Dear Dr. Samchez:

RE: CBI INFORMATION FOR THE HEAT TECH HTP 26 BAY PELLET STOVE

Please find enclosed the required two (2) copies of the CBI for the test report for the HEAT TECH HTP 26 BAY pellet stove. The main test report has been sent under a separate cover to the following address:

Dr. Rafael Sanchez, PhD.
U.S.EPA
Office of Enforcement and Compliance Assurance
Office of Compliance
William Jefferson Clinton Building, South
Room 7419D
1200 Pennsylvania Ave., N.W.
Washington, DC 20003

If you or anyone else has any questions about the CBI information in this test report, please contact me or Tom Bassett at HEAT TECH at 530 846 1985 immediately.

Sincerely,

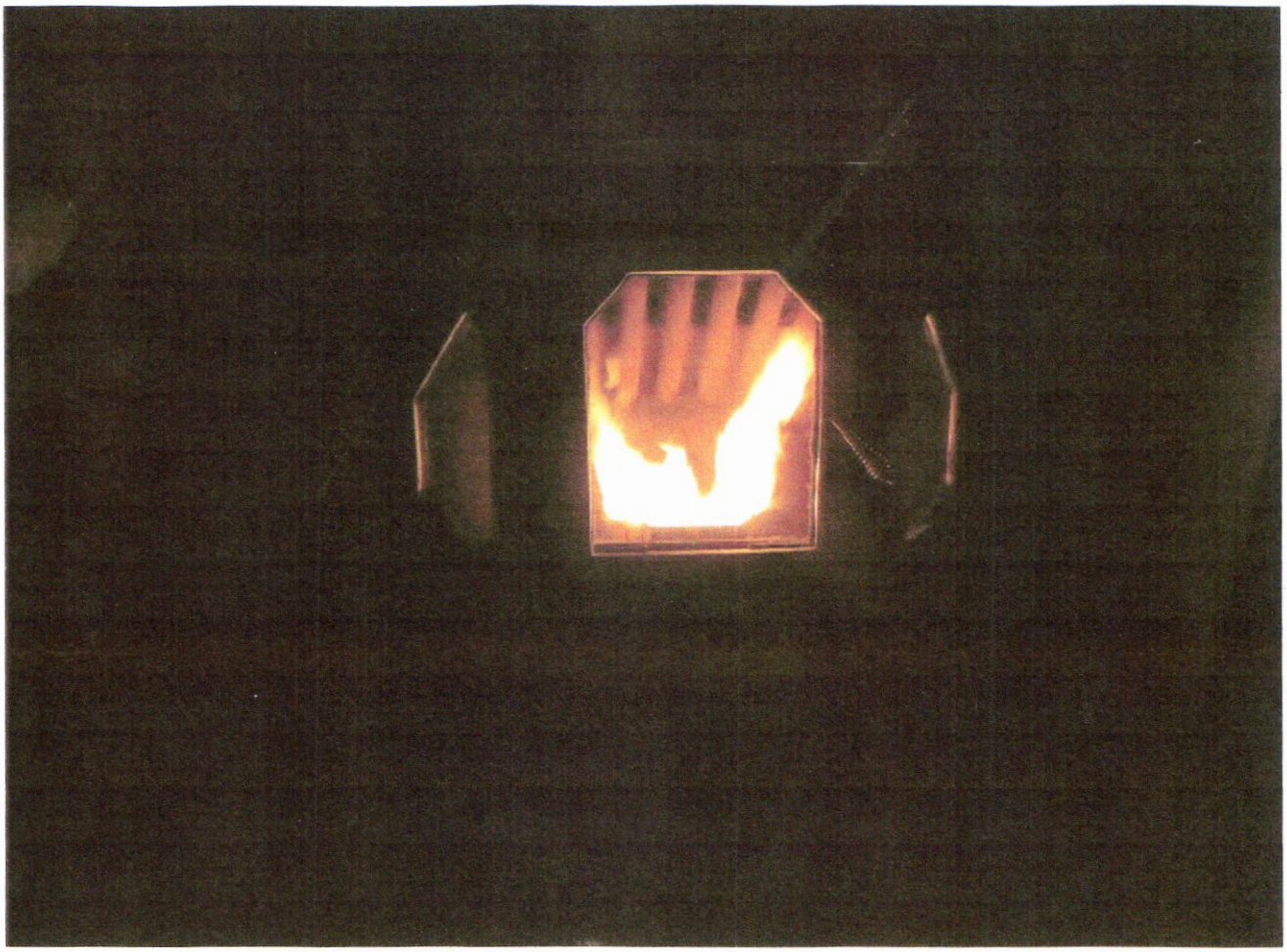
Ben Myren

Alben T. Myren Jr.
President
ATM/im

US EPA WOOD HEATER CERTIFICATION TEST REPORT

HEAT TECH 26 BAY PELLET STOVE

JANUARY 12, 2016



MYREN CONSULTING, INC.

OFFICE
512 WILLIAMS LAKE ROAD
COLVILLE, WA 99114
PHONE 509-684-1154
FAX 509-684-3987

LABORATORY
501 C WILLIAMS LAKE ROAD
COLVILLE, WA 99114
PHONE 509-685-9458
EMAIL myren.ben@gmail.com

****

Confidential

****

The data and information in this test report is confidential, proprietary information and is not to be released to and/or discussed with any party who is not authorized by the manufacturer or the testing laboratory to receive such data.

****

Confidential

****

Report Certification

The sampling and analysis for the appliance described in this report was carried out under my direction and supervision.

Date: 1/13/2016 Signature: Albert T. Myren Jr
Title: President

I have reviewed all of the test data and test results found in this report and hereby certify that the test report is authentic and accurate.

Date: 1/13/2016 Signature: Albert T. Myren Jr.
Title: President

PELLET STOVE
TABLE OF CONTENTS

TESTING LOCATION AND PERSONNELL INFORMATION

Unit Name: HEAT TECH HTP 26 BAY PELLET STOVE

Manufacturer Name: HEAT TECH

Manufacturer Address: PO BOX 727
Biggs, CA 95917

Manufacturer Phone: 530 846 1985
Fax:

Observers & Affiliation: None

SUPERVISOR: Ben Myren

MYREN CONSULTING'S LAB TEAM: Ilse Myren, Ben Myren, Eric Schaefer

LAB LOCATION: Myren Consulting's lab in Colville, WA

ELEVATION: ~ 1650 FEET

MYREN CONSULTING, INC.

LABORATORY
501-C WILLIAMS LAKE ROAD
COLVILLE, WA 99114
509 685 9458
509 684 3987(Fax)

OFFICE
512 WILLIAMS LAKE ROAD
COLVILLE, WA 99114
509 684 1154
email: <myren.ben@gmail.com>

Pellet Stove Page Number Index

d. Humidity Gauge Calibration (Sling Psychrometer)	Cal Data	P. 13
F. Combustion Gas (CO_2, O_2, CO) Train Response Check	Cal Data	P. 20
G. CO_2 Analyzer		
1. Calibration	Cal Data	P. 22
2. Pre and Post Test Zero/Span	Individual Test Run	Data Sheet #15-3
B. CO Analyzer		
1. Calibration	Cal Data	P. 24
2. Pre and Post Test Zero/Span	Individual Test Run	Data Sheet #15-1
C. Calibration Gas Certificates of Analysis		
15. Quality Checks		
A. Leak Checks		
1. Particulate Sampling Train	Individual Test Runs	P.1 of Data Sheet #2
2. Combustion Gas (CO_2, O_2, CO) (CEM) Train	Individual Test Runs	Data Sheet #16
B. Proportional Checks	Individual Test Runs	Table 1
16. Sample Calculations		
A. Dry Burn Rate	Individual Test Runs	Data Sheet # 8; Computer Printout
17. Raw Test Data	Individual Test Runs	Data Sheets #1-16
18. Analytical Data		
A. Filter and Beaker Tares	Individual Test Runs	Data Sheets #4-1, 4-2
B. Solvent Blanks	Individual Test Runs	Data Sheets #4-3, 5
C. Particulate Catches		
1. Gross	Individual Test Runs	Data Sheet #5
2. Blanks	Individual Test Runs	Data Sheet #5
3. Net	Individual Test Runs	Data Sheet #5
D. Constant Weight Weighings		
1. Tares	Individual Test Runs	Data Sheets # 4-1, 4-2
2. Finals	Individual Test Runs	Data Sheet #4-3
3. Analytical Balance QC Checks	Individual Test Runs	Data Sheet #4-4 (Variable pp.)

ASTM E2515/ EPA M5G-1 Individual Test Run Page Index (Pellet Stove)

The data sheets in the individual test runs are organized in the following sequence.

Page Description	# of Pages
Filters photo	1
CSA B415.1-10 "Report" computer spreadsheet printout	Variable
CSA B415.1-10 "Data Input" computer spreadsheet printout	Variable
Dilution Tunnel Traverse data	1
Dilution Tunnel Gas Velocity and Volumetric Flow Rate Calculations	1
Train 1 Emission Rate/ Dilution Tunnel Calculations computer spreadsheet printout	Variable
Train 1 0-60 Minute Emission Rate/ Dilution Tunnel Calculations computer spreadsheet printout	Variable
Train 1 0-60 Minute Particulate Sampling data (Meter Box data)	Variable
Train 1 60 Minute Plus Particulate Sampling data (Meter Box data)	Variable
Filter Constant Tare Weight data	Variable
Beaker Constant Tare Weight data	Variable
Acetone Blank Beaker Constant Final Weight data	1
Train 1 0-60 Minute PM Sample Constant Final Weight data	1
Train 1 60 Minute Plus Constant Final Weight data	1
Train 1 Particulate Matter Catch Calculations	Variable
Train 2 Emission Rate/ Dilution Tunnel Calculations computer spreadsheet printout	Variable
Train 2 Particulate Sampling data (Meter Box data)	Variable
Train 2 PM Sample Constant Final Weight data	1
Train 2 Particulate Matter Catch Calculations	1
Train 3 Room Blank Sampling Rate and PM Concentration Calculations computer spreadsheet printout	Variable
Train 3 Particulate Sampling data (Meter Box data)	Variable
Train 3 PM Sample Constant Final Weight data	1
Train 3 Particulate Matter Catch Calculations	1
Analytical Balance QA/ QC data	Variable
Woodstove Data Sheet #8 Miscellaneous data	1
Woodstove Data Sheet #9 Pellet Stove Operating data	1
Woodstove Data Sheet #10 Preburn and Fuel Load Moisture Determination data	1
Woodstove Data Sheet #11 ASTM E2780 Fuel Load Calculations	1
Woodstove Data Sheet #13 Pre Burn Data	Variable
Woodstove Data Sheet #14 Burn Rate, Flue Gas and Temperature Data	Variable
Woodstove Data Sheet #15-1 CO_2 Pre and Post Test Zero/Span Audits	1
Woodstove Data Sheet #15-3 CO Pre and Post Test Zero/Span Audits	1
Woodstove Data Sheet #16 Quality Checks	1

TEST SERIES INFORMATION AND DISCUSSION

MODEL LINE: HEAT TECH HTP 26 BAY PELLET STOVE

TEST UNIT: HEAT TECH HTP 26 BAY PELLET STOVE

Manufacturer: HEAT TECH

Date Received: 6/20/2015

Date(s) Aged: 6/24, 25, 26, 29, 30, 2015. See AGING Section

Test Date(s): 7/30/2015

PM Sampling Method(s): ASTM E2515 using 4" filters (EPA M5G-1)

Operating and Fueling Protocol: EPA M28R, ASTM E2779

Number of Test Runs: 1

The Heat Tech HTP 26 Bay Pellet stove manufactured by Heat Tech located in Biggs, CA was tested by Myren Consulting, Inc. using the Environmental Protection Agency's (EPA) Test Method 28R, "*Certification and Auditing of Wood Heaters*", ASTM E2515-11, "*Standard Test Method for Determination of Particulate Emissions Collected in a Dilution Tunnel*" and ASTM E2779-10, *Standard Test Method for Determining Particulate Matter Emissions from Pellet Heaters*". (See the Federal Register/ Vol.80, No.50/ Monday, March 16, 2015. [pp.13672-13753]). On March 28, 2015 Myren Consulting, Inc. requested approval from EPA to use four-inch filters when conducting all PM emission certification tests and received the approval to do so on April 7, 2015. Thus the PM sampling and PM sample processing procedures used during the certification tests found in this test report are what are found in EPA M5G-1 in the old NSPS. (See the Federal Register/ Vol.53,No.38/ Friday, February 26, 1988/ pp.5860-54926, especially in Method 5G in Appendix A on pp. 5884-5892.) The particulate matter (PM) emission data was calculated as specified in the Wood Heater New Source Performance Standard (NSPS) dated March 16, 2015. The percent overall efficiency (%OE) for the test run was calculated using the %OE algorithm found in CSA's B415.1-10.

All events and information pertinent to the test data are recorded on the data sheets for the test run, particularly on pp. 9, 13 and 14.

Any deviations made or noted from the promulgated methods other than those that were accepted and certified by EPA during the laboratory accreditation process are listed and discussed below. The Heat Tech HTP 26 Bay pellet stove was tested at Myren Consulting's lab in Colville, WA using Myren Consulting laboratory's lab accreditation. A copy of both Myren Consulting's old Lab Accreditation Certificate (#6) and new Lab Accreditation Certificate (#2) are included in the following pages because at the time the Heat Tech HTP 26 was tested, EPA had not yet been issued the new Lab Accreditation Certificate. (Myren Consulting, Inc. had formally notified EPA on February 15, 2015 that Myren Consulting, Inc. wished to continue as an accredited laboratory after the new NSPS went into effect.)

A brief note about how the four-inch (EPA M5G-1) particulate samples were processed is necessary to help the reviewer understand the net catch values. Experience has shown that the small portions of the filters that are left on the frits in the M5G-1 filter housing apparatus after the filters are removed are full of static electricity. When these small portions are removed to a plastic petri dish, they quickly adhere to the petri dish. Because trying to recapture these small pieces of filter material during weighing causes them to disintegrate into smaller and smaller pieces, which makes obtaining accurate catch weights difficult, it was decided to place this filter material in with the particulate captured with the acetone wash, where it shows up as catch. Some of the filter material was already following this pathway. Thus, there may be negative filter catch weights, particularly for the back half filters, that are used during the particulate emission rate calculation process. However, the filter material lost off the filters is accounted for in the acetone catch. The first page in the TEST RUN Section is a photo of the filters from the test run for this unit and shows this problem.

ASTM E2778-10 Equation 1 calls for a dry moisture content for the test fuel used during testing. There is no way to measure the moisture content of pellets on a dry basis. Instead one can determine the wet basis moisture content by drying a sample. This is what done and the data for this is on Data Sheet 11 in the test run. Once the wet basis moisture content is known, it is then possible to calculate the fuel burnt on a dry basis, which again is what was done. The dry burn rate (DBR) determined is the same. The revised procedures and equations used to determine the actual DBR are to be found on the page after Data Sheet 11.

The following pages contain: (1.) A discussion of test results. (2.) A diagram showing the height of the appliance and chimney used during testing (ICC EXCEL Pellet Pipe) and the location of the sampling ports in the chimney. (3.) A diagram of the EPA 6" diameter dilution tunnel used by Myren Consulting during EPA Certification testing, (4.) Three pages of photographs showing the unit installed on the platform scale. One of these photos is a close up of the flue pipe/ flue collar junction and shows the static probe and the thermocouple used to measure stack temperature at one foot. (5.) A copy of the letter from EPA granting Myren Consulting, Inc accreditation under the new NSPS. (6.) a copy of the old and new EPA Laboratory Accreditation Certificates for Myren Consulting's lab and (7.) a copy of the 30 day advance certification test notification sent to EPA for the week the unit was tested.

DISCUSSION:

(1.) The test series was done at Myren Consulting's lab in Colville, WA.
(2.) The test series required 1 test run.
(3.) This is the second pellet stove report Myren Consulting has submitted to EPA since the new NSPS went into effect. Thus, because the whole testing format for pellet stoves has changed, there are several revisions to the report format necessitated by the difference in rules and reporting requirements in the old NSPS versus the rules and reporting requirements in the new NSPS. Specifically the following changes have been made:

a. Because the pellet stove test is now an integrated sample test, there are no weighted average calculations because collecting the integrated sample "automatically" generates a "weighted average". Instead of the pages used to calculate a weighted average, there is now a single page titled *Integrated Test Results,* which reports the emission rate and overall efficiency (%OE) for the unit.
b. A new page has been added to the Data Summary Section (p. 2) which summarizes the PM Sampling Train Performance information and addresses the *Dual Train Comparison* criteria found in ASTM E2515 Section 11.7. The average emission rate calculated and reported on this new page using the data from the 2 PM sampling trains is then also reported on the page titled *Integrated Test Results*. Also reported on this page are the performance data for

the "Room Blank" train and the PM emission rate (g/h) data for the 0-60 minute filter set from Train 1.

c. Section 60.534(d) requires that filter sets be changed (switched) at 1 h into a test run on one of the PM sampling trains. This was done on Train 1 during the test run. Thus there are additional data sheets in each test run for the 2 filter sets used in Train 1 to accomplish this requirement. There is also a photo of the filters from the test run in the section with the raw data sheets for the test run. As noted above, the PM emission rate for the first hour is reported on the computer spreadsheet for that PM sample and again in the Data Summary section itself.

d. ASTM E2515 requires 2 PM sampling trains and a third "Room Blank" train. That means there are also additional data sheets for Trains 2 and 3 in the section with the Raw Data sheets for the test run and in the Cal Data Section where the calibration and post test audit data is presented for the equipment used in all 3 of these trains.

Please look at the Table of Contents (p. iv), the Pellet Stove Test Report Page Number Index (pp. vi-vii) and the Individual Test Run Page Index (p. viii) to find any pages of interest. Or call Myren Consulting, Inc. at either 509 685 9458 or 509 684 1154 if further assistance is needed.

Stack Measurements and Sampling Port Locations

Total Stack Height 180 1/2"
15.0 ± 1 Ft (M28, 4.1.1) 15' 1/2"

Steel Flue Pipe Ht N/A
8.5 ± .5 ft (M28, 4.1.1)

Wet Bulb/Dry Bulb
Probe Ht N/A
(No Specifications Given)

Stack Temperature
Probe Ht 101 3/4"
8.0 [redacted] ± .5 ft (DEQ, 3.3.1) 8'5 3/4"
[ASTM, 9.2.4 (draft)]

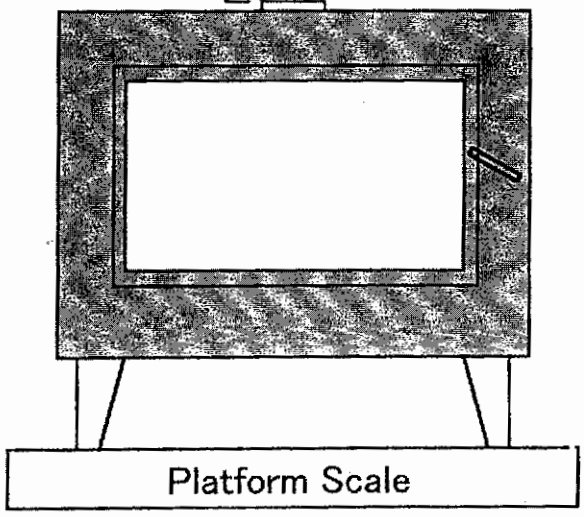
Stack Temp.
Probe Ht. 11"
< 1.0 ft.
Above Flue Collar

Stove Ht at Flue Collar 15 1/2"

Flow Rate Measurement System Probe
Ht 94 1/4" 7.5 ± 1.0 ft (M5H, 5.1.6)
7'10 1/4"

N/A Cutaway Detail on
Barometric Oil Seal

Static Pressure Probe Ht 11"
< 1.0 ft Above Flue Connector M28, 6.2.3



HEAT TECH
Unit HTP 26 BAY
Date 7/29/15
Technician(s) ESS

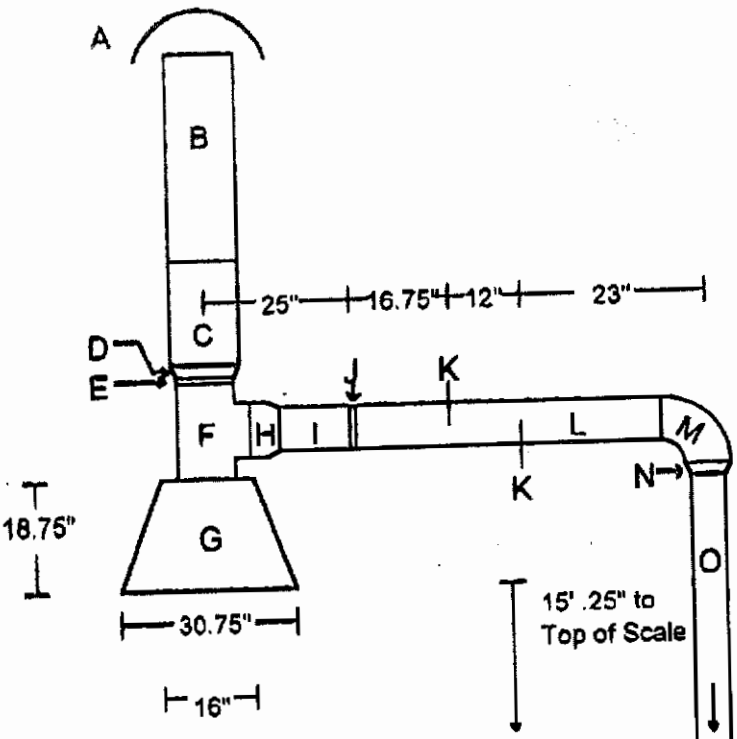
Stack is all 4" ICC EXCEL PELLET

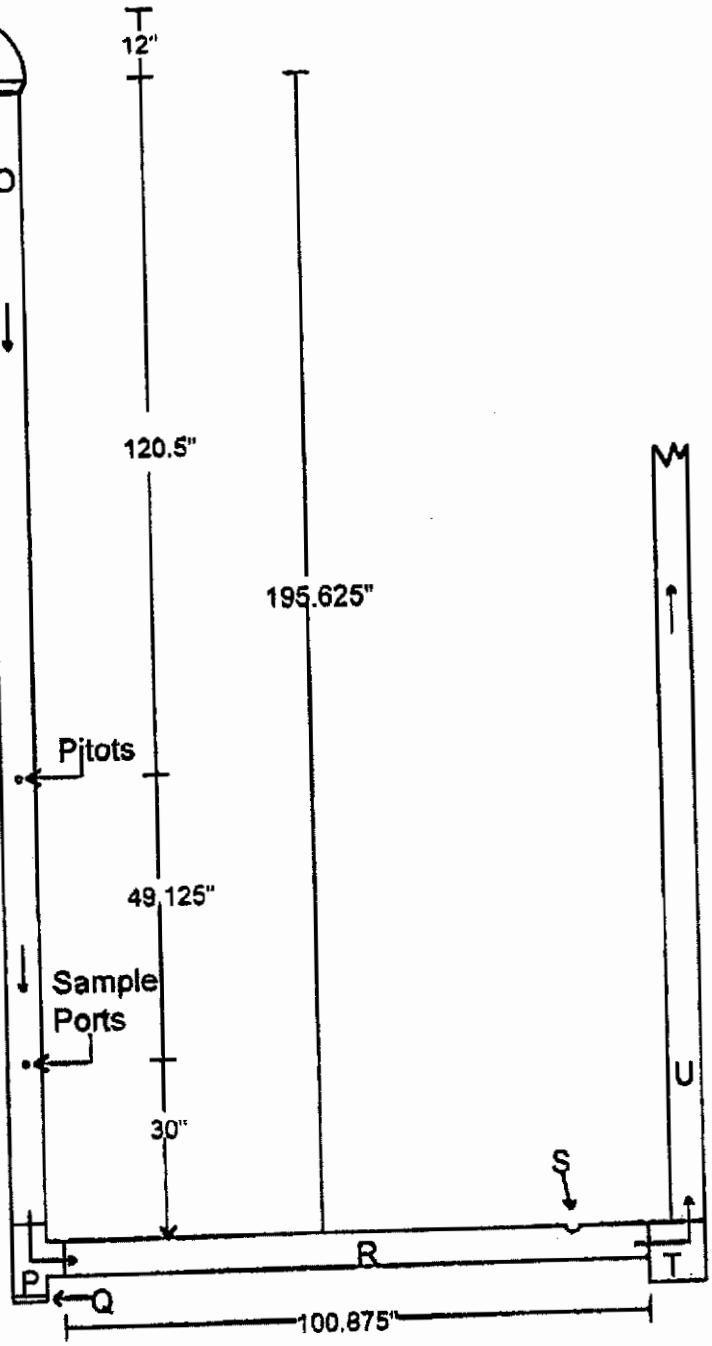
Myren Consulting Inc

Dilution Tunnel Schematic

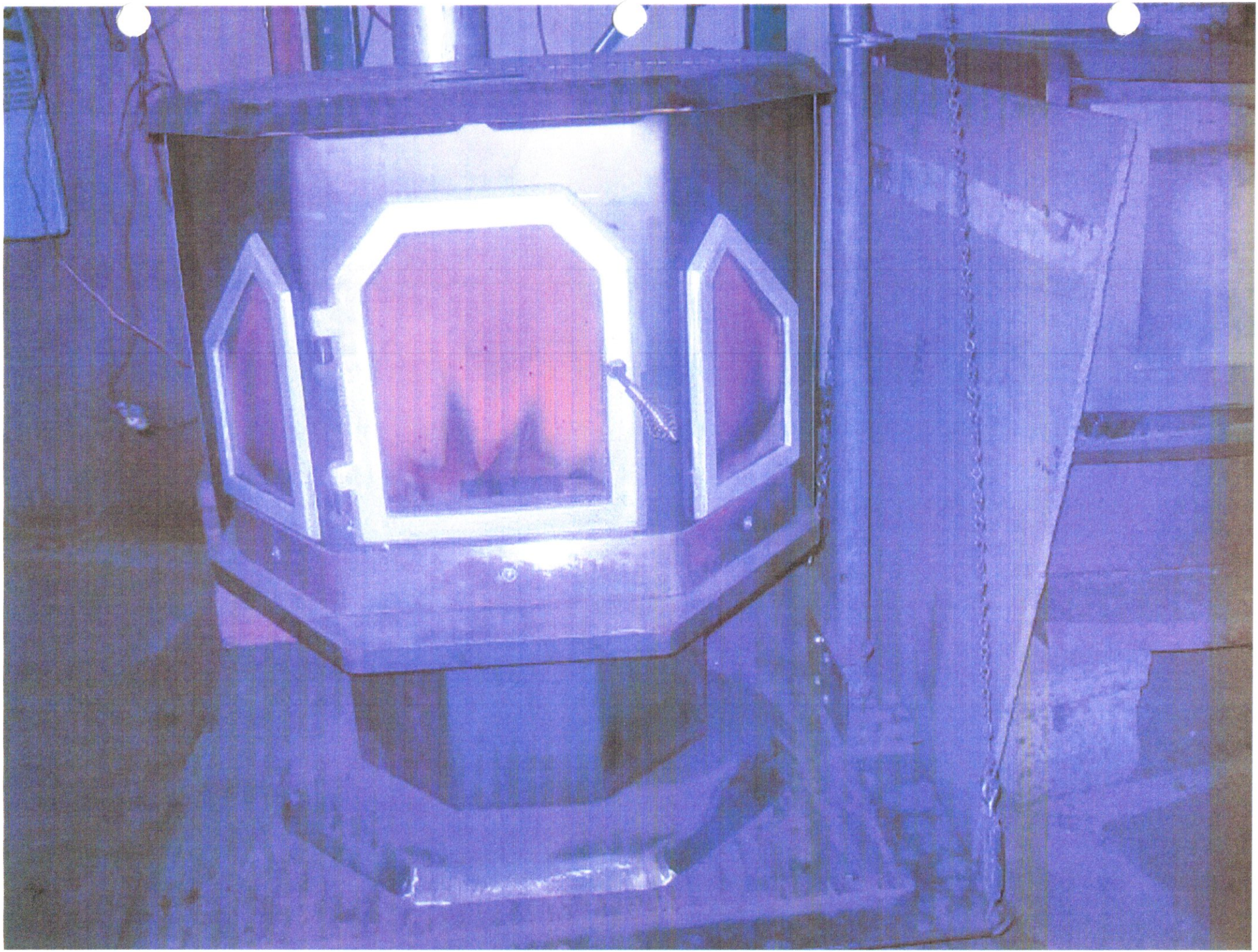
9/9/1997

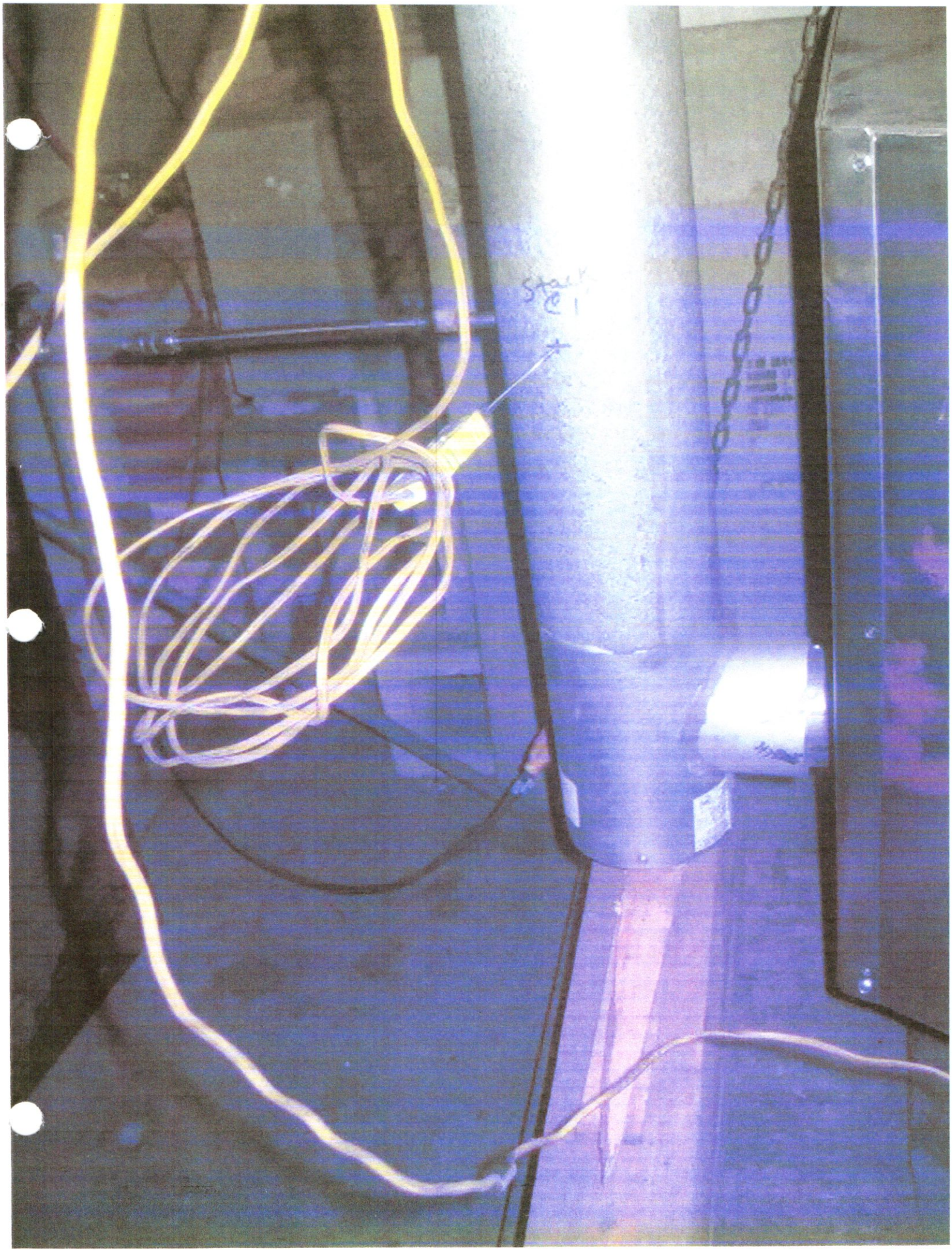
Not to Scale
Dimensions Shown are Actual
Total Tunnel Length: 22.635'
(Hood Inlet to Sampling Port)





A: 10" Class A Rain Cap
B: 36"- 10" ID Class A Chimney
C: 18"- 10" ID Class A Chimney
D: 10" Class A to Black Pipe Adapter
E: 10" Self Cleaning Full Closure Blast Gate
F: 10"- 22 ga Black Steel Pipe "T"
G: Dilution Tunnel Hood
H: 10" to 8" Black Steel Pipe Reducer
I: 12" of 8" Black Steel Pipe
J: 8" Self Cleaning Full Closure Blast Gate
K: Mixing Baffles
L: 51.75" of 8" Black Steel Pipe
M: 8" 90 Degree Black Steel Pipe Elbow
N: 8" to 6" Black Steel Pipe Reducer
O: 194.5" of 6" Black Steel Pipe
P: 6" Black Steel Pipe "T" Section
Q: 6" Self Cleaning Full Closure Blast Gate
(for adjusting tunnel flows)
R: 100.875" of 6" Black Steel Pipe
S: 2.25" Diameter Bleed Hole
T: Dayton Blower Model# 6K0300
1/3 HP 1725 RPM
U: 6" black Steel Pipe Exhaust





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

NOV 12 2015

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

Ben Myren
Myren Consulting, Inc.
512 Williams Lake Road
Coleville, WA 99114

Dear Mr. Myren:

Thank you for your recent inquiry regarding the United States Environmental Protection Agency (EPA) wood heater laboratory accreditation program. The review of your reaccreditation letter that you submitted November 10, 2015 is complete and acceptable. Enclosed is your current certificate of accreditation. Myren Consulting, Inc. is accredited under Subpart AAA 40 CFR Standards of Performance for New Residential Wood Heaters Sections (60.534, 60.535) and Subpart QQQQ 40 CFR Standards of Performance for New Residential Hydronic Heaters and Forced-Air Furnaces Sections (60.5476, 60.5477). Please follow the requirements for EPA Test Method 28R Certification and Auditing of Wood Heaters in Appendix A-8 to Part 60-Test Methods 26 through 30B. This approval expires on March 16, 2018, unless renewed by Myren Consulting, Inc.

As a condition of your lab accreditation, Myren Consulting, Inc. must abide by the following provisions:
(i) Agree to participate biennially in an independently operated proficiency testing program with no direct ties to the laboratories participating;
(ii) Agree to allow the EPA, regulatory agencies and certifying bodies access to observe certification testing;
(iii) Agree to comply with calibration, reporting and recordkeeping requirements that affect testing laboratories; and
(iv) Agree to perform a compliance audit test at the manufacturer's expense at the testing cost normally charged to such manufacturer if the laboratory is selected by the EPA to conduct a compliance audit test of the manufacturer's model line;
(v) Have no conflict of interest and receive no financial benefit from the outcome of certification testing conducted pursuant to §60.5475;
(vi) Agree to not perform initial certification tests on any models manufactured by a manufacturer for which the laboratory has conducted research and development design services within the last 5 years;
(vii) Agree to seal any wood heater on which it performed certification tests, immediately upon completion or suspension of certification testing, by using a laboratory-specific seal.
(viii) Agree to immediately notify the EPA of any suspended tests through email and in writing, giving the date suspended, the reason(s) why, and the projected date for restarting.

Emission test reports should be submitted to EPA's Office of Enforcement and Compliance Assurance, at one of the following addresses:

U.S. Postal Service
U.S. EPA
Office of Enforcement and Compliance
Assurance, Office of Compliance
William Jefferson Clinton Building, South
Mail Code 2227A
1200 Pennsylvania Ave, NW
Washington, DC 20003

Attn: Wood heater Certification Lead

Private Courier
U.S. EPA
Office of Enforcement and Compliance
Assurance, Office of Compliance
William Jefferson Clinton Building, South
Room 7419D
1200 Pennsylvania Ave, NW
Washington, DC 20003

Attn: Woodheater Certification Lead

I would like to thank you for your cooperation in the wood heater certification program.

Sincerely,

Steffan Johnson
Measurement Technology Group

Enclosure (2)

cc.
Julius Banks, OECA (2227A)
Rafael Sanchez, OECA (2227A)
Adam Baumgart-Getz, OID (C304-05)
Amanda Aldridge, OID (C304-05)
David Cole, OID (C304-05)

CERTIFICATE OF ACCREDITATION

This certifies that:

Myren Consulting, Inc

Has satisfied the requirements for laboratory accreditation for the certification of wood heaters pursuant to subpart AAA of 40 CFR Part 60, New Source Performance Standards For Residential Wood Heaters

June 5, 2012 - June 5, 2017
EFFECTIVE DATE

Connie Oldham
MEASUREMENT TECHNOLOGY GROUP
GROUP LEADER

Methods 5G, 28, 28A, 5H
METHODS

6
CERTIFICATE NUMBER

CERTIFICATE OF ACCREDITATION

This certifies that:

Myren Consulting, Inc

Has satisfied the requirements for laboratory accreditation for the certification of wood heaters pursuant to subpart AAA of 40 CFR Part 60, New Source Performance Standards For Residential Wood Heaters and subpart QQQQ of 40 CFR Part 60, Standards of Performance for New Hydronic Heaters and Forced Air Furnaces.

November 12, 2015 - March 16, 2018
EFFECTIVE DATE

MEASUREMENT TECHNOLOGY GROUP
GROUP LEADER

Methods 28R, 28 WHH, 28 WHH-PTS,
All Methods listed in Sections 60.534 and 60.5476
METHODS

2
CERTIFICATE NUMBER

Myren Consulting, Inc.

512 Williams Lake Road

Colville, WA 99114

Office: (509)684-1154 Lab: (509)685-9458

Fax: (509)684-3987 email:myren.ben@gmail.com

DATE: 4 June 2015

TO: Dr. Rafael Sanchez, PhD., EPA

CC: Tom Bassett, Heat Tech

FROM: Ben Myren

RE: Wood Heater 30 Day Advance Certification Test Notification for the Heat Tech H.T.P. P 26 Bay

Section 60.534(e)(1) of the Wood Heater NSPS requires that EPA be notified at least 30 days in advance of the start or resumption of EPA Certification Testing for each specific model line. To comply with the above requirement, Myren Consulting, Inc. hereby notifies EPA that Myren Consulting, Inc., 512 Williams Lake Road, Colville, WA 99114 plans to start an EPA Certification Test series on the unit identified below.

UNIT: H.T.P. P 26 Bay pellet stove

Manufactured by:

Heat tech Industries, LLC.
PO Box 727
Biggs, CA 95917
P: 530 846 1985
Email: sharletasgarden@gmail.com
Website: www.heattechstoves.com

starting sometime during the period beginning on :

Monday July 27, 2015.

The testing will be conducted at:

Myren Consulting, Inc's lab at 512 Williams Lake Road, Colville, WA 99114

3rd Party Certifying Entity (Probable)

PFS, 1507 Matt Pass, Cottage Grove, WI 53527 P: 608 839 1085

If you have any questions about this notification, contact me immediately.

EPA
PELLET STOVE
INTEGRATED TEST RESULTS

The integrated average particulate matter (PM) emission rate for the

HEAT TECH HTP 26 BAY PELLET STOVE

is

1.3845 g/h.

The integrated average overall HHV efficiency (%OE) for the

HEAT TECH HTP 26 STANDARD PELLET STOVE

is

69.7%.

The integrated average overall LHV efficiency (%OE) for the

HEAT TECH HTP 26 STANDARD PELLET STOVE

is

75.2%.

SUMMARY OF ASTM E2515 PARTICULATE EMISSIONS SAMPLING TRAIN PERFORMANCE

		T1					T2						
RUN #	DBR (kg/hr)	CATCH (mg)	SAMPLE RATE (cfm)	SAMPLE VOl (dscf)	AVG. % PROP	EMISSIONS (g/h)	CATCH (mg)	SAMPLE RATE (cfm)	SAMPLE VOL (dscf)	AVG. % PROP	EMISSIONS g/h)	Avg. g/h.	% DIFF
EPA 1	0.998	14.0	.538	189.534	99.904	1.463	12.0	.551	180.125	99.941	1.306	1.3845	5.67

SUMMARY OF ASTM E2515 AMBIENT AIR (ROOM BLANK) SAMPLING TRAIN PERFORMANCE

RUN #	CATCH (mg)	SAMPLE RATE (cfm)	SAMPLE VOL. (dscf)	AMBIENT PM CONCENTRATION (mg/dscf)
EPA 1	1.1	.532	175.270	.0.006276

TRAIN 1 0-60 MINUTE DBR and PM EMISSIONS

Run #	DBR (kg/h)	EMISSIONS g/h
EPA 1	1.797	0.360

HEAT TECH

Unit: HTP 2G BAY

WST2-Form 12 Rev 11/2011

Woodstove Data Summary

		Run # 1								
Particulate Emissions:										
Emission Rate:		1.3845								g/hr
Emission Factor:		1.3875								g/kg
(Dry fuel weight basis)										
Efficiency Values: (CSA B415.10-1)										
Combustion Efficiency:		99.5								%
Heat Transfer Efficiency: HHV:		70.0								%
Heat Transfer Efficiency: LHV:		75.7								%
Overall Efficiency: HHV:		69.7								%
Overall Efficiency: LHV:		75.4								%
Heat Output:										
Avg. EPA Btu/hr. for test cycle		14,901								Btu/hr.
Avg. B415 Btu/hr. for test cycle		13,081								Btu/hr.
Fuel Burn Rates:										
Avg. Dry Burn Rate (Wet Basis)		1.058								kg/hr.
Avg. Dry Burn Rate (Dry Basis)		1.00								kg/hr.
PM Sampling Parameters:										
Avg. Tunnel Flow(Qsd):		140.291								dscfm
Avg. Tunnel Velocity(Vs):		835.015								ft./min.
Pitot Correction Factor:		.98122	T2							
Total Sample Volume:	T1	189.534	180.125							dscf
Avg. Sampling Flow Rate:		.538	.551							cfm
Avg. % Proportionality:		99904	99941							%
Total Particulate Catch:		14	12							mg

HEAT TECH

Unit: HTP 26 BAY

WST2-Form 12 Rev 11/2011

Woodstove Data Summary

	Run #	1							
Fuel Moisture Content:									
Kindling (Wet basis):		–							%
Pre Test Fuel (Wet basis):		5.70							%
Test Fuel (Wet basis):		5.70							%
Air/Fuel Ratio:									
lbs. air/lbs. fuel:		30.15							
Average Stack Gas Composition:									
Avg. % CO_2:		4.02							%
Avg. % O_2: (stochiometrically)		16.90							%
Avg. % CO:		.04							%
Average Stack Gas Flow Rate:									
Stack Flow Rate- EPA CMB		–							dscfm
Draft (static):		-.0458							in. H_2O
Average Stack Gas Emission Factors:									
CO:		13.47							g/Kg
		13.45							g/hr.

Woodstove Data Summary

	Run # 1								
Average Temperatures:									
Stack Gas:	317								°F
Stove Top:	N/A								°F
Stove Left Sidewall:	N/A								°F
Stove Back:	N/A								°F
Stove Right Sidewall:	N/A								°F
Stove Bottom:	N/A								°F
Primary Combustion Chamber Gas:	N/A								°F
Secondary Combustion Chamber Gas:	N/A								°F
Catalytic Combustor Exit Gas:	N/A								°F
Stove Temperature Change:	N/A								°F
Test Chamber Environment:									
Avg. Barometric Pressure:	28.553								in. Hg
Avg. Temperature:	89								°F
Avg. % Ambient Moisture:	1.175								% H_2O
Avg. % Relative Humidity:	42.0								% RH
Avg. Air Velocity:	5								ft/sec
Avg. Dilution Tunnel Draft: (If Applicable)	.000								in/H_2O
Test Fuel Weight and Burn Time:									
Density (Dry basis):	—								g/cm^3
Coal Bed Weight:	—								lbs.
Pre Test Fuel Weight (Inc. Kindling):	9.0								lbs.
Test Fuel Load Weight:	14.0								lbs.
Total Test Cycle Burn Time:	360								min.

AGING DATA

The Heat Tech HTP 26 BAY Pellet Stove was aged by Myren Consulting, Inc. The Aging installation configuration was the same as the installation used during certification testing. During Aging the stove was run on the Medium setting used during certification testing and the temperature and the (wet) burn rate data were collected using a Data Acquisition System (DAS). The Aging data was then transferred from the DAS spreadsheet to the Aging data pages in this section.

PELLET STOVE AGING DATA
Woodstove Test Data Sheet #25P
WST5-Form 3A, Rev 12/15

Unit: HEAT TECH HTP 26 Bay
Date(s): 6/24, 25, 26, 29, 30, 2015
Technicians: ATM ESS
Page: 1 **of** 2

T/C#

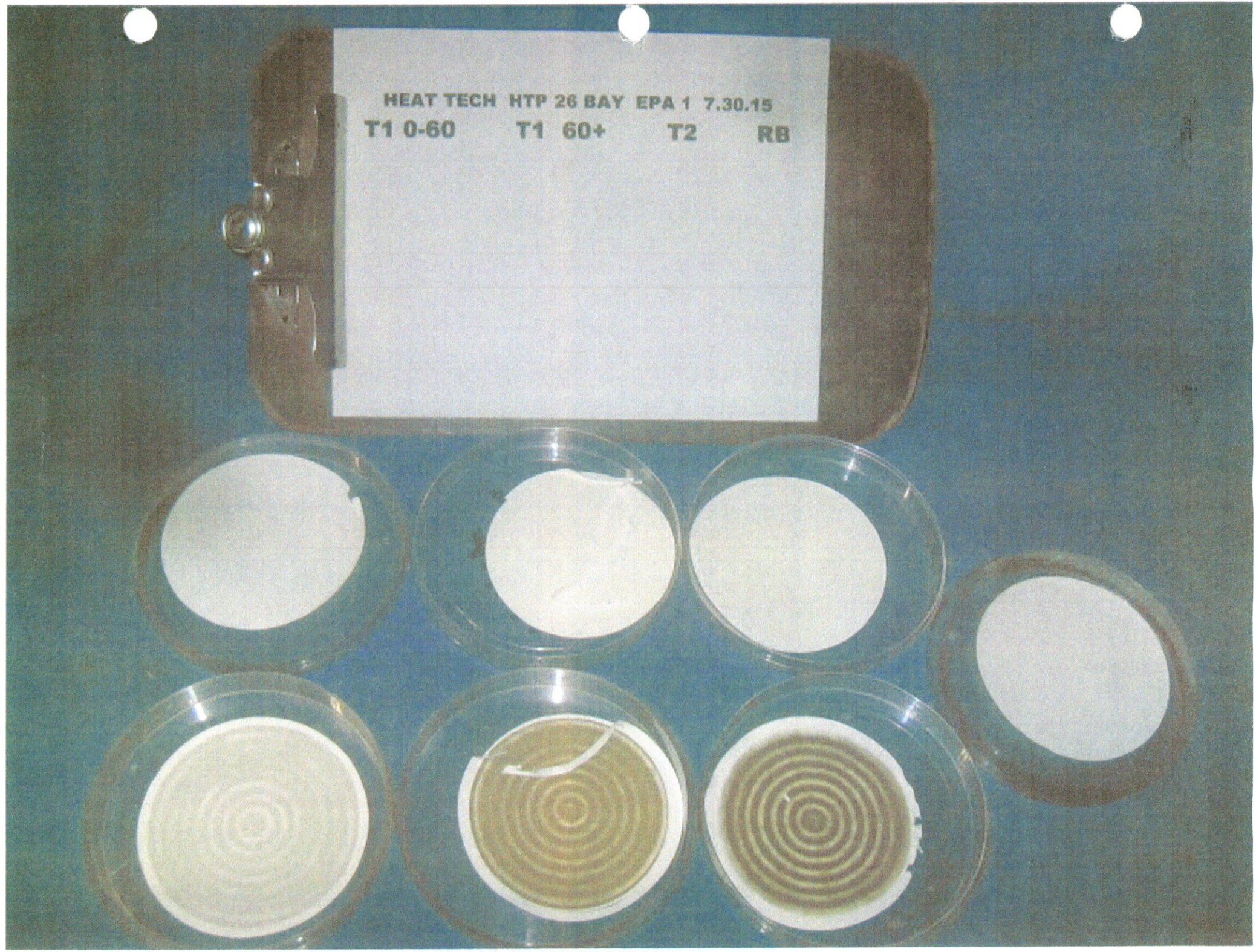
HOUR #	2015 DATE	TIME	POUNDS BURNT	STACK TEMP	COMMENTS
1	6/24	950	2.5	324	Fire Started @ 8:50
2		1050	2.5	313	
3		1150	2.6	310	
4		1250	2.6	312	
5		1350	2.7	327	
6		1450	2.6	320	
7		1550	2.7	337	
8		1650	2.7	338	
9		1750	2.7	327	
10		1850	2.5	344	
11		1950	2.6	345	
12		2050	2.8	337	
13		2130	2.5	329	
14		2230	2.6	335	
15	↓	2330	2.6	332	
16	6/25	0030	2.5	342	
17		0130	2.6	337	
18		0230	2.4	327	
19	↓	0330	2.0	280	
20	6/25	0945	2.7	326	Fire Started @ 9:45
21		1045	2.9	323	
22		1145	2.6	326	
23		1245	1.0	327	
24		1345	2.5	343	
25		1445	3.0	356	
26		1545	2.6	347	
27		1645	2.9	345	Added fuel @ 1605
28		1745	3.0	343	
29	↓	1845	2.5	347	

PELLET STOVE AGING DATA
Woodstove Test Data Sheet #25P
WST5-Form 3A, Rev 12/15

Unit: HEAT TECH HTP 26 BNG
Date(s): 6/24, 25, 26, 29, 30, 2015
Technicians: ATM ESS
Page: 2 of 2

T/C# 1

HOUR #	2015 DATE	TIME	POUNDS BURNT	STACK TEMP			COMMENTS
30	6/25	1945	2.9	342			
31		2045	2.7	340			
32		2145	2.6	346			
33		2245	2.5	342			
34	↓	2345	2.7	339			
35	6/26	0045	2.6	333			
36		0145	2.6	341			
37		0245	2.7	350			
38		0345	2.7	344			
39		0445	2.5	339			
40		0545	2.4	323			
41	↓	0645	2.3	304			
42	6/29	1503	1.2	230			Fire Started @ 1403
43		1603	1.5	243			
44		1703	1.8	230			
45		1803	1.2	249			
46		1903	1.7	241			
47		2003	2.9	266			
48		2103	1.5	261			
49		2203	1.8	240			
50	↓	2303	2.9	246			
51	6/30	0003	1.5	246			


HEAT TECH HTP 26 BAY EPA 1 7.30.15
T1 0-60
T1 60+
T2
RB

MYREN CONSULTING, INC

Manufacturer:	HEAT TECH	**Technicians:**	ATMYREN
Model:	HTP 26 BAY		
Date:	7.30.15		
Run:	EPA 1		
Control #:			
Test Duration:	360		
Output Category:	VARIABLE		

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	69.7%	75.4%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	70%	75.7%

Output Rate (kJ/h)	13,789	13,081	**(Btu/h)**
Burn Rate (kg/h)	1.00	2.20	**(lb/h)**
Input (kJ/h)	19,777	18,761	**(Btu/h)**

Test Load Weight (dry kg)	5.99	13.20	**dry lb**
MC wet (%)	5.7		
MC dry (%)	6.04		
Particulate (g)	3.23065		
CO (g)	81		
Test Duration (h)	6.00		

Emissions	**Particulate**	**CO**
g/MJ Output	0.04	0.98
g/kg Dry Fuel	0.54	13.47
g/h	0.54	13.45
lb/MM Btu Output	0.09	2.27

Air/Fuel Ratio (A/F)	30.15

VERSION: 2.2 12/14/2009

VERSION: 2.2 12/14/2009

Manufacturer: HEAT TECH
Model: HTP 26 BAY
Date: 7.30.15
Run: EPA 1
Control #:
Test Duration: 360
Output Category: VARIABLE

Appliance Type: NON CAT (Cat, Non-Cat, Pellet)

Temp. Units F (F or C)
Weight Units lb (kg or lb)

Default Fuel Values

	D. Flr	Oak
HHV (kJ/kg)	19,810	19,887
%C	48.73	50
%H	6.87	6.6
%O	43.9	42.9
%Ash	0.5	0.5

Fuel Data

	D. Flr	
HHV	19,810	kJ/kg
%C	48.73	
%H	6.87	
%O	43.9	
%Ash	0.5	

Wood Moisture (% wet): 5.70
Load Weight (lb wet): 14.00
Burn Rate (dry kg/h): 1.00
Total Particulate Emissions: 3.23065 g

Note 1: For other fuels, use the heating value and fuel composition determined by analysis of fuel sample in accordance with Clause 9.2.

Note 2: In cases where the "Fuel Weight Remaining" is the same for three or more readings in a row, a "divide by zero error" will occur in the calculation sheet. In such cases, adjust the weight values by interpolation between the first occurence and the next reading showing a decrease in weight.

						Temp. (°F)	
	Averages	0.04	4.02	16.90	316.43	88.68	
Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Flue Gas	Room Temp
0	14.00	0.03	6.28	14.65	422.0	89.0
10	13.20	0.02	6.33	14.60	425.0	88.0
20	12.60	0.02	6.03	14.90	421.0	89.0
30	12.00	0.01	6.55	14.39	428.0	89.0
40	11.30	0.01	5.80	15.14	424.0	89.0
50	10.50	0.02	5.78	15.15	423.0	90.0
60	9.80	0.02	5.03	15.90	422.0	90.0
70	9.40	0.03	3.66	17.27	386.0	90.0
80	8.90	0.03	5.08	15.85	373.0	90.0
90	8.50	0.09	3.13	17.77	363.0	90.0
100	8.10	0.08	3.03	17.87	351.0	84.0
110	7.70	0.05	3.61	17.11	348.0	84.0
120	7.20	0.04	4.56	16.36	349.0	85.0
130	6.80	0.04	3.71	17.21	348.0	89.0
140	6.40	0.02	4.68	16.25	349.0	90.0
150	5.90	0.02	4.93	16.00	359.0	88.0
160	5.40	0.03	4.78	16.15	351.0	88.0
170	5.00	0.04	4.56	16.36	348.0	90.0
180	4.50	0.06	3.26	17.65	347.0	88.0
190	4.10	0.05	2.88	18.04	308.0	89.0
200	3.90	0.04	3.68	17.24	275.0	90.0
210	3.60	0.03	3.26	17.67	256.0	88.0
220	3.40	0.14	1.48	19.39	236.0	88.0
230	3.20	0.03	3.43	17.50	242.0	88.0
240	2.90	0.05	2.81	18.11	246.0	89.0
250	2.70	0.06	2.58	18.33	238.0	88.0
260	2.40	0.01	4.78	16.16	250.0	89.0
270	2.20	0.03	3.58	17.35	243.0	88.0
280	1.90	0.10	2.58	18.31	238.0	89.0
290	1.70	0.06	2.68	18.23	238.0	88.0
300	1.50	0.08	3.06	17.84	246.0	90.0
310	1.20	0.02	5.13	15.80	245.0	89.0
320	1.00	0.04	3.66	17.26	239.0	89.0
330	0.70	0.06	2.41	18.50	234.0	90.0
340	0.50	0.11	2.11	18.78	245.0	90.0
350	0.20	0.05	2.76	18.16	242.0	90.0
360	0.00	0.02	4.83	16.10	250.0	89.0

MYREN CONSULTING, INC

Manufacturer:	HEAT TECH
Model:	HTP 26 BAY
Date:	7.30.15
Run:	EPA 1
Control #:	
Test Duration:	60
Output Category:	HIGH

Technicians: ATMYREN

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	68.1%	73.6%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	68%	74.0%

Output Rate (kJ/h)	24,244	22,998	**(Btu/h)**
Burn Rate (kg/h)	1.80	3.96	**(lb/h)**
Input (kJ/h)	35,599	33,769	**(Btu/h)**

Test Load Weight (dry kg)	1.80	3.96	**dry lb**
MC wet (%)	5.7		
MC dry (%)	6.04		
Particulate (g)	0.8407		
CO (g)	6		
Test Duration (h)	1.00		

Emissions	Particulate	CO
g/MJ Output	0.03	0.26
g/kg Dry Fuel	0.47	3.52
g/h	0.84	6.33
lb/MM Btu Output	0.08	0.61

Air/Fuel Ratio (A/F)	20.45

VERSION: 2.2 12/14/2009

VERSION: 2.2 12/14/2009

Manufacturer: HEAT TECH
Model: HTP 26 BAY
Date: 7.30.15
Run: EPA 1
Control #:
Test Duration: 60
Output Category: HIGH

Appliance Type: NON CAT (Cat, Non-Cat, Pellet)

Temp. Units	F	(F or C)
Weight Units	lb	(kg or lb)

Default Fuel Values

	D. Fir	Oak
HHV (kJ/kg)	19,810	19,887
%C	48.73	50
%H	6.87	6.6
%O	43.9	42.9
%Ash	0.5	0.5

Wood Moisture (% wet):	5.70
Load Weight (lb wet):	4.20
Burn Rate (dry kg/h):	1.80
Total Particulate Emissions:	0.8407 g

Fuel Data

	D. Fir	
HHV	19,810	kJ/kg
%C	48.73	
%H	6.87	
%O	43.9	
%Ash	0.5	

Note 1: For other fuels, use the heating value and fuel composition determined by analysis of fuel sample in accordance with Clause 9.2.

Note 2: In cases where the "Fuel Weight Remaining" is the same for three or more readings in a row, a "divide by zero error" will occur in the calculation sheet. In such cases, adjust the weight values by interpolation between the first occurence and the next reading showing a decrease in weight.

Averages		**0.02**	**5.97**	**14.96**	**423.57**	**89.14**
					Temp. (°F)	
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas Composition (%) CO**	**CO_2**	**O_2**	**Flue Gas**	**Room Temp**
0	4.20	0.03	6.28	14.65	422.0	89.0
10	3.40	0.02	6.33	14.60	425.0	88.0
20	2.80	0.02	6.03	14.90	421.0	89.0
30	2.20	0.01	6.55	14.39	428.0	89.0
40	1.50	0.01	5.80	15.14	424.0	89.0
50	0.70	0.02	5.78	15.15	423.0	90.0
60	0.00	0.02	5.03	15.90	422.0	90.0

MYREN CONSULTING, INC.
Dilution Tunnel Traverse Data with 8
Traverse Points Rev: 1.7.12

Unit: HEAT Tech HTP 26 Bag
Run #: EPA 1
Date: 7/30/15
Technicians: ATM ESS

Point	Location	Δp	$\sqrt{\Delta p_{trav}}$	Δp	$\sqrt{\Delta p_{cent}}$	T_{trav}	T_{cent}	Pg
W-1	0.5"	.034	.184 X			119		
2	1.5	.037	.192 X			121		
Center	Center			.039	.197 X		121	—
3	4.5	.040	.200 X			122		
4	5.5	.039	.197 X			121		
S-1	0.5	.035	.187 X			120		
2	1.5	.038	.195 X			121		
Center	Center			.039	.197 X		122	—
3	4.5	.039	.197 X			122		
4	5.5	.038	.195 X			121		
	Totals		1.547 X		.394 X	967 X	243 X	—
	Average		.1934 X		.1970 X	120.9 X	121.5 X	—
	°R = (°F + 460)					580.9 X	581.5 X	

BP = 28.60 "Hg Ps = BP + (-Pg/13.6) = 28.60 + (— /13.6) = 28.60 " Hg

LEAK CHECKS: Manometer Level: OK ✓ Zeroed: OK ✓ Tech: ESS
Pg Leg: Pre Test: Pressure: -.250+ " H_2O Movement: .000 " H_2O Tech: ESS
Post Test: Pressure: -.250+ " H_2O Movement: .000 " H_2O Tech: ESS
Velocity Head Leg: Pre Test: Pressure: +.024 " H_2O Movement: .000 " H_2O Tech: ES
Post Test: Pressure: +.009 " H_2O Movement: .000 " H_2O Tech: ESS

MYREN CONSULTING, INC. EPA/ ASTM DATA SHEET # 5-2 PAGE 2 OF 2

DILUTION TUNNEL GAS VELOCITY & VOLUMETRIC FLOW RATE CALCULATIONS Rev 1/7/12

UNIT: HEAT Tech HTP26Bay DATE: 7/30/15 RUN #: EPA 1 TECHNICIAN(S): ATM ESS

Average Gas Velocity in the Dilution Tunnel Vstrav (EPA M2 eqn 2-9, ASTM E 2515 EQN 7)

(9) Vstrav = (85.49) (0.99 cp) (.1934 $\overline{X}$ $\sqrt{\Delta P}$ "H_2O) $\sqrt{\frac{580.9 \text{ Ts °A}}{(28.60 \text{ Ps "Hg}) (28.78 \text{ lb./ lb. mole})}}$ = 13.75084 fps

{2} {2} {0} {2} {2}

(9A) Vs = (13.75084 fps) (60) = 825.050 fpm

{2} {2}

EQN. 2-7 Gas Velocity in the Center of the Dilution Tunnel - Vscent (ASTM E 2515-07 EQN 7)

(9) Vscent = (85.49) (0.99cp) (.1970 $\overline{X}$ $\sqrt{\Delta P}$ "H_2O) $\sqrt{\frac{581.5 \text{ Ts °A}}{(28.60 \text{ Ps "Hg}) (28.78 \text{ lb./ lb. mole})}}$ = 14.01403 fps

{2} {2} {0} {2} {2}

(9A) Vs = (14.01403 fps) (60) = 840.842 fpm

{2} {2}

ASTM E 2515-07 EQN 1 Adjustment Factor for center of Tunnel Pitot Tube Location

Fp = Vstrav/ Vscent = 825.050 ÷ 840.842 = .98122

EQN. 2-8 Average Stack Gas Dry Volumetric Flow Rate Qstd (ASTM E 2515-07 EQN 3)

Qsd = 3600 (1 - 0.02 Bws) (13.75084 fps) (.1963 ft^2) [(528 °A) (28.60 Ps "Hg) / (580.9 T_s °A) (29.92" Hg)] =

{2} {2} {3} {2} {0}

8273.9925 dscfhr (or dscfh)

{1}

(10A) 8273.9925 dscfhr ÷ 60 = 137.901 dscfmin (or dscfm)

{1} {1}

Note: Number in { } under blank lines denotes number of decimals to be used. If a blank calls for an answer already calculated, use the number of decimals previously specified for that answer.

EP[illegible] T 1

DILUTION TUNNEL CALCULATIONS

MYREN CONSULTING CERTIFICATION TEST DATA

10.11.15 MD=28.78 Bws = 2%

	6"Tunnel
File Name:	EPA 1 T 1
Manufacturer:	HEAT TECH
Model Number:	HTP 26 BAY
Lab Name:	MYREN
Test Date:	7.30.15
Run Number:	EPA 1 T 1
Meter Box Y Factor:	1.066
Barometric Pressure (in Hg):	28.553
Dry Gas Meter Temp(avg.)(F):	**90**
Delta H(Avg.)(in H2)):	**0.900**
Gas meter initial reading:	862.4010
Gas meter final reading:	1056.1610
Total Particulate Catch(mg):	14
Sampling Flow Rate(cfm):	0.538
Tunnel Flow (Qsd) (dscfm)	**140.291**
Emission Rate(g/hr):	**1.463**
Emission Factor(g/kg)	**1.466**
Avg. of Delta P Sq. Roots:	**0.2000**
Vs (Avg.)(ft/min):	**835.015**
Tunnel Avg. Temperature (F):	**116.946**
Test time(min):	360
Fuel Load: (lbs. Dry):	13.2020
Wood moisture(%wet):	5.700
Burn rate(dry kg/hr):	**0.998**
Sample Volume (dscf)	**189.534**
Avg. Tunnel Static (-inch H2O):	**0.0000**
Room Blank Catch (mg/dscf):	0.006276
Total PM Emissions(Er))(g):	**3.4136**
Pitot Correction Factor:	0.98122
Front Filter Number:	711, 706
Back Filter Number:	710, 707
Beaker number:	27, 22
PRELIMINARY RESULTS	
FINAL RESULTS:	AUDITED

DATA SUMMARY

MODEL:	HTP 26 BAY
RUN:	EPA 1 T 1
DATE:	7.30.15
DBR:	0.998
EMISSION RATE (g/hr)(unadj):	1.4630
EMISSION FACTOR (g/kg):	3.4136
AVG. % PROPORTIONALITY :	99.904

RUN TIME (min)	PITOT DELTAP (in H2O)	TNL TEMP (°F)	GAS METER RDG (ft3)	GAS METER TEMP (°F)	GAS METER DELTA H (in.H2O)	TUNNEL VELOCITY (ft/min)	PROP RATE (%)	dDGM vol std (ft3)	Tunnel Static (- Inch H2O)	SQUARE ROOT DELTA P	DRY GAS METER READING (M3)
0	0.040	122	862.4010	71.0	0.900	838.66			0.000	0.20000	
10	0.040	123	867.6760	73.0	0.900	839.02	105.3	5.336	0.000	0.20000	
20	0.040	124	872.9970	77.0	0.900	839.74	105.2	5.352	0.000	0.20000	
30	0.040	124	878.3120	81.0	0.900	840.10	103.5	5.307	0.000	0.20000	
40	0.040	126	883.6270	86.0	0.900	840.82	101.9	5.263	0.000	0.20000	
50	0.040	126	888.9970	88.0	0.900	841.54	101.8	5.283	0.000	0.20000	
60	0.040	127	894.3760	91.0	0.900	841.90	101.0	5.268	0.000	0.20000	
70	0.040	124	899.7260	93.0	0.900	841.18	99.4	5.216	0.000	0.20000	
80	0.040	123	905.0780	95.0	0.900	839.74	98.5	5.199	0.000	0.20000	
90	0.040	123	910.4950	96.0	0.900	839.38	99.2	5.248	0.000	0.20000	
100	0.040	121	915.9240	97.0	0.900	838.66	99.0	5.250	0.000	0.20000	
110	0.040	120	921.3510	98.0	0.900	837.58	98.4	5.239	0.000	0.20000	
120	0.040	120	926.8080	98.0	0.900	837.22	98.8	5.263	0.000	0.20000	
130	0.040	121	932.2490	98.0	0.900	837.58	98.6	5.248	0.000	0.20000	
140	0.040	121	937.6980	98.0	0.900	837.94	98.8	5.255	0.000	0.20000	
150	0.040	123	943.1410	98.0	0.900	838.66	98.8	5.249	0.000	0.20000	
160	0.040	124	948.7830	99.0	0.900	839.74	102.4	5.437	0.000	0.20000	
170	0.040	124	954.0090	98.0	0.900	840.10	94.8	5.036	0.000	0.20000	
180	0.040	123	959.4710	95.0	0.900	839.74	99.7	5.282	0.000	0.20000	
190	0.040	116	964.9180	93.0	0.900	836.86	99.9	5.291	0.000	0.20000	
200	0.040	112	970.3360	92.0	0.900	832.88	99.3	5.277	0.000	0.20000	
210	0.040	110	975.7320	91.0	0.900	830.70	99.1	5.265	0.000	0.20000	
220	0.040	109	981.1220	90.0	0.900	829.61	99.3	5.269	0.000	0.20000	
230	0.040	108	986.5100	89.0	0.900	828.88	99.6	5.277	0.000	0.20000	
240	0.040	110	991.8920	89.0	0.900	829.25	99.7	5.276	0.000	0.20000	
250	0.040	109	997.2750	89.0	0.900	829.61	99.8	5.277	0.000	0.20000	
260	0.040	110	1002.6510	88.0	0.900	829.61	99.8	5.275	0.000	0.20000	
270	0.040	110	1008.0260	88.0	0.900	829.97	100.1	5.279	0.000	0.20000	
280	0.040	110	1013.3930	88.0	0.900	829.97	99.9	5.271	0.000	0.20000	
290	0.040	110	1018.7640	88.0	0.900	829.97	100.0	5.275	0.000	0.20000	
300	0.040	111	1024.1350	88.0	0.900	830.34	100.0	5.275	0.000	0.20000	
310	0.040	110	1029.4700	88.0	0.900	830.34	99.3	5.239	0.000	0.20000	
320	0.040	110	1034.8120	89.0	0.900	829.97	99.2	5.241	0.000	0.20000	
330	0.040	110	1040.1570	89.0	0.900	829.97	99.1	5.239	0.000	0.20000	
340	0.040	111	1045.4870	89.0	0.900	830.34	98.9	5.225	0.000	0.20000	
350	0.040	111	1050.8210	89.0	0.900	830.70	99.0	5.229	0.000	0.20000	
360	0.040	111	1056.1610	89.0	0.900	830.70	99.1	5.235	0.000	0.20000	
370											
380											

EPA 1 T 1 0-60

DILUTION TUNNEL CALCULATIONS — MYREN CONSULTING CERTIFICATION TEST DATA

10.11.15 MD=28.78 Bws = 2% — 6"Tunnel

File Name:	EPA 1 T 1 0-60
Manufacturer:	HEAT TECH
Model Number:	HTP 26 BAY
Lab Name:	MYREN
Test Date:	7.30.15
Run Number:	EPA 1 T 1 0-60
Meter Box Y Factor:	1.066
Barometric Pressure (in Hg):	28.595
Dry Gas Meter Temp(avg.)(F):	**81**
Delta H(Avg.)(in H2)):	**0.900**
Gas meter initial reading:	862.4010
Gas meter final reading:	894.3760
Total Particulate Catch(mg):	3.4
Sampling Flow Rate(cfm):	0.533
Tunnel Flow (Qsd) (dscfm)	**139.475**
Emission Rate(g/hr):	**0.360**
Emission Factor(g/kg)	**0.201**
Avg. of Delta P Sq. Roots:	**0.2000**
Vs (Avg.)(ft/min):	**839.898**
Tunnel Avg. Temperature (F):	**124.571**
Test time(min):	60
Fuel Load: (lbs. Dry):	3.9606
Wood moisture(%wet):	5.700
Burn rate(dry kg/hr):	**1.797**
Sample Volume (dscf)	**31.854**
Avg. Tunnel Static (-inch H2O):	**0.0000**
Room Blank Catch (mg/dscf):	0.006276
Total PM Emissions(Er))(g):	**0.8407**
Pitot Correction Factor:	0.98122
Front Filter Number:	711
Back Filter Number:	710
Beaker number:	27
PRELIMINARY RESULTS	
FINAL RESULTS:	AUDITED

DATA SUMMARY

MODEL:	HTP 26 BAY
RUN:	EPA 1 T 1 0-60
DATE:	7.30.15
DBR:	1.797
EMISSION RATE (g/hr)(unadj):	0.3603
EMISSION FACTOR (g/kg):	0.8407
AVG. % PROPORTIONALITY :	100.057

RUN TIME (min)	PITOT DELTAP (in H2O)	TNL TEMP (°F)	GAS METER RDG (ft3)	GAS METER TEMP (°F)	GAS METER DELTA H (in.H2O)	TUNNEL VELOCITY (ft/min)	PROP RATE (%)	dDGM vol std (ft3)	Tunnel Static (- Inch H2O)	SQUARE ROOT DELTA P	DRY GAS METER READING (M3)
0	0.040	122	862.4010	71.0	0.900	838.05			0.000	0.20000	
10	0.040	123	867.6760	73.0	0.900	838.41	102.2	5.344	0.000	0.20000	
20	0.040	124	872.9970	77.0	0.900	839.13	102.0	5.360	0.000	0.20000	
30	0.040	124	878.3120	81.0	0.900	839.49	100.4	5.315	0.000	0.20000	
40	0.040	126	883.6270	86.0	0.900	840.21	98.9	5.271	0.000	0.20000	
50	0.040	126	888.9970	88.0	0.900	840.92	98.7	5.291	0.000	0.20000	
60	0.040	127	894.3760	91.0	0.900	841.28	98.0	5.276	0.000	0.20000	
70											
80											
90											
100											
110											
120											
130											
140											
150											
160											
170											
180											
190											
200											
210											
220											
230											
240											
250											
260											
270											
280											
290											
300											
310											
320											
330											
340											
350											
360											
370											
380											

Square Top 1

T1
0-60

METHOD 5G-1 **PARTICULATE SAMPLING DATA** **Rev. 10/09**

DATE: 7/30/15 **PAGE** 1 **OF** 1 **UNIT:** HEAT Tech 28 HTP Boy **RUN:** EPA 1

METER BOX: 45G-P **METER Y:** 1.0066 **FILTER #'S: (F)** 711 **(R)** 710
.0565/.0565 **FILTER/ O-RING ID # :** —

PRE TEST LEAK CHECK: .000 **CFM @** -16.10 **IN HG** **FILTER SIZE:** 110 **mm**
.257/.259 **PROBE ID # :** —

POST TEST LEAK CHECK: .002 **CFM @** -10.25 **IN HG** **PROBE LENGTH** ____ **IN**

TIME		METER READING		PITOT		TUNNEL TEMP	METER TEMP	GAS METER	VAC
CLOCK	ELAPSED	(m^3)	(ft^3)	ΔP	Pg	(°F)	(°F)	Δh	(in Hg)
1040	(00)	862.401		.040		122	71	.90	-1.0
50	10	867.676		.040		123	73	.90	-1.1
1100	20	872.997		.040		124	77	.90	-1.1
10	30	878.312		.040		124	81	.90	-1.1
20	40	883.627		.040		126	86	.90	-1.1
30	50	888.997		.040		126	88	.90	-1.1
40	(60)	894.376		.040		127	91	.90	-1.1
	70								
	80								
	90								
	00								
	10								
	20								
	30								
	40								
	50								
	60								
	70								
	80								
	90								

BP

00	28.60		
60	28.59		
	AVG.=	28.595	

Pre Test Filter Check Weighing
F .6507
R .6505

End of Test Weight
F .6520 R .6502

.6509 .6503
.0011 -.0001

White Round top

T1
60+

METHOD 5G-1 **PARTICULATE SAMPLING DATA** **Rev. 10/09**

DATE: 7/30/15 **PAGE** 1 **OF** 2 **UNIT:** Heat Tech HTP 26B **RUN:** EPA 1

METER BOX: 45G-P **METER Y:** 1.066 **FILTER #'S: (F)** 706 **(R)** 707
.9005/.9025
FILTER/ O-RING ID # : —
PRE TEST LEAK CHECK: .002 **CFM @** -15.0 **IN HG** **FILTER SIZE:** 110 **mm**
PROBE ID # : _____
POST TEST LEAK CHECK: _____ **CFM @** _____ **IN HG** **PROBE LENGTH** ____ **IN**

TIME		METER READING	PITOT		TUNNEL TEMP	METER TEMP	GAS METER	VAC
CLOCK	ELAPSED	(m^3) (ft^3)	ΔP	Pg	(°F)	(°F)	Δh	(in Hg)
1140	00	894.376	.040		127	91	.90	-1.1
50	10	899.726	.040		124	98	.90	-1.1
1200	20	905.078	.040		123	95	.90	-1.1
10	30	910.495	.040		123	96	.90	-1.1
20	40	915.924	.040		121	97	.90	-1.1
30	50	921.351	.040		120	98	.90	-1.1
40	(60)	926.808	.040		120	98	.90	-1.1
50	70	932.249	.040		121	98	.90	-1.1
1300	80	937.698	.040		121	98	.90	-1.1
10	90	943.141	.040		123	98	.90	-1.1
20	100	948.783	.040		124	99	.90	-1.1
30	110	954.009	.040		124	98	.90	-1.1
40	(120)	959.471	.040		123	95	.90	-1.1
50	130	964.918	.040		116	93	.90	-1.1
1400	140	970.336	.040		112	92	.90	-1.1
10	150	975.732	.040		110	91	.90	-1.1
20	160	981.122	.040		109	90	.90	-1.1
30	170	986.510	.040		108	89	.90	-1.1
40	(180)	991.892	.040		110	89	.90	-1.1
50	190	997.275	.040		109	89	.90	-1.1

BP

00	28.60	300	28.52
60	28.54	360	28.51
120	28.58		
180	28.54		
240	28.53	AVG. =	28.553

Pre Test Filter Check Weighing
F .6467
R .6424

End of Test Weight
F .6526 R .6252
.6465 .6423

T1
60+

METHOD 5G - 1 **PARTICULATE SAMPLING DATA** **Rev. 10/09**

DATE: 7/30/15 **PAGE** 2 **OF** 2 **UNIT:** HEAT Tech HTP 2B 3Hy **RUN:** EPA 1

METER BOX: 45G-P **METER Y:** 1.066 **FILTER #'S: (F)** 706 **(R)** 707

FILTER/ O-RING ID # : —

PRE TEST LEAK CHECK: .188/.191 **CFM @** _____ **IN HG** **FILTER SIZE:** 110 **mm**

PROBE ID # : —

POST TEST LEAK CHECK: .003 **CFM @** -10.25 **IN HG** **PROBE LENGTH** ____ **IN**

TIME		METER READING	PITOT		TUNNEL TEMP	METER TEMP	GAS METER	VAC
CLOCK	ELAPSED	(m^3) (ft^3)	ΔP	Pg	(°F)	(°F)	Δh	(in Hg)
1500	200	1002.651	.040		110	88	.90	-1.1
10	210	1008.026	.040		110	88	.90	-1.1
20	220	1013.393	.040		110	88	.90	-1.1
30	230	1018.764	.040		110	88	.90	-1.1
40	240	1024.135	.040		111	88	.90	-1.1
50	250	1029.470	.040		110	88	.90	-1.1
1600	260	1034.812	.040		110	89	.90	-1.1
10	270	1040.157	.040		110	89	.90	-1.1
20	280	1045.487	.040		111	89	.90	-1.1
30	290	1050.821	.040		111	89	.90	-1.1
40	300	1056.161	.040		111	89	.90	-1.1
	10							
	20							
	30							
	40							
	50							
	60							
	70							
	80							
	90							

BP

00	28.60	300	28.52
60	28.59	360	28.51
120	28.58		
180	28.54		
240	28.52	AVG.=	28.553

Pre Test Filter Check Weighing
F .6467
R .6424

End of Test Weight
F _____ R _____
_____ _____
.6465 .6423

Woodstove Data Sheet #4-1: Initial Filter Weights (Tare Weights)

Into Dessicator: Date 6/20/15 Time 1245 By ATM Front Half ✓ Back Half ✓

Manufacturer: PALL **Size:** 110 mm **Lot.No.:** T41116 **Grade:** A/E Glass 1.0 µm

Balance Used: Sartorius **Model:** CP224S **SN:** 24850860

	Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
	701	.6445	6/25	1513	ESS	.6442	7/8	1133	ATM	.6442	7/14	1523	ESS
	702	.6466		1512	ESS	.6462		1135	ATM	.6462		1524	ESS
T3	703	.6460		1511	ESS	.6455		1137	ATM	.6455		1525	ESS
T2	704	.6476		1510	ESS	.6472		1139	ATM	.6473		1526	ESS
T2	705	.6450		1509	ESS	.6444		1141	ATM	.6445		1527	ESS
T160+	706	.6472		1508	ESS	.6467		1143	ATM	.6465		1528	ESS
T160r	707	.6425		1507	ESS	.6423		1144	ATM				
	708	.6470		1506	ESS	.6465		1146	ATM	.6467		1529	ESS
	709	.6503		1506	ESS	.6499	↓	1147	ATM	.6497		1530	ESS
T10-60	710	.6509		1505	ESS	.6505	7/10	1338	ATM	.6503		1531	ESS
T10-60	711	.6514		1504	ESS	.6511		1339	ATM	.6509		1532	ESS
	712	.6515		1503	ESS	.6511		1340	ATM	.6512		1533	ESS
	713	.6498		1502	ESS	.6496		1341	ATM				
	714	.6522		1501	ESS	.6520		1342	ATM				
	715	.6494		1500	ESS	.6493		1343	ATM				
	716	.6480		1459	ESS	.6481		1343	ATM				
	717	.6503		1458	ESS	.6502		1344	ATM				
	718	.6539		1457	ESS	.6537		1345	ATM				
	719	.6476		1456	ESS	.6474		1347	ATM				
	720	.6539		1455	ESS	.6934		1348	ATM	.6536		1534	ESS
	721	.6455		1454	ESS	.6455		1349	ATM				
	722	.6588		1453	ESS	.6588		1350	ATM				
	723	.6564		1452	ESS	.6564		1350	ATM				
	724	.6571		1451	ESS	.6569		1351	ATM				
	725	.6601		1450	ESS	.6602		1352	ATM				

Checked by A.T. Myren **Date:** 7/26/15 **Time:** 1500

QA Reweigh

Filter #	WT	Date	Time	By
716	.6481	7.26.15	1525	
711	.6510	7.26.15	1526	
709	.6499	7.26.15	1527	
704	.6475	7.26.15	1528	

Balance Room Environmental Conditions

WB	DB	%RH	Date	Time	By
56	69	43	6/25	839	ATM
58	72	42	7/10	1315	ATM
57	69	46	7/14	1512	ESS
57	69	47	7.26	1421	ATM

Post Weighing Scale Check	Date	1st	2nd	3rd	4th	5th
	0.0000g	0.0000	0.0000	0.0000	0.0000	
	100.0000g	99.9995	99.9996	99.9996	99.9994	

Woodstove Data Sheet #4-2: Initial Beaker Weights (Tare Weights) 7/23/15 1254 ATM 30-32

Into Dessicator: Date 7/21/15 Time 1600 By ATM 20-29

Balance Used: Sartorius Model: CP224S SN:24850860

Bkr #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
00	73.3176	7/23	1243	ATM	73.3173	7/24	1535	ESS	73.3174	7/26	1454	AM
01	71.0016	"	1244	ATM	71.0019	"	1534	ESS	71.0019	7/26	1443	AM
02	71.8344	"	1246	ATM	71.8342	"	1533	ESS	← T1 60+			
03	70.7389	"	1247	ATM	70.7384	"	1532	ESS	70.7385	7/26	1446	AM
04	73.2188	"	1240	ATM	73.2188	"	1540	ESS	← T3			
05	72.6525	"	1241	ATM	72.6524	"	1539	ESS	← T1 0-60			
06	71.7871	"	1242	ATM	71.7870	"	1538	ESS				
07	72.3306	"	1243	ATM	72.3306	"	1537	ESS	72.3306	7/26	1450	AM
08	70.5976	"	1238	ATM	70.5975	"	1541	ESS				
09	71.5194	↓	1239	ATM	71.5191	↓	1542	ESS	71.5192	7/26	1443	AM
30	~~70.7854~~	~~7/26~~	~~1459~~	~~ATM~~		7/30			← T2			
31	~~69.6666~~	~~7/26~~	~~1457~~	~~ATM~~								
32	~~53.5997~~	~~7/26~~	~~1455~~	~~ATM~~								
32												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												

Checked by_____ **Date:**_____ **Time:**_____

QA Reweigh

Beaker #	WT	Date	Time	By

Balance Room Environmental Conditions

WB	DB	%RH	Date (2015)	Time	By
54	65	47	7/23	1205	AM
55	66	48	7/24	1525	ESS
57	69	47	7/26	1421	AM

	1st	2nd	3rd	4th	5th
Date	7/23	7/24	7/26		
Post Weighing 0.0000g	0.0000	0.0000	0.0000		
Scale Check 100.0000g	99.9996	99.9996	99.9996		

Woodstove Data Sheet #4-2: Initial Beaker Weights (Tare Weights)

Into Dessicator: Date 6/17 Time 1600 By ATM
Balance Used: Sartorius Model: CP224S SN:24850860

Bkr #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
20												
21												
22												
23												
24												
25	72.6528	6/23	1315	ATM								
26	71.7864	6/20	1643	[illegible]	71.7869	6/22	1437	ESS	71.7869	6/23	1321	ATM
27												
28	70.5910	6/20	1649	[illegible]	70.5972	6/22	1438	ESS				
29												
30												
31												
32												
33	53.1485	6/20	1639	[illegible]	53.1490	6/22	1440	ESS	53.1490	6/23	1323	ATM
34												
35												
36	53.5737	6/20	1651	[illegible]	53.5734	6/22	1442	ESS	53.5743	6/23	1320	ATM
37												
38												
39												
40	53.1650	6/23	1317	ATM								
41												
42												
43												

Acetone Blank

Checked by_____ **Date:**_____ **Time:**_____

QA Reweigh

Beaker #	WT	Date	Time	By

Balance Room Environmental Conditions

WB	DB	%RH	Date	Time	By
56	68	46	6/20	1549	ATM
55	67	45	6/22	1432	ESS
55	68	42	6/23	1213	ATM

	1st	2nd	3rd	4th	5th
Date	6/20	6/22	6/23		
Post Weighing 0.0000g	0.0000	0.0000	0.0000		
Scale Check 100.0000g	99.9996	99.9996	99.9996		

Fisher Acetone Blank
Lot 141092 50 ml 6/23/15

Woodstove Data Sheet #4-3: Constant Final Weights

Blank Bottle 1 (BD)

Unit HEAT TECH HTP26 Boy
Run # EPA 1
Date: 7/30/15
WST5-Form 9, Pg 1, Rev 10/10

Final Beaker Weights

Beaker	Into	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
26	71.7863	6/24	1029	ESS	71.7870	6/25	900	ATM	71.7889	6/26	1252	ESS	71.7869	7/1	1331	ATM
					(71.7869)	7/2	1430									

Final Filter Weights

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
F																	
R																	

QA Reweigh: Final Weight

Date	Beaker #	Final Wt	By

Date	Filter #	Final Wt	By

Scale Room Environmental Conditions

Weighing Session	2015 Date	Time	By	WB	DB	%RH
1	6/25	839	ATM	56	69	43
2	6/26	1233	ESS	57	69	46
3	6/27	1322	AM	58	71	45
4	7/2	1354	ATM	58	70	48
5						
6						
7						

Scale Room Environmental Conditions

8						
9						
10						
11						
12						

Comment

6/25 0.0000
✓ Tare wt. 71.7867 99995
6/27 7/2 ✓ 71.7869 6/26
0.0050 0.0000 0.0000

HTP 30 Bay

Unit HEAT 7 CH
Run # EPA 1
Date: 7/30/15

T1 0-60

60 ml

Woodstove Data Sheet #4-3: Constant Final Weights

WST5-Form 9, Pg 1, Rev 10/10

Final Beaker Weights

Beaker	Into	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
27	72.3309	7/31	1143	ATM	72.3347	7/31	1438	ESS	72.3335	8/1	6 14	ATM	(72.3334)	8/2	1841	

Final Filter Weights

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
F	711	.6520	7/30	2140	ATM	(.6518)	7/31	1439	ESS	.6517	8/1	1637	ATM				
												1.3018					
R	710	.6502	7/30	2140	ATM	(.6501)	7/31	1440	ESS	.6501	8/1	1638	ATM				

QA Reweigh: Final Weight

Date	Beaker #	Final Wt	By

Date	Filter #	Final Wt	By

Scale Room Environmental Conditions

Weighing Session	2015 Date	Time	By	WB	DB	%RH
1	7/31	1413	ESS	58	70	47
2	8/1	1547	ATM	54	66	45
3	8/2	1813	ATM	57	69	45
4						
5						
6						
7						

8	
9	
10	
11	
12	

Comment
7/31 0.0000 99.9995
8/1 0.0000 99.9996
8/2 0.0000 99.9996

Scale Room Environmental Conditions

70 ml

T1
60+

Unit HEAT (2011
Run # GP6 1
Date: 7/30/15

WST5-Form 9, Pg 1, Rev 10/10

Woodstove Data Sheet #4-3: Constant Final Weights

Final Beaker Weights

Beaker	Into	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
22	71.8522	7/31	1141	ATM	71.8565	7/31	1431	ESS	71.8561	8/1	1615	ATM	71.8561	8/2	1842	Bm

Final Filter Weights

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
F	706	.6526	7/30	2210	ATM	.6524	7/31	1435	ESS	.6523	8/1	1628	ATM				
R	707	.6252	7/30	2210	ATM	.6252	7/31	1433	ESS	.6252	8/1	1640	ATM				

QA Reweigh: Final Weight

Date	Beaker #	Final Wt	By

Date	Filter #	Final Wt	By

Scale Room Environmental Conditions

Weighing Session	2015 Date	Time	By	WB	DB	%RH
1	7/31	1413	ESS	58	70	47
2	8/1	1542	ATM	54	66	45
3	8/2	1813	ATM	57	69	45
4						
5						
6						
7						

8	
9	
10	
11	
12	

Comment
7/31 0.0000 99.9995
8/1 0.0000 99.9996
8/2 0.0000 99.9996

Scale Room Environmental Conditions

Train 1 Woodstove Particulate
Catch Processing Sheet
Woodstove Data Sheet #5
ASTM E 2515/ EPA M5G-1

Unit: HEAT TECH HTP 26 BAY
Run: EPA 1 **Train** 1
Date: 7/30/15
Technicians: ATM ESS
Revised 11/15 - Data Sheet #5

0-60 Minutes:
Filters:

Filter # (Front): 711 **Beaker #:** 27 **Final Wt.:** 72,3334 g
Tare Wt.: .6509 g **ml** 60 **Tare Wt.:** 72.3306 g
Filter # (Rear): 710 **Desiccant: Acetone** **Net Wt.:** .0028 g
Tare Wt.: .6503 g **Beaker Tare Wt,. Check:** 73,3306 g
0-60 Minute Combined Filter Final Weight: 1,3018 g
0-60 Minute Combined Filter Tare Weight: 1.3012 g
0-60 Minute Combined Net Catch Weight: .0006 g

60 Minutes Plus:

Filter # (Front): 706 **Beaker #:** 22 **Final Wt.:** 71,8561 g
Tare Wt.: .6465 g **ml** 70 **Tare Wt.:** 71,8342 g
Filter # (Rear): 707 **Desiccant: Acetone** **Net Wt.:** .0219 g
Tare Wt.: .6423 g **Beaker Tare Wt. Check:** 71,8340 g
60 Minute Plus Combined Filter Final Weight: 1,2775 g
60 Minute Plus Combined Filter Tare Weight: 1.2888 g
60 Minute Plus Combined Net Catch Weight: -.0113 g

Acetone Blank Calculation: **Blank Date:** 6/23/15 **Blank Beaker #:** 26 **Desiccant: 50 ml Acetone**
Final Wt.: 71,7869 g - **Tare Wt.:** 71,7869 g = **Net Catch Wt.:** .0000 g
Net Catch Weight: .0000 g / **50 ml Acetone =** .0000 **g/ml Acetone Blank Residual Value**

0-60 Minute Acetone Residue Value Calculation:
(.0000 g/ml Acetone)(60 ml Acetone) = .0000 g **Residue Value**

60 Minute Plus Acetone Residue Value Calculation:
(.0000 g/ml Acetone)(70 ml Acetone) = .0000 g **Residue Value**

Total Particulate Catch Calculations:	**0-60 Minute**	**60 Minute Plus**
Combined Filter Net Catch Weight:	.0006 g	-.0113 g
Acetone Wash Catch Weight:	.0028 g	.0219 g
Less Acetone Residual Value:	-.0000 g	-.0000 g
Equals Net Acetone Wash Catch:	.0028 g	.0219 g
Total Net Catch (Combined Filter + Acetone Catch):	.0034 g	.0106 g
	3.4 mg	10.6 mg

Total Train 1 Net Catch (0-60 Minute + 60 Minute Plus Catches): 14.0 mg

DILUTION TUNNEL CALCULATIONS

MYREN CONSULTING CERTIFICATION TEST DATA

10.11.15 MD=28.78 Bws = 2%

	6"Tunnel
File Name:	EPA 1 T 2
Manufacturer:	HEAT TECH
Model Number:	HTP 26 BAY
Lab Name:	MYREN
Test Date:	7.30.15
Run Number:	EPA 1 T 2
Meter Box Y Factor:	0.9685
Barometric Pressure (in Hg):	28.553
Dry Gas Meter Temp(avg.)(F):	**78**
Delta H(Avg.)(in H2)):	**0.750**
Gas meter initial reading:	355.9060
Gas meter final reading:	554.1460
Total Particulate Catch(mg):	12
Sampling Flow Rate(cfm):	0.551
Tunnel Flow (Qsd) (dscfm)	**140.291**
Emission Rate(g/hr):	**1.306**
Emission Factor(g/kg)	**1.309**
Avg. of Delta P Sq. Roots:	**0.2000**
Vs (Avg.)(ft/min):	**835.015**
Tunnel Avg. Temperature (F):	**116.946**
Test time(min):	360
Fuel Load: (lbs. Dry):	13.2020
Wood moisture(%wet):	5.700
Burn rate(dry kg/hr):	**0.998**
Sample Volume (dscf)	**180.125**
Avg. Tunnel Static (-inch H2O):	**0.0000**
Room Blank Catch (mg/dscf):	0.006276
Total PM Emissions(Er))(g):	**3.0477**
Pitot Correction Factor:	0.98122
Front Filter Number:	704
Back Filter Number:	705
Beaker number:	29
PRELIMINARY RESULTS	
FINAL RESULTS:	AUDITED

DATA SUMMARY

MODEL:	HTP 26 BAY
RUN:	EPA 1 T 2
DATE:	7.30.15
DBR:	0.998
EMISSION RATE (g/hr)(unadj):	1.3062
EMISSION FACTOR (g/kg):	3.0477
AVG. % PROPORTIONALITY :	99.941

RUN TIME (min)	PITOT DELTAP (in H2O)	TNL TEMP (°F)	GAS METER RDG (ft3)	GAS METER TEMP (°F)	GAS METER DELTA H (in.H2O)	TUNNEL VELOCITY (ft/min)	PROP RATE (%)	dDGM vol std (ft3)	Tunnel Static (- Inch H2O)	SQUARE ROOT DELTA P	DRY GAS METER READING (M3)
0	0.040	122	355.9060	64.0	0.750	838.66			0.000	0.20000	
10	0.040	123	361.3550	66.0	0.750	839.02	104.4	5.073	0.000	0.20000	
20	0.040	124	366.8150	70.0	0.750	839.74	103.5	5.054	0.000	0.20000	
30	0.040	124	372.2560	70.5	0.750	840.10	102.3	5.015	0.000	0.20000	
40	0.040	126	377.6970	72.5	0.750	840.82	102.0	5.003	0.000	0.20000	
50	0.040	126	383.2380	73.5	0.750	841.54	103.3	5.081	0.000	0.20000	
60	0.040	127	388.7830	74.5	0.750	841.90	103.0	5.075	0.000	0.20000	
70	0.040	124	394.2150	75.5	0.750	841.18	100.4	4.962	0.000	0.20000	
80	0.040	123	399.6470	76.5	0.750	839.74	99.8	4.953	0.000	0.20000	
90	0.040	123	405.2440	78.0	0.750	839.38	102.4	5.092	0.000	0.20000	
100	0.040	121	410.7740	78.5	0.750	838.66	100.7	5.021	0.000	0.20000	
110	0.040	120	416.3550	79.0	0.750	837.58	101.3	5.063	0.000	0.20000	
120	0.040	120	421.8320	80.0	0.750	837.22	99.1	4.962	0.000	0.20000	
130	0.040	121	427.3500	80.0	0.750	837.58	99.8	4.994	0.000	0.20000	
140	0.040	121	432.8950	81.0	0.750	837.94	100.1	5.014	0.000	0.20000	
150	0.040	123	438.3910	81.0	0.750	838.66	99.1	4.965	0.000	0.20000	
160	0.040	124	443.9380	81.0	0.750	839.74	100.2	5.011	0.000	0.20000	
170	0.040	124	449.4450	82.0	0.750	840.10	99.3	4.971	0.000	0.20000	
180	0.040	123	454.9790	81.5	0.750	839.74	99.6	4.993	0.000	0.20000	
190	0.040	116	460.5070	81.5	0.750	836.86	99.1	4.990	0.000	0.20000	
200	0.040	112	466.0180	80.5	0.750	832.88	98.4	4.979	0.000	0.20000	
210	0.040	110	471.5450	80.5	0.750	830.70	98.8	4.998	0.000	0.20000	
220	0.040	109	476.0640	80.5	0.750	829.61	80.7	4.086	0.000	0.20000	
230	0.040	108	482.5930	79.5	0.750	828.88	116.7	5.909	0.000	0.20000	
240	0.040	110	488.1100	79.5	0.750	829.25	98.9	4.998	0.000	0.20000	
250	0.040	109	493.6410	79.5	0.750	829.61	99.2	5.011	0.000	0.20000	
260	0.040	110	499.1340	79.5	0.750	829.61	98.5	4.976	0.000	0.20000	
270	0.040	110	504.6450	79.0	0.750	829.97	99.0	4.995	0.000	0.20000	
280	0.040	110	510.1530	79.5	0.750	829.97	98.9	4.992	0.000	0.20000	
290	0.040	110	515.6680	79.5	0.750	829.97	99.0	4.996	0.000	0.20000	
300	0.040	111	521.1610	79.5	0.750	830.34	98.6	4.976	0.000	0.20000	
310	0.040	110	526.6630	79.5	0.750	830.34	98.8	4.984	0.000	0.20000	
320	0.040	110	532.1600	79.5	0.750	829.97	98.6	4.980	0.000	0.20000	
330	0.040	110	537.6850	80.0	0.750	829.97	99.0	5.003	0.000	0.20000	
340	0.040	111	543.1630	80.0	0.750	830.34	98.2	4.958	0.000	0.20000	
350	0.040	111	548.6530	80.0	0.750	830.70	98.4	4.969	0.000	0.20000	
360	0.040	111	554.1460	80.0	0.750	830.70	98.5	4.972	0.000	0.20000	
370											
380											

T2

Black Round TOP

METHOD 5G - 1 **PARTICULATE SAMPLING DATA** **Rev. 10/09**

DATE: 7/30/15 **PAGE** 1 **OF** 2 **UNIT:** HEAT Tech HTP 26 Bay **RUN:** EPA 1

METER BOX: 511-M **METER Y:** 0.9685 **FILTER #'S: (F)** 704 **(R)** 705
.272/.273
FILTER/ O-RING ID # : —

PRE TEST LEAK CHECK: .001 **CFM @** -17.5 **IN HG** **FILTER SIZE:** 110 mm
.214/.215
PROBE ID # : —

541
944
9848

POST TEST LEAK CHECK: .001 **CFM @** -15.5 **IN HG** **PROBE LENGTH** 24 **IN**

TIME		METER READING		PITOT		TUNNEL TEMP	METER TEMP	GAS METER	VAC
CLOCK	ELAPSED	(m^3)	(ft^3)	ΔP	Pg	(°F)	(°F)	Δh	(in Hg)
1040	(00)	355.906		.040		122	64	.75	-0
50	10	361.355		.040		123	66	.75	0
1100	20	366.815		.040		124	70	.75	0
10	30	372.256		.040		124	70.5	.75	0
20	40	377.697		.040		126	72.5	.75	0
30	50	383.238		.040		126	73.5	.75	0
40	(60)	388.783		.040		127	74.5	.75	0
50	70	394.215		.040		124	75	.75	0
1200	80	399.647		.040		123	76.5	.75	0
10	90	405.244		.040		123	78	.75	0
20	100	410.774		.040		121	78.5	.75	0
30	110	416.355		.040		120	79	.75	0
40	(120)	421.832		.040		120	80	.75	0
50	130	427.350		.040		121	80	.75	0
1300	140	432.895		.040		121	81	.75	0
10	150	438.391		.040		123	81	.75	0
20	160	443.933		.040		124	81	.75	0
30	170	449.445		.040		124	82	.75	0
40	(180)	454.979		.040		123	81.5	.75	0
50	190	460.507		.040		116	81.5	.75	0

	BP		
00	28.60	300	28.52
60	28.59	360	28.51
120	28.58	—	—
180	28.54	—	—
240	28.53	AVG. =	28.553

Pre Test Filter Check Weighing
F .6473
R .6447

End of Test Weight
F .6560 R .6416
— —
— —
.6473 .6445

.0087

T2

METHOD 5G -1 **PARTICULATE SAMPLING DATA** **Rev. 10/09**

DATE: 7/30/15 **PAGE** 2 **OF** 2 **UNIT:** HGM Tech HTP 26 Boy **RUN:** EPA 1

METER BOX: 511-M **METER Y:** 0.9685 **FILTER #'S: (F)** 704 **(R)** 705

.272/.273 **FILTER/ O-RING ID # :** —

PRE TEST LEAK CHECK: .001 **CFM @** -17.5 **IN HG** **FILTER SIZE:** 110 mm

.214/.215 **PROBE ID # :** —

POST TEST LEAK CHECK: .001 **CFM @** -15.5 **IN HG** **PROBE LENGTH** 24 **IN**

TIME		METER READING	PITOT		TUNNEL TEMP	METER TEMP	GAS METER	VAC
CLOCK	ELAPSED	(m^3) (ft^3)	ΔP	Pg	(°F)	(°F)	Δh	(in Hg)
1400	200	466.018	.040		112	80.5	.75	0
10	210	471.545	.040		110	80.5	.75	0
20	220	476.064	.040		109	80.5	.75	0
30	230	482.593	.040		108	79.5	.75	0
40	240	488.110	.040		110	79.5	.75	0
50	250	493.641	.040		109	79.5	.75	0
1500	260	499.134	.040		110	79.5	.75	0
10	270	504.645	.040		110	79	.75	0
20	280	510.153	.040		110	79.5	.75	0
30	290	515.668	.040		110	79.5	.75	0
40	300	521.161	.040		111	79.5	.75	0
50	310	526.663	.040		110	79.5	.75	0
1600	320	532.160	.040		110	79.5	.75	0
10	330	537.685	.040		110	80	.75	0
20	340	543.163	.040		111	80	.75	0
30	350	548.653	.040		111	80	.75	0
40	360	554.146	.040		111	80	.75	0
	70							
	80							
	90							

BP

00	28.60	300	28.52
60	28.59	360	28.51
120	28.58	—	—
180	28.54	—	—
240	28.53	AVG. =	28.553

Pre Test Filter Check Weighing
F .6473
R .6447

End of Test Weight
F _____ R _____
_____ _____
_____ _____
.6473 .6445

Woodstove Data Sheet #4-3: Constant Final Weights

T2

Unit HEAT 7 .H HTP Boy
Run # EPA 1 26 Boy
Date: 7/30/15

WST5-Form 9, Pg 1, Rev 10/10

50 M1

Final Beaker Weights

Beaker	Into	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
29	71.5204	7/30	2130	ATM	71.5264	7/31	1446	ESS	71.5258	8/1	1606	ATM	71.5254	8/2	1845	Jm
					71.5254	8/3	957	ATM								

Final Filter Weights

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
F	704	.6560	7/30	1930	ATM	.6563	7/31	1448	ESS	.6561	8/1	1632	ATM	1.2976			
R	705	.6416	7/30	1930	ATM	.6416	7/31	1448	ESS	.6415	8/1	1634	ATM				

QA Reweigh: Final Weight

Date	Beaker #	Final Wt	By

Date	Filter #	Final Wt	By

Scale Room Environmental Conditions

Weighing Session	2015 Date	Time	By	WB	DB	%RH
1	7/31	1413	ESS	58	70	47
2	8/1	1547	ATM	54	66	45
3	8/2	1813	ATM	57	69	45
4	8/3	949	ATM	57	69	45
5						
6						
7						

Scale Room Environmental Conditions

8	
9	
10	
11	
12	

Comment

	8/1	8/2	8/3
7/31	0.0000	0.0000	
0.0000	99.9996	99.9996	
99.9995			

Train 2/ Room Blank Woodstove
Particulate Catch Processing Sheet
Woodstove Data Sheet #5
ASTM E 2515/ EPA M5G-1

T2

Unit: HEAT TECH HTP 26 Bay
Run: EPA 1 **Train** 2
Date: 7/30/15
Technicians: ATM ESS
Revised 11/15 - Data Sheet #5A

Filters:

Filter # (Front): 704 **Beaker #:** 29 **Final Wt.:** 71.5254 g
Tare Wt.: .6473 g ml 50 **Tare Wt.:** 71.5192 g
Filter # (Rear): 705 **Desiccant: Acetone** **Net Wt.:** .0062 g
Tare Wt.: .6445 g **Beaker Tare Wt,. Check:** 71.5191 g
Combined Filter Final Weight: 1.2976 g
Combined Filter Tare Weight: 1.2918 g
Combined Net Catch Weight: .0058 g

Acetone Blank Calculation: **Blank Date:** 6/23/15 **Blank Beaker #:** 26 **Desiccant: 50 ml Acetone**
Final Wt.: 71.7869 g - **Tare Wt.:** 71.7869 g = **Net Catch Wt.:** .0000 g
Net Catch Weight: .0000 g / **50 ml Acetone =** .0000 g/ml **Acetone Blank Residual Value**

Acetone Residue Value Calculation:

(.0000 g/ml Acetone)(50 ml Acetone) = .0000 g **Residue Value**

Total Particulate Catch Calculations:

Combined Filter Net Catch Weight: .0058 g
Acetone Wash Catch Weight: .0062 g
Less Acetone Residual Value: -.0000 g
Equals Net Acetone Wash Catch: .0062 g
Total Net Catch (Combined Filter + Acetone Catch): .0120 g
12.0 mg

ROOM BLANK SAMPLE FLOW PROPORTIONALITY MYREN CONSULTING CERTIFICATION TEST DATA

5/1/2008

File Name:	EPA 1 T 3
Manufacturer:	HEAT TECH
Model Number:	HTP 26 BAY
Lab Name:	MYREN
Test Date:	7.30.15
Run Number:	EPA 1 T 3
ıitial Meter Reading (cf):	4917.2142
Final Meter Reading (cf):	5108.6762
Test Time (Min):	360.0
\verage Sample Rate (cfm):	0.532
Preliminary Results:	
Final results:	X
BP:	28.553
Average Δh:	0.115
Dry Gas Meter Temp (F):	75.7
Sample Volume (dscf):	175.270
Dry Gas Meter Y:	0.9734
:al Room Blank Catch (mg):	1.100
Room Blank mg/dscf	0.006276
Avg. Sampling Rate $\Delta_{s(s)}$:	-0.463

NOTE: THE SAMPLED VOLUME FOR EACH SAMPLING INTERVAL MUST BE WITHIN 20% OF THE SAMPLE VOLUME FOR THE FIRST SAMPLING INTERVAL SEE ASTM E2515 SECTION 9.8.1

RUN TIME (min)	GAS METER READING (Cu, Ft,)	INTERVAL SAMPLE VOLUME (Cu. Ft.)	SAMPLING RATE % DIFFERENCE	INTERVAL SAMPLING RATE (cfm)	DRY GAS METER READING (M3)	DRY GAS METER Δh	DRY GAS TEMP F
0	4917.2142				139.24000	0.115	66.00
10	4922.5573	5.3431	0.0000	0.53431	139.39130	0.115	69.5
20	4927.8969	5.3396	-0.0661	0.53396	139.54250	0.115	72.0
30	4933.2259	5.3290	-0.2644	0.53290	139.69340	0.115	74.0
40	4938.5584	5.3325	-0.1983	0.53325	139.84440	0.115	75.0
50	4943.8874	5.3290	-0.2644	0.53290	139.99530	0.115	77.5
60	4949.2129	5.3255	-0.3305	0.53255	140.14610	0.115	77.5
70	4954.5418	5.3290	-0.2644	0.53290	140.29700	0.115	78.5
80	4959.8143	5.2725	-1.3219	0.52725	140.44630	0.115	79.5
90	4965.1610	5.3466	0.0661	0.53466	140.59770	0.115	81.0
100	4970.4793	5.3184	-0.4627	0.53184	140.74830	0.115	81.0
110	4975.8295	5.3502	0.1322	0.53502	140.8998	0.115	81.5
120	4981.3139	5.4844	2.6438	0.54844	141.0551	0.115	82.0
130	4986.4663	5.1524	-3.5691	0.51524	141.2010	0.115	82.5
140	4991.7953	5.3290	-0.2644	0.53290	141.3519	0.115	83.0
150	4997.1349	5.3396	-0.0661	0.53396	141.5031	0.115	83.5
160	5002.4638	5.3290	-0.2644	0.53290	141.6540	0.115	83.5
170	5007.7893	5.3255	-0.3305	0.53255	141.8048	0.115	79.0
180	5012.7475	4.9582	-7.2042	0.49582	141.9452	0.115	76.5
190	5018.4119	5.6645	6.0145	0.56645	142.1056	0.115	75.0
200	5023.7480	5.3360	-0.1322	0.53360	142.2567	0.115	74.0
210	5029.0593	5.3113	-0.5948	0.53113	142.4071	0.115	73.5
220	5034.4095	5.3502	0.1322	0.53502	142.5586	0.115	73.5
230	5039.7032	5.2937	-0.9253	0.52937	142.7085	0.115	73.0
240	5045.0110	5.3078	-0.6609	0.53078	142.8588	0.115	72.5
250	5050.3046	5.2937	-0.9253	0.52937	143.0087	0.115	73.0
260	5055.6089	5.3043	-0.7270	0.53043	143.1589	0.115	73.0
270	5060.9237	5.3149	-0.5288	0.53149	143.3094	0.115	73.0
280	5066.2351	5.3113	-0.5948	0.53113	143.4598	0.115	73.0
290	5071.5252	5.2901	-0.9914	0.52901	143.6096	0.115	73.0
300	5076.8365	5.3113	-0.5948	0.53113	143.7600	0.115	73.0
310	5082.1620	5.3255	-0.3305	0.53255	143.9108	0.115	73.0
320	5087.4592	5.2972	-0.8592	0.52972	144.0608	0.115	73.0
330	5092.7599	5.3007	-0.7931	0.53007	144.2109	0.115	73.0
340	5098.0818	5.3219	-0.3966	0.53219	144.3616	0.115	73.0
350	5103.3967	5.3149	-0.5288	0.53149	144.5121	0.115	74.0
360	5108.6762	5.2795	-1.1897	0.52795	144.6616	0.115	73.5
370							
380							

RB

METHOD 5G-1 **PARTICULATE SAMPLING DATA** **Rev. 10/09**

DATE: 7/30/15 **PAGE** 1 **OF** 2 **UNIT:** Heat Tech FITP 36 Bay **RUN:** EPA 1

METER BOX: RBT **METER Y:** 0.9734 **FILTER #'S: (F)** 703 **(R)** ——

,2290/,2290 ,0002 CMM **FILTER/ O-RING ID # :** ——

PRE TEST LEAK CHECK: .000 **CFM @** -10D **IN HG** **FILTER SIZE:** 110 **mm**

,6628/,6628 **PROBE ID # :** ——

POST TEST LEAK CHECK: .000 **CFM @** -10.25 **IN HG** **PROBE LENGTH** N/A **IN**

TIME		METER READING	PITOT		TUNNEL TEMP	METER TEMP	GAS METER	VAC
CLOCK	ELAPSED	(m^3) (ft^3)	ΔP	Pg	(°F)	(°F)	Δh	(in Hg)
1040	00	139.2400				66	.115	-1.50
50	10	139.3913				69.5	.115	-1.50
1100	20	139.5425				72	.115	-1.50
10	30	139.6934				74	.115	-1.50
20	40	139.8444				75	.115	-1.50
30	50	139.9953				77.5	.115	-1.50
40	60	140.1461				77.5	.115	-1.50
50	70	140.2970				78.5	.115	-1.50
1200	80	140.4463				79.5	.115	-1.50
10	90	140.5972				81	.115	-1.50
20	100	140.7483				81	.115	-1.50
30	110	140.9989				81.5	.115	-1.50
40	120	141.0551				82	.115	-1.50
50	130	141.2010				82.5	.115	-1.50
1300	140	141.3519				83	.115	-1.50
10	150	141.5031				83.5	.115	-1.50
20	160	141.6540				83.5	.115	-1.50
30	170	141.8048				79	.115	-1.50
40	180	141.9452				76.5	.115	-1.50
50	190	142.1056				75	.	-1.50

	BP		BP
00	28.60	300	28.52
60	28.59	360	28.51
120	28.58	___	___
180	28.54	___	___
240	28.53	AVG.=	28.553

Pre Test Filter Check Weighing
F .6456
R _____

End of Test Weight
F .6446 R _____
_____ _____
_____ _____
.6455
-0.9

RB

METHOD 5G - 1 **PARTICULATE SAMPLING DATA** **Rev. 10/09**

DATE: 7/30/15 **PAGE** 2 **OF** 2 **UNIT:** HEAT Tech HTP 26 BAY **RUN:** EPA 1

METER BOX: RBT **METER Y:** 0.9734 **FILTER #'S: (F)** 703 **(R)** —

.2290/.2290 .0000 CMM **FILTER/ O-RING ID # :** —

PRE TEST LEAK CHECK: .000 **CFM @** -18.0 **IN HG** **FILTER SIZE:** 110 **mm**

.6629/.6628 0.0000 CMM **PROBE ID # :** —

POST TEST LEAK CHECK: 0.000 **CFM @** -10.25 **IN HG** **PROBE LENGTH** N/A **IN**

TIME		METER READING	PITOT		TUNNEL TEMP	METER TEMP	GAS METER	VAC
CLOCK	ELAPSED	(m^3) (ft³)	ΔP	Pg	(°F)	(°F)	Δh	(in Hg)
1400	200	142.2567				74	.115	-1.50
10	210	142.4071				73.5	.115	-1.50
20	220	142.5586				73.5	.115	-1.50
30	230	142.7085				73	.115	-1.50
40	(240)	142.8586				72.5	.115	-1.50
50	250	143.0088				73	.115	-1.50
1500	260	143.1589				73	.115	-1.50
10	270	143.3094				73	.115	-1.50
20	280	143.4598				73	.115	-1.50
30	290	143.6096				73	.115	-1.50
40	(300)	143.7600				73	.115	-1.50
50	310	143.9108				73	.115	-1.50
1600	320	144.0608				73	.115	-1.50
10	330	144.2109				73	.115	-1.50
20	340	144.3616				73	.115	-1.50
30	350	144.5121				74	.115	-1.50
40	(360)	144.6616				73.5	.115	-1.50
	70							
	80							
	90							

BP

00	28.60	300	28.52
60	28.59	360	28.51
120	28.58	—	—
180	28.54	—	—
240	28.53	AVG.=	28.553

Pre Test Filter Check Weighing
F .6455
R _____

End of Test Weight
F _____ R _____
_____ _____
_____ _____
.6455

HTR 26 Boy

40 ml

RB

Woodstove Data Sheet #4-3: Constant Final Weights

Unit HEAT 3 SH
Run # EPA 1
Date: 7/30/15
WST5-Form 9, Pg 1, Rev 10/10

Final Beaker Weights

Beaker	Into	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
23	70.7370	7/30	2133	ATM	70.7412	7/31	1442	ESS	70.7406	8/1	1613	AM	70.7407	8/2	1843	Jon

Final Filter Weights

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
F	703	.6446	7/30	1930	ATM	.64146	7/31	1443	ESS	.64414	8/1	1635	AM				
R																	

QA Reweigh: Final Weight

Date	Beaker #	Final Wt	By

Date	Filter #	Final Wt	By

Scale Room Environmental Conditions

Weighing Session	2015 Date	Time	By	WB	DB	%RH
1	7/31	1413	ESS	58	70	47
2	8/1	1647	ATM	54	66	45
3	8/2	1813	ATM	57	69	45
4						
5						
6						
7						

Scale Room Environmental Conditions

8						
9						
10						
11						
12						

Comment
7/31 0.0000 99.9995
8/1 0.0000 99.9996
8/2 0.0000 99.9996

Train 2/ Room Blank Woodstove
Particulate Catch Processing Sheet
Woodstove Data Sheet #5
ASTM E 2515/ EPA M5G-1

RB
T3

Unit: HEM TECH HTP 26 BAY
Run: EPA 1 **Train** 3
Date: 7/30/15
Technicians: ATM ESS
Revised 11/15 - Data Sheet #5A

Filters:

Filter # (Front): 703 **Beaker #:** 23 **Final Wt.:** 70.7407 g
Tare Wt.: .6455 g **ml** 40 **Tare Wt.:** 70.7385 g
Filter # (Rear): — **Desiccant: Acetone** **Net Wt.:** .0022 g
Tare Wt.: — g **Beaker Tare Wt,. Check:** 70.7385 g
Combined Filter Final Weight: .6444 g
Combined Filter Tare Weight: .6455 g
Combined Net Catch Weight: -.0011 g

Acetone Blank Calculation: **Blank Date:** 6/26/15 **Blank Beaker #:** 26 **Desiccant: 50 ml Acetone**
Final Wt.: 71.7869 g - **Tare Wt.:** 71.7869 g = **Net Catch Wt.:** .0000 g
Net Catch Weight: .0000 g / **50 ml Acetone =** .0000 **g/ml Acetone Blank Residual Value**

Acetone Residue Value Calculation:
(.0000 **g/ml Acetone)(** 40 **ml Acetone) =** .0000 **g Residue Value**

Total Particulate Catch Calculations:

Combined Filter Net Catch Weight:		-.0011 g
Acetone Wash Catch Weight:	.0022 g	
Less Acetone Residual Value:	-.0000 g	
Equals Net Acetone Wash Catch:		.0022 g
Total Net Catch (Combined Filter + Acetone Catch):		.0011 g
		1.1 mg

Woodstove Data Sheet 4-4 Scale QC Record Sheet
Scale 2

From: 5/8/15
Through: 7/5/15
100+20+10+5

50 2015

Scale: Sartorius
Model: CPA 2245
SN: 24850860
Rev: 5/10

Level	Recali-brated	135g Weights	100g Weight	10g Weight	1.0 g Weight	100mg Weight	[illegible] mg Weight	Date	Time	Tech	BP	Wet Bulb	Dry Bulb	% RH	Lims Vol#
Yes	No	134.9997	99.9996	10.0000	1.0000	0.1000	0.0501	5/8/15	1311	ATM	28.48	55	67	45	119
Yes	Yes	134.9995	99.9994	10.0000	0.9999			5/29/15	936	ATM	28.56				119
Yes	No	134.9996	99.9995	9.9999	0.9999	0.1000	0.0501	5/30/15	905	ATM	28.57	65	78	49	118
Yes	No	134.9994	99.9994	10.0000	1.0000	0.1000	0.0501	6/2/15	843	ATM	28.40	62	75	47	119
Yes	NO	134.9994	99.9994	9.9999	1.0000	0.1000	0.0502	6/3/15	921	ESS	28.49	57	69	46	118
Yes	No	134.9995	99.9994	9.9999	0.9999	0.0999	0.0500	6/4/15	824	ATM	28.52	59	71	48	116
Yes	No	134.9997	99.9996	9.9999	0.9999	0.0999	0.0500	6/6/15	1028	ATM	28.61	60	72	49	118
Yes	No	134.9996	99.9995	9.9999	0.9999	0.1000	0.0500	6/8/15	11110	ATM	28.42	59	76	40	117
Yes	No	134.9997	99.9996	9.9999	1.0000	0.1000	0.0501	6/10/15	1437	ATM	28.32	56	68	47	116
Yes	No	134.9996	99.9996	9.9999	1.0000	0.1000	0.0500	6/11/15	2245	ATM	28.30	56	68	47	117
Yes	No	134.9996	99.9995	9.9999	1.0000	0.1000	0.0501	6/12/15	2138	ATM	28.50	55	67	46	120
Yes	No	134.9995	99.9995	10.0000	1.0000	0.1000	0.0501	6/13/15	833	ATM	28.52	54	65	48	119
Yes	No	134.9995	99.9994	10.0000	1.0000	0.1000	0.0501	6/11/15	15:14	ATM	28.46	53	64	47	118
Yes	No	134.9996	99.9996	10.0000	1.0000	0.1000	0.0500	6/17/15	13:39	ATM	28.38	57	69	46	116
Yes	No	134.9996	99.9995	10.0000	1.0000	0.0999	0.0501	6/18/15	17:30	ATM	28.42	56	68	46	119
Yes	No	134.9996	99.9995	9.9999	1.0000	0.1000	0.0501	6/20/15	1547	ATM	28.40	56	68	46	119
Yes	NO	134.9997	99.9996	9.9999	1.0000	0.1001	0.0501	6/22/15	1432	ESS	28.46	55	67	45	118
Yes	NO	134.9996	99.9995	9.9999	0.9999	0.1000	0.0501	6/23/15	12:18	ATM	28.49	55	68	42	117
Yes	NO	134.9996	99.9996	9.9999	1.0000	0.1000	0.0501	6/24/15	1434	ESS	28.49	58	70	48	119
Yes	No	134.9996	99.9995	9.9999	1.0000	0.1000	0.0501	6/25	839	ATM	28.60	56	69	43	117
Yes	NO	134.9995	99.9996	9.9999	1.0000	0.1001	0.0501	6/26/15	1233	ESS	28.51	57	69	46	114
Yes	No	134.9995	99.9995	10.0000	1.0000	0.1000	0.0501	6/27/15	2222	ATM	28.405	58	71	45	120
Yes	NO	134.9995	99.9995	9.9999	1.0000	0.1000	0.0502	6/30/15	1433	ESS	28.47	59	71	48	119
Yes	No	134.9997	99.9996	10.0000	1.0000	0.1000	0.0500	7/1/15	1309	ATM	28.435	57	70	44	116
Yes	NO	134.9995	99.9995	9.9999	0.9999	0.0999	0.0500	7/2/15	1354	ATM	28.49	58	70	48	116
Yes	No	134.9996	99.9995	9.9999	1.0000	0.1000	0.0501	7/5/15	1912	ATM	28.38	58	70	48	119

From: 7/17/15
Through: 9/10/15

Woodstove Data Sheet 4-4 Scale QC Record Sheet
Scale 2

Scale: Sartorius
Model: CPA 2245
SN: 24850860
Rev: 5/10

Level	Recali-brated	100g Weight	10g Weight	1g Weight	100mg Weight	10mg Weight	DATE	TIME	TECH	BP	LINE VOLTS	WET BULB	DRY BULB	% RH
Yes	No	99.9994	10.0000	1.0000	0.1000	.0100	7/17/15	1900	ATM	28.40	119	55	67	45
Yes	No	99.9995	10.0000	1.0000	.1000	.0100	7/18/15	1957	ATM	28.37	120	57	70	44
Yes	No	99.9994	10.0000	1.0000	.0999	.0100	7/19/15	1413	ATM	28.42	121	57	70	44
Yes	NO	99.9994	9.9999	1.0000	0.1000	0.0101	7/20/15	1022	ESS	28.40	118	57	69	46
Yes	No	99.9996	10.0000	1.0000	0.1000	0.0100	7/21/15	1358	ATM	28.28	116	55	66	48
Yes	NO	99.9995	9.9999	0.9999	0.1000	0.0100	7/22/15	1606	ESS	28.27	116	54	65	47
Yes	No	99.9995	9.9999	1.0000	0.1000	0.0100	7/23/15	1205	ATM	28.33	118	54	65	47
Yes	NO	99.9994	10.0000	0.9999	0.1001	0.0101	7/24/15	1525	ESS	28.38	118	55	66	48
Yes	No	99.9996	10.0000	1.0000	0.0999	0.0100	7/26/15	1421	ATM	28.42	118	57	69	47
Yes	No	99.9996	9.9999	0.9999	0.1000	0.0100	7/28/15	1603	ATM	28.58	118	56	67	47
Yes	NO	99.9995	10.0000	1.0000	0.1000	0.0101	7/29/15	1325	ESS	28.57	117	56	68	46
Yes	No	99.9994	9.9999	1.0000	0.1000	0.0100	7/30/15	949	ATM	28.60	119	55	66	48
Yes	NO	99.9995	9.9999	1.0000	0.1000	0.0100	7/30/15	2105	ATM	28.48	118	56	67	48
Yes		99.9995	9.9999	0.9999	0.1000	0.0100	7/31/15	1413	ESS	28.45	116	58	70	48
Yes	No	99.9995	9.9999	1.0000	0.1000	0.0101	8/1/15	1547	ATM	28.33	118	54	66	45
Yes	No	99.9995	9.9999	0.9999	0.0999	0.0100	8/2/15	1813	ATM	28.27	120	57	69	45
Yes	No	99.9995	9.9999	1.0000	0.1000	0.0100	8/3/15	949	ATM	28.30	120	57	69	45
Yes	NO	99.9994	9.9999	1.0000	0.1000	0.0101	8/12/15	1038	ESS	28.43	120	57	69	45
Yes	No	99.9994	9.9999	0.9999	0.1000	0.0100	8/18/15	1530	ATM	28.42	119	58	70	48
Yes	No	99.9996	9.9999	0.9999	0.0999	0.0100	8/19/15	0636	ATM	28.42	119	57	69	45
Yes	No	99.9995	10.0000	1.000	0.1000	0.0100	8/19/15	2244	ATM	28.20	119	58	70	48
Yes	NO	99.9995	10.0000	0.9999	0.1000	0.0101	8/20/15	1610	ESS	28.20	119	58	70	48
Yes	NO	99.9995	10.0000	1.0000	0.0999	0.0100	8/26/15	1425	ESS	28.40	118	57	70	43
Yes	No	99.9994	10.0000	0.9999	0.1000	0.0100	8/28/15	1200	ESS	28.48	119	58	70	48
Yes	NO	99.9995	9.9999	1.0000	0.1000	0.0100	8/31/15	1547	ESS	28.40	118	57	69	47
Yes	NO	99.9995	10.0000	1.0000	0.1000	0.0100	9/10/15	1047	AM	28.50	117	56	68	46

HTP 26 Bay

Unit: HEAT TECH
Run # EPA 1
Date: 7/ 1/15
Technician: ATM ESS
WST6-Form1, Rev 6/11

Miscellaneous Test Data
Woodstove Data Sheet #8

Useable Firebox Dimensions: See QC Section Useable Volume: N/A ft^3

Dilution Tunnel Draft (If Applicable):Start: .000 Stop: .000 Avg: .000 in. H_2O

Test Chamber Air Velocity: Start: 70, 65 Stop: 75, 410 Avg: 5 ft./m.

Wet Bulb/ Start: WB: 59 °F DB: 72 °F % Amb Moisture: 1.25 %RH: 45

Dry Bulb Stop: WB: 60 °F DB: 78 °F % Amb Moisture: 1.10 %RH: 39

X Ambient Moisture(%Vol.) = 1.175 % X Relative Humidty (%RH) = 42.0 %

Empty Stove Wt: 185.7 lbs.

Empty Stove Wt with Stack (inc oil seal) Wet: N/A lbs. Dry: N/A lbs.

Empty Stove Wt with Stack and Ash Ash: — lbs. Total: — lbs.

Kindling Wt. Paper: N/A lbs. Wood: N/A lbs. Total: — lbs.

Pre Burn Fuel Wt. 4.5 + 4.5 Total: 9.0 lbs.

Total Kindling and Pre Burn Fuel Wt. 9.0 lbs.

Coal Bed Wt.: Range(N/A - N/A) lbs. Actual: — lbs.

Allowable Amount of Charcoal That Can Be Removed:

Coal Bed Wt. Range (N/A (Upper Wt.) + N/A (Lower Wt.) /2) .25 = N/A lbs.

Test Fuel Wt.: Ideal N/A lbs. Range: N/A lbs. Actual: 14.0 lbs.

Test Fuel Size (pcs.) (.75 x 1.5 x 5" Spacers): N/A Pcs. N/A lbs.

2 x 4's x N/A " N/A Pcs. N/A lbs. N/A %

4 x 4's x N/A " N/A Pcs. N/A lbs. N/A %

Est. Dry Burn Rate(Kg/Hr.) $\frac{14.0 - (14.0 \times .057)}{2.2046} \times \frac{60}{360} = .9981$ Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HO_E)(Avg BTU's/Hr)(19,140) X 78 x .9981 = 14,901

100 EPA Heat Output (HO_E)BTU's/Hr

STOVE OPERATION

The after cleaning out the stove and stack before the start of the certification, the hopper was filled with pellets and stove was started with the controls set at "Manual". After the stove went thru its "Start" cycle (approximately 10 minutes), the controls were turned to "HIGH" and it ran for about 1 hour as we finished preparing for the test. Then Preburn was started, which lasted another hour. After 60 minutes of preburn, the stove's controls were left on "High" for the first hour of the test. At 60 minutes the stove's controls were set to "Medium". At 180 minutes the stove's controls was turned down to "Low".

Wood Density Determination
Woodstove Test Data Sheet #11

Unit: Heat Tech HTP 26 Boy
Run#: EPA 1
Date: 7/30/15
Technician: ATM ESS

Rev 5/10

Wood Piece: Nominal Dimensions: _____ X _____ X _____

Depth (D): _____ cm
Width (W): _____ cm
Length(L): _____ cm
_____ cm Length $\overline{X}$ = _____ cm
_____ cm
_____ cm Volume: _____ cm^3

(D x W x L)

Room Temperature: _____ °F Correction Factor: _____

Meter Readings Corrected for temperature: Yes_____ No_____

Note: Record Moisture Meter readings to the nearest 0.5% or 0.1%

	Uncor	Cor	Avg % Moisture (Dry)_____%
Top:		%	
Bottom:		%	Avg % Moisture (Wet)_____%
Side:		%	Scale: Leveled In_____ Out_____
$\overline{X}$:		%	Zeroed: In_____ Out_____

Wet Weight: _____ g Dry Weight: _____ g

% Moisture Dried Basis: _____%

([1 – (Dry Wt/Wet Wt)] X 100)

Density = _____g/ _____cm^3 = _____g/cm^3

(dry wt) (volume)

	Date	Time	Temp
Into Dryer	7/30/15	1605	216 °F
Out of Dryer	8/6/15	942	218 °F

(Minimum Time in Dryer: 24 hrs.)

No # (#63)

Pellet Fuel Moisture Content Determintation

Pellet Name: Bear Mountain
Pellet Manufacturer: Bear Mountain
Pellet Grade: Premium Plus

Tare Beaker Wt. 70.6254 g

Wet Wt: 165.0159 g - 70.6254 g = 94.3905 g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: 159.6379 g - 70.6254 g = 89.0125 g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

% Moisture Wet Basis: 5.6976 % = 5.70%

[1 – (Net Dry Wt./Net Wet Wt.)] X 100

MYREN CONSULTING, INC.
ASTM E 2779 Pellet Stove Equations.
Forms/ Pellet Stoves/ Eqns. Rev 12.15.15

UNIT: Hearth Tech MP26 Ex
RUN #: EPA 1
DATE: 7/20/15
TECH: ATM ESS

ASTM 2779 EQN 1: Pounds of Dry Fuel Burnt, db. (Revised)

$M_{Bdb} = ((M_{Swb} - M_{Ewb}) - ((M_{Swb} - M_{Ewb})(FM_{wb}/100)))$

FM_{wb} = average fuel moisture of test fuel, % wet basis.
M_{Sdb} = Weight of the test fuel in the hopper at the start of the test run, wet basis, kg (lb).
M_{Ewb} = Weight of the test fuel in the hopper at the start of the test run, wet basis, kg (lb), and
M_{Bdb} = Weight of the fuel burnt during the test run, dry basis, kg(lb).
2.2046 = lbs/ kg

14.0

M_{Bdb} = ((270.1 - 256.1) – ((270.1 - 256.1) (5.700/100))) = 13.202 lbs./ 2.2046 = 5.9884 kg

ASTM 2779 EQN 2: Pounds of Dry Fuel Burnt During a Test Segment (S_i), db. (Revised)

$M_{Bdb} = ((M_{SSiwb} - M_{ESiwb}) - ((M_{SSiwb} - M_{ESiwb})FM_{wb}))$

FM_{wb} = average fuel moisture of test fuel, % wet basis.
M_{SSidb} = Weight of the test fuel in the hopper at the start of the test run, wet basis, kg (lb).
M_{ESiwb} = Weight of the test fuel in the hopper at the start of the test run, wet basis, kg (lb), and
M_{BSidb} = Weight of the fuel burnt during the test run, dry basis, kg(lb).
2.2046 = lbs/ kg

4.2

M_{BSidb} = ((270.1 - 265.9) – ((270.1 - 265.9) (5.70/100))) = 3.9606 lbs./ 2.2046 = 1.7965 kg

ASTM 2779 EQN 3: Average Dry Burn Rate (DBR)

BR(DBR) = (60 (M_{Bdb}))/Θ = (60(5.9884))/ 360 = 0.9981 kg/h

BR (DBR) = average dry burn rate over the full integrated test run, kg/h (lb/h), and
Θ = total length of the full integrated test run, min.

ASTM 2779 EQN 4: Average Dry Burn Rate (DBR) During a Test Run Segment (S_i)

BR(DBR) = 60 (M_{BSidb})/Θ = (60(1.7965))/ 60 = 1.7965 kg/h

BR (DBR) = average dry burn rate over the test run segment *i*, kg/h (lb/h), and
Θ = total length of test run segment *i*, min.

HTP 26

Pre Burn Data
Record Sheet #13

Unit: HEAT TECH Date: 7/30/15
Run: EPA 1 Technician(s): ATM ESS
Page: 1 of 1 WST2-Form 16, Rev 6/11

Preburn Start Wt. 274.6 Lbs. Up — lbs.
Test Start Wt Range — lbs.
Baro. Pressure 28.60 "Hg

Hot Box On ✓

Minute/🕐	Scale Weight	Burn Rate	T/C# 1 Stack	2 Stove Top	3 Left Side	4 Back	5 Right Side	6 Bottom	7 Firebox	8 2nd Burn Catalytic	9 Room Temp	Static	19 Stack C1'	Comments
0 930	274.6	0.0	280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	75	-.035	330	Primary Air Set At MAX
5 935	274.2	.4	332	|	|	|	|	|	|	|	79	-.053	378	Secondary Air Set At N/A
10 940	273.9	.3	364	|	|	|	|	|	|	|	83	-.057	420	Fan: MAX
15 945	273.6	.3	374	|	|	|	|	|	|	|	84	-.059	424	Tunnel on at: 956
20 950	273.3	.3	385	|	|	|	|	|	|	|	87	-.059	435	Buckets Iced ✓
25 955	273.0	.3	400	|	|	|	|	|	|	|	83	-.061	456	Analyzers Spanned ✓
30 1000	272.7	.3	402	|	|	|	|	|	|	|	83	-.061	464	Pumps Turned on at: ✓
35 05	272.3	.4	412	|	|	|	|	|	|	|	83	-.063	472	ΔT ΔΔT
40 10	272.0	.3	413	|	|	|	|	|	|	|	84	-.062	470	
45 15	271.7	.3	407	|	|	|	|	|	|	|	83	-.061	460	
50 20	271.4	.3	414	|	|	|	|	|	|	|	84	-.061	477	
55 25	271.1	.3	414	|	|	|	|	|	|	|	84	-.061	475	Tunnel ΔP
X	—		—	|	—	|	|	—	|	—		—	X	Probe In Tunnel
60 1030	270.7	.4	424	|	|	|	|	|	|	|	85	-.062	476	
65 35	270.3	.4	417	|	|	|	|	|	|	|	85	-.061	475	
70 40	270.1	.2	422	|	|	|	|	|	|	|	89	-.064	492	
75				|	|	|	|	|	|	|				
80				|	|	|	|	|	|	|				
85		4.5	lbs burnt during preburn											
90														
95														
100														
105														
110														
115														

Myren Consulting Inc Data Sheet #14 P 1 of 7 Unit HEAT TECH HTP 26 Day Date 7 / 30 / 15 Run EPA 1

Test End Wt. ______ ΔT ______ Barometric Pressure 28.60 "Hg Gas Flow @ 1.5" Technician(s) AJM ESS

Time E/T Min	Time ⏲	Scale WT.	Lbs. Left	Burn Rate	CO_2 V.	CO_2 %	O_2 %	CO V.	CO %	Gas Bal	Stack Temp #1	Stack Static Pressure	Opacity		#18 T8 Notes P. Cond	Stack @ 1'	Cgn Inlet vac
0	1040	270.1	14.0	0.0	.250	6.28	14.65	.003	.03	209.3	422	-.064			62	492	-13.5
05	45	269.7	13.6	.4	.280	7.03	13.91	.001	.01	703.0	425	-.064	C		43	488	-13.2
10	50	269.3	13.2	.4	.252	6.33	14.60	.002	.02	316.5	425	-.064	"		40	489	-13.2
15	55	269.0	12.9	.3	.255	6.40	14.53	.001	.01	640.5	425	-.063	"		40	492	-13.2
20	1100	268.7	12.6	.3	.240	6.03	14.90	.002	.02	301.4	421	-.061	"		41	481	-13.1
25	05	268.5	12.4	.2	.310	7.78	13.16	.001	.01	777.9	425	-.063	"		41	495	-13.1
30	10	268.1	12.0	.4	.261	6.55	14.38	.001	.01	655.5	428	-.062	"		41	492	-13.0
35	15	267.6	11.5	.5	.275	6.90	14.03	.001	.01	690.5	427	-.062	"		41	491	-13.0
40	20	267.4	11.3	.2	.231	5.80	15.13	.001	.01	580.5	424	-.062	"		41	489	-13.0
45	25	267.1	11.0	.3	.226	5.68	15.26	.001	.01	568.0	424	-.060	"		41	495	-13.0
50	30	266.6	10.5	.5	.230	5.78	15.15	.002	.02	289.0	423	-.061	"		42	474	-13.0
55	35	266.4	10.3	.2	.264	6.63	14.30	.002	.02	331.5	425	-.061	"		42	490	-13.0
Total											5094	-.747					

Time E/T Min	Time ⏲	Top #2	Left #3	Back #4	Right #5	Bottom #6	Firebox #7	Fr. 2nd #8	Amb #9	Tnl. #10	C Gas Box #11	C Gas Impin #12	T1 Part. Filt. #13	T1 Part. Cond. #14	T2 Part Filt #15	T2 Part Cond #16	T3 Part Filt #17
0	1040	NA	N/A	N/A	N/A	N/A	N/A	N/A	89	122	222	34	68	59	70	65	73
05	45								88	122	221	34	72	40	75	45	75
10	50								88	123	222	34	76	40	81	44	78
15	55								88	122	224	34	79	40	83	44	80
20	1100								89	124	225	34	81	40	84	44	81
25	05								89	124	225	34	81	40	84	44	81
30	10								89	124	225	34	81	41	83	44	79
35	15								89	126	225	34	81	41	83	44	79
40	20								89	126	225	34	81	41	83	44	79
45	25								89	126	225	34	81	41	83	45	79
50	30								90	126	225	34	82	42	84	45	79
55	35								90	127	225	34	82	42	84	45	79
Total									1067								

Myren Consulting Inc Data Sheet #14 P 2 of 7 Unit HEAT TECH HTP 26 Boiler Date 7/30/15 Run EPA 1

Test End Wt. _____ ΔT _____ Barometric Pressure 28.59 "Hg Gas Flow @ 1.5" Technician(s) AM & SS #19 Orifice

Time E/T Min	Time @	Scale WT.	Lbs. Left	Burn Rate	CO_2 V.	CO_2 %	O_2 %	CO V.	CO %	Gas Bal	Stack Temp #1	Stack Static Pressure	Opacity	SET TO MED	#13 P. Out Notes	Stack @ T1	Inlet VAC
60	1140	265.9	9.8	.5	.200	5.03	15.90	.002	.02	251.5	422	-.061	C	SWAPPED T1 Filter	42	485	-13.0
65	45	265.8	9.7	.1	.255	5.65	15.28	.001	.01	565.5	405	-.059	"		42	445	-13.0
70	50	265.5	9.4	.3	.145	3.66	17.27	.003	.03	121.9	386	-.056	"		42	444	-13.0
75	55	265.3	9.2	.2	.175	4.41	16.52	.002	.02	220.3	373	-.055	"		42	411	-13.0
80	1200	265.0	8.9	.3	.202	5.08	15.84	.003	.03	169.3	373	-.055	"		42	402	-13.0
85	05	264.8	8.7	.2	.198	4.98	15.95	.002	.02	249.0	371	-.054	"		43	416	-13.0
90	10	264.6	8.5	.2	.124	3.13	17.76	.009	.09	34.8	363	-.053	"		43	413	-13.0
95	15	264.4	8.3	.2	.166	4.18	16.74	.003	.03	139.3	358	-.053	"	Turned on A/C	43	399	-13.0
100	20	264.2	8.1	.2	.120	3.03	17.87	.008	.08	37.9	351	-.051	"		43	399	-13.0
105	25	264.0	7.9	.2	.178	4.48	16.44	.003	.03	149.3	347	-.051	"		43	408	-13.0
110	30	263.8	7.7	.2	.151	3.81	17.11	.005	.05	76.1	348	-.051	"		43	397	-13.0
115	35	263.6	7.5	.2	.142	3.58	17.34	.004	.04	89.5	343	-.051	"		43	384	-13.0
Total											4440	-.650					

Time E/T Min	Time @	Top #2	Left #3	Back #4	Right #5	Bottom #6	Firebox #7	Fr. 2nd #8	Amb #9	Tnl. #10	C Gas Box #11	C Gas Impin #12	Part. Filt. #13 (T1)	Part. Cond. #14 (T1)	Part Filter #15 (T2)	Part Cond #16 (T2)	Part Filter #17 (T3)
60	1140	N/A	N/A	N/A	N/A	N/A	N/A	N/A	90	127	225	34	82	42	85	45	80
65	45								90	125	225	34	80	42	85	45	80
70	50								90	124	224	34	82	43	85	45	80
75	55								90	124	224	35	83	43	85	45	80
80	1200								90	123	223	35	83	43	85	45	81
85	05								90	123	222	35	84	43	85	46	81
90	10								90	123	222	35	84	43	85	46	81
95	15								90	122	221	35	85	43	85	46	81
100	20								84	121	220	35	85	43	85	46	81
105	25								84	119	217	35	85	43	84	46	80
110	30								84	120	214	35	85	43	83	46	80
115	35								84	121	215	35	86	43	83	46	80
Total									1056								

HTP 26

Myren Consulting Inc Data Sheet #14 P 3 of 7 Unit HEAT TECH BAY Date 7/30/15 Run EPA 1

Test End Wt. _____ ΔT _____ Barometric Pressure 28.58 "Hg Gas Flow @ 1.5" Technician(s) ATM ESS

Time E/T Min	Time 🕐	Scale WT.	Lbs. Left	Burn Rate	CO_2 V.	CO_2 %	O_2 %	CO V.	CO %	Gas Bal	Stack Temp #1	Stack Static Pressure	Opacity	Notes	Inches WC
120	1240	263.3	7.2	.3	.181	4.56	16.36	.004	.04	113.9	349	-.051	C		-13.0
125	45	263.1	7.0	.2	.180	4.53	16.39	.003	.03	151.0	350	-.051	"		-13.0
130	50	262.9	6.8	.2	.147	3.71	17.21	.004	.04	92.6	348	-.050	"		-13.0
135	55	262.7	6.6	.2	.162	4.08	16.84	.003	.03	136.0	349	-.051	"		-13.0
140	1300	262.5	6.4	.2	.186	4.68	16.25	.002	.02	231.0	349	-.051	"		-13.0
145	05	262.3	6.2	.2	.168	4.23	16.69	.003	.03	141.0	352	-.050	"		-13.0
150	10	262.0	5.9	.3	.196	4.93	16.00	.002	.02	246.5	359	-.052	"		-13.0
155	15	261.8	5.7	.2	.144	3.63	17.28	.006	.06	60.5	353	-.051	"		-13.0
160	20	261.5	5.4	.3	.190	4.78	16.14	.003	.03	159.3	351	-.050	"		-13.0
165	25	261.3	5.2	.2	.230	5.78	15.16	.001	.01	578.0	352	-.050	"		-13.0
170	30	261.1	5.0	.2	.181	4.56	16.36	.004	.04	113.9	348	-.050	"		-13.0
175	35	260.8	4.7	.3	.205	5.16	15.77	.002	.02	257.8	359	-.051	"		-13.0
Total											(4219)	(-.608)			

Time E/T Min	Time 🕐	Top #2	Left #3	Back #4	Right #5	Bottom #6	Firebox #7	Fr. 2nd #8	Amb #9	Tnl. #10	C Gas Box #11	C Gas Impin #12	Part. Filt. #13	Part. Cond. #14	T1 F / C	T1 F / C	T2 F / C	T3 F / C	Stack @ 1'
120	1240	N/A	N/A	N/A	N/A	N/A	N/A	N/A	85	120	218	35	86	43	83/46		80/43		395
125	45								89	121	222	35	86	43	83/46		80/44		392
130	50								89	121	225	35	87	43	83/46		81/44		404
135	55								87	121	224	35	87	43	83/46		81/44		390
140	1300								90	121	223	35	87	44	84/46		81/44		396
145	05								90	123	221	35	88	44	85/46		82/44		401
150	10								88	123	220	35	88	44	85/46		83/45		414
155	15								89	123	219	35	86	44	84/46		82/45		398
160	20								88	124	219	35	85	44	83/46		82/45		397
165	25								90	123	219	35	84	44	83/46		83/46		414
170	30								90	124	220	35	83	45	83/47		83/46		382
175	35								90	125	221	35	83	45	83/47		84/46		399
Total									(1065)										

HTP 26

Myren Consulting Inc Data Sheet #14 P 4 of 7 Unit HEAT Tech Bay Date 7/30/15 Run EPA 1

Test End Wt. _____ ΔT _____ Barometric Pressure 28.54 "Hg Gas Flow @ 1.5" Technician(s) AJM TSE

Time E/T Min	Time	Scale WT.	Lbs. Left	Burn Rate	CO_2 V.	CO_2 %	O_2 %	CO V.	CO %	Gas Bal	Stack Temp #1	Stack Static Pressure	Opacity	Notes	Q Gas Flow
180	1340	260.6	4.5	.2	.129	3.26	17.65	.006	.06	54.3	347	-.051	C	SET TO LOW	-13.0
185	45	260.4	4.3	.2	.133	3.36	17.55	.006	.06	55.9	344	-.050	"		-13.0
190	50	260.2	4.1	.2	.114	2.88	18.03	.005	.05	57.6	308	-.045	"		-13.0
195	55	260.1	4.0	.1	.118	2.98	17.93	.005	.05	59.6	288	-.042	"		-13.0
200	1400	260.0	3.9	.1	.146	3.68	17.24	.004	.04	92.0	275	-.040	"		-13.0
205	05	259.8	3.7	.2	.190	4.78	16.15	.002	.02	239.0	270	-.040	"		-13.0
210	10	259.7	3.6	.1	.129	3.26	17.67	.003	.03	108.5	256	-.037	"		-13.0
215	15	259.6	3.5	.1	.197	4.96	15.97	.003	.03	165.2	257	-.037	"		-13.0
220	20	259.5	3.4	.1	.058	1.48	19.39	.014	.14	10.6	236	-.034	"		-13.0
225	25	259.4	3.3	.1	.149	3.76	17.17	.003	.03	125.2	246	-.036	"		-13.0
230	30	259.3	3.2	.1	.136	3.43	17.49	.003	.03	114.4	242	-.034	"		-13.0
235	35	259.2	3.1	.1	.104	2.63	18.26	.009	.09	29.2	243	-.034	"		-13.0
Total											3312	-.480			

T1 T1 T2 T3

Time E/T Min	Time	Top #2	Left #3	Back #4	Right #5	Bottom #6	Firebox #7	Fr. 2nd #8	Amb #9	Tnl. #10	C Gas Box #11	C Gas Impin #12	Part. Filt. #13	Part. Cond. #14	F C	F C	Stack 11
180	1340	N/A	N/A	N/A	N/A	N/A	N/A	N/A	88	123	222	35	84	45	84/47	84/46	394
185	45								90	121	223	35	84	45	84/47	84/47	399
190	50								89	116	223	35	84	45	83/47	84/47	344
195	55								88	113	223	35	83	45	83/47	84/47	331
200	1400								90	112	223	35	83	45	83/47	85/47	303
205	05								88	111	223	35	84	45	82/47	85/47	299
210	10								88	110	222	35	84	45	82/47	85/47	284
215	15								89	110	222	35	85	45	82/47	85/47	285
220	20								88	109	222	35	85	45	82/47	85/47	269
225	25								88	108	222	35	86	45	82/46	85/47	283
230	30								88	108	222	35	86	45	82/46	85/47	283
235	35								88	109	223	35	86	45	82/46	85/47	274
Total									1062								

Myren Consulting Inc Data Sheet #14 P 5 of 7 Unit Heat Tech HTP 26 Bay Date 7/30/15 Run 6 PM

Test End Wt. ΔT Barometric Pressure 28.53 "Hg Gas Flow @ 1.5" Technician(s) Adm ESS CGas

Time E/T Min	Time	Scale WT.	Lbs. Left	Burn Rate	CO_2 V.	CO_2 %	O_2 %	CO V.	CO %	Gas Bal	Stack Temp #1	Stack Static Pressure	Opacity	Notes	Tunnel Vac
240	1440	259.0	2.9	.2	.111	2.81	18.11	.005	.05	56.1	246	-.035	C		-13.0
245	45	258.9	2.8	.1	.111	2.81	18.10	.007	.07	40.1	244	-.035	"		-13.0
250	50	258.8	2.7	.1	.102	2.58	18.33	.006	.06	43.0	238	-.034	"		-13.0
255	55	258.7	2.6	.1	.111	2.81	18.10	.006	.06	46.8	240	-.034	"		-13.0
260	1500	258.5	2.4	.2	.190	4.78	16.15	.001	.01	478.0	250	-.036	"		-13.0
265	05	258.4	2.3	.1	.094	2.38	18.52	.007	.07	34.0	243	-.035	"		-13.0
270	10	258.3	2.2	.1	.142	3.58	17.34	.003	.03	119.4	243	-.035	"		-13.0
275	15	258.2	2.1	.1	.136	3.43	17.49	.003	.03	114.4	238	-.034	"		-13.0
280	20	258.0	1.9	.2	.102	2.58	18.31	.010	.10	25.8	238	-.034	"		-13.0
285	25	257.9	1.8	.1	.130	3.28	17.63	.006	.06	54.7	244	-.034	"		-13.0
290	30	257.8	1.7	.1	.106	2.68	18.23	.006	.06	44.7	238	-.034	"		-13.0
295	35	257.7	1.6	.1	.090	2.28	18.60	.011	.11	20.7	240	-.034	"		-13.0
Total											2902	-.414			

Time E/T Min	Time	Top #2	Left #3	Back #4	Right #5	Bottom #6	Firebox #7	Fr. 2nd #8	Amb #9	Tnl. #10	C Gas Box #11	C Gas Impin #12	Part. Filt. #13	Part. Cond. #14	T1 F / C	T1 F / C	T2 F / C	T3 F / C	Stack
240	1440	N/A	N/A	N/A	N/A	N/A	N/A	N/A	89	110	223	35	87	45	82/47	86/47	83/46	86/47	284
245	45								89	110	224	35	87	45	83/46	86/47	83/46	86/47	268
250	50								88	109	224	35	87	45	83/47	86/47	83/47	86/47	273
255	55								89	109	225	36	87	46	84/47	86/47	84/47	86/47	272
260	1500								89	110	225	36	85	46	83/47	86/47	83/47	86/47	293
265	05								88	110	225	36	83	46	82/47	87/47	82/47	87/47	267
270	10								88	110	225	36	82	46	82/47	86/47	82/47	86/47	272
275	15								89	110	223	36	82	45	81/47	87/47	82/47	87/47	266
280	20								89	110	222	36	82	46	82/47	87/47	82/47	87/47	267
285	25								90	111	220	36	82	46	82/47	87/47	82/47	87/47	282
290	30								88	110	219	36	82	46	82/47	87/47	82/47	87/47	266
295	35								89	110	219	36	82	46	82/47	86/48	82/47	86/47	279
Total									1065										

MTP 26 Boy

Myren Consulting Inc Data Sheet #14 P 6 of 7 Unit Heat Tech Date 7/30/15 Run EPA 1

Test End Wt. ΔT Barometric Pressure 28.52 "Hg Gas Flow @ 1.5" Technician(s) ATM ESS

Time E/T Min	Time 🕐	Scale WT.	Lbs. Left	Burn Rate	CO_2 V.	CO_2 %	O_2 %	CO V.	CO %	Gas Bal	Stack Temp #1	Stack Static Pressure	Opacity	Notes	C GAS VAC
300	1540	257.6	1.5	.1	.121	3.06	17.84	.008	.08	38.2	246	-.035	C		-13.0
305	45	257.4	1.3	.2	.168	4.23	16.70	.002	.02	211.5	247	-.035	"		-13.0
310	50	257.3	1.2	.1	.204	5.13	15.80	.002	.02	256.5	245	-.035	"		-13.0
315	55	257.2	1.1	.1	.070	1.78	19.08	.015	.15	11.9	245	-.035	"		-13.0
320	1600	257.1	1.0	.1	.145	3.66	17.26	.004	.04	91.4	239	-.034	"		-13.0
325	05	256.9	.8	.2	.117	2.96	17.96	.005	.05	59.1	235	-.033	"		-13.0
330	10	256.8	.7	.1	.095	2.41	18.50	.006	.06	40.1	234	-.032	"		-13.0
335	15	256.7	.6	.1	.104	2.63	18.28	.005	.05	52.6	240	-.034	"		-13.0
340	20	256.6	.5	.1	.083	2.11	18.78	.011	.11	19.1	245	-.034	"		-13.0
345	25	256.4	.3	.2	.136	3.43	17.48	.005	.05	68.6	247	-.035	"		-13.0
350	30	256.3	.2	.1	.109	2.76	18.16	.005	.05	55.1	242	-.035	"		-13.0
355	35	256.2	.1	.1	.074	1.88	18.99	.014	.14	13.4	246	-.035	"		-13.0
Total											291	-.412			

T1 T1 T2 T2

Time E/T Min	Time 🕐	Top #2	Left #3	Back #4	Right #5	Bottom #6	Firebox #7	Fr. 2nd #8	Amb #9	Tnl. #10	C Gas Box #11	C Gas Impin #12	Part. Filt. #13	Part. Cond. #14	F C	F C	Stack 2-1
300	1540	N/A	N/A	N/A	N/A	N/A	N/A	N/A	90	111	221	36	82	46	82/47	85/48	279
305	45								88	110	223	36	82	46	82/47	85/48	277
310	50								89	110	225	36	83	47	82/47	85/48	286
315	55								90	110	226	36	83	47	82/47	85/48	269
320	1600								89	110	227	36	84	47	83/47	85/48	263
325	05								90	110	228	36	84	47	83/48	86/48	266
330	10								90	110	228	36	85	47	83/48	86/48	277
335	15								90	110	227	36	86	47	84/48	86/48	277
340	20								90	111	225	36	87	47	84/48	86/48	277
345	25								90	111	223	36	87	47	84/48	86/48	276
350	30								90	111	221	37	88	47	84/48	86/48	266
355	35								89	111	220	36	88	47	85/48	86/48	270
Total									1075								

Myren Consulting Inc Data Sheet #14 P 7 of 7 Unit 14 East Brick MTP 36 Bay Date 7/30/15 Run EPA 1

Test End Wt. _____ ΔT _____ Barometric Pressure 28.51 "Hg Gas Flow @ 1.5" Technician(s) _____

Time E/T Min	Time 🕐	Scale WT.	Lbs. Left	Burn Rate	CO_2 V.	CO_2 %	O_2 %	CO V.	CO %	Gas Bal	Stack Temp #1	Stack Static Pressure	Opacity	Notes
360	1640	256.1	0	.1	.192	4.83	16.10	.002	.02	2415	250	-.036		-13.0
365											250	-.036		
370											23,128	-3.347	Total	
375											316.8	-.0458	÷ 73	
380														
385														
390														
395														
400														
405														
410														
415														
Total														

C Gas Temp

T1 T1 T2 T3

Time E/T Min	Time 🕐	Top #2	Left #3	Back #4	Right #5	Bottom #6	Firebox #7	Fr. 2nd #8	Amb #9	Tnl. #10	C Gas Box #11	C Gas Impin #12	Part. Filt. #13	Part. Cond. #14	P C	F C	Stack °F
360	1640	N/A	N/A	N/A	N/A	N/A	N/A	N/A	89	111	219	37	89	48	85/48	86/48	275
365									89								
370									6479	Total							
375									88.8	÷73							
380																	
385																	
390																	
395																	
400																	
405																	
410																	
415																	
Total																	

Pre and Post Test Zero/Span Check
Woodstove Data Sheet # 15-1

Site: Myren Consulting, Colville, WA Date: 4/ 15 Analyte: CO_2

Source: Heat Tech HTP26 Bay Run #: EPA 1

Zero Cyl #: ITM8803/11 Conc. 00.0 % CO_2 Cyl Press: 220 psi

Certified By: Oxarc Date: 6/11/12

Span Cyl #: EB-0019810 Conc. 12.4 % CO_2 Cyl Press: 220 psi

Certified By: Liquid Technology Corp. Date: 4/25/12

Analyzer: Make: Horiba Model: PIR-2000 SN: 607024

Range: 0 - 25.0% CO_2 Analyzer Output: 0 – 1.0 v.

Flow: 1.5 SCFH Measured By: Rotameter: X Flowmeter: _____

EPA Span Values= 25.0% CO_2
EPA Control Limits = ± 2.5% of 25.0% CO_2 = ± 0.625% CO_2

Pre Run Audit: By: A.T. Myren Time: 955 Temp: 82 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	.000	.03162	+0.03162	+0.13
Span	496	.496	12.4	49.0	.496	12.4280	+0.0280	+0.23

Comments:

Post Run Audit: By: _____ Time: 1723 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	00.0	00.0	00.0	.002	.08160	+.08160	+0.33
Span	49.6	.496	12.4	50.0	.507	12.70292	+0.30292	+2.44

Comments:

±CONC. Difference = Act % - Exp (Std) %

Zero % Difference (Δ%) = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference (Δ%) = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}}$ X 100

Pre and Post Test Zero/Span Check
Woodstove Data Sheet # 15-3

Site: Myren Consulting, Colville, WA Date: 7/ /15 Analyte: CO

Source: HEAT Tech HTP 26 Boy Run #: EPA 1

Zero Cyl #: ITM 9803/11 Conc. 00.0 % CO Cyl Press: 220 psi

Certified By: Oxarc Date: 6/11/12

Span Cyl #: EB-0019810 Conc. 2.5 % CO Cyl Press: 220 psi

Certified By: Liquid Technology Corp Date: 4/25/12

Analyzer: Make: Horiba Model: Mexa 311 GE SN: GE-30075

Range: 0 - 10.0% CO (0 – 5.0% CO) Analyzer Output: 0 – 1.0 v.

Flow: 1.5 SCFH Measured By: Rotameter: X Flowmeter: _____

EPA Span Values= 5.0% CO

EPA Control Limits = ±2.5% of 5.0% CO = ±0.125% CO

Pre Run Audit: By: [signature] Time: 955 Temp: 82 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	—	.000	.02832	+0.02832	+0.57
Span	—	.257	2.57	—	.257	2.54547	-0.02453	-0.95

Comments: Meter on front panel is broken

Post Run Audit: By: [signature] Time: 1723 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	—	.000	.02832	+0.02832	+0.57
Span	—	.257	2.57	—	.271	2.6826	+0.1126	+4.38

Comments:

±CONC. Difference= Act % - Exp (Std) %

Zero % Difference(Δ%) = (Act % (ppm) – Exp % (ppm)) / Full Scale Value X 100

Span % Difference (Δ%)= (Act % (ppm) – Exp % (ppm)) / Exp % (ppm) X 100

FIREPLACE DATA SHEET #10
Quality Checks (Revised 1/10)

Unit: Heat Tech HTP 36 Dry
Run #: EPA 1
Date: 1/30/15

Ambient Blank Probe Inlet Location 37 1/4 " from the bottom of the hood (Spec = ≤ 6.6') and 32 1/2 " from the chimney centerline (Spec = ≤ 3.3').

Dilution Tunnel Draft: Start: .000 Stop: .000 Avg.: .000 "H_2O

Test Chamber Air Velocity: Start: >0, <5 Stop: >5, <10 Avg.: 5 ft/min

Test Chamber Ambient Moisture (AM) / Relative Humidity (%RH)

Start: Wet Bulb 59 Dry Bulb 72 =%RH 45, %AM (%By Vol) 1.25
Stop: Wet Bulb 60 Dry Bulb 78 =%RH 39, %AM (% by Vol) 1.10
Avg. %RH 42.0, %AM (% by Vol) 1.175

Minimum Tunnel Flow For 100% Smoke Capture: Pitot Reading (Δp): 0.10
~ Tunnel Flow: 71. dscfm

Fireplace Back Wall Temperature Immediately Prior to Test Start: N/A °F

Scale Check: Pre (Wt., #): 279.7 - 274.7 = 5.0 / 5.0 lbs. OK ~~598~~
Post (Wt.,#): 260.6 - 255.6 = 5.0 / 5.0 lbs OK ~~598~~

Scale Zero Drift: Pre: — lbs. Post: — lbs. Drift: — lbs.

(Note: To avoid having the heat from the bottom of the unit affect the load cells, the fireplace is set on a large steel plate which is supported by 4-2x4's. There also is a piece of insulation directly over the electronics in the scale deck. When the steel plate and fireplace were lifted off the scale deck, the 2X4's and insulation are still on the deck. Thus, the weight shown rather than zero.)

Combustion Gas (CO_2, O_2 &CO) Train Leak Checks: Pre: OK ✓ ~~598~~ (AC: -21" Hg) Post: OK ✓ ~~598~~ (-21.9" Hg)
Draft (Static [P_g]) Gauge Level and Zero Check: Pre: OK ✓ ~~598~~ Post: OK ✓ ~~598~~

THERMOCOUPLE CHECK (@ Ambient):

T/C #1: 60	T/C #2: 61	T/C #3: 62	T/C #4: —	T/C #5: —	T/C #6: —
T/C #7: —	T/C #8: —	T/C #9: 60	T/C #10: 63	T/C #11: 59	T/C #12: 59
T/C #13: 58	T/C #14: 64	T/C #15: 59	T/C #16: 63	T/C #17: 59	T/C #18: 60
T/C #19: 60	T/C #20: —	T/C #21: —	T/C #22: —		

Thermocouple Readout:

Pretest Zero & Span Check and Calibration
Zero (0° F): 0 ° F Adj to: — ° F
Span (2000° F): 2000 ° F Adj to: — ° F

Post Test Zero & Span Check
0° F 1 Δ%: -0.22
Span (2000° F): 2002 Δ%: -0.08

Pretest Thermocouple Readout Linearity Check:

0 °F = 0	200 °F = 202	400 °F = 399	600 °F = 601
800 °F = 801	1000 °F = 1000	1200 °F = 1198	1400 °F = 1399
1600 °F = 1600	1800 °F = 1800	2000 °F = 2000	

From: 7/17/15
Through: 9/10/15

Woodstove Data Sheet 4-4 Scale QC Record Sheet
Scale 2

Scale: Sartorius
Model: CPA 2245
SN: 24850860
Rev: 5/10

Level	Recali-brated	100g Weight	10g Weight	1g Weight	100mg Weight	10mg Weight	DATE	TIME	TECH	BP	LINE VOLTS	WET BULB	DRY BULB	% RH
Yes	No	99.9994	10.0000	1.0000	0.1000	.0100	7/17/15	1900	ATM	28.40	119	55	67	45
Yes	No	99.9995	10.0000	1.0000	.1000	.0100	7/18/15	1957	ATM	28.37	120	57	70	44
Yes	No	99.9994	10.0000	1.0000	.0999	.0100	7/19/15	1413	ATM	28.42	121	57	70	44
Yes	NO	99.9994	9.9999	1.0000	0.1000	0.0101	7/20/15	1022	ESS	28.40	118	57	69	46
Yes	No	99.9996	10.0000	1.0000	0.1000	0.0100	7/21/15	1358	ATM	28.28	116	55	66	48
Yes	NO	99.9995	9.9999	0.9999	0.1000	0.0100	7/22/15	1606	ESS	28.27	116	54	65	47
Yes	No	99.9995	9.9999	1.0000	0.1000	0.0100	7/23/15	1205	ATM	28.33	118	54	65	47
Yes	NO	99.9994	10.0000	0.9999	0.1001	0.0101	7/24/15	1525	ESS	28.38	118	55	66	48
Yes	No	99.9996	10.0000	1.0000	0.0999	0.0100	7/26/15	1421	ATM	28.42	118	57	69	47
Yes	No	99.9996	9.9999	0.9999	0.1000	0.0100	7/28/15	1603	ATM	28.58	118	56	67	47
Yes	NO	99.9995	10.0000	1.0000	0.1000	0.0101	7/29/15	1325	ESS	28.57	117	56	68	46
Yes	No	99.9994	9.9999	1.0000	0.1000	0.0100	7/30/15	949	ATM	28.60	119	55	66	48
Yes	NO	99.9995	9.9999	1.0000	0.1000	0.0100	7/30/15	2105	ATM	28.48	118	56	67	48
Yes		99.9995	9.9999	0.9999	0.1000	0.0100	7/31/15	1413	ESS	28.45	116	58	70	48
Yes	No	99.9995	9.9999	1.0000	0.1000	0.0101	8/1/15	1547	ATM	28.33	118	54	66	45
Yes	No	99.9995	9.9999	0.9999	0.0999	0.0100	8/2/15	1813	ATM	28.27	120	57	69	45
Yes	No	99.9995	9.9999	1.0000	0.1000	0.0100	8/3/15	949	ATM	28.30	120	57	69	45
Yes	NO	99.9994	9.9999	1.0000	0.1000	0.0101	8/12/15	1038	ESS	28.43	120	57	69	45
Yes	No	99.9994	9.9999	0.9999	0.1000	0.0100	8/18/15	1530	ATM	28.42	119	58	70	48
Yes	No	99.9996	9.9999	0.9999	0.0999	0.0100	8/19/15	0636	ATM	28.42	119	57	69	45
Yes	No	99.9995	10.0000	1.000	0.1000	0.0100	8/19/15	2244	ATM	28.20	119	58	70	48
Yes	NO	99.9995	10.0000	0.9999	0.1000	0.0101	8/20/15	1610	ESS	28.20	119	58	70	48
Yes	NO	99.9995	10.0000	1.0000	0.0999	0.0100	8/26/15	1425	ESS	28.40	118	57	70	43
Yes	No	99.9994	10.0000	0.9999	0.1000	0.0100	8/28/15	1200	ESS	28.48	119	58	70	48
Yes	NO	99.9995	9.9999	1.0000	0.1000	0.0100	8/31/15	1547	ESS	28.40	118	57	69	47
Yes	NO	99.9995	10.0000	1.0000	0.1000	0.0100	9/10/15	1047	AM	28.50	117	56	68	46

Woodstove Data Sheet 4-4 Scale QC Record Sheet
Scale 2

From: 5/8/15
Through: 7/5/15

Scale: Sartorius
Model: CPA 2245
SN: 24850860
Rev: 5/10

100+20+10+5 — 50 — 2015

Level	Recali-brated	135g Weights	100g Weight	10g Weight	1.0 g Weight	100mg Weight	50 mg Weight	Date	Time	Tech	BP	Wet Bulb	Dry Bulb	% RH	Lines Volts
Yes	No	134.9997	99.9996	10.0000	1.0000	0.1000	0.0501	5/8/15	1311	ATM	28.48	55	67	45	119
Yes	Yes	134.9995	99.9994	10.0000	0.9999			5/29/15	936	ATM	28.56				119
Yes	No	134.9996	99.9995	9.9999	0.9999	0.1000	0.0501	5/30/15	905	ATM	28.57	65	78	49	118
Yes	No	134.9994	99.9994	10.0000	1.0000	0.1000	0.0501	6/2/15	843	ATM	28.40	62	75	47	119
Yes	NO	134.9994	99.9994	9.9999	1.0000	0.1000	0.0502	6/3/15	921	ESS	28.49	57	69	46	118
Yes	No	134.9995	99.9994	9.9999	0.9999	0.0999	0.0500	6/4/15	824	ATM	28.52	59	71	48	116
Yes	No	134.9997	99.9996	9.9999	0.9999	0.0999	0.0500	6/6/15	1028	ATM	28.61	60	72	49	118
Yes	No	134.9996	99.9995	9.9999	0.9999	0.1000	0.0500	6/8/15	1110	ATM	28.42	59	76	40	117
Yes	No	134.9997	99.9996	9.9999	1.0000	0.1000	0.0501	6/10/15	1437	ATM	28.32	56	68	47	116
Yes	NO	134.9996	99.9996	9.9999	1.0000	0.1000	0.0500	6/11/15	2245	ATM	28.30	56	68	47	117
Yes	No	134.9996	99.9995	9.9999	1.0000	0.1000	0.0501	6/12/15	0138	ATM	28.50	55	67	46	120
Yes	No	134.9995	99.9995	10.0000	1.0000	0.1000	0.0501	6/13/15	833	ATM	28.52	54	65	48	119
Yes	No	134.9995	99.9994	10.0000	1.0000	0.1000	0.0501	6/14/15	15:14	ATM	28.46	53	64	47	118
Yes	No	134.9996	99.9996	10.0000	1.0000	0.1000	0.0500	6/17/15	13:39	ATM	28.38	57	69	46	116
Yes	No	134.9996	99.9995	10.0000	1.0000	0.0999	0.0501	6/18/15	17:30	ATM	28.42	56	68	46	117
Yes	NO	134.9996	99.9995	9.9999	1.0000	0.1000	0.0501	6/20/15	1547	ATM	28.40	56	68	46	119
Yes	NO	134.9997	99.9996	9.9999	1.0000	0.1001	0.0501	6/22/15	1432	ESS	28.46	55	67	45	118
Yes	NO	134.9996	99.9995	9.9999	0.9999	0.1000	0.0501	6/23/15	12:18	ATM	28.49	55	68	42	117
Yes	NO	134.9996	99.9996	9.9999	1.0000	0.1000	0.0501	6/24/15	1434	ESS	28.49	58	70	48	119
Yes	No	134.9996	99.9995	9.9999	1.0000	0.1000	0.0501	6/25	839	ATM	28.60	56	69	43	117
yes	NO	134.9995	99.9996	9.9999	1.0000	0.1001	0.0501	6/26/15	1233	ESS	28.51	57	69	46	114
Yes	No	134.9995	99.9995	10.0000	1.0000	0.1000	0.0501	6/27/15	2222	ATM	28.405	58	71	45	120
Yes	NO	134.9995	99.9995	9.9999	1.0000	0.1000	0.0502	6/30/15	1433	ESS	28.47	59	71	48	119
Yes	No	134.9997	99.9996	10.0000	1.0000	0.1000	0.0500	7/1/15	1309	ATM	28.435	57	70	44	116
Yes	NO	134.9995	99.9995	9.9999	0.9999	0.0999	0.0500	7/2/15	1354	ATM	28.49	58	70	48	116
Yes	No	134.9996	99.9995	9.9999	1.0000	0.1000	0.0501	7/5/15	1912	ATM	28.38	56	70	48	119

Becherini Scale Center, Inc.
317 E. Sprague
Spokane, WA 99202

SCALE CALIBRATION RECORD

Customer: MYREN Consulting | Date: 3/26/15

Work Order Number: 48656 | PO Number:

Equipment Mfg.	Serial Number	Specifications	Weight used	Initial Readings	Final Readings
1. PANTHER	4466459	1000 x .1	Ø		
	Pass...Fail		50		
Notes: NOT WORKING, TOOK BACK TO SHOP			100		
			300		
			500		
			Ø		

Equipment Mfg.	Serial Number	Specifications	Weight used	Initial Readings	Final Readings
2. PANTHER	00155556CA	5K x 1			
	Pass...Fail				
Notes: NOT USING					

Equipment Mfg.	Serial Number	Specifications	Weight used	Initial Readings	Final Readings
3. PANTHER	00025736AS	1000 x .1	Ø		Ø
	(Pass)..Fail		50		50.0
Notes: 1 x SMALL - CALIBRATED			100		100.0
			300		300.0
			500	500.2	500.0
			Ø	Ø	Ø

Equipment Mfg.	Serial Number	Specifications	Weight used	Initial Readings	Final Readings
4. PANTHER	00926576KL	1000 x .1	Ø	Ø	Ø
	(Pass)..Fail		50	50.0	50.0
Notes: 3 x 5 DECK, CALIBRATED			100	100.0	100.0
			300	300.1	300.0
			500	500.2	500.0
			Ø	Ø	0

Additional Comments:

Last Checked: 9/14 | Next Check Due: 9/15

Weights Certified: 10/14 | Technician: ICC/BB

Calibration checked IAW NIST handbook 44

DENSITY STANDARD USED FOR TROEMNER PRECISION WEIGHTS

Troemner Inc. adjusts all new weights and all weights received for recalibration on the basis of apparent mass versus material of density 8.0g/cm³ at 20°C. This action is in accordance with the recommendations of the American Society for Testing and Materials specification ANSI/ASTM E 617 and the International Organization of Legal Metrology (OIML) International Recommendation No. 20.

Previously, all weights had usually been adjusted on the basis of apparent mass versus "brass," a hypothetic material of defined density 8.4g/cm³ at 0°C and 8.3909g/cm³ at 20°C. This practice originated in the early 1800's and was adopted in all of the English speaking countries as well as a number of other countries. Now most mass standards and test weights are made from stainless steel (density ranges from 7.77g/cm³ to 8.0g/cm³). A number of countries have adopted the recommendations of OIML and the foremost balance manufacturers are adjusting the built-in weights in their balances on the basis of apparent mass versus 8.0g/cm³. In order to smooth the transition in this country, the Reports of Calibration of the National Bureau of Standards are reporting the corrections to calibrated mass standards on both bases.

In terms of normal weighing procedures the change is very small. For a given weight, the mass value assigned on the basis of apparent mass versus density 8.0g/cm³ material will be 7 parts per million higher than the value assigned on the basis of apparent mass versus "density 8.4g/cm³" material. In many cases the allowed weight adjustment tolerances are so large that this change is immaterial although closely adjusted weights often have a smaller tolerance than the correction change. For example at the 1 kilogram level the change is 7 mg. For comparison the ANSI/ASTM E 617 Class 6 tolerance for 1 kilogram is 100 mg while the Class 1 tolerance is 2.5 mg. A detailed discussion of mass and mass values is given in Reference 3.

Precision Weights manufactured by Troemner Inc. to ASTM Class 1, 1.1, 2, 3, 4, 5, and 6 tolerances and the equivalent OIML and NBS tolerances are of the following materials:

Designation	*Base Material*	*Density*	*Weight Range*
Stainless Steel	18-8	7.84g/cm³ at 20°C	1 g & larger
Stainless Steel	18-8	8.0g/cm³ at 20°C	50 mg to 500 mg
Aluminum	1100	2.7g/cm³ at 20°C	30 mg & smaller

References:

1. ANSI/ASTM E 617
   Available from: Troemner Inc. 6825 Greenway Ave., Phila. Pa. 19142 215-724-0800 or American Society for Testing and Materials, 1916 Race Street, Phila., Pa. 19103
2. OIML INTERNATIONAL RECOMMENDATION No. 20
   Available from: Organisation Internationale De Metrologie Legale 11 Rue Trugot - 75009 Paris, France
3. NBS MONOGRAPH 133, MASS AND MASS VALUES
   Available from: Superintendent of Documents, U.S. Government Printing Office Washington, D.C. 20402 Order by SD Catalog No. C13,44:1331 Stock Number 0303-01178

TROEMNER INC.
Manufacturers of Precision Weights... Mass Standards • Balances • Laboratory Apparatus
6825 Greenway Avenue - Philadelphia, Pa. 19142
215/724-0800

Wts. used for Scale QC Checks, P. 4-4.

Established 1974

QUALITY CONTROL SERVICES

LABORATORY EQUIPMENT • SALES • SERVICE • CALIBRATION • REPAIRS
2340 SE 11TH Ave. Portland, Oregon 97214 • Box 14831 Portland, Oregon 97293
(503) 236-2712 • FAX (503) 235-2535 • www.qc-services.com

ACCREDITED
Calibration Services
Certificate Number: 1550.01
Laboratory code: 115953

Myren Consulting
512 Williams Lake Road
Colville, WA 99114

Report Number: MYRC0224850860150415

A2LA ACCREDITED
CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Balance	Sartorius	CPA224S	24850860	N/A	Lab

Units	Readability	SOP	Cal Date	Last Cal Date	Cal Due Date
g	0.0001	QC012	4/15/15	11/12/14	10/2015

FUNCTIONAL CHECKS

ECCENTRICITY
Test Wt: 100 Tol: 0.0003
As-Found: Pass: ☑ Fail: ☐
As-Left: Pass: ☑ Fail: ☐

LINEARITY
Test Wt: 50 x 4 Tol: 0.0002
As-Found: Pass: ☑ Fail: ☐
As-Left: Pass: ☑ Fail: ☐

STANDARD DEVIATION
Test Wt: 100 Tol: 0.0001

1. 100.0000	5. 99.9999	9. 99.9999
2. 100.0000	6. 100.0000	10. 100.0000
3. 100.0000	7. 100.0000	Result
4. 100.0000	8. 100.0000	0.00004

ENVIRONMENTAL CONDITIONS
☐ Good ☑ Fair ☐ Poor
Temperature: 21.3°C

A2LA ACCREDITED SECTION OF REPORT

Standard	As-Found	As-Left	Expanded Uncertainty
200	199.9992	200.0002	0.00014
100	99.9995	100.0000	0.00014
50	49.9997	50.0000	0.00014
10	9.9999	10.0000	0.00014
1	1.0000	1.0000	0.00014
0.1	0.1000	0.1000	0.00014

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Weight Set	Rice Lake	30 kg-1mg	S751	12/2/14	12/2015	OR-13-314-C

Permanent Information Concerning this Equipment:

Comments/Info Concerning this Calibration:
4/15 Performed internal calibration overwrite.

Report prepared/reviewed by: _____ **Date:** 4-15-2015

Technician: R. Hintz
Signature: _____

The uncertainty is calculated according to the ISO Guide to the Expression of Uncertainty in Measurement and includes the uncertainty of standards used combined with the observed standard deviation and readability of the unit under test. The uncertainty is expanded with a k factor of 2 for an approximate 95% level of confidence. Instruments listed above were calibrated using standards traceable to the National Institute of Standards and Technology (NIST). Calibration data reflect results at the time and location of calibration. Calibration data should be reviewed to insure that the instrument is performing to its required accuracy. Calibrations comply with ISO/IEC 17025 and ANSI/Z540-1-1994 quality standards.

PT ID: MYRC02

ALTEK

CERTIFICATE OF CALIBRATION

This is to Certify that your Altek Unit has been calibrated using standards whose accuracies are traceable to the National Institute of Standards and Technology (formerly NBS) within the limits of the NIST Calibration Services. Actual records pertaining to these standards are on file and are available for examination.

Certified by: Altek Industries Corp.
Recommend Recalibration: Annually

In service date 4/11/96

Model K2100F Serial No. Serial # 177533

T. Knech
Calibration Technician

31 AUG 95
Factory Calibration Date

ALTEK INDUSTRIES CORP
210 Commerce Drive, Rochester, NY 14623 U.S.A.
(716) 334-3720 FAX: (716) 334-6873
800-32-ALTEK
800-322-5835
Anywhere in USA

MYREN CONSULTING, INC.
512 Williams Lake Road
Colville, WA 99114
Office: 509 684 1154
Lab: 509 685 9458

Calibration Data Sheet # 65
Revision 1 3/3/04

THERMOCOUPLE READOUT CALIBRATION

DATE: 5/20/15
TECHNICIAN: ESS

Thermocouple Readout Manufacturer: OMEGA

Model #: 115 KF Serial #: 0011187 KF Type: K Range: 0-1900° F

Location: 45 G-P METER BOX

Calibrated with: ALTEK SERIES 22 TC SOURCE

As found: 0° F = -1 Adjusted to: 0
1900° F = 1901 Adjusted to: 1900

		% Dif			% Dif			% Dif
0 =	0	0	800 =	799	.0008	1600 =	1600	0
100 =	95	.0089	900 =	896	.0029	1700 =	1699	.0005
200 =	202	-.0030	1000 =	1000	0	1800 =	1800	0
300 =	299	.0013	1100 =	1098	.0013	1900 =	1900	0
400 =	400	0	1200 =	1198	.0012	2000 =	—	—
500 =	498	.0021	1300 =	1296	.0023	___ =	___	___
600 =	600	0	1400 =	1399	.0005			
700 =	695	.0043	1500 =	1498	.0010			

$$\% \text{ Dif} = \frac{(\text{Reference Temperature } ^\circ\text{F} + 460) - (\text{Readout Temperature } ^\circ\text{F} + 460)}{\text{Reference Temperature } ^\circ\text{F} + 460}$$

Or

$$\% \text{ Dif} = \frac{(\text{Reference Temperature } ^\circ\text{C} + 273) - (\text{Readout Temperature } ^\circ\text{C} + 273)}{\text{Reference Temperature } ^\circ\text{C} + 273}$$

MYREN CONSULTING, INC.
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Calibration Data Sheet # 65
Revision 1 3/3/04

THERMOCOUPLE READOUT CALIBRATION

DATE: 5/20/15
TECHNICIAN: ESS

Thermocouple Readout Manufacturer: JENCO

Model #: 768-KF02 Serial #: 900164 Type: K Range: 0-1999°F

Location: 511-M METER BOX

Calibrated with: ALTEK SERIES 22 TC SOURCE

As found: 0° F = -3 Adjusted to: 0
1900 ° F = 1896 Adjusted to: 1900

		% Dif			% Dif			% Dif
0 =	0	0	800 =	800	0	1600 =	1614	-.0068
100 =	94	.0107	900 =	900	0	1700 =	1710	-.0046
200 =	199	.0015	1000 =	1006	-.0041	1800 =	1807	-.0031
300 =	295	.0066	1100 =	1107	-.0045	1900 =	1900	0
400 =	394	.0070	1200 =	1210	-.0060	2000 =	—	—
500 =	490	.0104	1300 =	1313	-.0074	___ =	___	___
600 =	595	.0047	1400 =	1415	-.0081			
700 =	693	.0060	1500 =	1514	-.0071			

$$\% \text{ Dif} = \frac{(\text{Reference Temperature } ^\circ\text{F} + 460) - (\text{Readout Temperature } ^\circ\text{F} + 460)}{\text{Reference Temperature } ^\circ\text{F} + 460}$$

Or

$$\% \text{ Dif} = \frac{(\text{Reference Temperature } ^\circ\text{C} + 273) - (\text{Readout Temperature } ^\circ\text{C} + 273)}{\text{Reference Temperature } ^\circ\text{C} + 273}$$

MYREN CONSULTING, INC.
512 Williams Lake Road
Colville, WA 99114
Office: 509 684 1154
Lab: 509 685 9458

Calibration Data Sheet # 65
Revision 1 3/3/04

THERMOCOUPLE READOUT CALIBRATION

DATE: 5/20/15
TECHNICIAN: ESS

Thermocouple Readout Manufacturer: Omega

Model #: 460BK Serial #: 99110582 Type: K Range: 0-2000°F

Location: SOUTH STAND T/C Dial Readout - Dial #1

Calibrated with: ALTEK SERIES 22 TC SOURCE

As found: 0° F = .8 Adjusted to: 0
2000° F = 1999.3 Adjusted to: 2000

		% Dif			% Dif			% Dif
0 =	0	0	800 =	801.1	-.0009	1600 =	1599.5	.0002
100 =	97.1	.0052	900 =	897.6	.0018	1700 =	1698.6	.0006
200 =	201.4	-.0021	1000 =	1000.3	-.0002	1800 =	1799.8	.00009
300 =	297.0	.0013	1100 =	1098.0	.0013	1900 =	1898.6	.0006
400 =	398.9	.0012	1200 =	1198.0	.0012	2000 =	2000.0	0
500 =	497.0	.0031	1300 =	1298.2	.0010	2100 =	2098.7	.0005
600 =	601.0	-.0009	1400 =	1399.0	.0005			
700 =	697.4	.0022	1500 =	1498.6	.0007			

$$\% \text{ Dif} = \frac{(\text{Reference Temperature } °F + 460) - (\text{Readout Temperature } °F + 460)}{\text{Reference Temperature } °F + 460}$$

Or

$$\% \text{ Dif} = \frac{(\text{Reference Temperature } °C + 273) - (\text{Readout Temperature } °C + 273)}{\text{Reference Temperature } °C + 273}$$

Woodstove Data Sheet # 55
Revision 0 12/18/01

THERMOMETER CALIBRATION DATE: 6/5/15 TECHNICIAN: A.T. Myren

MANUFACTURER:	ERTCO	ERTCO	Fisher	Taylor	Taylor	Premium	
CAT #.	1005-3FC	E17	ASTM 59F	1330 N/A	1330 N/A	—	
SERIAL NO.	1697	K35473	AD4544	—	—	—	
RANGE:	-1 to 100°C	0-260°C	0-180°F	20-120°F	20-120°F	0-220°F	
GRADUATIONS:	0.1°C	1°C	1°F	1°F	1°F	2°F	
TYPE:	Tube	Tube	Tube	Tube	Tube	Dial	
TEMP. POINT 1	.9	1	34	35	35	36	
2	8.9	9.0	48	48	49	50	
3	20.1	21	69	70	70	72	
4	31.5	32	89	90	91	92	

COMMENTS:

Note: The 2 Taylor Thermometers are in the Sling Psychrometer

°F = (°C X 9/5) + 32
°C = (5/9) (°F -32)

EVER READY THERMOMETER CO., INC.
228 LACKAWANNA AVENUE
WEST PATTERSON, NJ 07424
(201) 812-7474

R E P O R T O F C A L I B R A T I O N

LIQUID-IN-GLASS-THERMOMETER

CALIBRATED BY EVER READY THERMOMETER CO.

MARKED: ERTCO CAT 1005-3FC S/N-1697
RANGE: -1 TO +101 DEGREES C IN 0.1 DEGREE GRADUATIONS.

THERMOMETER READING	CORRECTION (ITS-90)**
0.00 C	0.00 C
10.00	0.00
20.00	0.00
30.00	0.00
37.00	0.00
40.00	0.00
50.00	0.00
56.00	0.00
60.00	0.02
70.00	0.00
80.00	0.00
90.00	0.00
100.00	0.00

** ALL TEMPERATURES IN THIS REPORT ARE BASED ON THE INTERNATIONAL TEMPERATURE SCALE OF 1990 (ITS-90) PUBLISHED IN THE METROLGIA 27, NO. 1, 3/10/90.

THIS THERMOMETER WAS CALIBRATED AGAINST A STANDARD CALIBRATED AT THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST) FORMERLY THE NATIONAL BUREAU OF STANDARDS (NBS) IN ACCORDANCE WITH ASTM METHOD E 77, AND NBS MONOGRAPH 174.

FOR A DISCUSSION OF ACCURACIES ATTAINABLE WITH SUCH THERMOMETERS SEE NBS MONOGRAPH 250-23.

IF NO SIGN IS GIVEN ON THE CORRECTION, THE TRUE TEMPERATURE IS HIGHER THAN THE INDICATED TEMPERATURE; IF THE SIGN GIVEN IS NEGATIVE, THE TRUE TEMPERATURE IS LOWER THAN THE INDICATED TEMPERATURE. TO USE THE CORRECTIONS PROPERLY, REFERENCE SHOULD BE MADE TO THE NOTES GIVEN BELOW.

CONTINUED

TEST NUMBER: 152439
DATE: 07/16/96
STANDARD SERIAL NO. 128239
NIST IDENTIFICATION NO. 88024

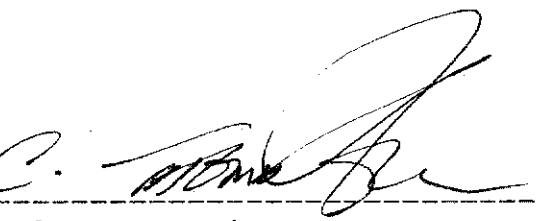
R E P O R T O F C A L I B R A T I O N

LIQUID-IN-GLASS-THERMOMETER

THE THERMOMETER WAS TESTED IN A LARGE, CLOSED-TOP, ELECTRICALLY HEATED, LIQUID BATH, BEING "IMMERSED" 76MM. THE TEMPERATURE OF THE ROOM WAS ABOUT 25 DEGREES C (77 DEGREES F). IF THE THERMOMETER IS USED UNDER CONDITIONS WHICH WOULD CAUSE THE AVERAGE TEMPERATURE OF THE EMERGENT LIQUID COLUMN TO DIFFER MARKEDLY FROM THAT PREVAILING IN THE TEST, APPRECIABLE DIFFERENCES IN THE INDICATIONS OF THE THERMOMETER WOULD RESULT.

THE TABULATED CORRECTIONS APPLY PROVIDED THE ICE-POINT READING, TAKEN AFTER EXPOSURE FOR NOT LESS THAN 3 DAYS TO A TEMPERATURE OF ABOUT 20 DEGREES C (70 DEGREES F) IS 0.00 DEGREES C. IF THE ICE-POINT READING IS FOUND TO BE HIGHER (OR LOWER) THAN STATED, ALL OTHER READINGS WILL BE HIGHER (OR LOWER) TO THE SAME EXTENT. IF THE THERMOMETER IS USED AT A GIVEN TEMPERATURE SHORTLY AFTER BEING HEATED TO A HIGHER TEMPERATURE. AN ERROR OF 0.01 DEGREES OR LESS, FOR EACH 10 DEGREE DIFFERENCE BETWEEN THE TWO TEMPERATURES, MAY BE INTRODUCED. THE TABULATED CORRECTIONS APPLY IF THE THERMOMETER IS USED IN THE UPRIGHT POSITION; IF USED IN A HORIZONTAL POSITION, THE INDICATIONS MAY BE A FEW HUNDREDTHS OF A DEGREE HIGHER.

TEST NUMBER: 152439
DATE: 07/16/96
STANDARD SERIAL NO. 128239
NIST IDENTIFICATION NO. 88024



Charles Tang-Nian
QUALITY CONTROL MANAGER

Dry Gas Meter Calibration Data

Date: 5/11/15 Technician: A.T. Myrum

Calibration Meter Mfr: Rockwell SN: 10522052 Y: 0.9963

Meter Box ID 450-P Meter Mfr: Rockwell SN: 3039270

Electrical Check Ok Pitot Leak Check N/A

Leak Check Front Half Ok Back Half Ok See back of page

BP = 28.32 in. Hg

Orifice (Δh) in. H_2O		Gas Volume			Temperature			Time (Θ), Min.	
		Cal. Meter (Vc), (cu.ft.)	Dry Gas Meter (Vm), (m^3)(ft^3)		Cal. Meter (Tc), °F	Dry Gas Meter Inlet (Tmi), (°F) (°C)	Dry Gas Meter Outlet (Tmo), (°F)(°C)		Vac
.80	initial	289.827	940.300	initial	72	74	74	14:00.34	-0.5
.80	final	296.640	947.060	mid	69.5	77	77	14.006	-0.5
.80				final	69.5	76	76		-0.5
	total	6.813	6.760	avg.	70.3	75.7	75.7	75.7	
					530.3	535.7	535.7	535.7	
.90	initial	297.291	947.700	initial	69.5	77	77	10:59.75	-0.5
.90	final	303.220	953.632	mid	68	79	79	10.996	-0.5
.90				final	67.5	81	81		-0.5
	total	5.929	5.932	avg.	68.3	79	79	79	
					528.3	539	539	539	
1.00	initial	303.878	954.300	initial	68	80	80	9:54.91	-0.5
1.00	final	309.613	960.075	mid	67.5	83	83	9.915	-0.5
1.00				final	67.5	84	84		-0.5
	total	5.735	5.775	avg.	67.7	82.3	82.3	82.3	
					527.7	542.3	542.3	542.3	
	initial			initial					
	final			mid					
				final					
	total			avg.					
	initial			initial					
	final			mid					
				final					
	total			avg.					

$$Y = \frac{(Y)(Vc)(Pb)(Tm + 460)}{(Vm)(Pb + \Delta h/13.6)(Tc + 460)} \qquad \Delta h@ = \frac{(0.0317)(\Delta h)}{Pb(Tmo + 460)} \; [(Tc + 460)(\Theta)] / [(Vc)(Yc)]^2$$

Back Half Leak Check

Side 1 mano

Start	8.35	"H_2O
Stop	8.35	"H_2O
	0.00	Leak Rate

Side 2 mano

Start	5.90	"H_2O
Stop	5.90	"H_2O
	0.00	Leak Rate

Front Half Leak Check

	Vac "Hg	mtr RDG Start	Stop	Leak Rate	
OGM	-18.0	939.123	939.124	.001	cfm
TM	-18.0	288.559	288.560	.001	cfm

Meter Box: 456-P
Date: 5/11/15

Rev 6-10

Meter Box Calibration Page 2

$$Y = \frac{(Y_c)(V_c)(BP)(T_m + 460)}{(V_m)(BP + \Delta H/13.6)(T_c + 460)} =$$

$$Y = \frac{(.9963)(6.813)(28.32)(703 + 460)}{(6.760)(28.32 + .80/13.6)(75.7 + 460)} = \frac{101,939,710}{102,769,142} = 0.99193$$

$$Y = \frac{(.9963)(5.929)(28.32)(79 + 460)}{(5.932)(28.32 + .90/13.6)(68.3 + 460)} = \frac{90,168,240}{88,958,746} = 1.01360$$

$$Y = \frac{(.9963)(5.735)(28.32)(82.3 + 460)}{(5.775)(28.32 + 1.00/13.6)(67.7 + 460)} = \frac{87,751,875}{86,528,358} = 1.01414$$

$$Y = \frac{(\quad)(\quad)(\quad)(\quad + 460)}{(\quad)(\quad + \quad/13.6)(\quad + 460)} = \quad = \quad$$

$$Y = \frac{(\quad)(\quad)(\quad)(\quad + 460)}{(\quad)(\quad + \quad/13.6)(\quad + 460)} = \quad = \quad$$

Y Factor	Variation (± 0.02 Allowed From Average Y)
0.99193	-0.01467
1.01360	+0.00700
1.01414	+0.00767

O/C

AM

Avg Y 1.00656

3.01967

METER BOX 45G-P
DATE 5/11/15

$$\Delta H@ = \frac{(0.0317)(\Delta H)}{(Pb)(T_{mo} + 460)} \cdot \left[\frac{(T_w + 460)(\Theta)}{(Y_c)(V_c)}\right]^2 =$$

$$\Delta H@ = \frac{(0.0317)(.80)}{(28.32)(757 + 460)} \cdot \left[\frac{(70.3 + 460)(141.006)}{(.9963)(6.813)}\right]^2 = 2.0015$$
(535.7; 530.3)

$$\Delta H@ = \frac{(0.0317)(.90)}{(28.32)(79 + 460)} \cdot \left[\frac{(68.3 + 460)(10.996)}{(.9963)(5.929)}\right]^2 = 1.8076$$
(539; 528.3)

$$\Delta H@ = \frac{(0.0317)(1.00)}{(28.32)(823 + 460)} \cdot \left[\frac{(67.7 + 460)(9.915)}{(.9963)(5.735)}\right]^2 = 1.7308$$
(542.3; 527.7)

$$\Delta H@ = \frac{(0.0317)(\quad)}{(\quad)(\quad + 460)} \cdot \left[\frac{(\quad + 460)(\quad)}{(\quad)(\quad)}\right]^2 =$$

$$\Delta H@ = \frac{(0.0317)(\quad)}{(\quad)(\quad + 460)} \cdot \left[\frac{(\quad + 460)(\quad)}{(\quad)(\quad)}\right]^2 =$$

ΔH@	VARIATION (± 0.20 ALLOWED)
2.0015	+0.1549
1.8076	-0.0390
1.7308	-0.1158

OK
AM

AVG ΔH@ 1.8466

5.5399

Post Test
Meter Box Audit
Woodstove Data Sheet #32

45G-P
T1

Unit: HEAT TECH HTP20 BP
Date: 8/3/15
Technician: ATM ESS
WST9-Form2, Rev 6/11

Meter Box Calibration Audit
Test Data

Run #	1	2	3	4	5	6	7	8	9	10
Avg.Δh	.90									
Max Vac	-1.1									

Avg. Test Series Δh: .90 in H_2O. Test Series Max Vac: -1.1 in Hg

Audit Dry Gas Meter Mfr: Rockewell SN: 10572202 Correction Factor (Y): 0.9963
Test Dry Gas Meter Mfr: Rockewell SN: 3039270 Correction Factor (Y): 1.0066

Audit Data

		Audit #1	Audit #2	Audit #3
BP ("Hg):		28.24	28.25	28.25
Vac("Hg):		-1.1	-1.1	-1.1
Audit Meter:	Final Vol	483.114	488,562	494.047
	Initial Vol	477.810	483.272	488.797
	Vol (V_c, Ft^3)	5.304	5.290	5.250
Audit Meter Temp (°F) (Tc)	Initial	75	73.5	73
	Mid	74.5	73	72.5
	Final	73.5	73	72.5
	Avg (°F/°A)	74.3 (534.3)	73.2 (533.2)	72.7 (532.7)
Δh("H_2O)	Initial	.90	.90	.90
	Mid	.90	.90	.90
	Final	.90	.90	.90
	Avg	.90	.90	.90
Dry Gas Meter:	Final Vol	63.436	68.963	74.580
	Initial Vol	58.100	63.600	69.200
	Vol(V_d)(ft^3)(m^3)	5.336	5.363	5.380
Dry Gas Meter Temp (°F) : Inlet (T_m)	Initial	77	80	94
	Mid	79	82	86
	Final	80	83	86
	Avg(°F/°A)	78.7 538.7	81.7 (541.7)	85.3 (545.3)
Dry Gas Meter Temp (°F) : Outlet (T_m)	Initial	77	80	94
	Mid	79	82	86
	Final	80	83	86
	Avg(°F/°A)	78.7 (538.7)	81.7 (541.7)	85.3 (545.3)
Avg Dry Gas Meter Temp (T_m - °F/°A)		78.7 (538.7)	81.7 (541.7)	85.3 (545.3)
Time (minutes)		10:00.69	10:00.00	10:01.25

Note: If volume is in m^3, multiply by 35.314667 to obtain ft^3.
Note: Add 460° to all temperatures for degrees Absolute.

456-P T1

$Y = \frac{(V_s)(MCF)(BP)(T_m)}{(V_d)(BP + \Delta h/13.6)(T_s)}$

Y Factor % Difference = $\frac{\text{Act} - \text{Exp}}{\text{Exp}} \times 100$

Note: MCF = Meter Correction Factor (Y) for Dry Gas Meter used as a Transfer Standard

Run 1

$Y = \frac{(5.304)(.9963)(28.24)(538.7)}{(5.336)(28.24 + .9/13.6)(534.3)} = \frac{80,390.608}{80,701.611} = 0.99614$

$\Delta\% = (.99614 - \_\_\_\_) \times 100 = \_\_\_\_\_\%$

Run 2

$Y = \frac{(5.290)(.9963)(28.25)(541.7)}{(5.363)(28.25 + .9/13.6)(533.2)} = \frac{80,653.476}{80,971.568} = 0.99607$

$\Delta\% = (.99607 - \_\_\_\_) \times 100 = \_\_\_\_\_\%$

Run 3

$Y = \frac{(5.250)(.9963)(28.25)(545.3)}{(5.380)(28.25 + .9/13.6)(532.7)} = \frac{80,575.569}{81,152.066} = 0.99386$

$\Delta\% = (0.99386 - \_\_\_\_) \times 100 = \_\_\_\_\_\%$

Note: The Y Factor % Difference must be < ±5.0% to be acceptable. Avg. Δ%=_____

Determination of Interpolated Y Factor for Average Certification Test Series Δ H from Dry Gas Meter Calibration Data:

_____ (A) inch H_2O Δh= _____ (C) Calculated Calibration Y Factor (from Calibration)

_____ (B) inch H_2O Δ h = _____ (D) Calculated Calibration Y Factor (from Calibration)

(B) ____ - (A) ____ = ____ X100 = ____ (E) (D) ____ - (C) ____ = ____ / (E) ____ = ____ (F)

Avg Δ h ____ - (A) ____ = ____ X 100 = ____ (G)

$\left(\frac{\text{F}}{\_\_\_\_} \times \frac{\text{G}}{\_\_\_\_}\right) + \frac{\text{C}}{\_\_\_\_} = \_\_\_\_$ Interpolated Y Factor For Avg. Test Series Δ h

Start +8.30" H_2O
Stop +8.30" H_2O
Δ 0.00

Dry Gas Meter Back Half Leak Check: .000 **inch H_2O in One Minute**

Front Half Leak Check — **Meter Reading** — **Leak Rate**

Meter	Vac In. Hg	Start	Stop	cmm	cfm
DGM	-17.0	.415	.415		.000
TM	-17.0	.047	.047		.000

Revised 7/11

Dry Gas Meter Calibration Data

Date: 5/11/15 Technician: [illegible]

Calibration Meter Mfr: Rockwell SN: 1052202 Y: 0.9963

Meter Box ID Apex 511-M Meter Mfr: Rockwell SN: 322914

Electrical Check Ok Pitot Leak Check N/A

Leak Check Front Half Ok Back Half Ok See Back of Page

BP = 28.32 in. Hg

Orifice (Δh) in. H_2O	Gas Volume	Cal. Meter (Vc), (cu.ft.)	Dry Gas Meter (Vm), (m^3)(ft^3)	Temperature	Cal. Meter (Tc), °F	Dry Gas Meter Inlet (Tmi), (°F) (°C)	Dry Gas Meter Outlet (Tmo), (°F)(°C)	Time (Θ), Min.	Vm
.80	initial	267.368	886.000	initial	70	68	68	16:01.04	0
.80	final	275.436	894.3045	mid	68.5	70	68	16.017	0
.90				final	68	71	68		0
	total	8.068	8.3045	avg.	68.8	69.7	68	68.83	
.80					528.8	529.7	528	528.8	
.90	initial	276.021	894.900	initial	68	70	68	11:37.83	00
.90	final	282.252	901.304	mid	67	71	68	11.626	0
.90				final	67	71	69		
	total	6.231	6.404	avg.	67.3	70.7	68.3	69.5	
.90					527.3	530.7	528.3	529.5	
.75	initial	282.926	902.000	initial	67	69	69	11.17.56	0
.75	final	288.424	907.672	mid	67	70	69	11.293	0
.75				final	67	71	69		0
	total	5.498	5.672	avg.	67	70	69	69.5	
.75					527	530	529	529.5	
	initial			initial					
	final			mid					
				final					
	total			avg.					
	initial			initial					
	final			mid					
				final					
	total			avg.					

$$Y = \frac{(Y)(Vc)(Pb)(Tm + 460)}{(Vm)(Pb + \Delta h/13.6)(Tc + 460)} \qquad \Delta h@ = \frac{(0.0317)(\Delta h)}{Pb(Tmo + 460)} \; [(Tc + 460)(\Theta)] / [(Vc)(Yc)]^2$$

Back Half Leak Check

Side 1 — mano

Start +9.10 "H_2O

Stop +9.10 "H_2O

0.00 Leak Rate

Side 2 — mano

Start +8.00 "H_2O

Stop +8.00 "H_2O

0.00 Leak Rate

2" Manometer System

Side 1 — mano

Start +.94 "H_2O

Stop +0.94 "H_2O

Side 2

Start 1.52 "H_2O

Stop 1.52 "H_2O

0.00 Leak Rate

Front Half Leak Check

	"VAC	MTR BDG Start	MTR BDG Stop	Leak Rate	
DGM	-165 "Hg	.303	303	.000 cfm	Had a leak on the pump outlet. Tightened Swag fitting, all OK.
TM	-165 "Hg	.685	.686	.001 cfm	

Meter Box: 511-M
Date: 8/11/15

Rev 6-10

Meter Box Calibration Page 2

A.T. Myran

$$Y = \frac{(Y_c)(V_c)(BP)(T_m + 460)}{(V_m)(BP + \Delta H/13.6)(T_c + 460)} =$$

528.8

$Y = \frac{(.9963)(8.068)(28.32)(68.8 + 460)}{(8.3045)(28.32 + .80/13.6)(68.8 + 460)} = \frac{120,376,224}{124,623,322} = 0.96592$ ✓

528.8

529.5

$Y = \frac{(.9963)(6.231)(28.32)(69.5 + 460)}{(6.404)(28.32 + .90/13.6)(67.3 + 460)} = \frac{93,090,871}{95,855,270} = 0.97116$ ✓

527.3

529.5

$Y = \frac{(.9963)(5.498)(28.32)(69.5 + 460)}{(5.672)(28.32 + .75/13.6)(67 + 460)} = \frac{82,139,883}{84,817,401} = 0.96843$ ✓

527

$Y = \frac{(\quad)(\quad)(\quad)(\quad + 460)}{(\quad)(\quad + \quad/13.6)(\quad + 460)} = \quad = \quad$

$Y = \frac{(\quad)(\quad)(\quad)(\quad + 460)}{(\quad)(\quad + \quad/13.6)(\quad + 460)} = \quad = \quad$

Y Factor	Variation (± 0.02 Allowed From Average Y)
0.96592 ✓	-0.0026 ✓
0.97116 ✓	+0.0027 ✓
0.96843 ✓	-0.0001 ✓

Ok

ATM

Avg Y 0.96850 ✓

2.90551 ✓

METER BOX 511-M
DATE 5/11/15
 A.T. Myers

$$\Delta H@ = \frac{(0.0317)(\Delta H)}{(Pb)(T_{mo} + 460)} \cdot \left[\frac{(T_w + 460)(\Theta)}{(Y_c)(V_c)}\right]^2 =$$

$$\Delta H@ = \frac{(0.0317)(\ .80\ )}{(28.32)(68 + 460)} \cdot \left[\frac{(68.8 + 460)(16.017)}{(.9963)(8.068)}\right]^2 = 1.8830$$
(528 → 528.8)

$$\Delta H@ = \frac{(0.0317)(\ .90\ )}{(28.32)(68.3 + 460)} \cdot \left[\frac{(673 + 460)(11.626)}{(.9963)(6.231)}\right]^2 = 1.8595$$
(528.3 → 527.3)

$$\Delta H@ = \frac{(0.0317)(\ .75\ )}{(28.32)(69 + 460)} \cdot \left[\frac{(67 + 460)(11.293)}{(.9963)(5.498)}\right]^2 = 1.8734$$
(529 → 527)

$$\Delta H@ = \frac{(0.0317)(\quad)}{(\quad)(\quad + 460)} \cdot \left[\frac{(\quad + 460)(\quad)}{(\quad)(\quad)}\right]^2 = \_\_\_\_$$

$$\Delta H@ = \frac{(0.0317)(\quad)}{(\quad)(\quad + 460)} \cdot \left[\frac{(\quad + 460)(\quad)}{(\quad)(\quad)}\right]^2 = \_\_\_\_$$

ΔH@	VARIATION (± 0.20 ALLOWED)
1.8830	+0.0110
1.8595	-0.0125
1.8734	+0.0143

ok AM

AVG ΔH@ 1.8720

5.6159

Post Test
Meter Box Audit
Woodstove Data Sheet #32

5/11/11
Tower 2

Unit: HEAT TECH HTP 76 BA
Date: 8/3/15
Technician: ATM ESD
WST9-Form2, Rev 6/11

Meter Box Calibration Audit
Test Data

Run #	1	2	3	4	5	6	7	8	9	10
Avg.Δh	.75									
Max Vac	0									

Avg. Test Series Δh: .75 in H_2O. Test Series Max Vac: 0 in Hg

Audit Dry Gas Meter Mfr: Rockwell SN: 10S7202 Correction Factor (Y): 0.9963
Test Dry Gas Meter Mfr: Kimmon SN: 5000571 Correction Factor (Y): 0.9734

Audit Data

		Audit #1	Audit #2	Audit #3
BP ("Hg):		28.39	28.385	28.38
Vac("Hg):		0	0	0
Audit Meter:	Final Vol	502.622	508.078	513.615
	Initial Vol	497.411	502.813	508.411
	Vol (V_c, Ft^3)	5.211	5.265	5.204
Audit Meter Temp (°F) (Tc)	Initial	66.5	65.5	65.5
	Mid	66.5	65.5	65.5
	Final	66	65.5	65.5
	Avg (°F/°A)	66.3 (526.3)	65.5 (525.5)	65.5 (525.5)
Δh("H_2O)	Initial	.75	.75	.75
	Mid	.75	.75	.75
	Final	.75	.75	.75
	Avg	.75	.75	.75
Dry Gas Meter:	Final Vol	562.705	568.265	573.887
	Initial Vol	557.400	562.900	568.600
	Vol(V_d)(ft^3)(m^3)	5.305	5.365	5.287
Dry Gas Meter Temp (°F) : Inlet (T_m)	Initial	63	66	67
	Mid	66	68	69
	Final	67	68	70
	Avg(°F/°A)	65.3 (525.3)	67.3 (527.3)	68.6 (528.7)
Dry Gas Meter Temp (°F) : Outlet (T_m)	Initial	62	64	66
	Mid	63	65	67
	Final	64	65	67
	Avg(°F/°A)	63 (523)	64.7 (524.7)	66.7 (526.7)
Avg Dry Gas Meter Temp (T_m - °F/°A)		64.2 (524.2)	66.0 (526)	67.7 (527.7)
Time (minutes)		10:19.31	10:23.03	10:18.47

Note: If volume is in m^3, multiply by 35.314667 to obtain ft^3.
Note: Add 460° to all temperatures for degrees Absolute.

$Y = \frac{(V_c)(MCF)(BP)(T_m)}{(V_d)(BP + \Delta h/13.6)(T_c)}$ Y Factor % Difference = $\frac{Act - Exp}{Exp}$ X 100 S11-M T2

Note: MCF = Meter Correction Factor (Y) for Dry Gas Meter used as a Transfer Standard

Run 1

$Y = \frac{(.9963)(5.211)(28.39)(524.2)}{(5.305)(28.39 + .75/13.6)(526.3)} = \frac{77,263,364}{79,419,462} = 0.97285$

$\Delta\% = (0.97285 - \_\_\_\_\_) \times 100 = \_\_\_\_\_\%$

Run 2

$Y = \frac{(.9963)(5.265)(28.385)(526)}{(5.365)(28.385 + .75/13.6)(525.5)} = \frac{78,318,291}{80,131,520} = 0.97676$

$\Delta\% = (0.97676 - \_\_\_\_\_) \times 100 = \_\_\_\_\_\%$

Run 3

$Y = \frac{(.9963)(5.204)(28.38)(527.7)}{(5.287)(28.38 + .75/13.6)(525.5)} = \frac{77,647,397}{79,001.895} = 0.98285$

$\Delta\% = (0.98285 - \_\_\_\_\_) \times 100 = \_\_\_\_\_\%$

Note: The Y Factor % Difference must be < ±5.0% to be acceptable. Avg. Δ%=_____

Determination of Interpolated Y Factor for Average Certification Test Series Δ H from Dry Gas Meter Calibration Data:

_____ (A) inch H_2O Δh= _____ (C) Calculated Calibration Y Factor (from Calibration)

_____ (B) inch H_2O Δ h = _____ (D) Calculated Calibration Y Factor (from Calibration)

(B) _____ - (A) _____ = _____ X100 = (E) _____ (D) _____ - (C) _____ = _____ / (E) _____ = (F) _____

Avg Δ h _____ - (A) _____ = _____ X 100 = (G) _____

$\left(\frac{\text{F}}{\_\_\_\_\_} \times \frac{\text{G}}{\_\_\_\_\_}\right) + \text{C} \_\_\_\_\_ = \_\_\_\_\_$ Interpolated Y Factor For Avg. Test Series Δ h

Start: +9.14
Stop: +9.14
Δ 0.00

Dry Gas Meter Back Half Leak Check: 0.00 **inch H_2O in One Minute**

Front Half Leak Check — **Meter Reading** — **Leak Rate**

Meter	Vac In. Hg	Start	Stop	cmm	cfm
DGM	-22.25	.992	.998		.006
TM	-22.25	.925	.935		.010

Revised 7/11

RB

Dry Gas Meter Calibration Data

Date: 5/12/15 Technician: A.T. Mynn

Calibration Meter Mfr: Rockwell SN: 10572202 Y: 0.9963

Meter Box ID Room Blank Meter Mfr: Kimmon SN: 8000571

Electrical Check ok Pitot Leak Check N/A

Leak Check Front Half ok Back Half ok over

BP = 28.34 in. Hg

Orifice (Δh) in. H_2O		Gas Volume: Cal. Meter (Vc), (cu.ft.)	Gas Volume: Dry Gas Meter (Vm), (m^3) (ft^3)		Temperature: Cal. Meter (Tc), °F	Temperature: Dry Gas Meter Inlet (Tmi), (°F) (°C)	Temperature: Dry Gas Meter Outlet (Tmo), (°F)(°C)	Time (Θ), Min.
.115	initial	315.769	127.3690	initial	73	70	70	9:58.54
.115	final	320.996	127.5209	mid	72	73	71	9.976
1115				final	72	75	72	
	total	5.227	.1519	avg.	72.3	72.7	71	71.83
.115			5.3643		532.3	532.7	531	531.8
.100	initial	322.240	127.5570	initial	72	74	72	12:11.75
.100	final	328.115	127.72755	mid	72	75	73	12.196
1100				final	72	76	73	
	total	5.875	.17055	avg.	72	75	72.7	738
.100			6.0229		532	535	532.7	533.8
1130	initial	329.235	127.7600	initial	71.5	75	73	9:19.31
1135	final	334.505	127.9132	mid	72	77	73	9.322
1135				final	71.5	77	74	
	total	5.270	.1532	avg.	71.7	76.3	73.3	74.8
.133			5.4102		531.7	536.3	533.3	534.8
	initial			initial				
	final			mid				
				final				
	total			avg.				
	initial			initial				
	final			mid				
				final				
	total			avg.				

$$Y = \frac{(Y)(Vc)(Pb)(Tm + 460)}{(Vm)(Pb + \Delta h/13.6)(Tc + 460)} \qquad \Delta h@ = \frac{(0.0317)(\Delta h)}{Pb(Tmo + 460)} \qquad [(Tc + 460)(\Theta)] / [(Vc)(Yc)]^2$$

Back Half Leak Check

Start - 7.52" H_2O

Stop - 7.52" H_2O

0.00 Leak Rate

Front Half Leak Check.

Mtr	Vac "Hg	Mtr Rdg Start	Stop	Leak Rate cmm	cfm
OGM	-20.5	.22635	.22645	.0001	
TM	-20.5	.740	.751	.011	

~~.Yoo~~

.2

Meter Box: Room Blank
Date: 5/12/15
Page: 2 of 3
Rev 6-10

Meter Box Calibration Page 2

ATMyrem

$$Y = \frac{(Y_c)(V_c)(BP)(T_m + 460)}{(V_m)(BP + \Delta H/13.6)(T_c + 460)} =$$

$$Y = \frac{(.9963)(5.227)(28.34)(71.8 + 460)}{(5.3643)(28.34 + .115/13.6)(72.3 + 460)} = \frac{78,485.747}{80,946.660} = .96960$$

531.8
532.3

$$Y = \frac{(.9963)(5.875)(28.34)(73.8 + 460)}{(6.0279)(28.34 + .100/13.6)(72 + 460)} = \frac{88,547.523}{90,830.101} = 0.97487$$

532.8
533.2

$$Y = \frac{(.9963)(5.270)(28.34)(74.8 + 460)}{(5.4102)(28.34 + .133/13.6)(71.7 + 460)} = \frac{79,571.811}{81,551.070} = 0.97580$$

534.8
531.7

$$Y = \frac{(\quad)(\quad)(\quad)(\quad + 460)}{(\quad)(\quad + \quad/13.6)(\quad + 460)} = \quad = \quad$$

$$Y = \frac{(\quad)(\quad)(\quad)(\quad + 460)}{(\quad)(\quad + \quad/13.6)(\quad + 460)} = \quad = \quad$$

Y Factor	Variation (± 0.02 Allowed From Average Y)
0.96960	-0.00382
0.97487	+0.00145
0.97580	+0.00238

Avg Y 0.97342

2.92027

METER BOX Room Blank
DATE 5/12/15
 ATMyron

$$\Delta H@ = \frac{(0.0317)(\Delta H)}{(Pb)(T_{mo} + 460)} \cdot \left[\frac{(T_w + 460)(\Theta)}{(Y_c)(V_c)}\right]^2 =$$

$$\Delta H@ = \frac{(0.0317)(.115)}{(26.34)(71 + 460)} \cdot \left[\frac{(523 + 460)(9.976)}{(.9963)(5.227)}\right]^2 = .25189$$

$$\Delta H@ = \frac{(0.0317)(.100)}{(28.34)(727 + 460)} \cdot \left[\frac{(72 + 460)(12196)}{(.9963)(5.875)}\right]^2 = .25801$$

$$\Delta H@ = \frac{(0.0317)(.133)}{(28.34)(733 + 460)} \cdot \left[\frac{(717 + 460)(9.329)}{(.9963)(5.270)}\right]^2 = .24859$$

$$\Delta H@ = \frac{(0.0317)(\quad)}{(\quad)(\quad + 460)} \cdot \left[\frac{(\quad + 460)(\quad)}{(\quad)(\quad)}\right]^2 = \_\_\_\_$$

$$\Delta H@ = \frac{(0.0317)(\quad)}{(\quad)(\quad + 460)} \cdot \left[\frac{(\quad + 460)(\quad)}{(\quad)(\quad)}\right]^2 = \_\_\_\_$$

ΔH@	VARIATION (± 0.20 ALLOWED)
.25189	-.00094
.25801	+.00518
.24859	-.00424

AVG ΔH@ 0.25283

.75849

Post Test
Meter Box Audit
Woodstove Data Sheet #32

RB
T3

Unit: Hoyt Tech HP20 Gas
Date: 8/13/15
Technician: ATM BSS
WST9-Form2, Rev 6/11

Meter Box Calibration Audit
Test Data

Run #	1	2	3	4	5	6	7	8	9	10
Avg.Δh	.115									
Max Vac	-1.50									

Avg. Test Series Δh: .115 in H_2O. Test Series Max Vac: -1.50 in Hg

Audit Dry Gas Meter Mfr: Rockwell SN: 1052202 Correction Factor (Y): 0.9963
Test Dry Gas Meter Mfr: Rockwell SN: 322914 Correction Factor (Y): 0.9685

Audit Data

		Audit #1	Audit #2	Audit #3
BP ("Hg):		28.375	28.365	28.340
Vac("Hg):		-1.50	-1.50	-1.50
Audit Meter:	Final Vol	521.7385	527.324	533.062
	Initial Vol	516.0750	521.941	527.802
	Vol (V_c, Ft^3)	5.6635	5.383	5.260
Audit Meter Temp (°F) (Tc)	Initial	66.5	67	67.5
	Mid	66.5	67.5	68.5
	Final	66.5	67.5	68.5
	Avg (°F/°A)	66.5 (526.5)	67.3 (527.3)	68.2 (528.2)
Δh("H_2O)	Initial	.115	.115	.115
	Mid	.115	.115	.115
	Final	.115	.115	.115
	Avg	.115	.115	.115
Dry Gas Meter:	Final Vol	144.8939	145.0561	145.2228
	Initial Vol	144.7290	144.9000	145.0700
	Vol(V_d)(ft^3)(m^3)	.1649 5.8234	.1561 5.5126	.1528 5.3961
Dry Gas Meter Temp (°F) : Inlet (T_m)	Initial	68	69	69
	Mid	68	69	70
	Final	68	69	70
	Avg(°F/°A)	68 (528)	69 (529)	69.7 (529.7)
Dry Gas Meter Temp (°F) : Outlet (T_m)	Initial	68	68	69
	Mid	68	69	69
	Final	68	69	70
	Avg(°F/°A)	68 (528)	68.7 (528.7)	69.3 (529.3)
Avg Dry Gas Meter Temp (T_m - °F/°A)		68 (528)	68.8 (528.8)	69.5 (529.5)
Time (minutes)		11:21.90	10:35.44	10:19.13

Note: If volume is in m^3, multiply by 35.314667 to obtain ft^3.
Note: Add 460° to all temperatures for degrees Absolute.

RB-T3

$Y = \frac{(V_s)(MCF)(BP)(T_m)}{(V_d)(BP + \Delta h/13.6)(T_s)}$

Y Factor % Difference = $\frac{\text{Act} - \text{Exp}}{\text{Exp}} \times 100$

Note: MCF = Meter Correction Factor (Y) for Dry Gas Meter used as a Transfer Standard

Run 1

$Y = \frac{(.9963)(5.6635)(28.375)(528)}{(5.8234)(28.375 + .115/13.6)(526.5)} = \frac{84,536.610}{87,024.246} = 0.97141$

$\Delta\% = (0.97141 - \_\_\_\_\_) \times 100 = \_\_\_\_\_\%$

Run 2

$Y = \frac{(.9963)(5.383)(28.365)(528.8)}{(5.5126)(28.365 + .115/13.6)(527.3)} = \frac{80,443.090}{82,475.791} = 0.97535$

$\Delta\% = (0.97535 - \_\_\_\_\_) \times 100 = \_\_\_\_\_\%$

Run 3

$Y = \frac{(.9963)(5.260)(28.340)(529.5)}{(5.3961)(28.340 + .115/13.6)(528.2)} = \frac{78,565.412}{80,199.336} = 0.97235$

$\Delta\% = (\_\_\_\_\_ - \_\_\_\_\_) \times 100 = \_\_\_\_\_\%$

Note: The Y Factor % Difference must be < ±5.0% to be acceptable. Avg. Δ%=_____

Determination of Interpolated Y Factor for Average Certification Test Series Δ H from Dry Gas Meter Calibration Data:

_____ (A) inch H_2O Δh= _____ (C) Calculated Calibration Y Factor (from Calibration)

_____ (B) inch H_2O Δ h = _____ (D) Calculated Calibration Y Factor (from Calibration)

(B) _____ - (A) _____ = _____ X100 = _____ (E) (D) _____ - (C) _____ = _____ / (E) _____ = _____ (F)

Avg Δ h _____ - (A) _____ = _____ X 100 = _____ (G)

$\left(\text{F} \_\_\_\_\_ \times \text{G} \_\_\_\_\_\right) + \text{C} \_\_\_\_\_ =$ _____ Interpolated Y Factor For Avg. Test Series Δ h

Time 1:00 min
Start 9.190
Stop 9.190
Δ .000

Dry Gas Meter Back Half Leak Check: .000 **inch H_2O in One Minute**

Front Half Leak Check		Meter Reading		Leak Rate	
Meter	**Vac In. Hg**	**Start**	**Stop**	**cmm**	**cfm**
DGM	-21.0	.9870	.9870	.0000	.000
TM	-21.0	.825	.833		.008

APEX INSTRUMENTS REFERENCE METER VERIFICATION

USING WET-TEST METER #11AE6

2-POINT ENGLISH UNITS

Calibration Meter Information	
WTM Model #	AL20
WTM Serial #	11AE6
WTM Gamma	0.9999
Original 15Pt Gamma	0.9963

Calibration Conditions			
Date	Time	13-Mar-15	2:00
Barometric Pressure		30.05	in Hg
Calibration Tech		EW	
DGM Serial Number		S-110-1052202	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	°R/in Hg

Calibration Data												Results		
Run Time	Metering Console						Calibration Meter					Dry Gas Meter		
					Outlet Temp					Outlet Temp		Calibration Factor		Flowrate
Elapsed	DGM Input Pressure	Volume Initial	Volume Final	Volume Sample	Initial	Final	Volume Initial	Volume Final	Volume Sample	Initial	Final	Previous	Current	Std & Corr
(Θ)	(P_m)	(V_{mi})	(V_{mf})	(V_m)	(t_{mi})	(t_{mf})	(V_{wi})	(V_{wf})	(V_m)	(t_{wi})	(t_{wf})	(Y)	(Y)	($Q_{m(std)(corr)}$)
min	in H_2O	cubic feet	cubic feet	cubic feet	°F	°F	cubic feet	cubic feet	cubic feet	°F	°F			cfm
6.00	-3.7	253.732	259.811	6.079	73.4	73.4	731.750	737.710	5.960	71	71	0.9963	0.9939	0.992
											Variation	0.25%	must be less than 1.5%	
10.00	-2.2	259.811	265.431	5.620	73.4	73.4	737.710	743.240	5.530	71	71	0.9964	0.9938	0.552
											Variation	0.26%	must be less than 1.5%	

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, App A, Method 5, Paragraph 7.1.2.2, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 3785, certificate # F107, which is traceable to the National Bureau of Standards (N.I.S.T.).

Signature Eric Weber Date 3/13/15

APEX INSTRUMENTS REFERENCE METER CALIBRATION

USING WET-TEST METER #11AE6

15-POINT ENGLISH UNITS

Calibration Meter Information	
WTM Model #	AL-20
WTM Serial #	11AE6
WTM Gamma	0.9999

Calibration Conditions			
Date	Time	18-Feb-14	9:15
Barometric Pressure		29.8	in Hg
Calibration Technician		EW	
DGM Serial Number		S-110-1052202	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	°R/in Hg

Calibration Data												Results		
Run Time	Dry Gas Meter						Calibration Meter					Dry Gas Meter		
												Calibration Factor		Flowrate
Elapsed	Meter Pressure	Volume Initial	Volume Final	Sample Volume	Outlet Temp Initial	Outlet Temp Final	Volume Initial	Volume Final	Sample Volume	Outlet Temp Initial	Outlet Temp Final	Value	Variation	Std & Corr
(Θ)	(P_m)	(V_{mi})	(V_{mf})	(V_m)	(t_{mi})	(t_{mf})	(V_{wi})	(V_{wf})	(V_w)	(t_{wi})	(t_{wf})	(Y)	(ΔY)	($Q_{std(corr)}$)
min	in H_2O	cubic feet	cubic feet	cubic feet	°F	°F	cubic feet	cubic feet	cubic feet	°F	°F			cfm
5	-5.1	657.117	663.335	6.218	73.4	73.4	677.080	683.140	6.060	68.0	68.0	0.9970	0.00149	1.21
5	-5.1	663.335	669.550	6.215	73.4	73.4	683.140	689.180	6.040	68.0	68.0	0.9942	-0.00133	1.20
5	-5.1	669.550	675.768	6.218	73.4	73.4	689.180	695.230	6.050	68.0	68.0	0.9954	-0.00016	1.21
										Passed Calibration Fa		0.9955	Averages	1.21
6	-3.7	694.023	699.987	5.964	75.2	75.2	713.145	718.970	5.825	68.0	68.0	0.9990	0.00269	0.97
6	-3.7	699.987	705.997	6.010	75.2	75.2	718.970	724.820	5.850	68.0	68.0	0.9956	-0.00071	0.97
6	-3.7	705.997	712.025	6.028	75.2	75.2	724.820	730.680	5.860	68.0	68.0	0.9944	-0.00198	0.97
										Passed Calibration Fa		0.9963	Averages	0.97
7	-2.8	712.025	717.674	5.649	75.2	75.2	730.680	736.190	5.510	68.0	68.0	0.9955	0.00082	0.78
7	-2.8	717.674	723.317	5.643	75.2	75.2	736.190	741.690	5.500	68.0	68.0	0.9947	0.00007	0.78
7	-2.8	723.317	728.975	5.658	75.2	77.0	741.690	747.190	5.500	68.0	68.0	0.9938	-0.00090	0.78
										Passed Calibration Fa		0.9947	Averages	0.78
10	-2.0	728.975	734.645	5.670	77.0	77.0	747.190	752.730	5.540	68.0	68.0	0.9986	0.00215	0.55
10	-2.0	734.645	740.312	5.667	77.0	77.0	752.730	758.260	5.530	68.0	68.0	0.9973	0.00088	0.55
10	-2.0	740.312	745.991	5.679	77.0	77.0	758.260	763.780	5.520	68.0	68.0	0.9934	-0.00303	0.55
										Passed Calibration Fa		0.9964	Averages	0.55
15	-1.9	675.768	681.868	6.100	73.4	75.2	695.230	701.215	5.985	68.0	68.0	0.9974	-0.00135	0.40
15	-1.9	681.868	687.947	6.079	75.2	75.2	701.215	707.180	5.965	68.0	68.0	0.9992	0.00043	0.40
15	-1.9	687.947	694.023	6.076	75.2	75.2	707.180	713.145	5.965	68.0	68.0	0.9997	0.00092	0.40
										Passed Calibration Fa		0.9988	Averages	0.40
											Overall Average Y	**0.9963**		

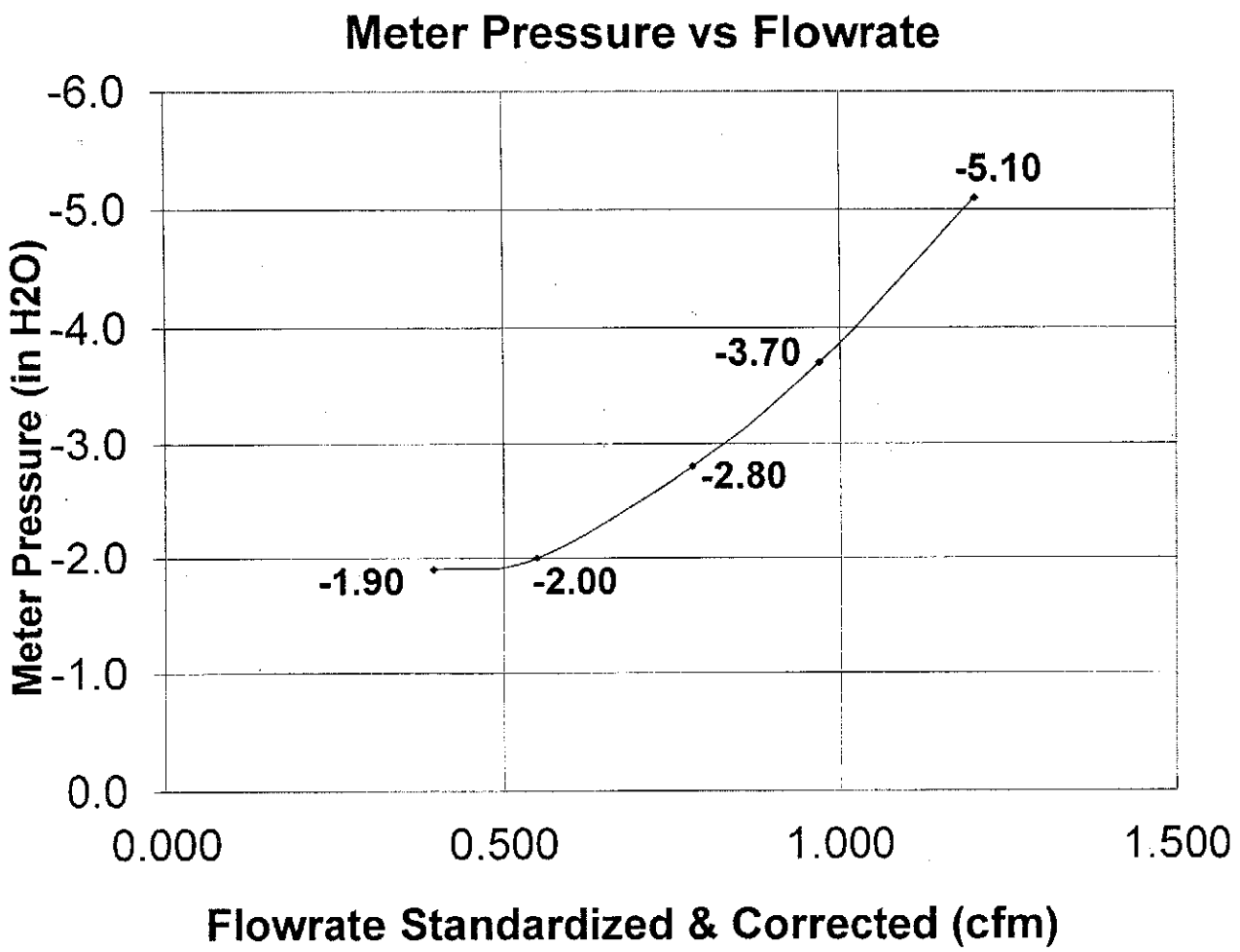
Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 3785, certificate # F107, which is traceable to the National Bureau of Standards (N.I.S.T.).

Signature Eric Wolk Date 2/18/14

Calibration Date: 2-18-2014

Calibration Technician:

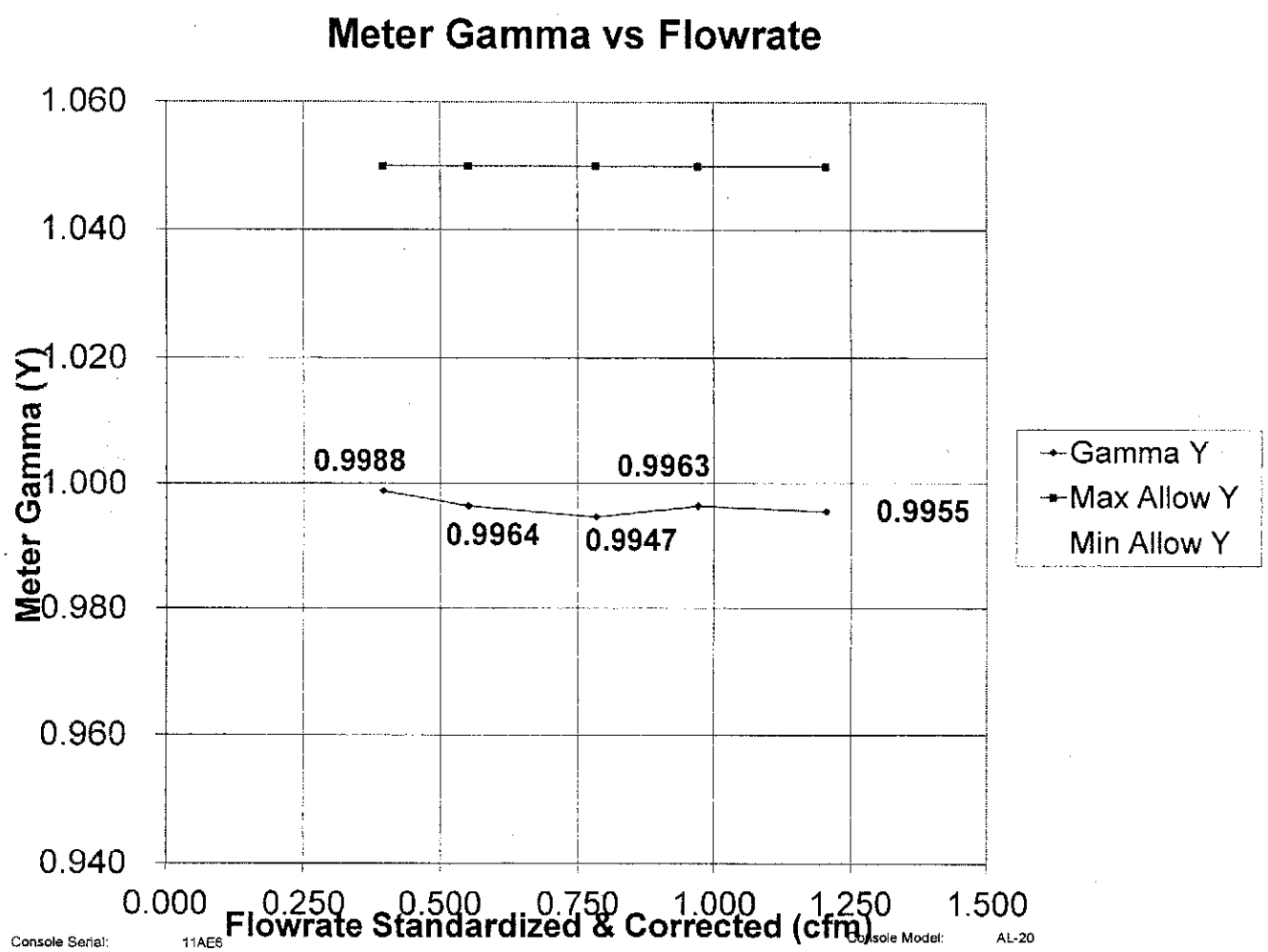


Console Model: AL-20

Console Serial: 11AE6

Calibration Date: 2-18-2014

Calibration Technician: EW



Console Serial: 11AE6

Console Model: AL-20

VANEOMETER CALIBRATION

Myren Consulting used a Dwyer Model 3480 Vaneometer to measure test chamber air velocity. The manufacturer's specifications for accuracy are ± 5.0% from 0 to 100 fpm and ± 10% from 100 to the top of the scale. Myren Consulting insures that the instrument is level and clean prior taking each reading. According to EPA personnel (Westlin, RTP) no further calibration is necessary.

DRAFT GUAGE CALIBRATION

Myren Consulting used a Dwyer Model 115 AV, a -0.05 - 0.0 - 0.25" inclined red oil manometer (readability resolution ± 0.001" H_2O) to measure the static pressure in the stack. Once leveled and zeroed as per the manufacturer's written operating instructions, the Dwyer manometer is a primary standard and needs no further calibration.

The manometer is leveled and zeroed at the start of each test, checked as necessary during a run to verify that the settings have not changed and again at the end of each test run. The results of these checks are recorded on Woodstove Data Sheet #16 in each individual test.

BAROMETER CALIBRATION

Myren Consulting used a Princo Model 453 SN W14275 Mercury barometer and a Weems and Plath aneroid barometer to measure the barometric pressure (BP). The Weems and Plath barometer was calibrated daily by comparing it to the Princo and adjusting it as necessary. The Princo when calibrated following the manufacturer's instructions is a primary standard and needs no further calibration.

MOISTURE METER CALIBRATION

Myren Consulting uses a Delmhorst J-2000 which was calibrated daily using the "Check" feature. Then the operation of the moisture meter was checked with a Delmhorst Moisture Content Standard Model MCS-1 at 12.6 and 23.8%. The results of these checks are recorded on Data Sheet #10.

The readings obtained with the moisture meter are then corrected as per the manufacturer's written instructions for temperature. If Delmhorst #496 insulated pins are used, the meter is set at 222 using the Set Pin Calibration instructions. The meter is set at 1 for the Species correction. 1 is the setting for D. Fir

WOODSTOVE DATA SHEET #26-A

CEM GAS TRAIN RESPONSE TIME

PRE CERTIFICATION TEST SERIES CHECK

Date	5/13/15	→	→	→	→	→					
Technicians	ATM	→	→	→	→	→					
Elapsed Time	CO_2 Conc.(V)	CO_2 Conc.(V)	CO_2 Conc.(V)	CO Conc.(V)	CO Conc.(V)	CO Conc.(V)	O_2 Conc.(V)	O_2 Conc.(V)	O_2 Conc.(V)	Conc.(V)	Conc.(V)
0 Seconds	.486	.484	.480	.156	.158	.159					
15	.486	.485	.480	.155	.158	.159					
30	.291	.290	.288	.149	.150	.151					
45	.106	.102	.101	.060	.061	.061					
60	.046	.048	.047	.043	.043	.044					
75	.008	.009	.008	.032	.031	.031					
90	.004	.006	.004	.005	.005	.006					
105	.003	.004	.002	.002	.002	.003					
120	.001	.001	.001	.001	.001	.001					
135	.001	.001	.001	.001	.001	.001					
150	.000	.001	.000	.000	.001	.001					
165	.000	.000	.000	.000	.000	.001					
180	.000	.000	.000	.000	.000	.000					
Initial Response Time (Seconds) ~~N 286 sec~~		~~N 295 sec~~	~~N 295 sec~~	>30, <45	730, <45	730, <45					
95% Response Time (Seconds)	>60 <75	>60 <75	>60 <75	>75 <90	>75 <90	>75 <90					
Analyzer Flow Rate 190 l/h.	→					→					

Comments

95% drop

.024 .024 .024 .008 .008 .008

Myren Consulting Inc.
512 Williams Lake Rd; Colville, WA 99114; (509)685-9458
QA WS, REV 1/10

Pre Heat Tech
HTP 26 Day

CO_2 Analyzer

Multipoint Calibration Report Form

Site: Myren Lab, Colville, WA Date: 7/30/15

Analyzer: Make: Horiba Model: PIR 2000 SN: 607204

Calibration by: A.T. Myren

Cal Gas Flow: 1.5 scfh Measured by: Rotameter: X Mass Flowmeter: _____

BP: 28.625 "Hg Instrument ID: Princo

Temp: 64 °F Instrument ID: Omega Digicator

Analyzer Last Calibrated: 7/28/15 By: A.T. Myren

Cylinders:

1. # ITM8803 / 11 Concentration: 0.00 %CO_2 Cyl. Press.: 220 psi.
   Certified By: Oxarc Date: 6/11/12
2. # FB-0019810 Concentration: 12.4 %CO_2 Cyl. Press.: 220 psi.
   Certified by: Liquid Technology Corp Date: 4/25/12
3. # 250-1175 Concentration: 21.0 %CO_2 Cyl. Press.: 680 psi.
   Certified by: Oxarc Date: 8/22/97
4. # SX-40585 Concentration: 6.04 %CO_2 Cyl. Press.: 1320 psi.
   Certified by: Matheson Tri Gas Date: 4/12/10

Analyzer: Calibrated Range: 0 – 25 % Output: 0 – 1.0 v.

Span Value = 25.0%
2% of Span Value = 0.500%

Flow: 1.5 scfh Measured by: Rotameter: X Mass Flowmeter: _____

Calibration Results

Point #	Cyl. #	% CO_2	Expected		Actual		Adj.		% Dif.	Curve Conc.	Potentiometer	
			Meter	DVM	Meter	DVM	Meter	DVM			Unadj.	Adj.
1	1	0.00	00.0	.000	00.0	.000	—	—		+0.13	4.90	—
2	2	12.4	49.6	.496	48.5	.493	48.75	.496		+0.23	6.92	6.98
3	3	21.0	84.0	.840	82.5	.839				+0.002		
4	4	6.04	24.2	.242	23.5	.238				-1.00		
5	1	0.00	00.0	.000	00.0	.000				+0.13		

Comments:

0.000 V = 0.03161709 %CO_2 = +0.0316
0.496 V = 12.42800009 = +0.0280
0.839 V = 21.0005002 = +0.0005
0.238 V = 5.97988319 = -0.0601

HTP 26 Bay

Linear Regression Results

Y= MX + B

Slope M= 0.040010 8

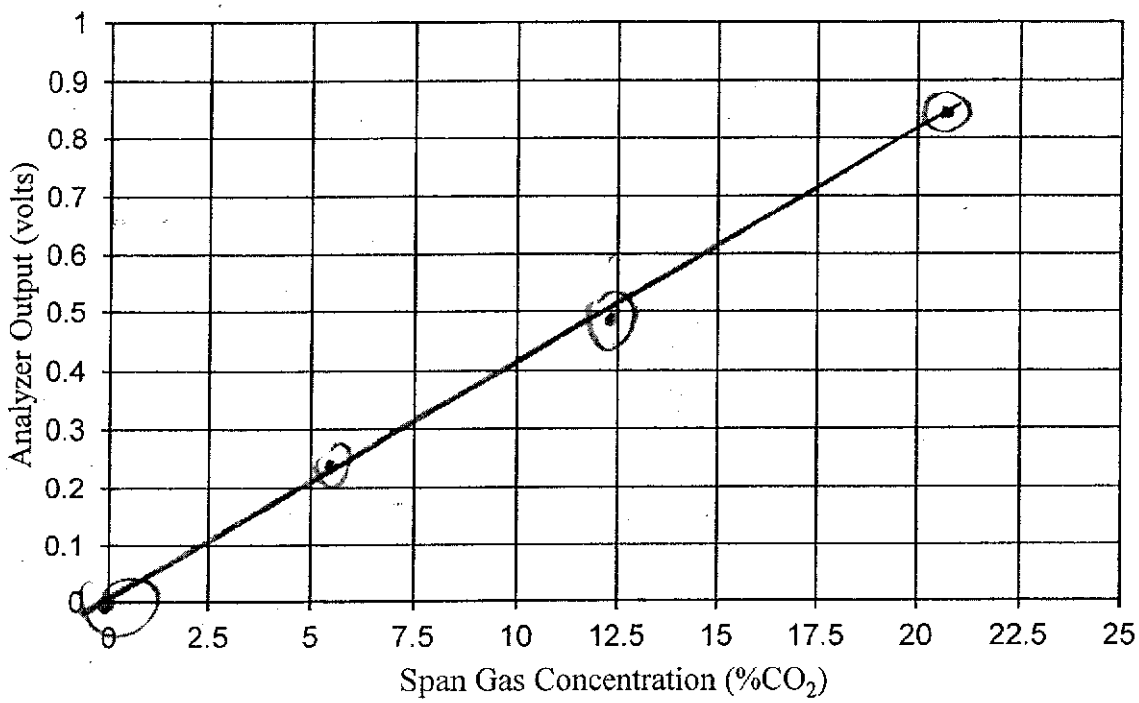
Y Intercept (B)= -0.001256 3

Correlation Coefficient (r) 0.9999389

Analyzer: Horiba PIR 2000

SN: 607204

Date: 7/30/15



Comments:

Myren Consulting Inc.
512 Williams Lake Rd; Colville, WA 99114; (509)685-9458

QA WS, REV 1/10

Pre Heat Tech
MJP 76 Bay

CO Analyzer

Multipoint Calibration Report Form

Site: EPA Lab, Colville, WA Date: 7/30/15

Analyzer: Make: Horiba Model: MEXA 311-GE SN: GE-30075

Calibration by: A.T. Myren

Cal Gas Flow: 1.5scfh Measured by: Rotameter: X Mass Flowmeter:

BP: 28.625 "Hg Instrument ID: Princo

Temp: 64 °F Instrument ID: Omega Digicator

Analyzer Last Calibrated: 7/28/15 By: A.T. Myren

Cylinders:

1. # ITM8803/11 Concentration: 0.00 %CO Cyl. Press.: 220 psi.
   Certified By: Oxarc Date: 6/11/12
2. # CC198810 Concentration: 2.57 %CO Cyl. Press.: 220 psi.
   Certified by: Liquid Technology Corp Date: 4/25/12
3. # 250-1175 Concentration: 4.03 %CO Cyl. Press.: 680 psi.
   Certified by: Oxarc Date: 8/22/97
4. # SX-405825 Concentration: 1.29 %CO Cyl. Press.: 1320 psi.
   Certified by: Matheson Tri Gas Date: 4/12/10

Analyzer: Calibrated Range: 0 - 5.0 % Output: 0 – 1.0 v. 0-0.5V for 0-5.0% For 0-10.0%

Flow: 1.50 CFH Measured by: Rotameter: X Mass Flowmeter:

Calibration Results 2% of Span Value = 0.100% CO

Point #	Cyl. #	% CO	Expected		Actual		Adj.		Curve Conc.	% Dif.	Potentiometer	
			Meter	DVM	Meter	DVM	Meter	DVM			Unadj.	Adj.
1	1	0.00	—	.000	—	-.002	—	—		+0.57	—	—
2	2	2.57	—	.257	—	.256	—	.257		-0.95	—	—
3	3	4.03	—	.403	—	.411	—			+0.59		
4	4	1.29	—	.129	—	.126	—			+2.13		
5	1	0.00	—	.000	—	.000	—			+0.57		

vs. 10

Comments: The meter on the instrument is broken and unrepairable, Horiba no longer makes the part

0.000 V = 0.0283233 %CO - +.0283
0.257 V = 2.5454690 %CO -.0245
0.411 V = 4.0537975 %CO +.0238
0.126 V = 1.2624108 %CO -.0276

Pre Heat Tech HTP 26 Bay

Linear Regression Results

Y= MX + B

Slope M= 0.1020686

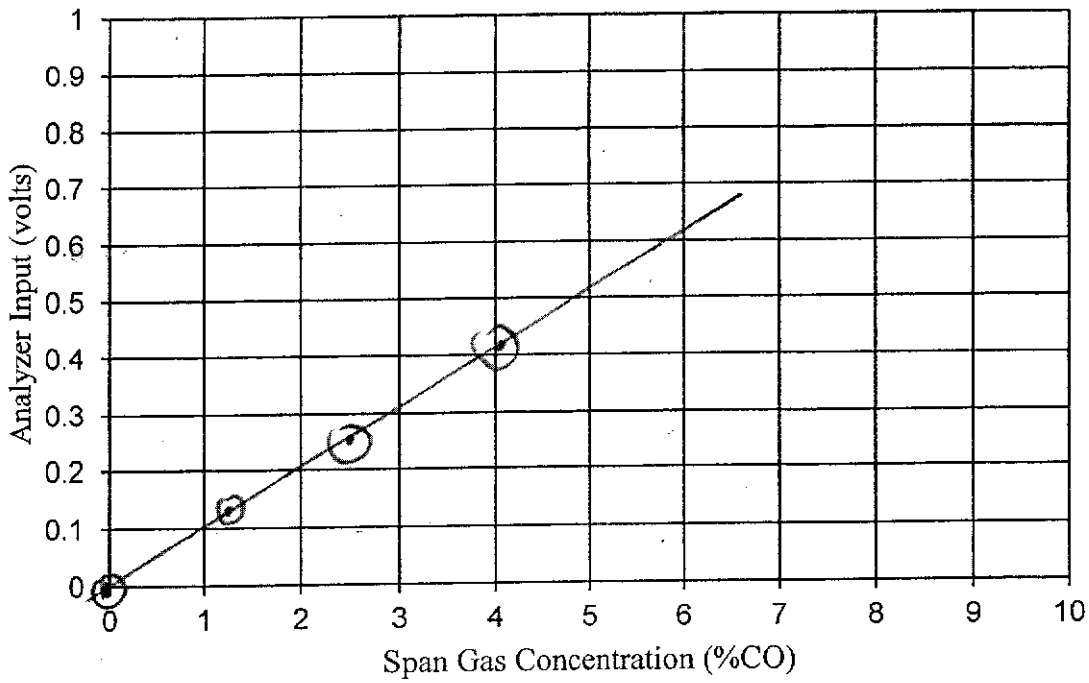
Y Intercept (B)= -0.0028303

Correlation Coefficient (r) 0.9998473

Analyzer: Horiba Mexa 311-GE

SN: GE - 30075

Date: 7/30/15



Comments:

LIQUID TECHNOLOGY CORPORATION

"INDUSTRY LEADER IN SPECIALTY GASES"

Certificate of Analysis

- EPA PROTOCOL GAS -

Customer	OXARC (Colville, WA)
Date	April 25, 2012
Delivery Receipt	DR-42051
Gas Standard	2.50% CO, 12.5% Carbon Dioxide/Nitrogen - EPA PROTOCOL
Final Analysis Date	April 25, 2012
Expiration Date	April 25, 2015

DO NOT USE BELOW 150 psig

Cylinder Data

Cylinder Serial Number:	EB-0019810	Cylinder Outlet:	CGA 350
Cylinder Volume:	133 Cubic Feet	Cylinder Pressure:	1900 psig, 70°F
Expiration Date:	April 25, 2015		

Analytical Data

EPA Protocol, Section No. 2.2, Procedure G-1

Replicate Concentrations

Carbon Monoxide: 2.57% +/- 0.02%

Carbon Dioxide: 12.4% +/- 0.12%

Nitrogen: Balance

Reference Standard(s):

SRM/GMIS:	GMIS	GMIS
Cylinder Number:	CC-166392	CC-125534
Concentration:	2.48% CO/Nitrogen	13.32% CO2/Nitrogen
Expiration Date:	04/18/14	10/14/12

Certification Instrumentation

Component:	Carbon Monoxide	Carbon Dioxide
Make/Model:	Horiba - VIA 510	Horiba - VIA 510
Serial Number:	4344482008	SN075GSF
Principal of Measurement:	NDIR	NDIR
Last Calibration:	April 06, 2012	April 06, 2012

Analytical uncertainty and NIST Traceability are in compliance with EPA-600/R-97/121.

Certified by:

Adam Strickland

PGVP Vendor ID: E12012

2048 APEX COURT APOPKA, FLORIDA 32703 ~ PHONE (407)-292-2990 FAX (407)-292-3313
WWW.LIQUIDTECHCORP.COM

MATHESON TRI•GAS
ask. . .The Gas Professionals™

Certificate of Analysis - EPA Protocol Mixtures

1650 Enterprise Parkway
Twinsburg, Ohio 44087
215-648-4000

Customer: OXARC INC
Cylinder Number: SX-40586
Cylinder pressure: 1600 psig
Last Analysis date: 4/9/2010
Expiration Date: 3/18/2013

Protocol:	Reference #	Lot #
G1	519323	109-96-17643

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 150 PSIG

REPLICATE RESPONSES

Component :	Oxygen	Date: 3/18/2010	Date:
Certified Conc:	5.98% ± 1% REL	5.98%	
		5.98%	
		5.99%	
Component:	Carbon Dioxide	Date: 3/18/2010	Date:
Certified Conc:	6.04% ± 1% REL	6.03%	
		6.07%	
		6.01%	
Component:	Carbon Monoxide	Date: 4/2/2010	Date: 4/9/2010
Certified Conc:	1.29% ± 1% REL	1.30%	1.29%
		1.30%	1.28%
		1.30%	1.29%

ANCE GAS: Nitrogen

REFERENCE STANDARDS

Component:	Oxygen	Carbon Dioxide	Carbon Monoxide
SRM #:	NTRM-82658	SRM-1674b	SRM-2639a
Sample #:	01110212	7-F-05	54-D-51
Cylinder #:	SX-20658	CAL-014611	CAL-013889
Concentration:	10.09%	6.876 %	0.991 %

CERTIFICATION INSTRUMENTS

Component:	Oxygen	Carbon Dioxide	Carbon Monoxide
Make/Model:	Rosemount 755	Varian 3800 GC	Varian 3800 GC
Serial Number:	2002832	LR-92489	LR-92489
Measurement Principle:	Paramagnetic	TC, FID	TC, FID
Last Calibration:	2/26/2010	3/16/2010	4/2/2010

Notes: T134744

This certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous alibration Standards September 1997, using procedure G1 and/or G2.

Analyst Phyj D. Mat. Date 4/12/2010

WELDING PRODUCTS
INDUSTRIAL SUPPLIES
INDUSTRIAL GASES
MEDICAL GASES

SPECIALTY GASES
BEVERAGE SYSTEMS
SAFETY PRODUCTS
FIRE EQUIPMENT

WWW.OXARC.COM

MAIN OFFICE
SPOKANE, WA 99220
4003 E. BROADWAY
P.O. BOX 2605
(509) 535-7794
FAX (509) 535-0368

BOISE, ID 83709
7615 W. LEMHI ST.
(208) 376-0377
FAX (208) 376-1133

COEUR D'ALENE, ID 83814
3530 RAMSEY RD.
(208) 765-3311
FAX (208) 667-5974

COLVILLE, WA 99114
328 W. 1ST.
(509) 684-3776
FAX (509) 684-6742

ELLENSBURG, WA 98926
704 N. WENAS
(509) 925-1518
FAX (509) 925-1136

HERMISTON, OR 97838
HERMISTON-
McNARY HIWAY
(503) 567-7377
FAX (503) 567-2265

KENNEWICK, WA 99336
800 W. COLUMBIA DR.
(509) 582-4202
FAX (509) 586-9659

LEWISTON, ID 83501
2513 3RD. AVE., NORTH
(208) 743-6571
FAX (208) 746-8374

MOSES LAKE, WA 98837
1401 WHEELER ROAD
(509) 765-9247
FAX (509) 766-9958

OKANOGAN, WA 98840
2256 ELMWAY
(509) 826-3205
FAX (509) 826-3905

PASCO, WA 99302
716 SOUTH OREGON
(509) 547-2494
FAX (509) 547-3103

TWIN FALLS, ID 83303
729 COMMERCIAL AVE.
(208) 734-9711
FAX (208) 734-7923

NATCHEE, WA 98801
ORME GARDENS RD.
(509) 662-8417
FAX (509) 662-1229

YAKIMA, WA 98903
1004 EAST MEAD
(509) 248-0827
FAX (509) 452-8704

Primary Standard Certificate of Analysis
Method of Analysis Micro GC / Gravimetric
Customer: Myren Consulting **Reference # PM7234-2**
P.O.# **Cylinder # 250-1175**

Results of Investigation

Component	Requested	Concentration
Air	N/A	N/A
Argon	N/A	N/A
Carbon Dioxide	21.0%	21.0%
Carbon Monoxide	4.00%	4.03%
Helium	N/A	N/A
Hydrogen	N/A	N/A
Methane	N/A	N/A
Nitrogen	Balance	Balance
Oxygen	21.0%	21.0%

Hazard Class	UN 1956
DOT Shipping Name	Compressed Gas NOS
Shipping Volume (scf approximate)	160 scf @ ntp
Cylinder Pressure	1500 psig
CGA Valve Connection	350

Oxarc Primary Standard mixtures are prepared with gravimetric techniques using weights traceable to NIST. Mixture blended to +/- 1% relative to minor component and certified to +/- 1% analytical accuracy.

Authorized Signature _____ Date 8/25/97
Travis Auger

Comments:

STOVE DESCRIPTION/ QC

The HEAT TECH HTP 26 BAY pellet stove has a bay shape. It uses a top feed auger system to drop pellets down a chute into the burn pot. The operating controls are located on the side and are easy to use.

CBI

The information in this Section of this test report is considered Confidential Business Information (CBI) and has been redacted and sent under a separate cover to the following address:

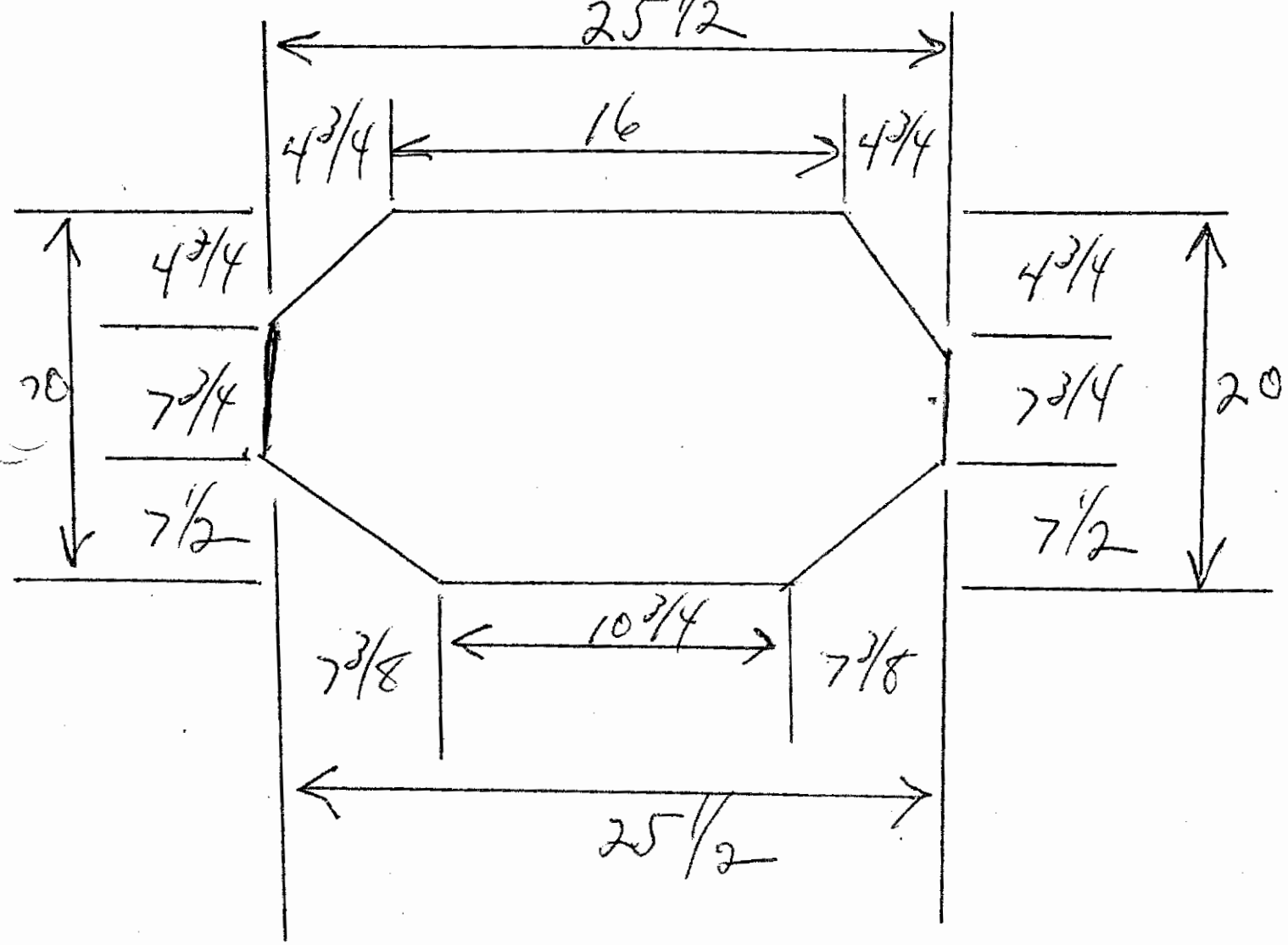
EPA CBI Office
Attn: Residential Wood Heater Compliance Program Lead
1200 Pennsylvania Ave. NW
Washington, D.C. 20004

5/06

~~PECSET~~ ~~BAY~~

~~PED. BASE~~

12 GA.



NOT TO SCALE

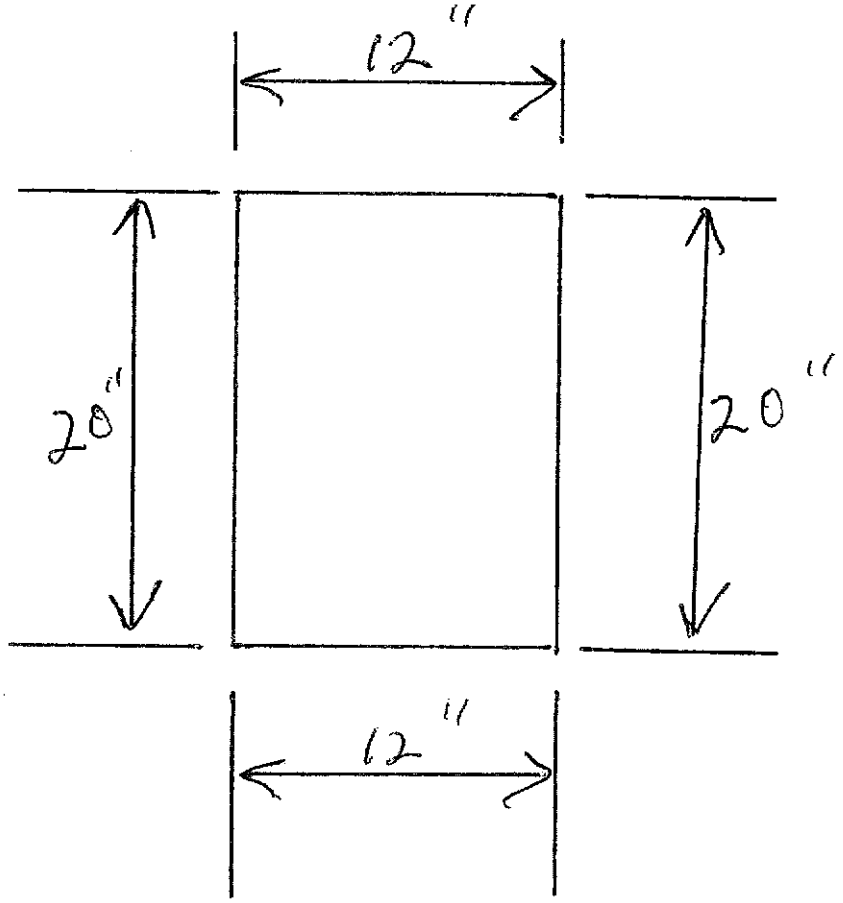
~~HEAT~~ TECH
6M 26 ~~BAY~~
~~PECSET~~

PUGET BAY

5706

PED. SIDE

16 GA.



NOT TO SCALE

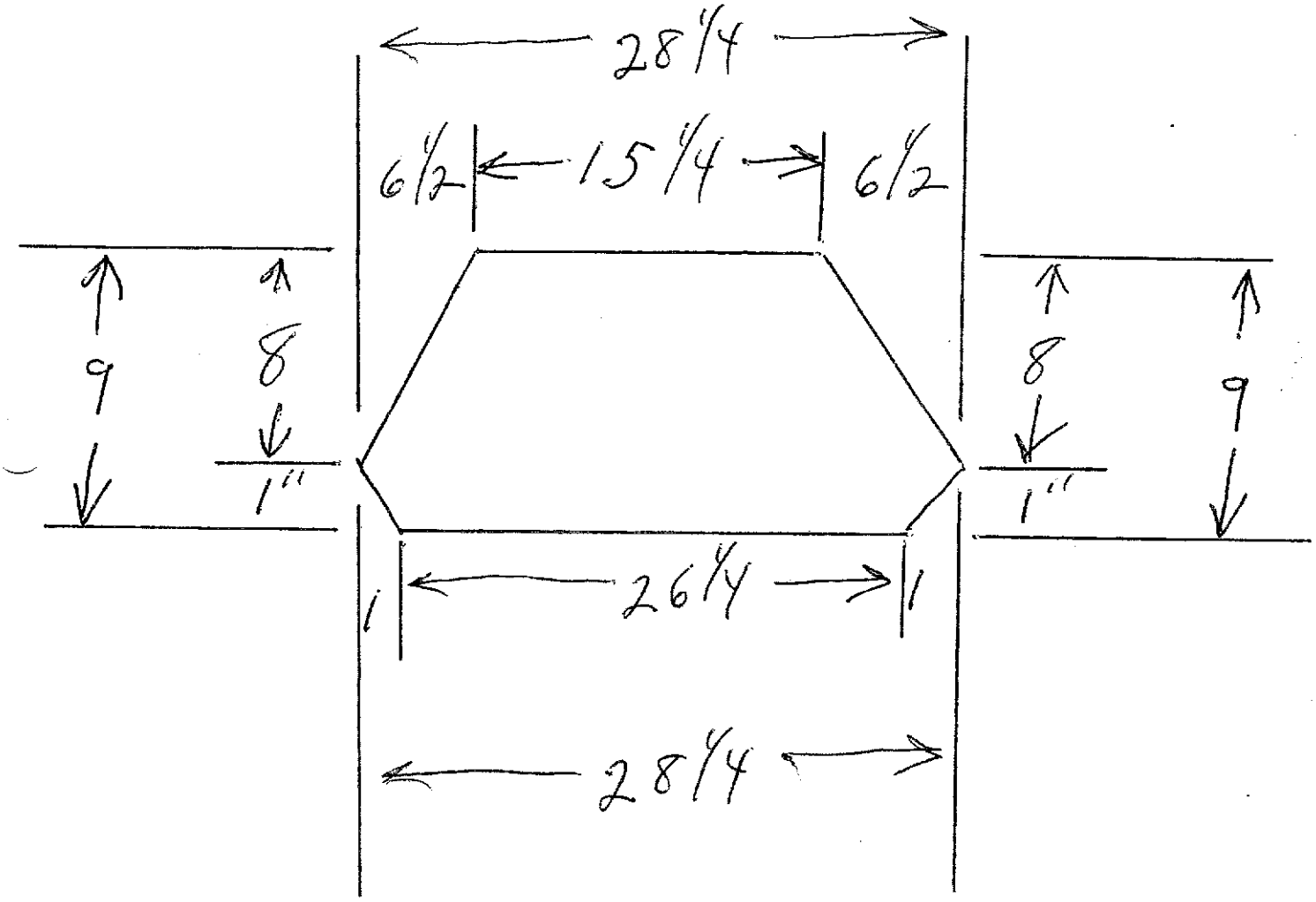
HEAT TECH
GM 26 BAY
PUGET

5/06

~~PELLET~~ BAY

~~FRONT~~ TOP

12 GA. ~~PLT~~.



NOT TO SCALE

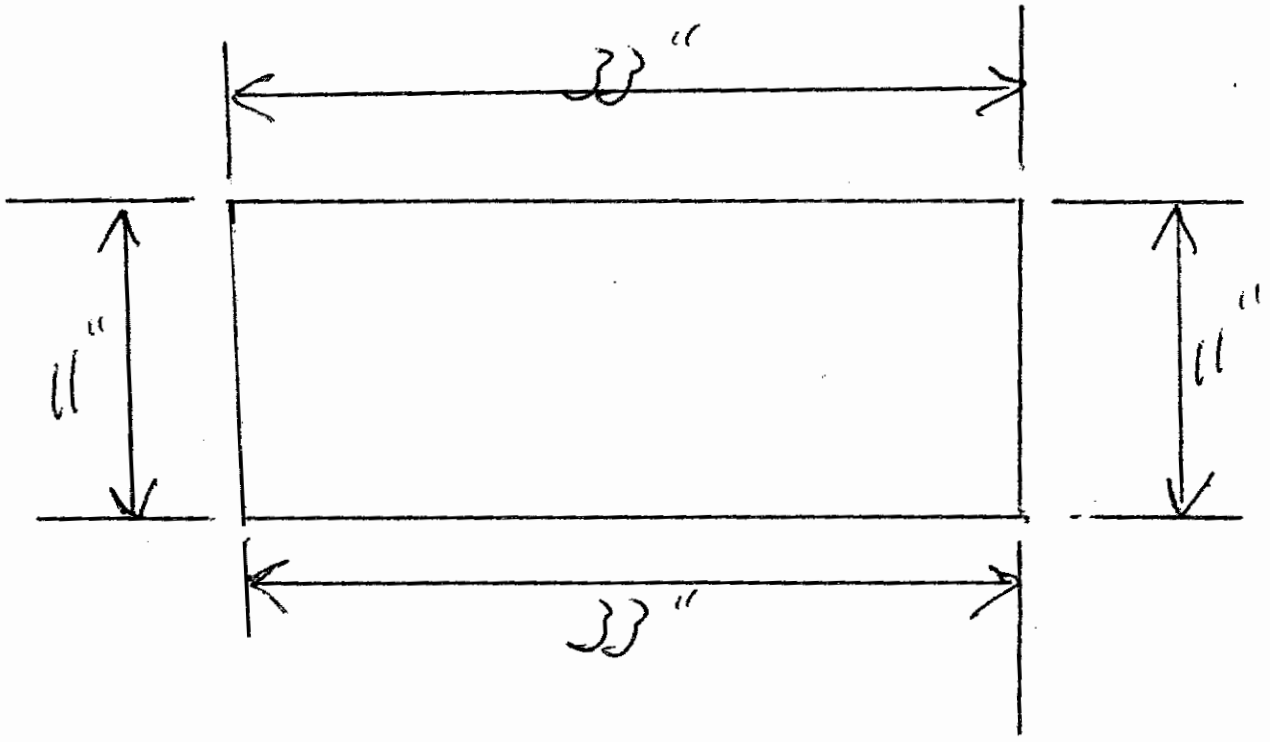
~~HEAT~~ TECH
6M 26 ~~BAY~~
~~PELLET~~

5/01

PUGET BAY

PEI

16 6A.



NOT TO SCALE

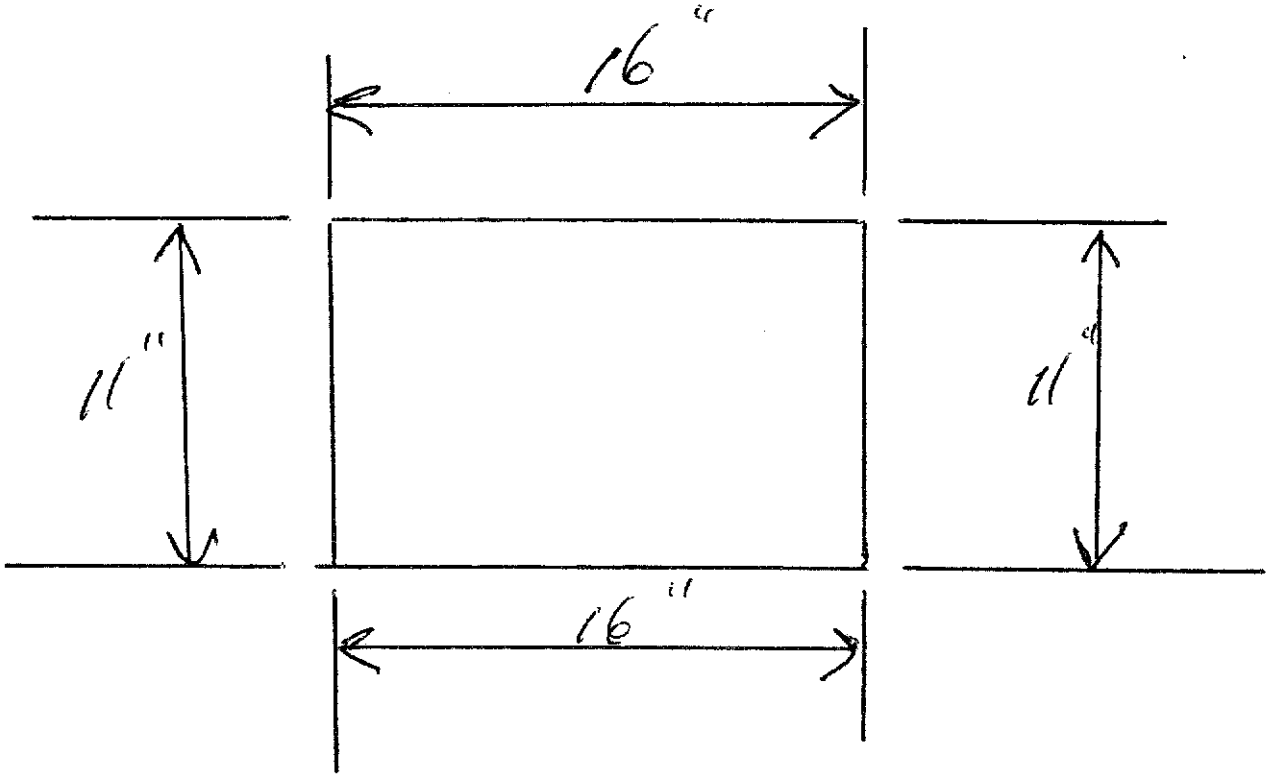
HEAT TECH
6A 26 BAY
PUGET

5/06

PUGET BAY

HOPPER SIDES

16 GA.



NOT TO SCALE

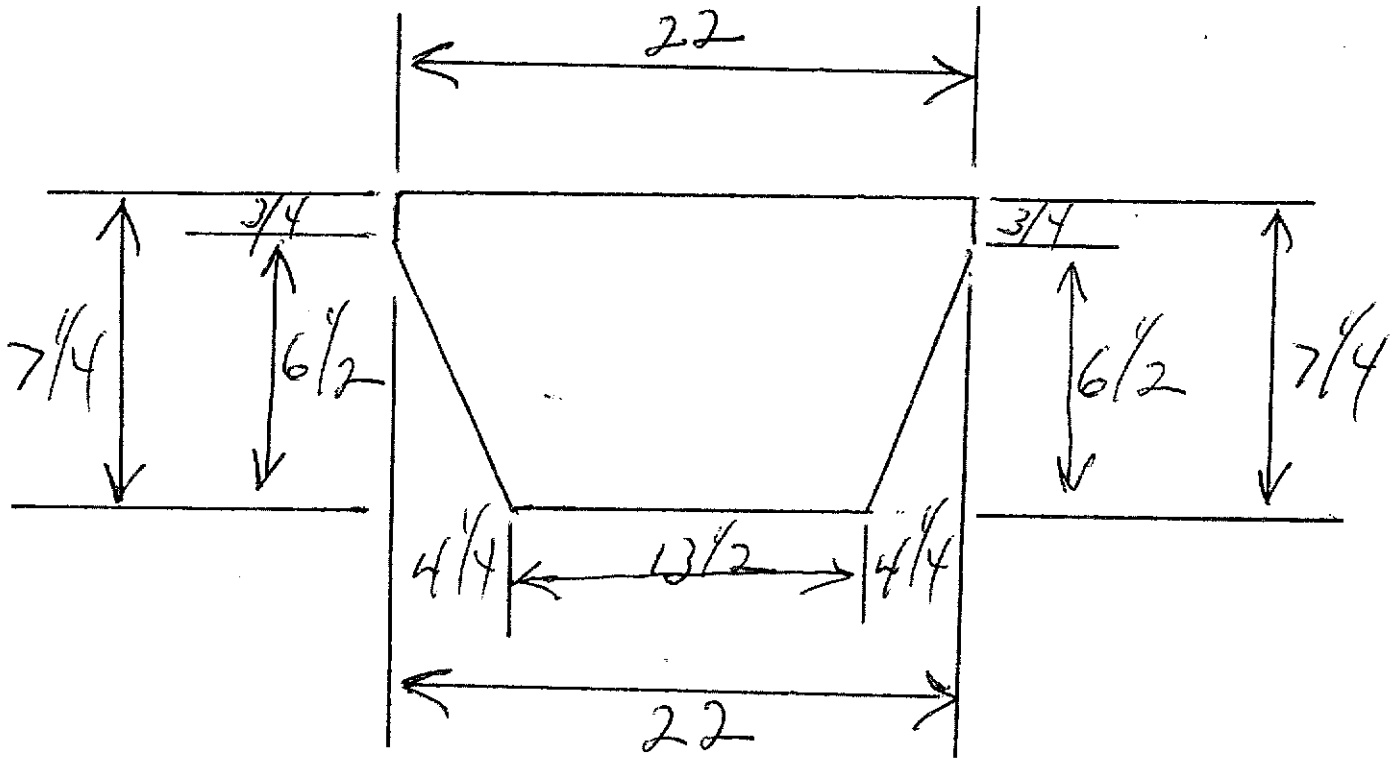
HEAT TECH
GW 26 BAY
PUGET

PECCET BAY

5/06

HOPPER SHIELD

16 GA.



NOT TO SCALE

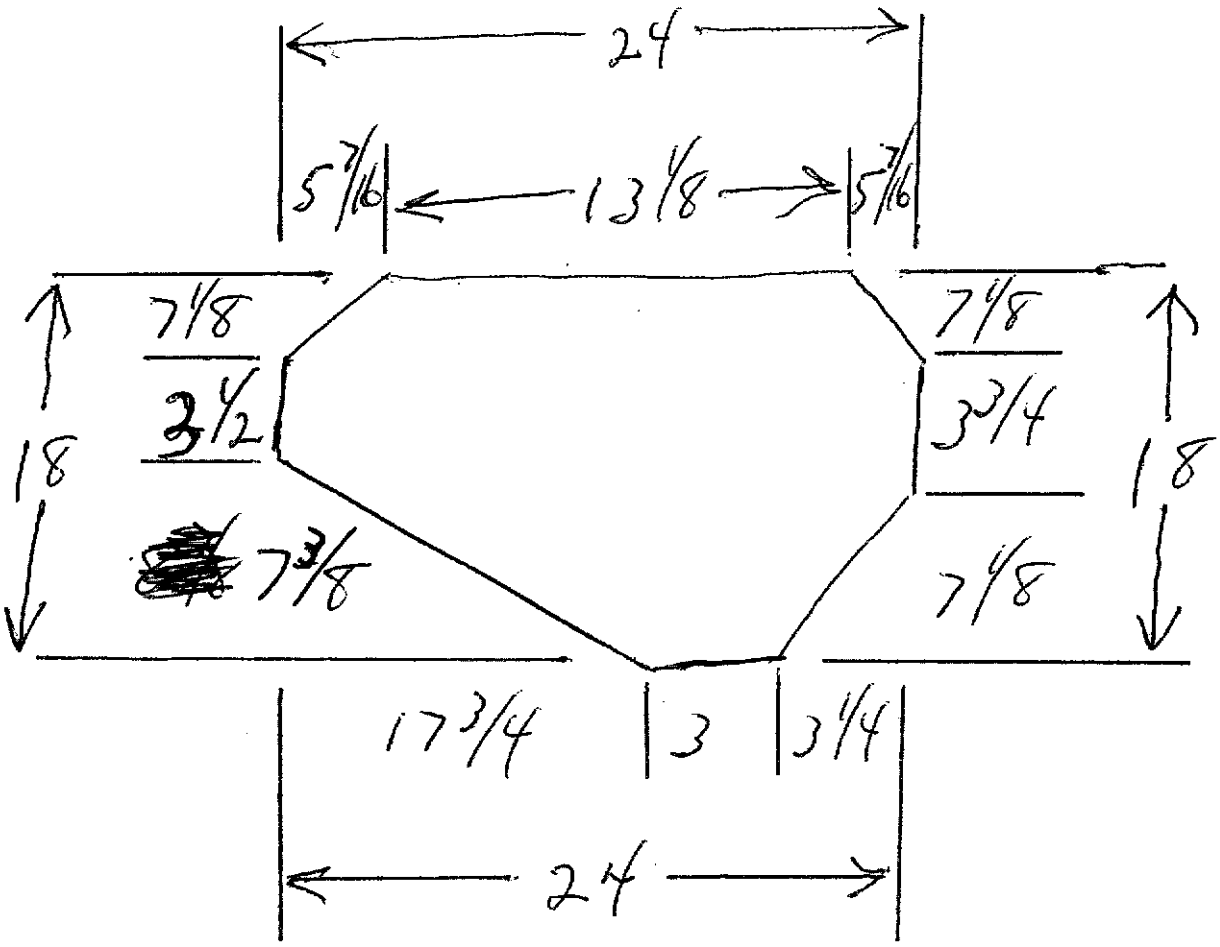
HEAT SHIELD
@M 26 BAY
PECCET

5/06

PELLET BAY

FALSE BOTTOM

12 GA PCT.



HEAT TECH
GIN 26 BAY
PELLET

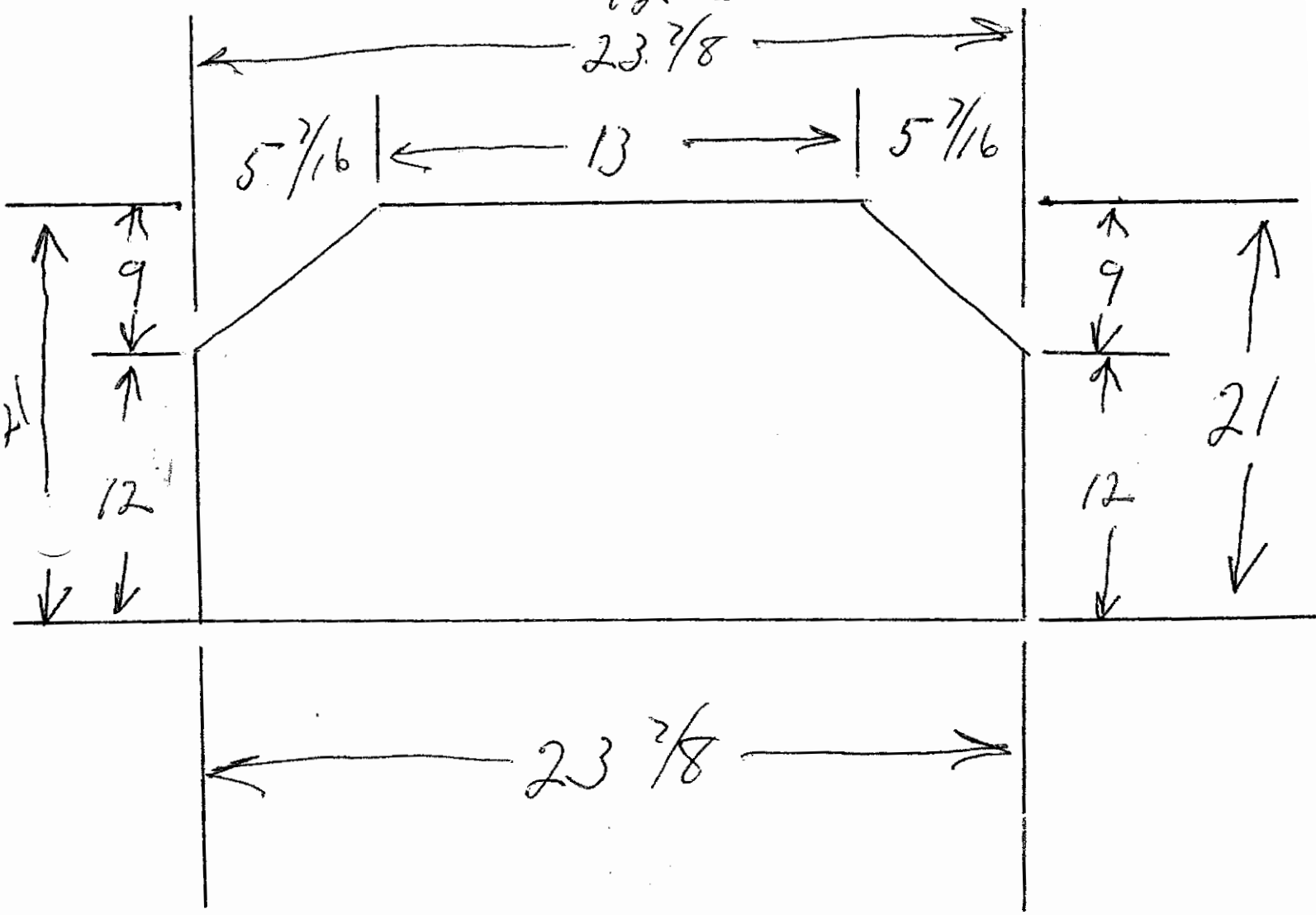
NOT TO SCALE

PELLET BAY

5/06

AIR CHAMBER

12 GA PLT.



NOT TO SCALE

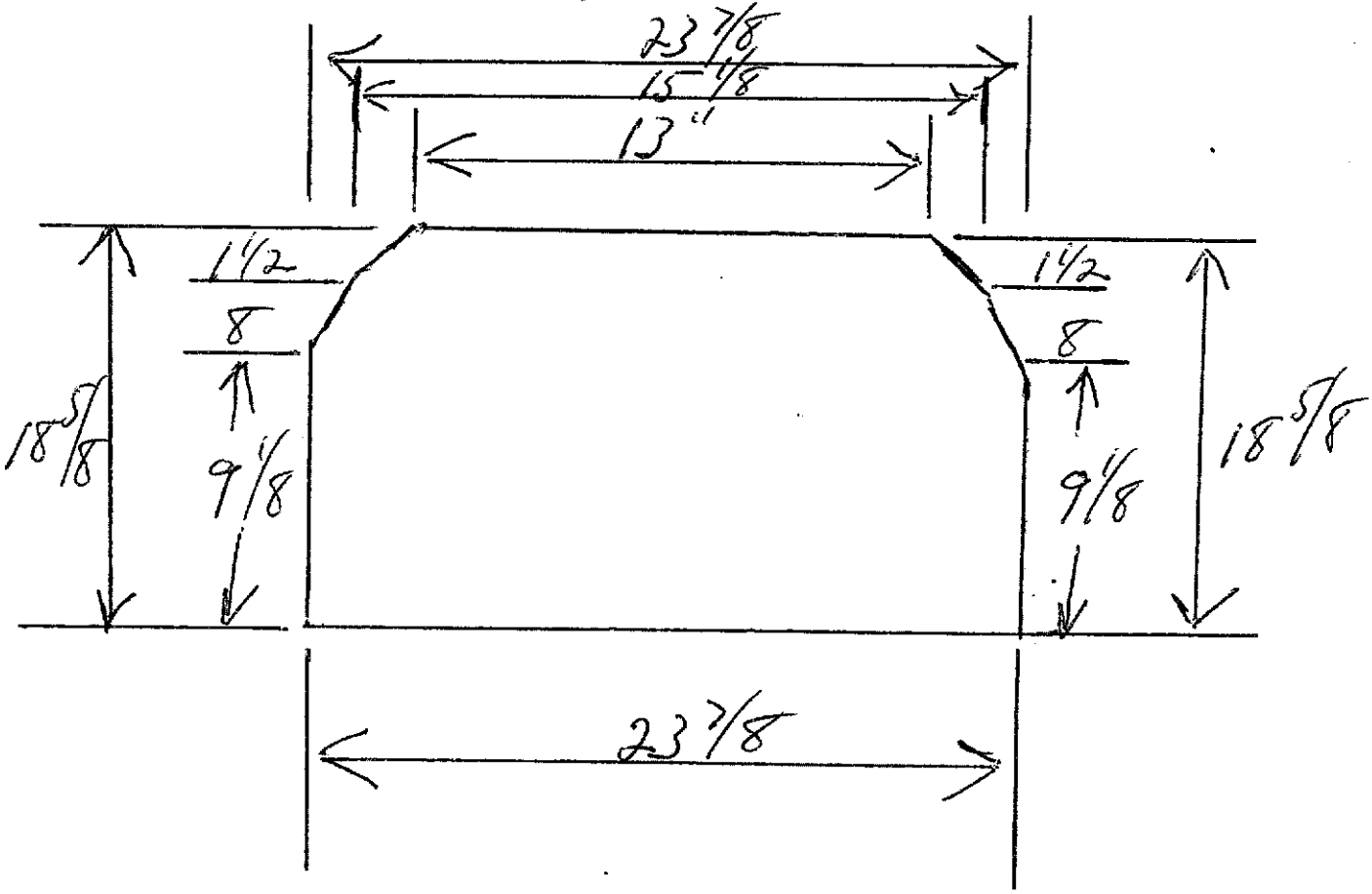
HEAT TREAT
CM 26 BAY
PELLET

PELLET BAY

5706

FIRE BOX

12 GA. PLT



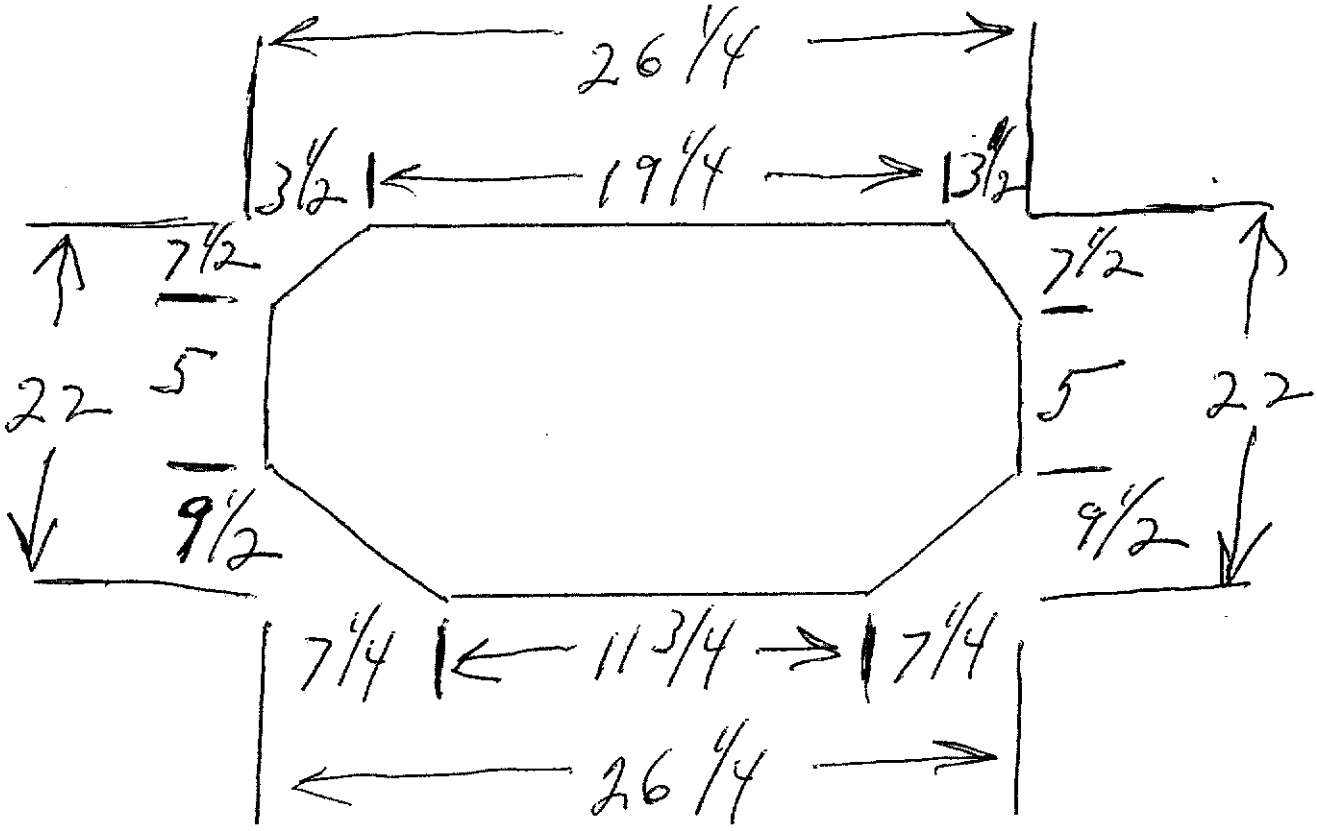
NOT TO SCALE

~~HEAT TECH~~
GM 26 ~~BAY~~
~~PELLET~~

~~PUGET BAY~~

Bottom

3/16 PLT



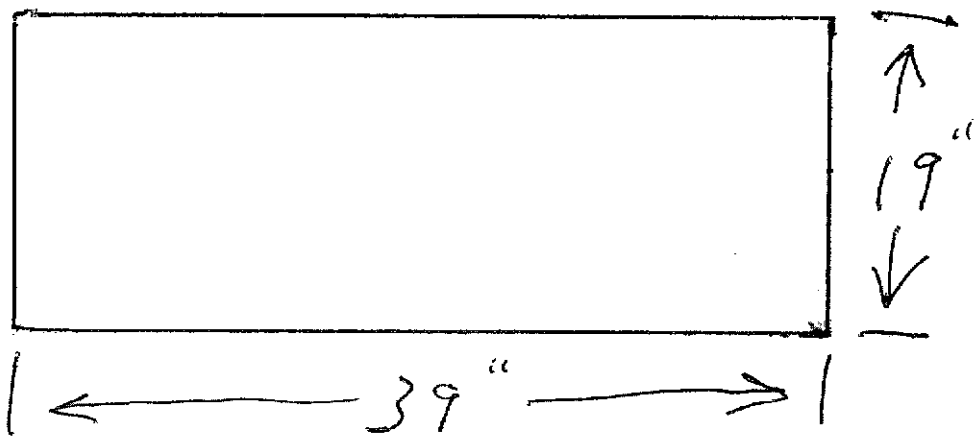
~~HEAT~~ TECH
COM 26 ~~BAY~~
~~PUGET~~

NOT TO SCALE

~~PELLET~~ BAY

BODY

10 GA. 19" X 39"



~~HEAT~~ ~~EXH~~
GM 26 ~~BAY~~
~~PELLET~~

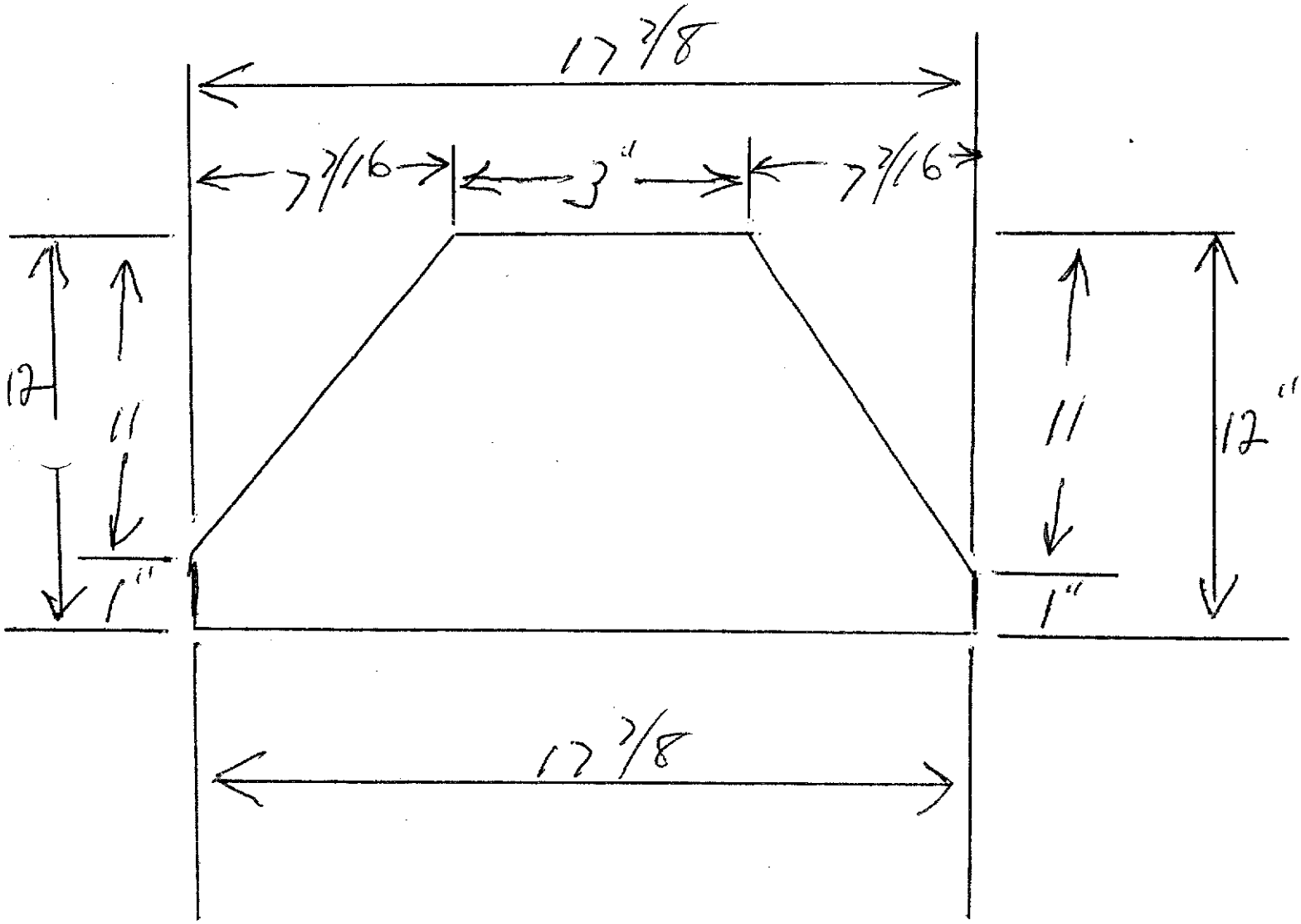
NOT TO SCALE

5/06

PELLET Bay

~~Hopper~~ Back

16 GA.



NOT TO SCALE

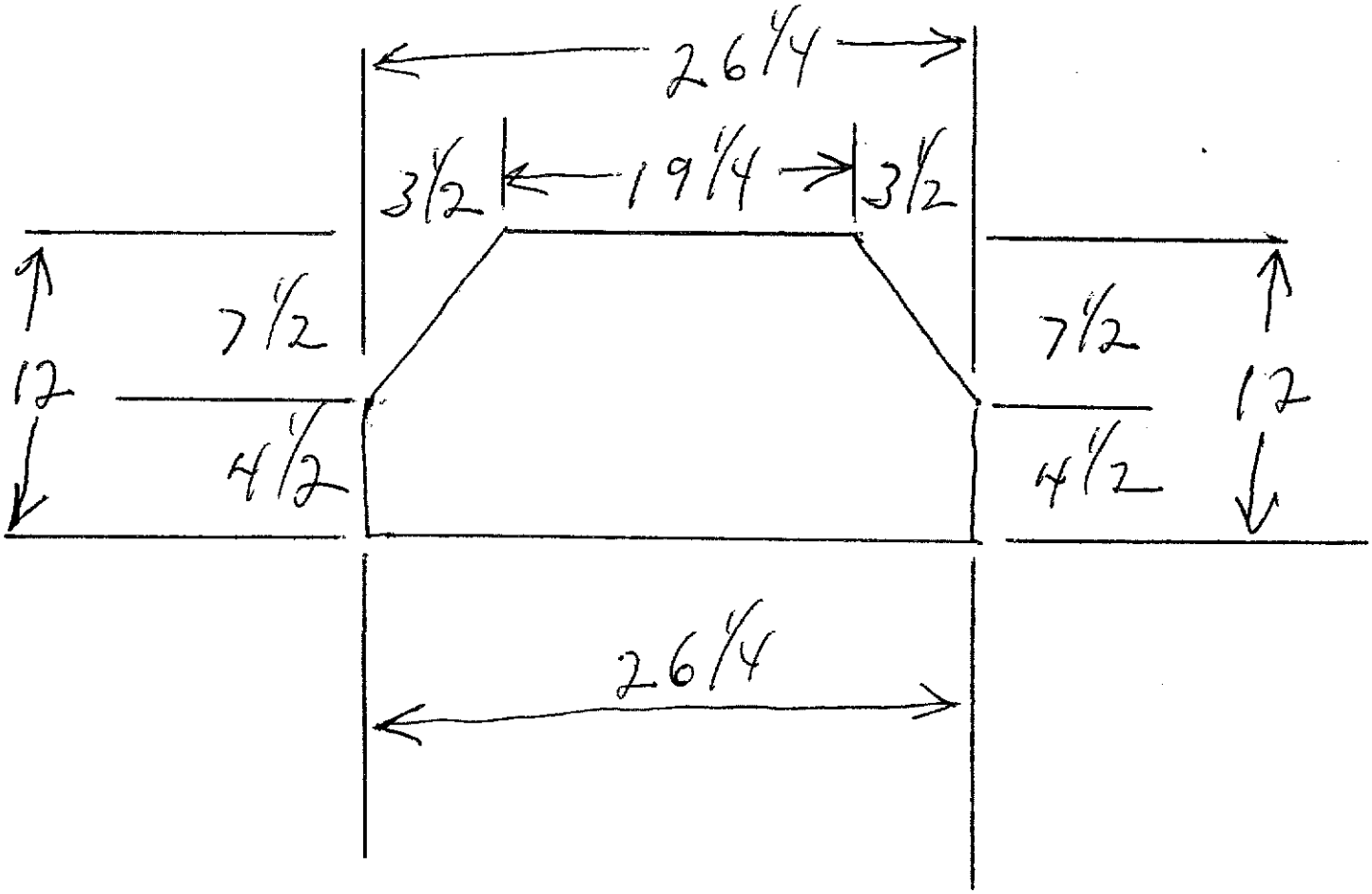
~~HEAT~~ TECH
GM 26 ~~PA~~ Y
~~PELLET~~

5/06

~~PIECE~~ TRAY

~~REAR~~ TOP

12 GA. PLT



NOT TO SCALE

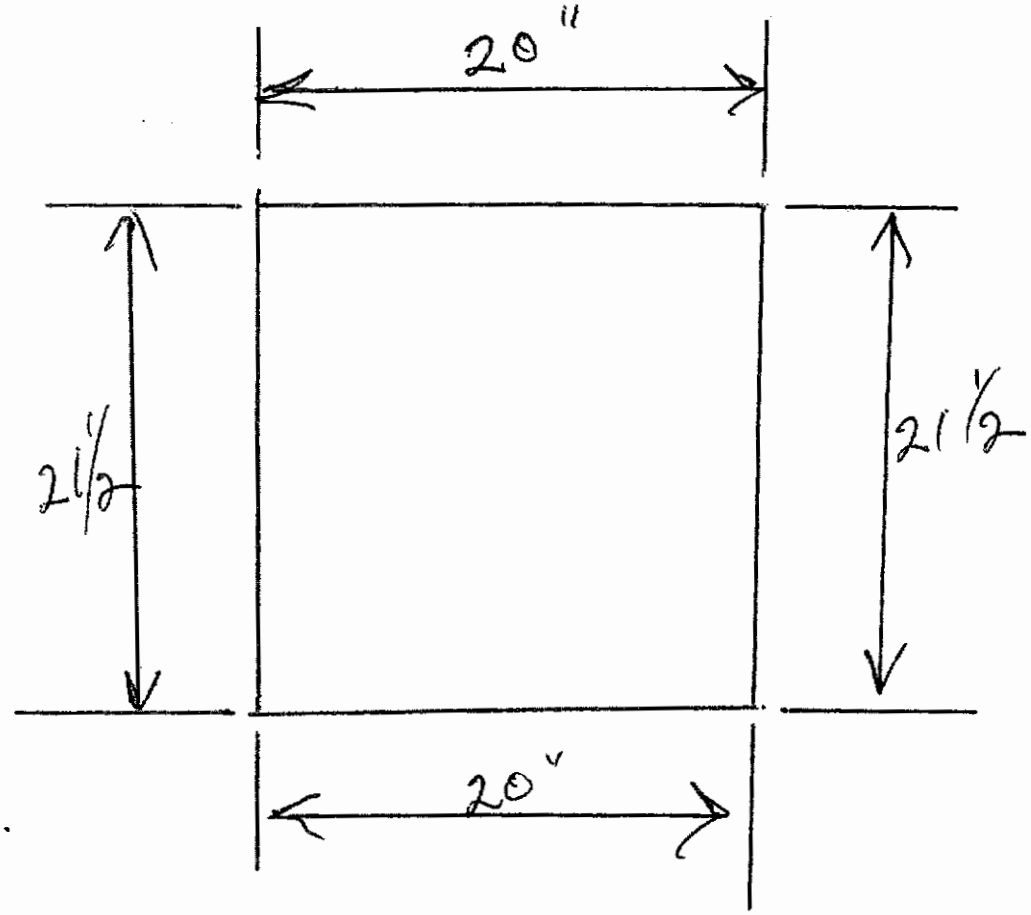
~~HEAT TECH~~
CM 26 TRAY
~~PIECE~~

5/06

~~PELLET~~ BAY

BACK

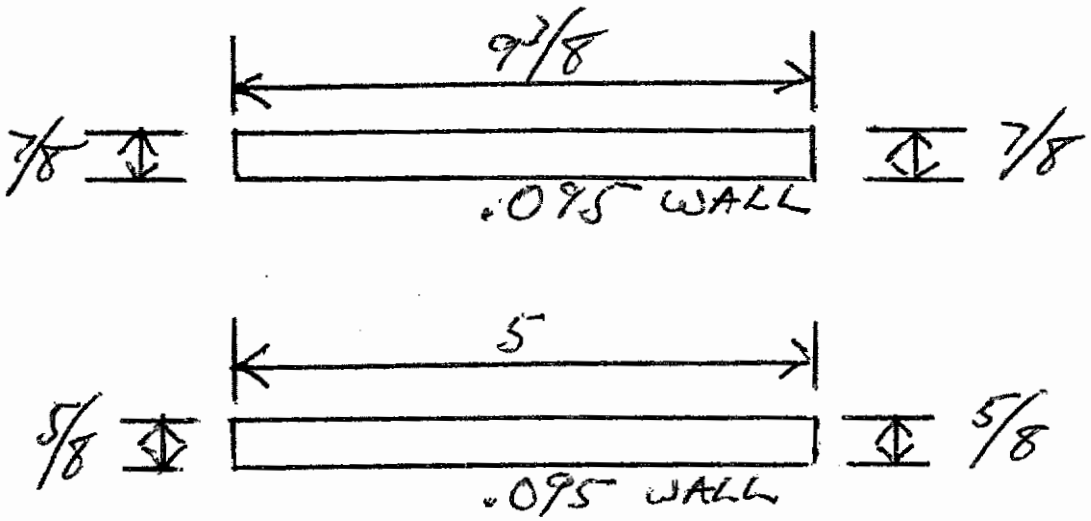
16 GA.



NOT TO SCALE

~~HEAT~~ TECH
6M 26 ~~BAY~~
~~PELLET~~

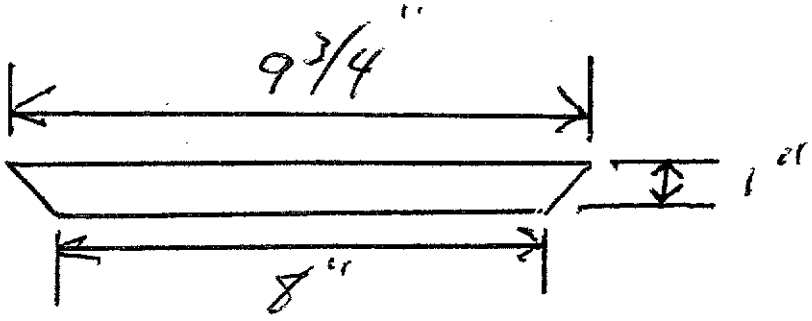
CMP 26 STANDARD PELLET
&
BAY



IGNITOR TUBE (OUTER)
IGNITOR TUBE (INNER)

HEAT TECH
CMP 26 STANDARD
IGNITOR TUBE
10-25-15
NOT TO SCALE

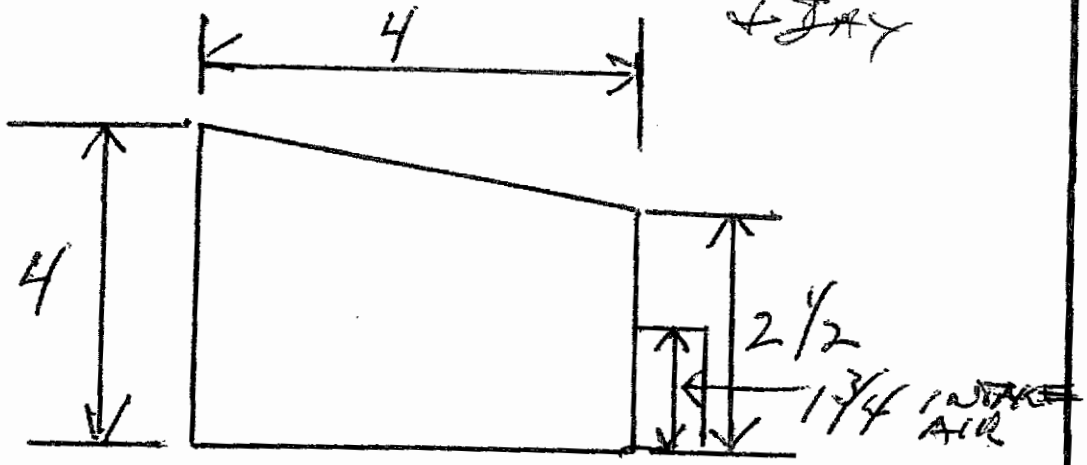
CMP 26 STANDARD ~~RELIEF~~
&
~~RAY~~

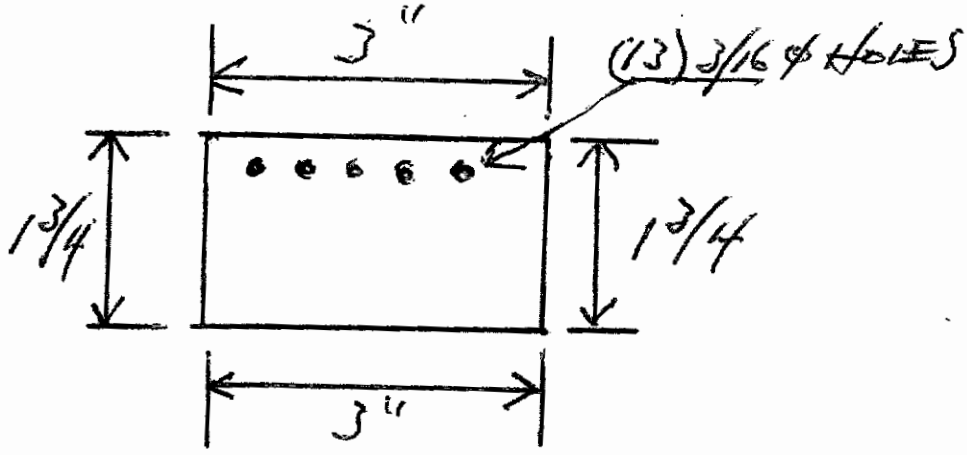


~~HEAT~~ EXCHANGE TUBE
1" ø .065 WALL

10-25-15
~~HEAT~~ TECH
CMP 26 STANDARD
HEAT EXCHANGE
TUBE
NOT TO SCALE

GMP 26 STANDARD PELLET
+ DRY

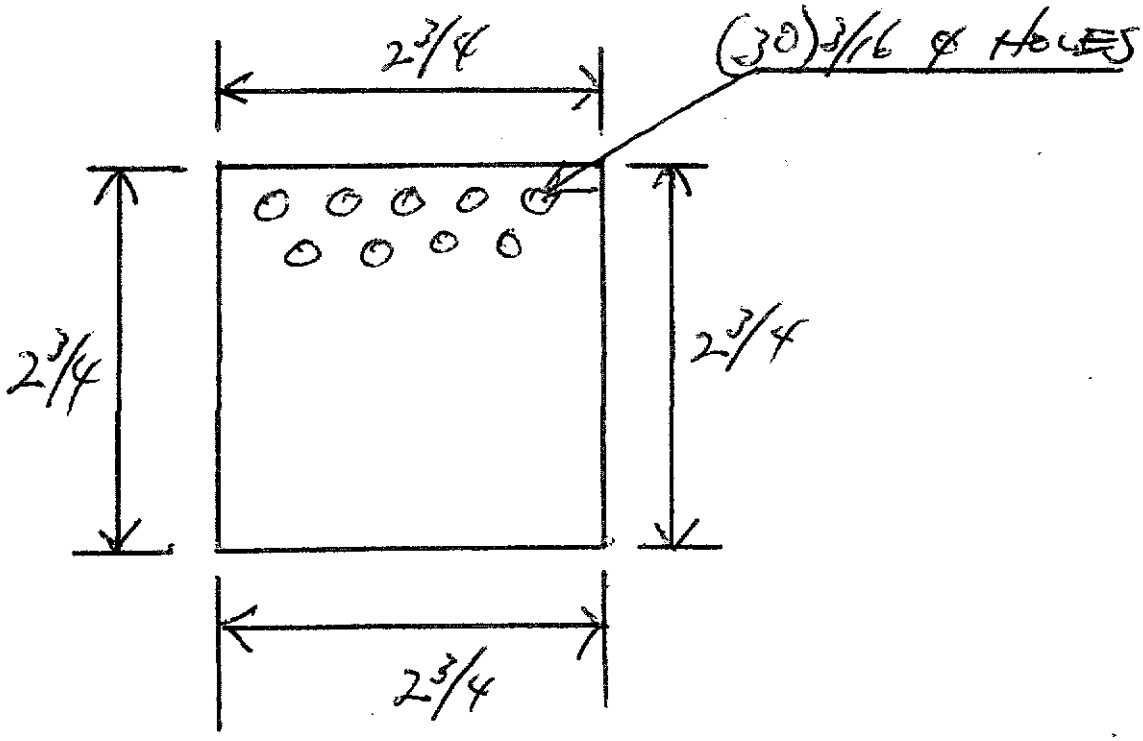




BURN POT
OUTER BOX 4" SQ TUBE .065
INNER LINER 3" S.S. SQ TUBE .065

~~HEAT TECH~~
GMP STANDARD
BURN POT
10-25-15
NOT TO SCALE

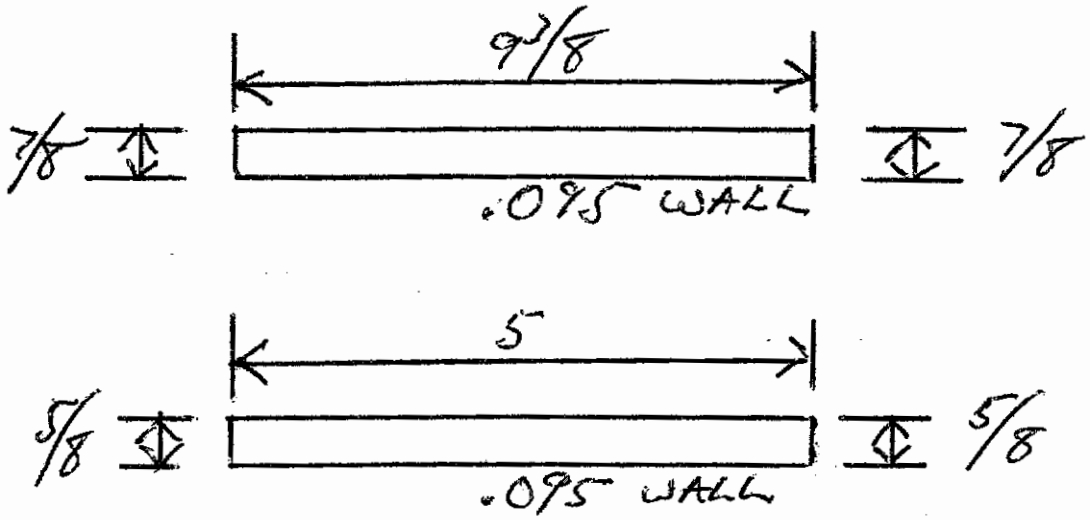
Comp 26 STANDARD PELLET
+
~~BAY~~



BURN POT BOTTOM PLT.
2 3/4 S.S.
12 GA.

HEAT TECH
COMP 26 STANDARD
BURN POT BOTTOM PLT.
10-25-15
NOT TO SCALE

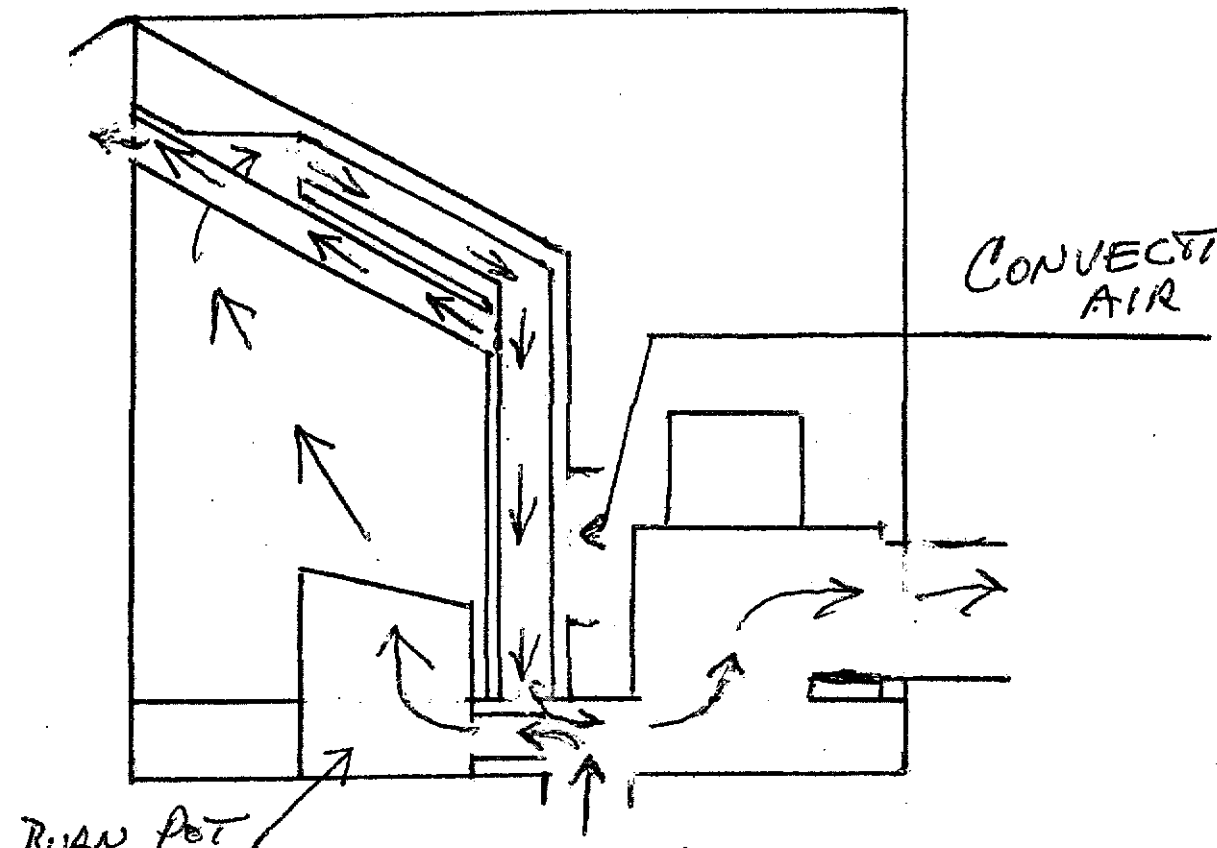
CMP 26 STANDARD PELLET
BAY



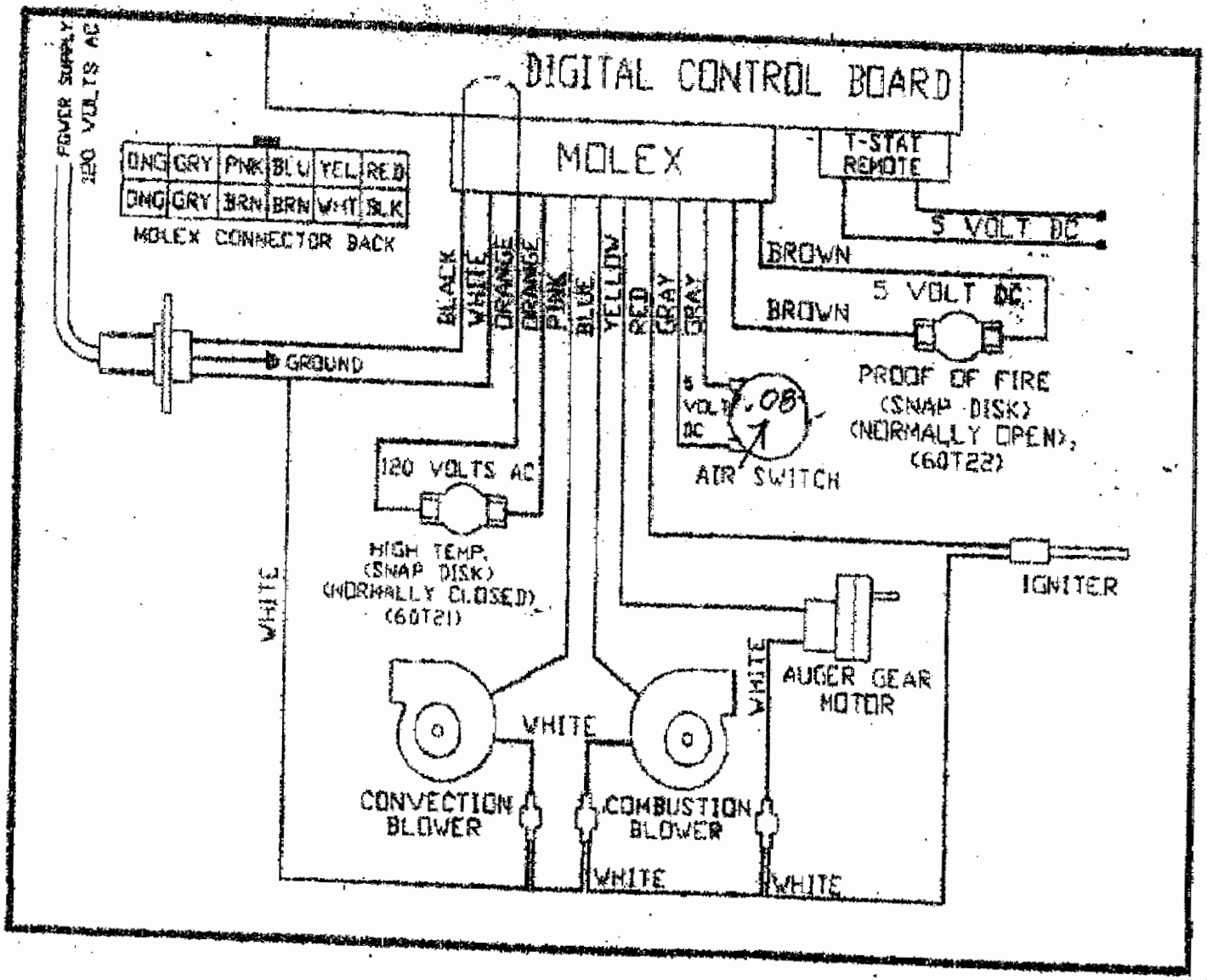
IGNITOR TUBE (OUTER)
IGNITOR TUBE (INNER)

HEAT TECH
CMP 26 STANDARD
IGNITOR TUBE
10-25-15
NOT TO SCALE

Comp 26 STANDARD PELLET
+ JAY



HEAT TECH
Comp 26 STANDARD
AIR FLOW (SIDE VIEW)
10-25-15
NOT TO SCALE


DIGITAL CONTROL BOARD
MOLEX
T-STAT REMOTE
5 VOLT DC
BROWN
5 VOLT DC
BROWN
PROOF OF FIRE (SNAP DISK) (NORMALLY OPEN), (60T22)
AIR SWITCH
.08
IGNITER
AUGER GEAR MOTOR
CONVECTION BLOWER
COMBUSTION BLOWER
WHITE
WHITE
WHITE
WHITE
WHITE
120 VOLTS AC
HIGH TEMP. (SNAP DISK) (NORMALLY CLOSED) (60T21)
GROUND
POWER SUPPLY 120 VOLTS AC
MOLEX CONNECTOR BACK
DNG GRY PNK BLU YEL RED
DNG GRY BRN BRN WHT BLK
BLACK
WHITE
ORANGE
ORANGE
PINK
BLUE
YELLOW
RED
GRAY
GRAY

Revised 3.10.08

WOODSTOVE DATA SHEET # 30
STOVE STORAGE

The Heat Tech HTP 26 Bay Pellet stove tested by Myren Consulting, Inc. is being held in custody by:

Heat Tech
PO Box 727
Biggs, Ca 95917

Phone 530 846 1985

Contact: Tom Bassett

Heat Tech
867 Hiway 99
Gridley, CA 95948

The unit was tested at Myren Consulting's lab in Colville, WA. It was sealed on 7/29/15 after the unit had cooled after testing. The following page contains photos taken after the unit was sealed on 7/29/15.

The unit was sealed with several lengths of metal banding/strapping that were placed around the stove in a manner that prevents the door from being opened. At least two of these straps cross at 90° angles. At one or more of these crossings on the stove a label that clearly identifies the unit as a sealed EPA test stove and/ or a Myren Consulting, Inc. address label is placed over the crossing and taped into place with 2" clear packing tape. The stove was also loaded onto a pallet and strapped to a pallet for transport back to Heat Tech and to its final storage location. A sample stove storage label follows this page.

Once the unit is/ was certified by EPA, the unit will be returned to Heat Tech via common carries;

Carrier: _____

Shipped on: _____

WST5-Form11

W A R N I N G

SEALED EPA TEST STOVE

DO NOT OPEN OR TAMPER WITH THE SEALS AND PACKAGING ON THIS STOVE.

TO DO SO WILL VOID THE CERTIFICATION ON THIS STOVE.

HEAT TECH HTP 26 BAY

WST5-Form11

W A R N I N G

SEALED EPA TEST STOVE

DO NOT OPEN OR TAMPER WITH THE SEALS AND PACKAGING ON THIS STOVE.

TO DO SO WILL VOID THE CERTIFICATION ON THIS STOVE.

HEAT TECH HTP 26 BAY