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 STANDARD PELLET STOVE TO THE U.S. EPA.

Signature: Tom Bassett

Printed Name: Tom Bassett

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

RE: Heat Tech HTP 26 Standard Pellet Stove Test Report

Please find enclosed your copy of the EPA test report for the HEAT TECH HTP 26 STANDARD 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

26 December 2015

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 STANDARD pellet stove. As the test results indicate, the unit's emissions are well below the EPA standard of 4.5 g/hr.

This is the first pellet stove report Myren Consulting, Inc. has submitted since the new NSPS took effect on May 15, 2015. 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>

11 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 STNDARD PELLET STOVE

Please find enclosed the required two (2) copies of the CBI for the test report for the HEAT TECH HTP 26 STANDARD 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.

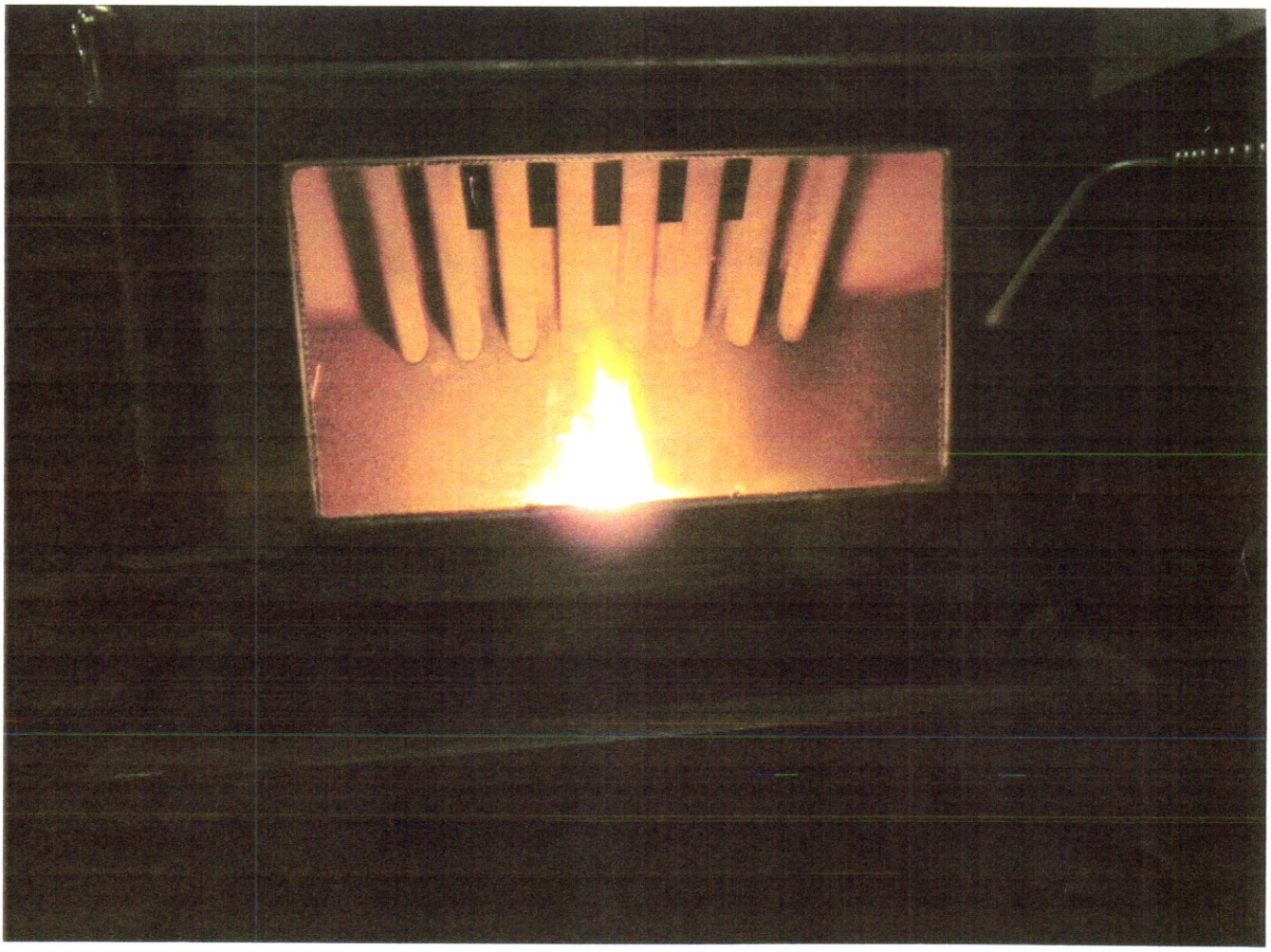
Sincerely,

Alben T. Myren Jr.
President
ATM/im

US EPA WOOD HEATER CERTIFICATION TEST REPORT

HEAT TECH
HTP 26 STANDARD
PELLET STOVE

DECEMBER 26, 2015



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: 1/11/2016 Signature: Albert T. Myers 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: 1/11/2016 Signature: Albert T. Myers Jr.
Title: President

PELLET STOVE
TABLE OF CONTENTS

Rev 0 12.15

TESTING LOCATION AND PERSONNELL INFORMATION

Unit Name: HEAT TECH HTP 26 STANDARD 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 Test Report 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 STANDARD PELLET STOVE

TEST UNIT: HEAT TECH HTP 26 STANDARD PELLET STOVE

Manufacturer: HEAT TECH

Date Received: 6/20/2015

Date(s) Aged: 7/1-7/3/2015, See AGING Section

Test Date(s): 7/28/2015

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 Standard 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 Standard 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 and (3.) a diagram of the EPA 6" diameter dilution tunnel used by Myren Consulting during EPA Certification testing, (4.) a copy of the letter from EPA granting Myren Consulting, Inc accreditation under the new NSPS, (5.) a copy of the old and new EPA Laboratory Accreditation Certificates for Myren Consulting's lab and (6.) 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.) As is noted in the cover letter for this report, this is the first 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' 1/2"
15.0 ± 1 Ft (M28, 4.1.1)

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 ± .5 ft (DEQ, 3.3.1) 8' 5 3/4"
[ASTM, 9.2.4 (draft)]

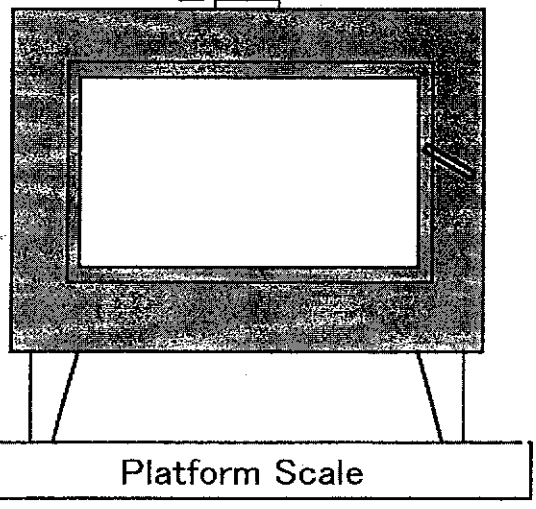
Flow Rate Measurement System Probe
Ht 94 3/8" 7' 10 3/8" 7.5 ± 1.0 ft (M5H, 5.1.6)

N/A Cutaway Detail on Barometric Oil Seal

Stack TEMP Probe
< 1.0 ft. 11"
ABOVE FLUE COLLAR

Stove Ht at Flue Collar 15 1/2"

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



HEAT TECH
Unit HTP 26 STD
Date 7/23/15
Technician(s) ESS

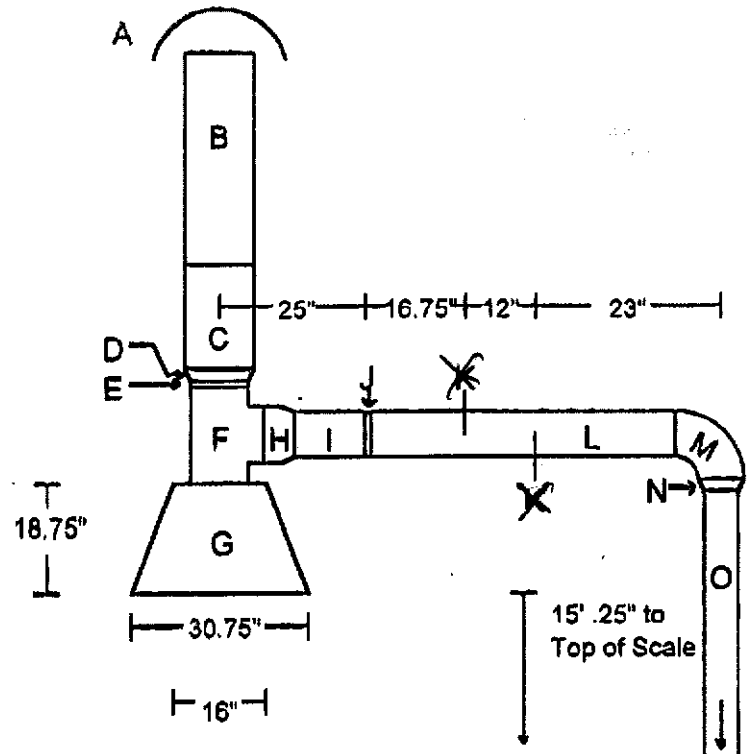
Stack is all 4" ICC Excel Pellet

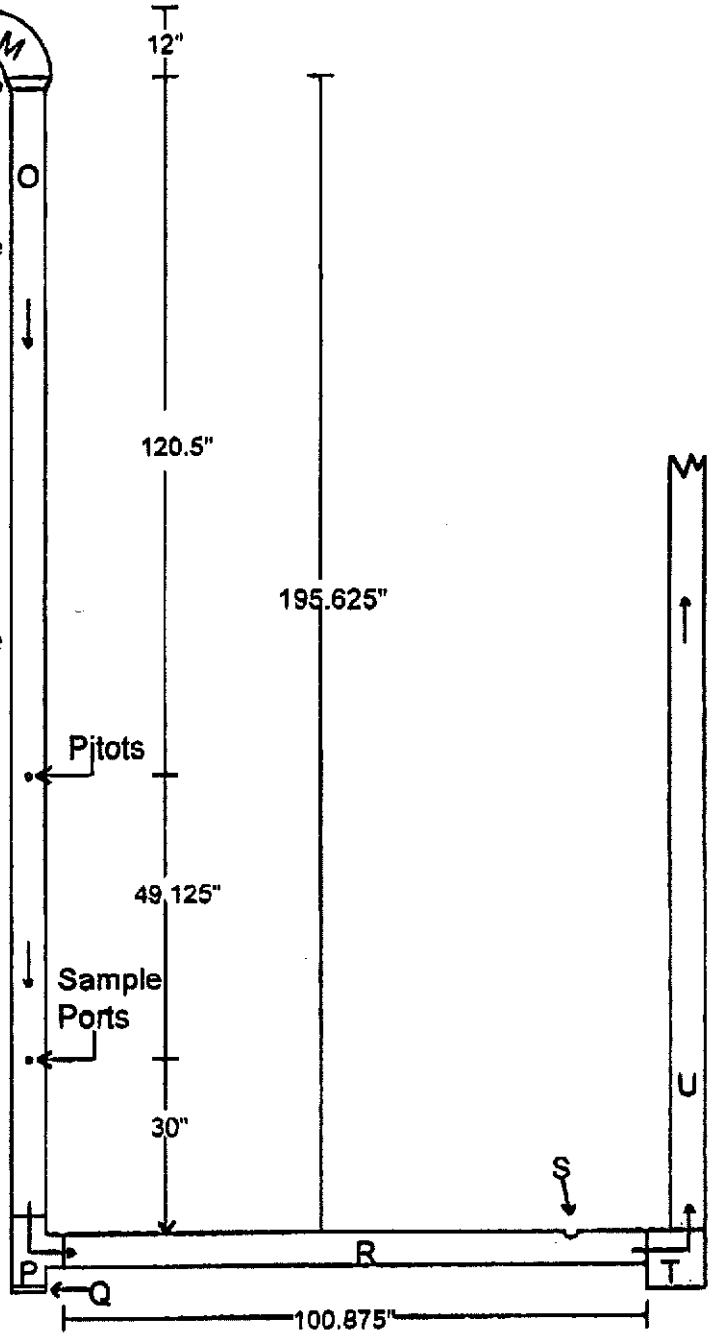
Myren Consulting Inc

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

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 Standard

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 Standard 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.

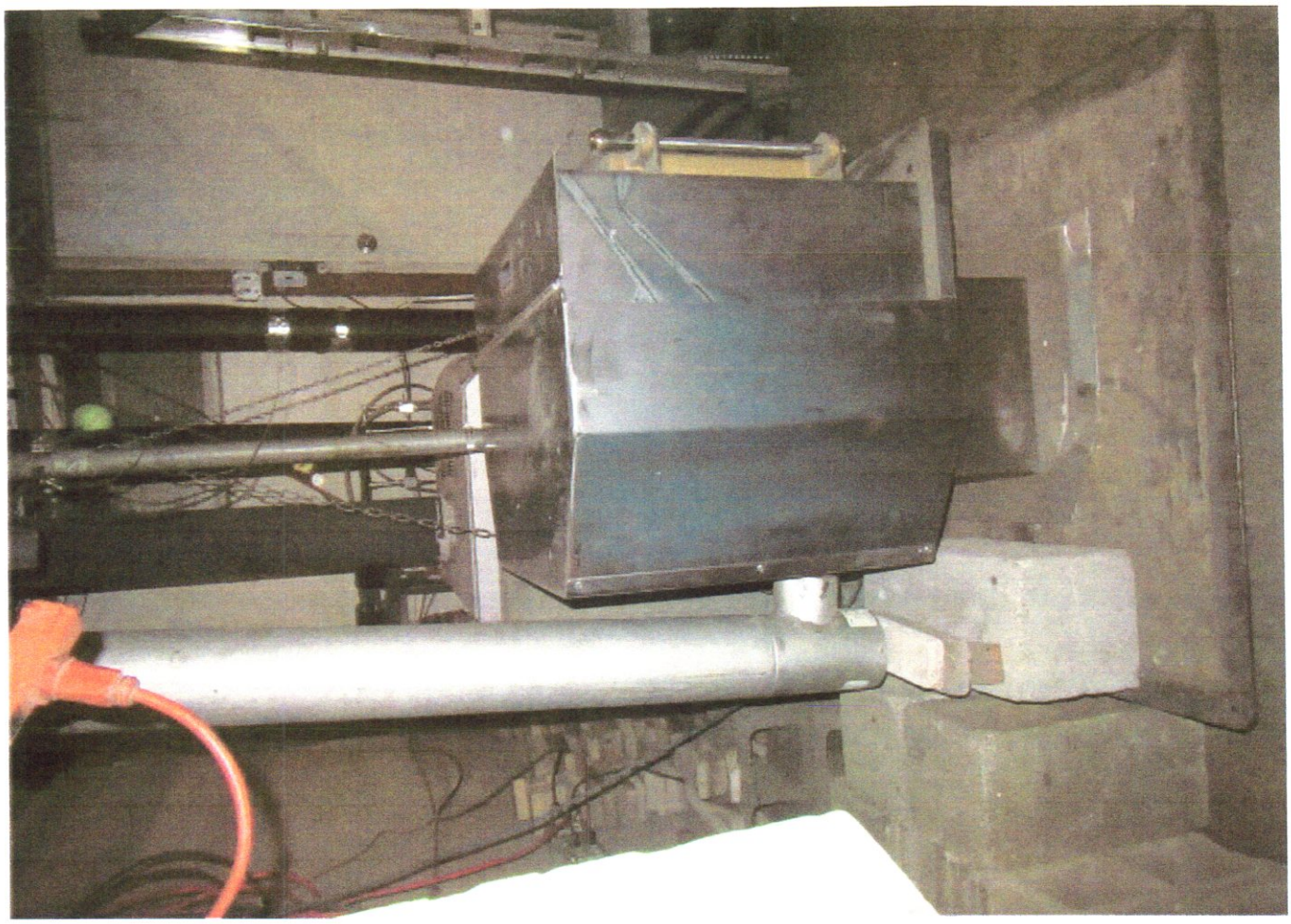
The testing will be conducted at:

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 STANDARD PELLET STOVE

is

1.9675 g/h.

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

HEAT TECH HTP 26 STANDARD PELLET STOVE

is

66.4%.

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

HEAT TECH HTP 26 STANDARD PELLET STOVE

is

71.8%.

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	0.862	19.0	.538	177.727	99.860	1.975	17.8	.539	176.892	99.875	1.960	1.9675	0.38

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	1.6	.528	172.997	.009249

TRAIN 1 0-60 MINUTE DBR and PM EMISSIONS

Run #	DBR (kg/h)	EMISSIONS g/h
EPA 1	1.369	0.274

HEAT TECH
Unit: HTP 26 Standard

WST2-Form 12 Rev 11/2011

Woodstove Data Summary

	Run #	1								
Particulate Emissions:										
Emission Rate:		1.9675								g/hr
Emission Factor:		2.2815								g/kg
(Dry fuel weight basis)										
Efficiency Values: (CSA B415.10-1)										
Combustion Efficiency:		99.5								%
Heat Transfer Efficiency: HHV:		67.0								%
Heat Transfer Efficiency: LHV:		72.1								%
Overall Efficiency: HHV:		66.4								%
Overall Efficiency: LHV:		71.8								%
Heat Output:										
Avg. EPA Btu/hr. for test cycle		12,874								Btu/hr.
Avg. B415 Btu/hr. for test cycle		10,762								Btu/hr.
Fuel Burn Rates:										
Avg. Dry Burn Rate (Wet Basis)		.915								kg/hr.
Avg. Dry Burn Rate (Dry Basis)		.862								kg/hr.
PM Sampling Parameters:										
Avg. Tunnel Flow(Qsd):		139.060								dscfm
Avg. Tunnel Velocity(Vs):		812.545								ft./min.
Pitot Correction Factor:		.97700								
Total Sample Volume:	T1	177.727	T2	176.892						dscf
Avg. Sampling Flow Rate:		.538		.539						cfm
Avg. % Proportionality:		99.860		99.875						%
Total Particulate Catch:		18.5		17.8						mg

Woodstove Data Summary

	Run #	1							
Fuel Moisture Content:									
Kindling (Wet basis):		N/A							%
Pre Test Fuel (Wet basis):		N/A							%
Test Fuel (Wet basis):		5.730							%
Air/Fuel Ratio:									
lbs. air/lbs. fuel:		35.86							
Average Stack Gas Composition:									
Avg. % CO_2:		3.38							%
Avg. % O_2: (stochiometrically)		17.53							%
Avg. % CO:		0.05							%
Average Stack Gas Flow Rate:									
Stack Flow Rate- EPA CMB									dscfm
Draft (static):		-.0473							in. H_2O
Average Stack Gas Emission Factors:									
CO:		20.53							g/Kg
		17.71							g/hr.

Woodstove Data Summary

	Run # 1							
Average Temperatures:								
Stack Gas:	299							°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:	28.577							in. Hg
Avg. Temperature:	80.5							°F
Avg. % Ambient Moisture:	1.35							% H_2O
Avg. % Relative Humidity:	46.0							% RH
Avg. Air Velocity:	5.0							ft/sec
Avg. Dilution Tunnel Draft: (If Applicable)	.000							in/H_2O
Test Fuel Weight and Burn Time:								
Density (Dry basis):	N/A							g/cm^3
Coal Bed Weight:	N/A							lbs.
Pre Test Fuel Weight (Inc. Kindling):	5.8							lbs.
Test Fuel Load Weight:	12.1							lbs.
Total Test Cycle Burn Time:	360							min.

AGING DATA

The Heat Tech HTP 26 Standard 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 STD
Date(s): 7/1 - 7/3/15
Technicians: ATM ESS
Page: 1 of 2

T/C# 1

HOUR #	2015 DATE	TIME	POUNDS BURNT	STACK TEMP	COMMENTS
1	7/1	1127	2.0	299	Fire Started @ 10:27
2		1227	2.1	320	
3		1327	2.2	318	
4		1427	2.3	339	
5		1527	2.4	343	Added fuel @ 1549
6		1627	1.7	344	
7		1727	2.4	343	
8		1827	2.4	352	
9		1927	2.3	346	
10		2027	2.3	344	
11		2127	2.2	340	
12		2227	2.2	328	
13	↓	2327	2.2	339	
14	7/2	0027	2.3	329	
15		0127	2.2	307	
16		0227	2.2	327	
17		0327	2.3	327	
18		0427	2.2	318	
19		0527	2.0	280	
20		0627	2.1	303	
21		0727	2.0	298	
22		0827	2.0	290	Added Fuel @ 911
23		0927	1.7	255	
24		1027	2.2	318	
25		1127	2.3	336	
26		1227	2.3	327	
27		1327	2.5	350	
28		1427	2.6	354	Added fuel @ 1507
29	↓	1527	2.6	357	

Unit: HEAT TECH HTP 26 STD

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

Date(s): 7/1 - 7/3/15
Technicians: AJM
Page: 2 of 2

T/C#

HOUR #	DATE	TIME	POUNDS BURNT	STACK TEMP			COMMENTS
30	7/2	1627	2.4	354			
31		1727	2.5	341			
32		1827	2.5	351			
33		1927	2.5	356			
34		2027	2.4	350			
35		2127	2.3	311			
36		2227	2.4	331			
37		2327	2.2	328			
38	7/3	0027	2.2	313			
39		0127	2.2	314			
40		0227	2.2	311			
41		0327	2.1	299			
42		0427	1.9	274			
43		0527	1.7	267			
44		0627	1.1	184			Hopper Ran Out of Fuel
45		0945	2.2	341			Fire Started @ 0845
46		1045	2.3	332			
47		1145	2.2	328			
48		1245	2.2	336			
49		1345	2.2	334			
50		1445	2.2	328			
51		1545	2.1	326			

MYREN CONSULTING, INC

Manufacturer: HEAT TECH
Model: TP 26 STANDARD
Date: 7.28.15
Run: EPA 1
Control #:
Test Duration: 360
Output Category: VARIABLE

Technicians: ATMYREN

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	66.4%	71.8%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	67%	72.1%

Output Rate (kJ/h)	11,345	10,762	(Btu/h)
Burn Rate (kg/h)	0.86	1.90	(lb/h)
Input (kJ/h)	17,088	16,209	(Btu/h)

Test Load Weight (dry kg)	5.18	11.41	dry lb
MC wet (%)	5.73		
MC dry (%)	6.08		
Particulate (g)	4.5909		
CO (g)	106		
Test Duration (h)	6.00		

Emissions	Particulate	CO
g/MJ Output	0.07	1.56
g/kg Dry Fuel	0.89	20.53
g/h	0.77	17.71
lb/MM Btu Output	0.16	3.63

Air/Fuel Ratio (A/F)	35.66

VERSION: 2.2 12/14/2009

VERSION: 2.2 12/14/2009

Manufacturer: HEAT TECH

Model: HTP 26 STANDARD

Date: 7.28.15

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)

Wood Moisture (% wet): 5.73

Load Weight (lb wet): 12.10

Burn Rate (dry kg/h): 0.86

Total Particulate Emissions: 4.5909 g

Fuel Data

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

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

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	0.05	3.38	17.53	299.30	80.49
					Temp. (°F)	
Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Flue Gas	Room Temp
0	12.10	0.01	3.98	16.96	371.0	74.0
10	11.60	0.01	4.59	16.35	377.0	75.0
20	11.00	0.02	6.08	14.85	385.0	76.0
30	10.50	0.02	3.73	17.20	385.0	76.0
40	10.00	0.02	4.88	16.05	396.0	76.0
50	9.40	0.09	4.46	16.44	383.0	78.0
60	8.90	0.01	5.36	15.58	399.0	77.0
70	8.40	0.01	5.16	15.78	373.0	78.0
80	8.00	0.01	4.53	16.41	353.0	78.0
90	7.60	0.04	2.33	18.59	340.0	79.0
100	7.20	0.06	2.98	17.93	338.0	79.0
110	6.80	0.04	2.66	18.26	336.0	80.0
120	6.30	0.01	4.51	16.43	338.0	80.0
130	5.90	0.10	3.26	17.63	337.0	80.0
140	5.50	0.06	4.06	16.85	342.0	80.0
150	5.10	0.05	5.08	15.84	342.0	80.0
160	4.70	0.03	4.71	16.22	339.0	80.0
170	4.30	0.07	2.11	18.80	333.0	81.0
180	3.90	0.02	4.51	16.42	342.0	81.0
190	3.70	0.03	3.68	17.25	289.0	80.0
200	3.40	0.12	1.93	18.95	251.0	83.0
210	3.20	0.03	3.51	17.42	245.0	82.0
220	3.00	0.06	2.68	18.23	250.0	83.0
230	2.80	0.11	2.38	18.51	239.0	83.0
240	2.60	0.14	1.88	18.99	231.0	83.0
250	2.40	0.04	3.03	17.89	230.0	83.0
260	2.10	0.09	1.53	19.37	225.0	83.0
270	1.90	0.06	2.23	18.68	223.0	83.0
280	1.70	0.06	2.31	18.60	228.0	83.0
290	1.50	0.09	0.96	19.94	210.0	83.0
300	1.30	0.02	4.08	16.85	238.0	83.0
310	1.10	0.10	2.18	18.71	228.0	83.0
320	0.90	0.02	4.83	16.10	248.0	83.0
330	0.70	0.06	2.48	18.43	235.0	83.0
340	0.40	0.10	1.16	19.73	218.0	83.0
350	0.20	0.04	2.66	18.26	241.0	83.0
360	0.00	0.06	2.71	18.20	236.0	83.0

MYREN CONSULTING, INC

Manufacturer: HEAT TECH
Model: FP 26 STANDARD
Date: 7.28.15
Run: EPA 1
Control #:
Test Duration: 60
Output Category: VARIABLE

Technicians: ATMYREN

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	64.9%	70.2%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	65%	70.5%

Output Rate (kJ/h)	17,606	16,701	(Btu/h)
Burn Rate (kg/h)	1.37	3.02	(lb/h)
Input (kJ/h)	27,114	25,721	(Btu/h)

Test Load Weight (dry kg)	1.37	3.02	dry lb
MC wet (%)	5.73		
MC dry (%)	6.08		
Particulate (g)	0.6392		
CO (g)	12		
Test Duration (h)	1.00		

Emissions	Particulate	CO
g/MJ Output	0.04	0.69
g/kg Dry Fuel	0.47	8.87
g/h	0.64	12.14
lb/MM Btu Output	0.08	1.60

Air/Fuel Ratio (A/F)	25.78

VERSION: 2.2 12/14/2009

VERSION: 2.2 12/14/2009

Manufacturer: HEAT TECH

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

Model: HTP 26 STANDARD

Date: 7.28.15

Run: EPA 1

Control #:

Test Duration: 60

Output Category: VARIABLE

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):	5.73
Load Weight (lb wet):	3.20
Burn Rate (dry kg/h):	1.37
Total Particulate Emissions:	0.6392 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		**0.03**	**4.73**	**16.20**	**385.14**	**76.00**
					Temp. (°F)	
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas Composition (%) CO**	**CO_2**	**O_2**	**Flue Gas**	**Room Temp**
0	3.20	0.01	3.98	16.96	371.0	74.0
10	2.70	0.01	4.59	16.35	377.0	75.0
20	2.10	0.02	6.08	14.85	385.0	76.0
30	1.60	0.02	3.73	17.20	385.0	76.0
40	1.10	0.02	4.88	16.05	396.0	76.0
50	0.50	0.09	4.46	16.44	383.0	78.0
60	0.00	0.01	5.36	15.58	399.0	77.0

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

Unit: HEAT Tech HTP 36 STD
Run #: EPA 1
Date: 7/28 15
Technicians: ADM ESS

Point	Location	Δp	$\sqrt{\Delta p_{trav}}$	Δp	$\sqrt{\Delta p_{cent}}$	T_{trav}	T_{cent}	Pg
W-1	0.5"	.035	.187 ✗			110		
2	1.5	.038	.195 ✗			111		
Center	Center			.040	.200 ✓		111	—
3	4.5	.041	.202 ✗			111		
4	5.5	.040	.200 ✗			112		
S-1	0.5	.037	.192 ✗			112		
2	1.5	.040	.200 ✗			112		
Center	Center			.040	.200 ✓		112	—
3	4.5	.039	.197 ✗			112		
4	5.5	.036	.190 ✗			112		
	Totals		1.563 ✗		.400 ✗	892 ✗	223 ✓	—
	Average		.1954 ✗		.2000 ✓	111.5 ✗	111.5 ✗	—
	°R = (°F + 460)					571.5 ✗	571.5 ✗	

BP = 28.59 ✓ "Hg Ps = BP + (-Pg/13.6) = 28.59 ✓ + (— /13.6) = 28.59 ✓ " Hg

LEAK CHECKS: Manometer Level: OK ✓ Zeroed: OK ✓ Tech: ~~EB~~
Pg Leg: Pre Test: Pressure: -.250+ " H_2O Movement: .000 " H_2O Tech: ~~EB~~ 4.500/1,000 ADM
Post Test: Pressure: -.180 " H_2O Movement: .000 " H_2O Tech: ~~EB~~ 4.100/1,000 ADM
Velocity Head Leg: Pre Test: Pressure: +.010 " H_2O Movement: .000 " H_2O Tech: ~~EB~~ 3,600 ADM
Post Test: Pressure: -.003 " H_2O Movement: .000 " H_2O Tech: ~~EB~~ 3,800 ADM

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 HTP26STD DATE: 7/28/15 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) {2} (.1954 $\bar{X}$ {2} $\sqrt{\Delta P}$ "H_2O) $\sqrt{\frac{571.5 \text{ Ts °A}}{\{0\}}}$ = 13.78259 fps

$\sqrt{\frac{(28.59 \text{ Ps "Hg})\ (28.\frac{0}{78} \text{ lb./ lb. mole})}{\{2\}}}$ {2}

(9A) Vs = (13.78259 fps {2}) (60) = 826.955 fpm {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) {2} (.2000 $\bar{X}$ {2} $\sqrt{\Delta P}$ "H_2O) $\sqrt{\frac{571.5 \text{ Ts °A}}{\{0\}}}$ = 14.10704 fps

$\sqrt{\frac{(28.59 \text{ Ps "Hg})\ (28.\frac{0}{78} \text{ lb./ lb. mole})}{\{2\}}}$ {2}

(9A) Vs = (14.10704 fps {2}) (60) = 846.423 fpm {2}

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

Fp = Vstrav/ Vscent = 13.78259 ÷ 14.10704 = .97700

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

Qsd = 3600 (1 − 0.0{2} Bws) (13.78259 {2} fps) (.1963 {3} ft^2) [(528 °A) (28.59 {2} Ps "Hg) / (571.5 {0} T_s °A) (29.92" Hg)] =

8426.551 {1} dscfhr (or dscfh)

(10A) 8426.551 {1} dscfhr ÷ 60 = 140.443 {1} dscfmin (or dscfm)

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.

DILUTION TUNNEL CALCULATIONS

MYREN CONSULTING CERTIFICATION TEST DATA

10.11.15 MD=28.78 Bws = 2%

	6"Tunnel
File Name:	R 1 T 1
Manufacturer:	HEAT TECH
Model Number:	HTP 26 STD
Lab Name:	MYREN
Test Date:	7.28.15
Run Number:	R 1 T 1
Meter Box Y Factor:	1.0066
Barometric Pressure (in Hg):	28.577
Dry Gas Meter Temp(avg.)(F):	**94**
Delta H(Avg.)(in H2)):	**0.900**
Gas meter initial reading:	622.9000
Gas meter final reading:	816.6240
Total Particulate Catch(mg):	18.0
Sampling Flow Rate(cfm):	0.538
Tunnel Flow (Qsd) (dscfm)	**139.060**
Emission Rate(g/hr):	**1.975**
Emission Factor(g/kg)	**2.290**
Avg. of Delta P Sq. Roots:	**0.1973**
Vs (Avg.)(ft/min):	**812.545**
Tunnel Avg. Temperature (F):	**106.865**
Test time(min):	360
Fuel Load: (lbs. Dry):	11.4070
Wood moisture(%wet):	5.730
Burn rate(dry kg/hr):	**0.862**
Sample Volume (dscf)	**177.727**
Avg. Tunnel Static (-inch H2O):	**0.0000**
Room Blank Catch (mg/dscf):	0.009249
Total PM Emissions(Er))(g):	**4.6072**
Pitot Correction Factor:	0.97700
Front Filter Number:	712, 708
Back Filter Number:	713, 709
Beaker number:	40, 38
PRELIMINARY RESULTS	
FINAL RESULTS:	AUDITED

DATA SUMMARY

MODEL:	HTP 26 STD
RUN:	R 1 T 1
DATE:	7.28.15
DBR:	0.862
EMISSION RATE (g/hr)(unadj):	1.9745
EMISSION FACTOR (g/kg):	4.6072
AVG. % PROPORTIONALITY :	99.860

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	0.039	113	622.9000	72.0	0.900	817.81			0.000	0.19748	
10	0.039	113	628.2400	75.0	0.900	817.81	107.6	5.091	0.000	0.19748	
20	0.039	114	633.5280	79.0	0.900	818.17	105.3	5.008	0.000	0.19748	
30	0.039	115	638.7980	83.0	0.900	818.88	103.5	4.954	0.000	0.19748	
40	0.039	115	644.1640	85.0	0.900	819.24	104.2	5.017	0.000	0.19748	
50	0.039	116	649.5350	88.0	0.900	819.59	103.4	4.999	0.000	0.19748	
60	0.038	117	654.9260	90.0	0.900	815.01	103.3	4.994	0.000	0.19494	
70	0.039	115	660.3650	92.0	0.900	814.66	103.7	5.020	0.000	0.19748	
80	0.039	113	665.7390	93.0	0.900	818.52	101.3	4.947	0.000	0.19748	
90	0.039	112	671.1410	93.0	0.900	817.45	101.2	4.968	0.000	0.19748	
100	0.039	112	676.5470	94.0	0.900	817.10	101.1	4.967	0.000	0.19748	
110	0.039	112	681.9380	95.0	0.900	817.10	100.5	4.945	0.000	0.19748	
120	0.039	113	687.3280	95.0	0.900	817.45	100.3	4.939	0.000	0.19748	
130	0.039	114	692.7140	96.0	0.900	818.17	100.2	4.931	0.000	0.19748	
140	0.039	113	698.0910	97.0	0.900	818.17	99.6	4.914	0.000	0.19748	
150	0.039	113	703.4650	97	0.900	817.81	99.3	4.907	0.000	0.19748	
160	0.039	113	708.8320	97	0.900	817.81	99.2	4.901	0.000	0.19748	
170	0.039	113	714.2040	97	0.900	817.81	99.3	4.905	0.000	0.19748	
180	0.039	113	719.5750	98	0.900	817.81	99.1	4.900	0.000	0.19748	
190	0.039	105	724.9480	98	0.900	814.95	98.5	4.897	0.000	0.19748	
200	0.039	102	730.3160	98	0.900	811.00	97.8	4.893	0.000	0.19748	
210	0.039	101	735.7200	98	0.900	809.56	98.5	4.926	0.000	0.19748	
220	0.039	102	741.1200	98	0.900	809.56	98.5	4.922	0.000	0.19748	
230	0.039	101	746.5190	98	0.900	809.56	98.5	4.921	0.000	0.19748	
240	0.039	100	751.9230	99	0.900	808.84	98.2	4.921	0.000	0.19748	
250	0.039	100	757.3310	99	0.900	808.48	98.1	4.920	0.000	0.19748	
260	0.039	99	762.7340	99	0.900	808.12	98.0	4.916	0.000	0.19748	
270	0.039	98	768.1420	99	0.900	807.40	98.0	4.920	0.000	0.19748	
280	0.039	99	773.5490	99	0.900	807.40	98.0	4.920	0.000	0.19748	
290	0.039	98	778.9270	99	0.900	807.40	97.5	4.893	0.000	0.19748	
300	0.039	98	784.3130	99	0.900	807.03	97.5	4.900	0.000	0.19748	
310	0.039	98	789.6970	99	0.900	807.03	97.5	4.899	0.000	0.19748	
320	0.039	99	795.0760	99	0.900	807.40	97.5	4.894	0.000	0.19748	
330	0.039	99	800.4600	99	0.900	807.76	97.6	4.899	0.000	0.19748	
340	0.039	98	805.8470	99	0.900	807.40	97.6	4.901	0.000	0.19748	
350	0.039	99	811.2320	99	0.900	807.40	97.6	4.899	0.000	0.19748	
360	0.039	99	816.6240	98	0.900	807.76	98.0	4.910	0.000	0.19748	
370											
380											

DILUTION TUNNEL CALCULATIONS

MYREN CONSULTING CERTIFICATION TEST DATA

10.11.15 MD=28.78 Bws = 2%

	6"Tunnel
File Name:	R 1 T 1 0-60
Manufacturer:	HEAT TECH
Model Number:	HTP 26 STD
Lab Name:	MYREN
Test Date:	7.28.15
Run Number:	R 1 T 1 0-60
Meter Box Y Factor:	1.0066
Barometric Pressure (in Hg):	28.59
Dry Gas Meter Temp(avg.)(F):	**82**
Delta H(Avg.)(in H2)):	**0.900**
Gas meter initial reading:	622.9000
Gas meter final reading:	654.9260
Total Particulate Catch(mg):	2.6
Sampling Flow Rate(cfm):	0.534
Tunnel Flow (Qsd) (dscfm)	**138.033**
Emission Rate(g/hr):	**0.274**
Emission Factor(g/kg)	**0.200**
Avg. of Delta P Sq. Roots:	**0.1971**
Vs (Avg.)(ft/min):	**817.336**
Tunnel Avg. Temperature (F):	**114.714**
Test time(min):	60
Fuel Load: (lbs. Dry):	3.0170
Wood moisture(%wet):	5.730
Burn rate(dry kg/hr):	**1.369**
Sample Volume (dscf)	**30.082**
Avg. Tunnel Static (-inch H2O):	**0.0000**
Room Blank Catch (mg/dscf):	0.009249
Total PM Emissions(Er))(g):	**0.6392**
Pitot Correction Factor:	0.97700
Front Filter Number:	712
Back Filter Number:	713
Beaker number:	40
PRELIMINARY RESULTS	
FINAL RESULTS:	AUDITED

DATA SUMMARY

MODEL:	HTP 26 STD
RUN:	R 1 T 1 0-60
DATE:	7.28.15
DBR:	1.369
EMISSION RATE (g/hr)(unadj):	0.2739
EMISSION FACTOR (g/kg):	0.6392
AVG. % PROPORTIONALITY :	99.864

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	0.039	113	622.9000	72.0	0.900	817.62			0.000	0.19748	
10	0.039	113	628.2400	75.0	0.900	817.62	102.8	5.093	0.000	0.19748	
20	0.039	114	633.5280	79.0	0.900	817.98	100.5	5.011	0.000	0.19748	
30	0.039	115	638.7980	83.0	0.900	818.69	98.8	4.957	0.000	0.19748	
40	0.039	115	644.1640	85.0	0.900	819.05	99.6	5.019	0.000	0.19748	
50	0.039	116	649.5350	88.0	0.900	819.41	98.8	5.001	0.000	0.19748	
60	0.038	117	654.9260	90.0	0.900	814.83	98.7	4.997	0.000	0.19494	
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											

T1
0-60

Black Round Top

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

DATE: 7/28/15 **PAGE** 1 **OF** 2 **UNIT:** HEAT Tech 26STD HTD **RUN:** EPA 1

METER BOX: 456-P **METER Y:** 1.0066 .681/.636 **FILTER #'S: (F)** 712 **(R)** 713

FILTER/ O-RING ID # : —

PRE TEST LEAK CHECK: .005 **CFM @** -15.5 **IN HG** .717/.7175 **FILTER SIZE:** 110 **mm**

PROBE ID # : —

POST TEST LEAK CHECK: .0005 **CFM @** -10.5 **IN HG** **PROBE LENGTH** ____ **IN**

TIME		METER READING	PITOT		TUNNEL TEMP	METER TEMP	GAS METER	VAC
CLOCK	ELAPSED	(m³) (ft³)	ΔP	Pg	(°F)	(°F)	Δh	(in Hg)
1300	00	622.900	.039		113	72	.90	-1.5
10	10	628.240	.039		113	75	.90	-1.5
20	20	633.528	.039		114	79	.90	-1.5
30	30	638.798	.039		115	83	.90	-1.5
40	40	644.164	.039		115	85	.90	-1.5
50	50	649.535	.039		116	88	.90	-1.5
1400	60	654.926	.038		117	90	.90	-1.5
	70							
	80							
	90							
	00							
	10							
	20							
	30							
	40							
	50							
	60							
	70							
	80							
	90							

BP

00	28.59	___	_____
60	28.59	___	_____
___	_____	___	_____
___	_____	___	_____
___	_____	AVG.=	28.59

Pre Test Filter Check Weighing
F .6510
R .6498

End of Test Weight
F .6528 R .6462
.6511 .6496

1.7

white Rnd Top

T1
60+

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

DATE: 7/28/15 **PAGE** 1 **OF** 2 **UNIT:** Heat Tech HTP 26 STD **RUN:** EPA 1

METER BOX: 456-P **METER Y:** 1.066 .554/.560 **FILTER #'S: (F)** 708 **(R)** 709

FILTER/ O-RING ID # : —

PRE TEST LEAK CHECK: .006 **CFM @** -15.5 **IN HG** **FILTER SIZE:** 110 **mm**

PROBE ID # : —

POST TEST LEAK CHECK: _____ **CFM @** _____ **IN HG** **PROBE LENGTH** 21.5 **IN**

TIME		METER READING	PITOT		TUNNEL TEMP	METER TEMP	GAS METER	VAC
CLOCK	ELAPSED	(m³) (ft³)	ΔP	Pg	(°F)	(°F)	Δh	(in Hg
1400	00	654.926	.038		117	90	.90	-1.5
10	10	660.365	.039		115	92	.90	-1.5
20	20	665.739	.039		113	93	.90	-1.5
30	30	671.141	.039		112	93	.90	-1.5
40	40	676.547	.039		112	94	.90	-1.5
50	50	681.938	.039		112	95	.90	-1.5
1500	(60)	687.328	.039		113	95	.90	-1.5
10	70	692.714	.039		114	96	.90	-1.5
20	80	698.091	.039		113	97	.90	-1.5
30	90	703.465	.039		113	97	.90	-1.5
40	100	708.832	.039		113	97	.90	-1.5
50	110	714.204	.039		113	97	.90	-1.5
1600	(120)	719.575	.039		113	98	.90	-1.5
10	130	724.948	.039		105	98	.90	-1.5
20	140	730.316	.039		102	98	.90	-1.5
30	150	735.720	.039		101	98	.90	-1.5
40	160	741.120	.039		102	98	.90	-1.5
50	170	746.519	.039		101	98	.90	-1.5
1700	(80)	751.923	.039		100	99	.90	-1.5
10	190	757.331	.039		100	99	.90	-1.5

BP

00	28.59	300	28.56
60	28.59		
120	28.58		
180	28.57		
240	28.56	AVG.=	28.575

RUN = 28.577

Pre Test Filter Check Weighing
F .6467
R .6499

End of Test Weight
F .6594 R .6497

.6467 .6497

127 0

White Rnd Top

T1
60+

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

DATE: 7/28/15 **PAGE** 2 **OF** 2 **UNIT:** HEAT Tech HTP 26 STD **RUN:** EPA 1

METER BOX: 45G-P **METER Y:** 1.066 **FILTER #'S: (F)** 708 **(R)** 709

.554 / .560 **FILTER/ O-RING ID # :** —

PRE TEST LEAK CHECK: .006 **CFM @** -15.5 **IN HG** **FILTER SIZE:** 110 **mm**

.652 / .657 **PROBE ID # :** —

POST TEST LEAK CHECK: .000 **CFM @** -10.2 **IN HG** **PROBE LENGTH** 21.5 **IN**

TIME		METER READING	PITOT		TUNNEL TEMP	METER TEMP	GAS METER	VAC
CLOCK	ELAPSED	(m³) (ft³)	ΔP	Pg	(°F)	(°F)	Δh	(in Hg
1720	200	762.734	.039		99	99	.90	-1.5
30	210	768.142	.039		98	99	.90	-1.5
40	220	773.549	.039		99	99	.90	-1.5
50	230	778.927	.039		98	99	.90	-1.5
1800	240	784.313	.039		98	99	.90	-1.5
10	250	789.697	.039		98	99	.90	-1.5
20	260	795.076	.039		99	99	.90	-1.5
30	270	800.460	.039		99	99	.90	-1.5
40	280	805.847	.039		98	99	.90	-1.5
50	290	811.232	.039		99	99	.90	-1.5
1900	300	816.624	.039		99	98	.90	-1.5
	10							
	20							
	30							
	40							
	50							
	60							
	70							
	80							
	90							

BP

00	28.59	300	28.56
60	28.59		
120	28.58		
180	28.57		
240	28.56	AVG.=	28.575

RUN = 28.577

Pre Test Filter Check Weighing
F .6467
R .6499

End of Test Weight
F .6594 R .6497

.6467 .6497

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 1.0µm
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	11:33	ATM	.6442	7/14	1523	ESS
702	.6466		1512	ESS	.6462		11:35	ATM	.6462		1524	ESS
703	.6460		1511	ESS	.6455		1137	ATM	.6455		1525	ESS
704	.6476		1510	ESS	.6472		1139	ATM	.6473		1526	ESS
705	.6450		1509	ESS	.6444		1141	ATM	.6445		1527	ESS
706	.6472		1508	ESS	.6467		1143	ATM	.6465		1528	ESS
707	.6425		1507	ESS	.6423		1144	ATM				
T1 708	.6470		1506	ESS	.6465		1146	ATM	.6467		1529	ESS
T1 709	.6503		1506	ESS	.6499	↓	1147	ATM	.6497		1530	ESS
710	.6509		1505	ESS	.6505	7/10	1338	ATM	.6503		1531	ESS
711	.6514		1504	ESS	.6511		1339	ATM	.6509		1532	ESS
T1 712	.6515		1503	ESS	.6511		1340	ATM	.6512		1533	ESS
T1 713	.6498		1502	ESS	.6496		1341	ATM				
T2 714	.6522		1501	ESS	.6520		1342	ATM				
T2 715	.6494		1500	ESS	.6493		1343	ATM				
T3 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	.6534		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	Date	1st	2nd	3rd	4th	5th
Weighing	0.0000g	0.0000	0.0000	0.0000	0.0000	
Scale Check	100.0000g	99.9995	99.9996	99.9996	99.9994	

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

Into Dessicator: Date 7/2/15 Time 1500 By A.T. Myren
Balance Used: Sartorius Model: CP224S SN:24850860

Bkr #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
VG150 | 20	73.3173	7/5	1930	ATM	73.3180	7/6	914	ESS	73.3174	7/8	1103	ATM
21	71.0019	7/5	1929	ATM	71.0018	|	915	ESS				
22	71.8347	7/5	1928	ATM	71.8346	|	912	ESS				
23	70.7383	7/5	1932	ATM	70.7387	|	909	ESS	70.7386	7/8	1105	ATM
24	73.2188	7/5	1931	ATM	73.2189	|	910	ESS				
25	72.6533	7/5	1930	ATM	72.6532	|	908	ESS				
26	71.7868	7/5	1934	ATM	71.7871	|	906	ESS	71.7869	7/8	1107	ATM
27	72.3305	7/5	1934	ATM	72.3304	|	907	ESS				
28	70.5973	7/5	1933	ATM	70.5976	|	905	ESS	70.5971	7/8	1108	ATM
29	71.5193	7/5	1945	ATM	71.5196	|	920	ESS	71.5195	7/8	1110	ATM
30	70.7855	7/5	1944	ATM	70.7857	|	921	ESS				
31	69.6666	7/5	1943	ATM	69.66668	|	920	ESS				
32	53.5996	7/5	1942	ATM	53.6001	|	925	ESS	53.5997	7/8	1112	ATM
33	53.1491	7/5	1941	ATM	53.1494	|	927	ESS	53.1493	7/8	1113	ATM
34	53.2615	7/5	1941	ATM	53.2617	|	926	ESS				
35	53.2831	7/5	1940	ATM	53.2835	|	930	ESS	53.2836	7/8	1115	ATM
36	53.5742	7/5	1939	ATM	53.5743	|	932	ESS				
37	53.7264	7/5	1938	ATM	53.7267	|	929	ESS	53.7266	7/8	1116	ATM
38	53.2521	7/5	1937	ATM	53.2515	|	933	ESS	53.2523	7/8	1117	ATM
39	53.1505	7/5	1936	ATM	53.1504	|	935	ESS				
40	53.4637	7/5	1935	ATM	53.4640	|	936	ESS	53.4607	7/8	1118	ATM
41	52.8367	7/5	1925	ATM	52.8371	|	917	ESS	52.8371	7/8	1120	ATM
42	53.8693	7/5	1927	ATM	53.8696	|	916	ESS	53.8690	7/8	1122	ATM
(43)	53.2323	7/5	1926	ATM	53.2324	|	918	ESS	(53.2322)	7/8	1124	ATM

Checked by A.T. Myren Date: 7/8/15 Time: 1202

QA Reweigh

Beaker #	WT	Date	Time	By
23	70.7385	7/10	1336	ATM
29	71.5196	|	1338	ATM
33	53.1492	|	1340	ATM
43	53.2321	↓	1342	ATM

Balance Room Environmental Conditions

WB	DB	%RH	Date	Time	By
58	70	48	7/5	1912	ATM
57	69	46	7/6	847	ESS
57	69	46	7/8	1010	ATM
58	72	46	7/10	1315	ATM

	1st	2nd	3rd	4th	5th
Date	7/5/15	7/6/15	7/8/15	7/10/15	
Post Weighing 0.0000g	0.0000	0.0000	0.0000	0.0000	
Scale Check 100.0000g	99.9996	99.9995	99.9995	99.9996	

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

Into Dessicator: Date 7/2/15 Time 1500 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	73.3176	7/9	903	ESS	73.3177	7/10	1332	ATM		T1		
28	70.5974	"	905	ESS	70.5976	7/10	1328	ATM				
32	53.5999	"	906	ESS	53.5996	7/10	1334	ATM	53.5999	7/14	1519	ESS
38	53.2526	"	908	ESS	53.2521	7/10	1329	ATM	53.2519	7/14	1516	ESS
40	53.4636	"	909	ESS	53.4630	7/10	1331	ATM	53.4630	7/14	1517	ESS
42	53.8693	"	910	ESS	53.8692	7/10	1327	ATM	T2	T1		

Checked by A.T. Myers Date: 7/15/15 Time: 1400

QA Reweigh

Beaker #	WT	Date	Time	By

Balance Room Environmental Conditions

WB	DB	%RH	Date	Time	By
58	71	44	7/9/15	859	ESS
58	72	42	7/10/15	815	ATM
57	69	46	7/14/15	1512	ESS

	1st	2nd	3rd	4th	5th
Date	7/9/15	7/10/15	7/14/15		
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									Acetone Blank			
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												

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	1215	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		

Woodstove Data Sheet #4-3: Constant Final Weights

T1 0-60

Unit HEAT TECH
Run # EPA 1
Date: 7/28/15

HTC 20 STD

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

50 ml

Final Beaker Weights

Beaker	Into	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
40	53.4638	7/29	1651	ATM	53.4673	7/30	1325	ATM	53.4680	7/31	1515	ESS	53.4678	8/1	1605	ATM

Final Filter Weights

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
F	712	.6528	7/28	2305	ATM	.6525	7/29	1336	ESS	.6523	7/30	1011	ATM				
														1.2986			
R	713	.6462	7/28	2305	ATM	.6464	7/29	1335	ESS	.6463	7/30	1007	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	7/29	1325	ESS	56	68	46
2	7/30	949	ATM	55	66	49
3	7/31	1413	ESS	58	70	47
4	8/1	1547	ATM	54	66	45
5						
6						
7						

Scale Room Environmental Conditions

8						
9						
10						
11						
12						

Comment	7/30	7/31	8/1
7/29	0.0000	0.0000	0.0000
0.0000	99.9995	99.9995	99.9996
99.9995			

Woodstove Data Sheet #4-3: Constant Final Weights

T1 60+

Unit HEAT TECH
Run # EPA 1
Date: 7/28 '15

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

60 ml

Final Beaker Weights

Beaker	Into	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
38	53.2514	7/29	1649	ATM	53.2556	7/30	1334	ATM	53.2562	7/31	1451	ESS	53.2556	8/1	1603	ATM
					53.2550	8/2	1848	ATM								

Final Filter Weights

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
F	708	.6594	7/28	2305	ATM	.6591	7/29	1329	ESS	.6591	7/30	1016	ATM	1.3081			
R	709	.6497	7/28	2305	ATM	.64489	7/29	1328	ESS	.6490	7/30	1015	ATM				

QA Reweigh: Final Weight

Date	Beaker #	Final Wt	By

Date	Filter #	Final Wt	By

Scale Room Environmental Conditions

Weighing Session	Date (2015)	Time	By	WB	DB	%RH
1	7/29	1325	ESS	56	68	46
2	7/30	949	ATM	55	66	49
3	7/31	1413	ESS	58	70	47
4	8/1	1547	ATM	54	66	45
5	8/2	1913	ATM	52	69	45
6						
7						

8	
9	
10	
11	
12	
Comment	7/29 0.0000 99.9995

Scale Room Environmental Conditions

	7/30	7/31	8/1	8/2
	0.0000 99.9996	0.0000 99.9995	0.0000 99.9995	0.0000 99.9996

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

Unit: HEAT TECH HTP 26 STO.
Run: EPA 1 Train 1
Date: 7/28/15
Technicians: ATM
Revised 11/15 - Data Sheet #5

0-60 Minutes:
Filters:

Filter # (Front): 712 Beaker #: 40 Final Wt.: 53.4678 g
Tare Wt.: .6512 g ml 50 Tare Wt.: 53.4630 g
Filter # (Rear): 713 Desiccant: Acetone Net Wt.: .0048 g
Tare Wt.: .6496 g Beaker Tare Wt,. Check: 53.4630 g
0-60 Minute Combined Filter Final Weight: 1.2986 g
0-60 Minute Combined Filter Tare Weight: 1.3008 g
0-60 Minute Combined Net Catch Weight: -.0022 g

60 Minutes Plus:

Filter # (Front): 708 Beaker #: 38 Final Wt.: 53.2556 g
Tare Wt.: .6467 g ml 60 Tare Wt.: 53.2519 g
Filter # (Rear): 709 Desiccant: Acetone Net Wt.: .0037 g
Tare Wt.: .6497 g Beaker Tare Wt. Check: 53.2518 g
60 Minute Plus Combined Filter Final Weight: 1.3081 g
60 Minute Plus Combined Filter Tare Weight: 1.2964 g
60 Minute Plus Combined Net Catch Weight: .0117 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)(50 ml Acetone) = .0000 g Residue Value

60 Minute Plus Acetone Residue Value Calculation:

(.0000 g/ml Acetone)(60 ml Acetone) = .0000 g Residue Value

Total Particulate Catch Calculations:	0-60 Minute	60 Minute Plus
Combined Filter Net Catch Weight:	-.0022 g	.0117 g
Acetone Wash Catch Weight:	.0048 g	.0037 g
Less Acetone Residual Value:	-.0000 g	-.0000 g
Equals Net Acetone Wash Catch:	.0048 g	.0037 g
Total Net Catch (Combined Filter + Acetone Catch):	.0026 g	.0154 g
	2.6 mg	15.4 mg

Total Train 1 Net Catch (0-60 Minute + 60 Minute Plus Catches): 18.0 mg

DILUTION TUNNEL CALCULATIONS

MYREN CONSULTING CERTIFICATION TEST DATA

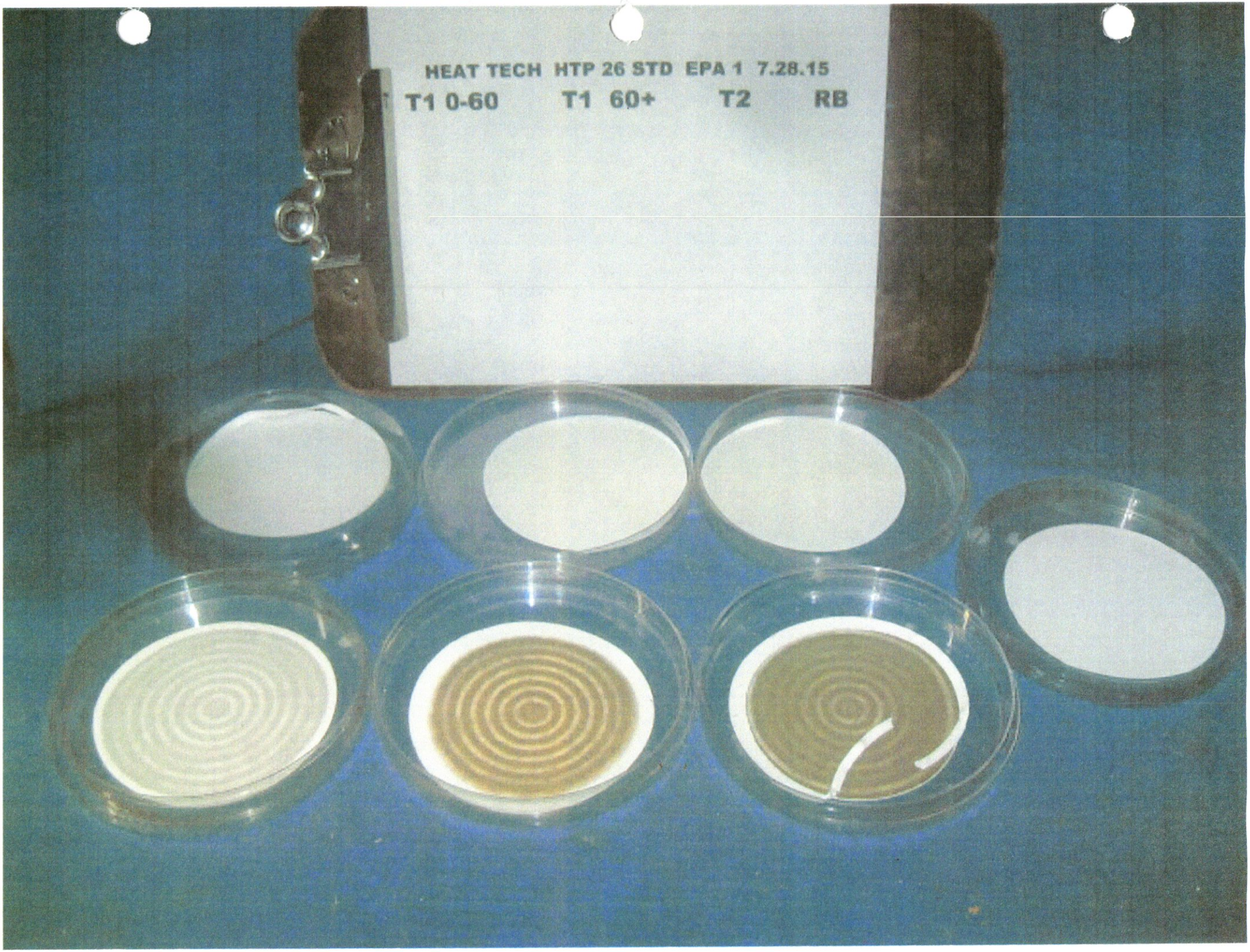
10.11.15 MD=28.78 Bws = 2%

	6"Tunnel
File Name:	EPA 1 T 2
Manufacturer:	HAT TECH
Model Number:	HTP 26 STD
Lab Name:	MYREN
Test Date:	7.28.15
Run Number:	EPA 1 T 2
Meter Box Y Factor:	0.9685
Barometric Pressure (in Hg):	28.577
Dry Gas Meter Temp(avg.)(F):	**77**
Delta H(Avg.)(in H2)):	**0.900**
Gas meter initial reading:	115.3000
Gas meter final reading:	309.4710
Total Particulate Catch(mg):	17.8
Sampling Flow Rate(cfm):	0.539
Tunnel Flow (Qsd) (dscfm)	**139.060**
Emission Rate(g/hr):	**1.960**
Emission Factor(g/kg)	**2.273**
Avg. of Delta P Sq. Roots:	**0.1973**
Vs (Avg.)(ft/min):	**812.545**
Tunnel Avg. Temperature (F):	**106.865**
Test time(min):	360
Fuel Load: (lbs. Dry):	11.4070
Wood moisture(%wet):	5.730
Burn rate(dry kg/hr):	**0.862**
Sample Volume (dscf)	**176.892**
Avg. Tunnel Static (-inch H2O):	**0.0000**
Room Blank Catch (mg/dscf):	0.009249
Total PM Emissions(Er))(g):	**4.5745**
Pitot Correction Factor:	0.97700
Front Filter Number:	714
Back Filter Number:	715
Beaker number:	42
PRELIMINARY RESULTS	
FINAL RESULTS:	AUDITED

DATA SUMMARY

MODEL:	HTP 26 STD
RUN:	EPA 1 T 2
DATE:	7.28.15
DBR:	0.862
EMISSION RATE (g/hr)(unadj):	1.9605
EMISSION FACTOR (g/kg):	4.5745
AVG. % PROPORTIONALITY :	99.875

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	0.039	113	115.3000	63.5	0.900	817.81			0.000	0.19748	
10	0.039	113	120.6420	67.0	0.900	817.81	104.0	4.977	0.000	0.19748	
20	0.039	114	126.0120	68.5	0.900	818.17	103.7	4.979	0.000	0.19748	
30	0.039	115	131.3830	70.5	0.900	818.88	103.1	4.964	0.000	0.19748	
40	0.039	115	136.7500	71.5	0.900	819.24	102.5	4.946	0.000	0.19748	
50	0.039	116	142.1310	73.5	0.900	819.59	102.2	4.945	0.000	0.19748	
60	0.038	117	147.5160	74.0	0.900	815.01	102.2	4.937	0.000	0.19494	
70	0.039	115	152.9040	75.0	0.900	814.66	102.2	4.933	0.000	0.19748	
80	0.039	113	158.2350	75.5	0.900	818.52	100.3	4.874	0.000	0.19748	
90	0.039	112	163.6130	76.0	0.900	817.45	100.6	4.912	0.000	0.19748	
100	0.039	112	168.9850	76.0	0.900	817.10	100.3	4.904	0.000	0.19748	
110	0.039	112	174.3700	77.0	0.900	817.10	100.4	4.912	0.000	0.19748	
120	0.039	113	179.7360	77.0	0.900	817.45	100.0	4.890	0.000	0.19748	
130	0.039	114	185.1310	78.0	0.900	818.17	100.4	4.912	0.000	0.19748	
140	0.039	113	190.5130	78.0	0.900	818.17	99.9	4.895	0.000	0.19748	
150	0.039	113	195.9200	78.0	0.900	817.81	100.3	4.918	0.000	0.19748	
160	0.039	113	201.3030	78.0	0.900	817.81	99.9	4.896	0.000	0.19748	
170	0.039	113	206.7010	78.0	0.900	817.81	100.2	4.910	0.000	0.19748	
180	0.039	113	212.1100	79.0	0.900	817.81	100.2	4.915	0.000	0.19748	
190	0.039	105	217.5190	80.0	0.900	814.95	99.3	4.906	0.000	0.19748	
200	0.039	102	222.8980	79.0	0.900	811.00	98.2	4.879	0.000	0.19748	
210	0.039	101	228.3030	79.5	0.900	809.56	98.8	4.905	0.000	0.19748	
220	0.039	102	233.8480	79.0	0.900	809.56	101.4	5.032	0.000	0.19748	
230	0.039	101	239.1190	80.0	0.900	809.56	96.3	4.781	0.000	0.19748	
240	0.039	100	244.5250	80.0	0.900	808.84	98.5	4.899	0.000	0.19748	
250	0.039	100	249.9260	80.0	0.900	808.48	98.4	4.894	0.000	0.19748	
260	0.039	99	255.3520	80.0	0.900	808.12	98.8	4.917	0.000	0.19748	
270	0.039	98	260.7730	80.0	0.900	807.40	98.6	4.913	0.000	0.19748	
280	0.039	99	266.1810	80.0	0.900	807.40	98.4	4.901	0.000	0.19748	
290	0.039	98	271.6110	80.5	0.900	807.40	98.7	4.918	0.000	0.19748	
300	0.039	98	277.0050	80.0	0.900	807.03	98.0	4.886	0.000	0.19748	
310	0.039	98	282.4150	80.5	0.900	807.03	98.3	4.900	0.000	0.19748	
320	0.039	99	287.8280	80.0	0.900	807.40	98.4	4.903	0.000	0.19748	
330	0.039	99	293.2330	81.0	0.900	807.76	98.2	4.893	0.000	0.19748	
340	0.039	98	298.6550	80.5	0.900	807.40	98.3	4.907	0.000	0.19748	
350	0.039	99	304.0600	80.0	0.900	807.40	98.2	4.896	0.000	0.19748	
360	0.039	99	309.4710	80.5	0.900	807.76	98.4	4.901	0.000	0.19748	
370											
380											


HEAT TECH HTP 26 STD EPA 1 7.28.15
T1 0-60
T1 60+
T2
RB

T2

Sq. Top #3

METHOD 5G - 1 **PARTICULATE SAMPLING DATA** **Rev. 10/0**

DATE: 7/28/15 **PAGE** 1 **OF** 2 **UNIT:** HEAT Tech HTD 26 STD **RUN:** EPA 1

METER BOX: 511-M **METER Y:** 0.9685 **FILTER #'S: (F)** 714 **(R)** 715
.783 / .786

FILTER/ O-RING ID # : —

PRE TEST LEAK CHECK: .003 **CFM @** -16.0 **IN HG** **FILTER SIZE:** 110 mm
.522 / .523

PROBE ID # : —

POST TEST LEAK CHECK: .000 **CFM @** -12.0 **IN HG** **PROBE LENGTH** 24 **IN**

TIME		METER READING	PITOT		TUNNEL TEMP	METER TEMP	GAS METER	VAC
CLOCK	ELAPSED	(ft³)	ΔP	Pg	(°F)	(°F)	Δh	(in Hg
1300	00	115.300	.039		113	63.5	.75	-1.0
10	10	120.442	.039		113	67	.75	-1.0
20	20	126.012	.039		114	68.5	.75	-1.0
30	30	131.383	.039		115	70.5	.75	-1.0
40	40	136.750	.039		115	71.5	.75	-1.0
50	50	142.131	.039		116	73.5	.75	-1.0
1400	60	147.516	.038		117	74	.75	-1.0
10	70	152.904	.039		115	75	.75	-1.0
20	80	158.235	.039		113	75.5	.75	-1.0
30	90	163.613	.039		112	76	.75	-1.0
40	100	168.985	.039		112	76	.75	-1.0
50	110	174.370	.039		112	77	.75	-1.0
1500	120	179.736	.039		113	77	.75	-1.0
10	130	185.131	.039		114	78	.75	-1.0
20	140	190.513	.039		113	78	.75	-1.0
30	150	195.920	.039		113	78	.75	-1.0
40	160	201.303	.039		113	78	.75	-1.0
50	170	206.701	.039		113	78	.75	-1.0
1600	180	212.110	.039		113	79	.75	-1.0
10	190	217.519	.039		105	80	.75	-1.0

	BP		
00	28.59	300	28.56
60	28.59	360	28.56
120	28.59	—	—
180	28.58	—	—
240	28.57	AVG. =	28.577

Pre Test Filter Check Weighing
F .6522
R .6491

End of Test Weight
F .6673 R .6494

.6520 .6493

.0153

Sq. Top #3

T2

METHOD 5G -1 **PARTICULATE SAMPLING DATA** **Rev. 10/0**

DATE: 7/28/15 **PAGE** 2 **OF** 2 **UNIT:** HTP Heat Tech 26 STD **RUN:** EPA 1

METER BOX: 511-M **METER Y:** 0.9685 **FILTER #'S: (F)** 714 **(R)** 715

.783 / .786 **FILTER/ O-RING ID # :** —

PRE TEST LEAK CHECK: .003 **CFM @** -16.0 **IN HG** **FILTER SIZE:** 110 mm

.522 / .523 **PROBE ID # :** —

POST TEST LEAK CHECK: .000 **CFM @** -12.0 **IN HG** **PROBE LENGTH** 24 **IN**

TIME		METER READING	PITOT		TUNNEL TEMP	METER TEMP	GAS METER	VAC
CLOCK	ELAPSED	(ft³)	ΔP	Pg	(°F)	(°F)	Δh	(in Hg
1620	200	222.398	.039		102	79	.75	-1.0
30	210	228.303	.039		101	79.5	.75	-1.0
40	220	233.848	.039		102	79	.75	-1.0
50	230	239.119	.039		101	80	.75	-1.0
1700	240	244.525	.039		100	80	.75	-1.0
10	250	249.976	.039		100	80	.75	-1.0
20	260	255.352	.039		94	80	.75	-1.0
30	270	260.773	.039		98	80	.75	-1.0
40	280	266.181	.039		99	80	.75	-1.0
50	290	271.611	.039		98	80.5	.75	-1.0
1800	300	277.005	.039		98	80	.75	-1.0
10	310	282.415	.039		98	80.5	.75	-1.0
20	320	287.828	.039		99	80	.75	-1.0
30	330	293.233	.039		99	81	.75	-1.0
40	340	298.655	.039		98	80.5	.75	-1.0
50	350	304.060	.039		99	80	.75	-1.0
1900	360	309.471	.039		99	80.5	.75	-1.0
	70							
	80							
	90							

	BP		
00	28.59	300	28.56
60	28.59	360	28.56
120	28.59		
180	28.58		
240	28.57	AVG. =	28.577

Pre Test Filter Check Weighing
F .6522
R .6491

End of Test Weight
F .6520 R .6493

HTP 26 STD

Unit HEAT TECH
Run # EPA 1
Date: 7/28/15

T2

Woodstove Data Sheet #4-3: Constant Final Weights

50 MI

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
42	53.8695	7/29	1655	ATM	53.8721	7/30	1326	ATM	53.8722	7/31	1510	ESS				

Final Filter Weights

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
F	714	.6673	7/28	2305	ATM	~~.6671~~ .6669	7/29 8/1	1341 1622	ESS ATM	.6668	7/30	1014	ATM	.6671	7/31	1512	ESS
										1.8161							
R	715	.6494	7/28	2305	ATM	.6497 .6492	7/29 8/1	1338 1621	ESS ATM	.6490	7/30	1012	ATM	.6494	7/31	1511	ESS

QA Reweigh: Final Weight

Date	Beaker #	Final Wt	By

Date	Filter #	Final Wt	By

Scale Room Environmental Conditions

Weighing Session	Date (2015)	Time	By	WB	DB	%RH
1	7/29	1325	ESS	56	68	46
2	7/30	949	ATM	55	66	49
3	7/31	1413	ESS	58	70	47
4	8/1	1547	ATM	54	66	45
5						
6						
7						

8	
9	
10	
11	
12	
Comment	7/29 0.0000 99.9995

Scale Room Environmental Conditions

	7/30	7/31	8/1
	0.0000 99.9996	0.0000 99.9995	0.0000 99.9990

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

Unit: Heat Tech. HTP 26 STD
Run: EPA 1 **Train** 2
Date: 7/25/15
Technicians: A.T. Murren
Revised 11/15 - Data Sheet #5A

Filters:

Filter # (Front): 714 **Beaker #:** 42 **Final Wt.:** 53.8722 g
Tare Wt.: .6520 g ml 50 **Tare Wt.:** 53.8692 g
Filter # (Rear): 715 **Desiccant: Acetone** **Net Wt.:** .0030 g
Tare Wt.: .6493 g **Beaker Tare Wt,. Check:** 53.8691 g
Combined Filter Final Weight: 1.3161 g
Combined Filter Tare Weight: 1.3013 g
Combined Net Catch Weight: .0148 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:		.0148 g
Acetone Wash Catch Weight:	.0030 g	
Less Acetone Residual Value:	- .0000 g	
Equals Net Acetone Wash Catch:		.0030 g
Total Net Catch (Combined Filter + Acetone Catch):		.0178 g
		17.8 mg

EPA 1 T 3 ROOM BLANK

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 STD
Lab Name:	MYREN
Test Date:	7.28.15
Run Number:	EPA 1 T 3
Initial Meter Reading (cf):	4672.4483
Final Meter Reading (cf):	4862.5118
Test Time (Min):	360.0
Average Sample Rate (cfm):	0.5280
Preliminary Results:	
Final results:	X
BP:	28.577
Average Δh:	0.115
Dry Gas Meter Temp (F):	79.3
Sample Volume (dscf):	172.997
Dry Gas Meter Y:	0.9734
Total Room Blank Catch (mg):	1.6
Room Blank mg/dscf	0.009249
Avg. Sampling Rate $\Delta H@$:	-1.645

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	4672.4483				132.30900	0.115	66.0
10	4677.8161	5.3678	0.0000	0.53678	132.46100	0.115	69.0
20	4683.1451	5.3290	-0.7237	0.53290	132.61190	0.115	72.0
30	4688.4564	5.3113	-1.0526	0.53113	132.76230	0.115	73.5
40	4693.7713	5.3149	-0.9868	0.53149	132.91280	0.115	75.0
50	4699.0649	5.2937	-1.3816	0.52937	133.06270	0.115	76.0
60	4704.3692	5.3043	-1.1842	0.53043	133.21290	0.115	77.0
70	4709.6841	5.3149	-0.9868	0.53149	133.36340	0.115	78.0
80	4714.9883	5.3043	-1.1842	0.53043	133.51360	0.115	78.0
90	4720.3208	5.3325	-0.6579	0.53325	133.66460	0.115	78.5
100	4725.6251	5.3043	-1.1842	0.53043	133.81480	0.115	79.0
110	4730.9647	5.3396	-0.5263	0.53396	133.9660	0.115	79.0
120	4736.2619	5.2972	-1.3158	0.52972	134.1160	0.115	80.0
130	4741.6297	5.3678	0.0000	0.53678	134.2680	0.115	80.0
140	4746.9128	5.2831	-1.5789	0.52831	134.4176	0.115	80.5
150	4752.0369	5.1242	-4.5395	0.51242	134.5627	0.115	80.5
160	4757.3977	5.3608	-0.1316	0.53608	134.7145	0.115	80.5
170	4762.5996	5.2019	-3.0921	0.52019	134.8618	0.115	80.5
180	4767.8614	5.2619	-1.9737	0.52619	135.0108	0.115	80.5
190	4773.1127	5.2513	-2.1711	0.52513	135.1595	0.115	81.0
200	4778.3640	5.2513	-2.1711	0.52513	135.3082	0.115	81.0
210	4783.5977	5.2336	-2.5000	0.52336	135.4564	0.115	81.5
220	4788.7359	5.1383	-4.2763	0.51383	135.6019	0.115	82.0
230	4794.1214	5.3855	0.3289	0.53855	135.7544	0.115	82.0
240	4799.3833	5.2619	-1.9737	0.52619	135.9034	0.115	82.5
250	4804.6523	5.2689	-1.8421	0.52689	136.0526	0.115	82.5
260	4809.9071	5.2548	-2.1053	0.52548	136.2014	0.115	81.5
270	4815.1584	5.2513	-2.1711	0.52513	136.3501	0.115	81.5
280	4820.4309	5.2725	-1.7763	0.52725	136.4994	0.115	81.5
290	4825.6786	5.2478	-2.2368	0.52478	136.6480	0.115	81.5
300	4830.9405	5.2619	-1.9737	0.52619	136.7970	0.115	81.5
310	4836.1883	5.2478	-2.2368	0.52478	136.9456	0.115	81.5
320	4841.4749	5.2866	-1.5132	0.52866	137.0953	0.115	81.5
330	4846.7403	5.2654	-1.9079	0.52654	137.2444	0.115	81.5
340	4852.0092	5.2689	-1.8421	0.52689	137.3936	0.115	82.0
350	4857.2429	5.2336	-2.5000	0.52336	137.5418	0.115	81.0
360	4862.5118	5.2689	-1.8421	0.52689	137.6910	0.115	81.5
370							
380							

RB

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

DATE: 7/28/15 **PAGE** 1 **OF** 2 **UNIT:** Heat Tech HTP 2G STD **RUN:** EPA 1

METER BOX: RBJ **METER Y:** 0.9734 **FILTER #'S: (F)** 7/6 **(R)** ——

.3011/.30115 .00005 cmm

FILTER/ O-RING ID # : ——

PRE TEST LEAK CHECK: .000 **CFM @** -16.5 **IN HG** **FILTER SIZE:** 110 mm

.6928/.6928 .0000 CMM

PROBE ID # : ——

POST TEST LEAK CHECK: .000 **CFM @** 16.25 **IN HG** **PROBE LENGTH** [redacted] **IN**

TIME		METER READING	PITOT		TUNNEL TEMP	METER TEMP	GAS METER	VAC
CLOCK	ELAPSED	(~~ft~~) (ft^3)	ΔP	Pg	(°F)	(°F)	Δh	(in Hg
1300	00	132.3090				66	.115	-1.75
10	10	132.4610				69	.115	-1.75
20	20	132.6119				72	.115	-1.75
30	30	132.7623				73.5	.115	-1.75
40	40	132.9128				75	.115	-1.75
50	50	133.0627				76	.115	-1.75
1400	60	133.2129				77	.115	-1.75
10	70	133.3634				78	.115	-1.75
20	80	133.5136				78	.115	-1.75
30	90	133.6646				78.5	.115	-1.50
40	100	133.8148				79	.115	-1.50
50	110	133.9660				79	.115	-1.50
1500	120	134.1160				80	.115	-1.50
10	130	134.2680				80	.115	-1.50
20	140	134.4176				80.5	.115	-1.50
30	150	134.5627				80.5	.115	-1.50
40	160	134.7145				80.5	.115	-1.50
50	170	134.8618				80.5	.115	-1.50
1600	180	135.0108				80.5	.115	-1.50
10	190	135.1595				81	.115	-1.50

BP

00	28.59	300	28.56
60	28.59	360	28.56
120	28.59	—	—
180	28.58	—	—
240	28.57	AVG. =	28.577

Pre Test Filter Check Weighing
F .6480
R ——

End of Test Weight
F .6476 R ——
.6481 ——

RB

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

DATE: 7/28/15 **PAGE** 2 **OF** 2 **UNIT:** HEAT Tech HITD STD **RUN:** EPA 1

METER BOX: RBT **METER Y:** 0.9734 **FILTER #'S: (F)** 716 **(R)** —

.3011/.3015 .00005 cmm **FILTER/ O-RING ID # :** —

PRE TEST LEAK CHECK: _____ **CFM @** -16.5 **IN HG** **FILTER SIZE:** 110 **mm**

.6928/.6928 .0000 cmm **PROBE ID # :** —

POST TEST LEAK CHECK: .000 **CFM @** -16.25 **IN HG** **PROBE LENGTH** — **IN**

TIME		METER READING	PITOT		TUNNEL TEMP	METER TEMP	GAS METER	VAC
CLOCK	ELAPSED	(m^3)	ΔP	Pg	(°F)	(°F)	Δh	(in Hg
1620	200	135.3082				81	.115	-1.50
30	210	135.4564				81.5	.115	-1.50
40	220	135.6019				82	.115	-1.50
50	230	135.7544				82	.115	-1.50
1700	(240)	135.9034				82.5	.115	-1.50
10	250	136.0526				82.5	.115	-1.50
20	260	136.2014				81.5	.115	-1.50
30	270	136.3501				81.5	.115	-1.50
40	280	136.4994				81.5	.115	-1.50
50	290	136.6487				81.5	.115	-1.50
1800	(300)	136.7970				81.5	.115	-1.50
10	310	136.9456				81.5	.115	-1.50
20	320	137.0953				81.5	.115	-1.50
30	330	137.2444				81.5	.115	-1.50
40	340	137.3936				82	.115	-1.50
50	350	137.5418				81	.115	-1.50
1900	(360)	137.6910				81.5	.115	-1.50
	70							
	80							
	90							

BP

00	28.59	300	28.56
60	28.59	360	28.56
120	28.59	—	
180	28.58		
240	28.57	AVG. =	28.577

Pre Test Filter Check Weighing

F _____

R _____

End of Test Weight

F .6476 R _____

.6481 _____

-.0005

30 ml

RB

HIP 25 STD

Woodstove Data Sheet #4-3: Constant Final Weights

Unit HEAT TECH
Run # EPA 1
Date: 7/28/15

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
43	53.2304	7/29	1653	ATM	53.2340	7/30	1336	ATM	53.2340	7/31	1517	ESS				

Final Filter Weights

	Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
F	716	.6476	7/28	2325	ATM	.6478	7/29	1332	ESS	.6478	7/30	1009	ATM				
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	7/29	1325	ESS	56	68	46
2	7/30	949	ATM	55	66	49
3	7/31	1413	ESS	58	70	47
4						
5						
6						
7						

	Scale Room Environmental Conditions					
8						
9						
10						
11						
12						

Comment
7/29 0.0000 99.9995
7/30 0.0000 99.9996
7/31 0.0000 99.9995

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

Unit: HTP 26 STO
Run: EPA 1 **Train** 3
Date: 7/28/15
Technicians: A.T.Mowry
Revised 11/15 - Data Sheet #5A

Filters:

Filter # (Front): 716 **Beaker #:** 43 **Final Wt.:** 53.2340 g
Tare Wt.: .6481 g **ml** 80 **Tare Wt.:** 53.2322 g
Filter # (Rear): — **Desiccant: Acetone** **Net Wt.:** .0018 g
Tare Wt.: — g **Beaker Tare Wt,. Check:** 53.2322 g
Combined Filter Final Weight: .6478 g
Combined Filter Tare Weight: .6480 g
Combined Net Catch Weight: −.0002 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)(30 ml Acetone) = .0000 g **Residue Value**

Total Particulate Catch Calculations:

Combined Filter Net Catch Weight:		−.0002 g
Acetone Wash Catch Weight:	.0018 g	
Less Acetone Residual Value:	-.0000 g	
Equals Net Acetone Wash Catch:		.0018 g
Total Net Catch (Combined Filter + Acetone Catch):		.0016 g
		1.6 mg

HTP 26 STO

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 ft³

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

Test Chamber Air Velocity: Start: 70, <5 Stop: 75, <10 Avg: 5.0 ft./m.

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

Dry Bulb Stop: WB: 67 °F DB: 82 °F % Amb Moisture: 1.45 %RH: 47

X Ambient Moisture(%Vol.) = 1.35 % X Relative Humidty (%RH) = 46 %

Empty Stove Wt: 222.2 lbs.
NO 0.1 Seal

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. 2.9 + 2.9 Total: 5.8 lbs.

Total Kindling and Pre Burn Fuel Wt. 5.8 lbs.

Coal Bed Wt.: Range(N/A - N/A) lbs. Actual: N/A 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: 12.1 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 %

5.1740 dkg

Est. Dry Burn Rate(Kg/Hr.) 12.1 - (12.1 x .0573) X 60/360 = 0.862

2.2046 Dry Burn Rate (Kg/Hr)

Est EPA Heat Output (HO_E)(Avg BTU's/Hr)(19,140) X 18 x 0.862 = 12,874

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 STD
Run#: EPA 1
Date: 7/28/15
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	7/28/15	1500	220 °F
Out of Dryer	8/6/15	942	218 °F

(Minimum Time in Dryer: 24 hrs.)

Blr # 46

Pellet Fuel Moisture Content Determintation

Pellet Name: Bear Mountain
Tare Beaker Wt. 68.3658 g
Pellet Manufacturer: Bear Mountain
Pellet Grade: Premium Plus

Wet Wt: 158.9236 g - 68.3658 g = 90.5578 g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: 153.7346 g - 68.3658 g = 85.3688 g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

% Moisture Wet Basis: 5.730 %

[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 HOP26 Insert
RUN #: EPA 1
DATE: 3/23/15
TECH: A. T. Myren

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

Full Test

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

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

M_{Bdb} = ((306.0 - 293.9) – ((306.0 - 293.9)(5.730/100))) = 11.407 lbs./ 2.2046 = 5.174 kg

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

0-60 mins

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

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

M_{BSidb} = ((306.0 - 302.8) – ((306.0 - 302.8)(5.730/100))) = 3.017 lbs./ 2.2046 = 1.368 kg

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

Full Test

BR(DBR) = (60 (M_{Bdb}))/Θ = (60(5.174))/ 360 = .8623 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(1.368))/ 60 = 1.368 kg/h

0-60 mins

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.

HITP 26

Pre Burn Data
Record Sheet #13

Unit: HEAT TECH STD Date: 7/28/15
Run: EPA 1 Technician(s): ATM ESS
Page: 1 of 1 WST2-Form 16, Rev 6/11

Preburn Start Wt. 2.9 Lbs. Up 308.9 lbs.
Test Start Wt Range ——— lbs.
Baro. Pressure 28.59 "Hg

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	1200	308.9	0.0	201	N/A	N/A	N/A	N/A	N/A	N/A	N/A	68	-.036	241	Hot Box On ✓
5	05	308.6	.3	206								70	-.046	316	Primary Air Set At MAX
10	10	308.4	.2	285								72	-.050	324	Secondary Air Set At N/A
15	15	308.2	.2	297								73	-.051	330	Fan: MAX
20	20	307.9	.3	323								75	-.054	377	Tunnel on at: 1227
25	25	307.7	.2	327								75	-.056	374	Buckets Iced ✓
30	30	307.5	.2	346								74	-.057	396	Analyzers Spanned ✓
35	35	307.3	.2	326								75	-.055	375	Pumps Turned on at:
40	40	307.0	.3	357								74	-.059	404	ΔT ΔΔT
45	45	306.8	.2	360								74	-.059	422	
50	50	306.5	.3	369								74	-.060	422	
55	55	306.2	.3	369								75	-.060	422	Tunnel ΔP
~~X~~	—	—		—		—			—		—		—	~~X~~	Probe In Tunnel ——
60	1300	306.0	.2	371								74	-.059	429	
65															
70															
75															
80															
85															
90															
95															
100															
105															
110															
115															

Myren Consulting Inc Data Sheet #14 P 1 of 7 Unit HEAT TECH HTP 2650D Date 7/28/15 Run EPA 1

Test End Wt. _____ ΔT — Barometric Pressure 28.59 "Hg Gas Flow @ 1.5" Technician(s) AJM EJS

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 T° P. Comb	Stack @ 1"	Comb. Inlet Vac
0	1300	306.0	12.1	0.0	.158	3.98	16.95	.001	.01	398.0	371	-.059			65	429	-16.0
05	05	305.7	11.8	.3	.179	4.51	16.42	.003	.03	150.2	370	-.059	C		43	418	-15.1
10	10	305.5	11.6	.2	.182	4.59	16.35	.001	.01	458.0	377	-.059	"		41	440	-15.0
15	15	305.2	11.3	.3	.226	5.68	15.26	.001	.01	568.0	381	-.060	"		41	443	-14.9
20	20	304.9	11.0	.3	.242	6.08	14.85	.002	.02	304.0	385	-.061	"		41	440	-14.5
25	25	304.7	10.8	.2	.216	5.43	15.50	.001	.01	543.0	388	-.061	"		41	445	-14.3
30	30	304.4	10.5	.3	.148	3.73	17.20	.002	.02	186.5	385	-.060	"		41	450	-14.3
35	35	304.2	10.3	.2	.258	6.48	14.46	.001	.01	648.0	395	-.062	"		41	448	-14.1
40	40	303.9	10.0	.3	.194	4.88	16.05	.002	.02	244.0	396	-.062	"		42	450	-14.0
45	45	303.6	9.7	.3	.224	5.63	15.30	.002	.02	281.5	389	-.060	"		42	458	-14.0
50	50	303.3	9.4	.3	.177	4.46	16.44	.009	.09	49.5	383	-.060	"		42	469	-14.0
55	55	303.0	9.1	.3	.163	4.11	16.82	.003	.03	136.8	387	-.060	"		42	455	-14.0
Total											4607	-.723					

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	1300	NA	N/A	N/A	N/A	N/A	N/A	N/A	74	113	227	33	71	59	70	64	74
05	05								75	113	228	33	74	40	74	45	76
10	10								75	113	227	33	79	41	78	43	77
15	15								75	113	226	33	81	41	81	43	78
20	20								76	114	225	33	83	41	82	43	79
25	25								76	116	225	33	84	41	84	43	79
30	30								76	115	225	33	84	41	84	44	80
35	35								76	116	225	33	85	42	85	44	80
40	40								76	115	225	34	85	42	85	44	81
45	45								76	116	225	34	86	42	85	44	81
50	50								78	116	225	33	85	42	85	44	81
55	55								78	116	225	33	84	42	84	44	82
Total									911								

Myren Consulting Inc Data Sheet #14 P 2 of 7 Unit HEAT TECH HTP 26STQ Date 7/28/15 Run EPA 1

Test End Wt. ΔT Barometric Pressure 28.59 "Hg Gas Flow @ 1.5" Technician(s) AM ES H19 CCRS

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		#13 P. Cond Notes	Stack @ 1"	Train VAC
60	1400	302.8	8.9	.2	.213	5.36	15.58	.001	.01	535.5	379	-.061	C	SET TO MED.	42	471	-14.0
65	05	302.5	8.6	.3	.129	3.26	17.65	.006	.06	54.3	370	-.059	"		42	424	-14.0
70	10	302.3	8.4	.2	.205	5.16	15.78	.001	.01	515.5	373	-.059	"		42	431	-14.0
75	15	302.1	8.2	.2	.132	3.33	17.59	.003	.03	111.0	359	-.057	"		42	416	-14.0
80	20	301.9	8.0	.2	.180	4.53	16.40	.001	.01	453.0	353	-.056	"		43	400	-14.0
85	25	301.7	7.8	.2	.115	2.91	18.01	.005	.05	58.1	338	-.055	"		43	399	-14.0
90	30	301.5	7.6	.2	.092	2.33	18.59	.004	.04	58.3	340	-.055	"		43	402	-14.0
95	35	301.3	7.4	.2	.067	1.71	19.16	.015	.15	11.4	311	-.050	"		43	355	-14.0
100	40	301.1	7.2	.2	.118	2.98	17.93	.006	.06	49.7	338	-.054	"		43	403	-14.0
105	45	300.9	7.0	.2	.205	5.16	15.78	.001	.01	515.5	349	-.056	"		43	368	-14.0
110	50	300.7	6.8	.2	.105	2.66	18.26	.004	.04	66.4	336	-.054	"		43	401	-14.0
115	55	300.5	6.6	.2	.194	4.88	16.05	.002	.02	244.0	349	-.056	"		44	371	-13.9
Total											(4215)	(-.672)					

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 Post Filter #15	T2 Post Cond #16	T3 Post Filter #17
60	1400	N/A	N/A	N/A	N/A	N/A	N/A	N/A	77	117	225	34	83	42	83	45	82
65	05								78	116	225	33	82	43	82	45	82
70	10								78	115	224	34	81	43	82	45	82
75	15								79	114	224	34	81	43	81	45	82
80	20								78	113	224	34	81	43	81	45	83
85	25								78	112	224	34	81	43	81	45	83
90	30								79	112	224	34	81	43	81	45	83
95	35								78	111	225	34	81	43	81	45	83
100	40								79	112	225	34	81	43	81	45	83
105	45								79	113	226	34	81	44	81	45	83
110	50								80	112	226	34	82	44	82	45	83
115	55								79	113	225	34	82	44	82	45	83
Total									(942)								

Myren Consulting Inc Data Sheet #14 P 3 of 7 Unit HEAT TECH HTD 36 STD Date 7/28/15 Run EPA 1

Test End Wt. _____ ΔT _____ Barometric Pressure 28.59 "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	Train VAC
120	1500	300.2	6.3	.3	.179	4.51	16.43	.001	.01	450.5	338	-.054	C		-13.9
125	05	300.0	6.1	.2	.173	4.36	16.55	.006	.06	72.6	339	-.054	"		-13.9
130	10	299.8	5.9	.2	.129	3.26	17.63	.010	.10	32.6	337	-.054	"		-13.9
135	15	299.6	5.7	.2	.156	3.93	16.99	.003	.03	131.0	341	-.055	"		-13.9
140	20	299.4	5.5	.2	.161	4.06	16.88	.006	.06	67.6	342	-.055	"		-13.9
145	25	299.2	5.3	.2	.141	3.56	17.36	.005	.05	71.1	337	-.054	"		-13.9
150	30	299.0	5.1	.2	.202	5.08	15.83	.005	.05	101.6	342	-.054	"		-13.9
155	35	298.8	4.9	.2	.190	4.78	16.15	.002	.02	239.0	343	-.055	"		-13.9
160	40	298.6	4.7	.2	.187	4.71	16.22	.003	.03	156.8	339	-.054	"		-13.9
165	45	298.4	4.5	.2	.217	5.46	15.47	.002	.02	272.8	343	-.054	"		-13.9
170	50	298.2	4.3	.2	.083	2.11	18.80	.007	.07	30.1	333	-.054	"		-13.9
175	55	298.0	4.1	.2	.162	4.08	16.83	.006	.06	68.0	337	-.054	"		-13.9
Total											(4071)	(-.651)			

T1 T2 T2 T3 HTB

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 @1'
120	1500	N/A	N/A	N/A	N/A	N/A	N/A	N/A	80	113	225	34	82	44	82/45	84/44	363
125	05								80	113	225	34	82	44	82/45	84/44	396
130	10								80	114	224	34	83	44	83/45	84/44	382
135	15								81	113	224	34	83	44	83/45	84/44	390
140	20								80	113	224	34	83	45	83/45	84/44	398
145	25								80	113	224	34	84	44	83/45	82/45	387
150	30								80	113	224	34	84	44	83/45	80/45	381
155	35								81	113	224	34	84	44	84/45	79/45	395
160	40								80	113	224	34	85	44	84/45	79/45	370
165	45								80	113	225	34	85	45	84/45	79/45	372
170	50								81	113	225	34	86	45	84/45	79/45	397
175	55								81	113	225	34	85	45	85/45	78/46	370
Total									(964)								

Myren Consulting Inc Data Sheet #14 P 4 of 7 Unit Heat Tech HTP 26 STD Date 7/28/15 Run EPA 1

Test End Wt. ΔT Barometric Pressure 28.58 "Hg Gas Flow @ 1.5" Technician(s) AJM ESE

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	10 Gas Factor
180	11600	297.8	3.9	.2	.179	4.51	16.42	.002	.02	225.3	312	-.055	C	SET TO LOW	-13.5
185	05	297.7	3.8	.1	.129	3.26	17.67	.002	.02	162.8	302	-.049	"		-13.5
190	10	297.6	3.7	.1	.146	3.68	17.24	.003	.03	122.7	289	-.046	"		-13.5
195	15	297.4	3.5	.2	.062	1.58	19.31	.010	.10	15.8	255	-.040	"		-13.5
200	20	297.3	3.4	.1	.076	1.93	18.95	.012	.12	16.1	251	-.040	"		-13.5
205	25	297.2	3.3	.1	.132	3.33	17.57	.008	.08	41.6	251	-.039	"		-13.5
210	30	297.1	3.2	.1	.139	3.51	17.42	.003	.03	116.9	245	-.039	"		-13.5
215	35	297.0	3.1	.1	.085	2.16	18.73	.010	.10	21.6	249	-.039	"		-13.5
220	40	296.9	3.0	.1	.106	2.68	18.23	.006	.06	44.7	250	-.040	"		-13.5
225	45	296.7	2.8	.2	.062	1.58	19.29	.014	.14	11.3	233	-.035	"		-13.5
230	50	296.7	2.8	0	.094	2.38	18.50	.011	.11	21.6	239	-.037	"		-13.5
235	55	296.6	2.7	.1	.102	2.58	18.32	.007	.07	36.9	241	-.037	"		-13.5
Total											(3147)	(-.496)			

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 #11
180	11600	N/A	N/A	N/A	N/A	N/A	N/A	N/A	81	113	225	34	85	45	85/46	78/46			385
185	05								81	108	225	34	85	45	85/45	78/46			321
190	10								80	105	224	34	84	45	84/46	78/46			317
195	15								82	103	223	34	84	45	84/45	78/46			284
200	20								83	102	221	34	84	45	84/46	78/46			274
205	25								83	102	221	34	84	45	84/45	78/46			271
210	30								82	101	221	34	84	45	84/46	79/46			263
215	35								83	101	222	34	84	46	84/46	79/46			300
220	40								83	102	223	34	84	46	84/46	79/47			277
225	45								83	101	224	34	84	46	84/46	79/47			261
230	50								83	101	224	34	84	46	84/46	79/47			253
235	55								83	101	224	34	84	46	84/46	80/47			251
Total									(987)										

Myren Consulting Inc Data Sheet #14 P 5 of 7 Unit Heat Tech HTP 26 STD Date 7/28/15 Run EPA 1

Test End Wt. ΔT Barometric Pressure 28.57 "Hg Gas Flow @ 1.5" Technician(s) AM EES 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	T/D in VAC
240	1700	296.5	2.6	.1	.074	1.88	18.99	.014	.14	13.4	231	-.035	C		-13.5
245	05	296.4	2.5	.1	.093	2.36	18.55	.006	.06	39.3	226	-.036	"		-13.5
250	10	296.3	2.4	.1	.120	3.03	17.89	.004	.04	75.8	230	-.036	"		-13.5
255	15	296.2	2.3	.1	.063	1.61	19.28	.011	.11	14.6	224	-.036	"		-13.5
260	20	296.0	2.1	.2	.060	1.53	19.36	.009	.09	17.0	225	-.035	"		-13.5
265	25	295.9	2.0	.1	.091	2.31	18.61	.005	.05	46.1	225	-.035	"		-13.5
270	30	295.8	1.9	.1	.088	2.23	18.68	.006	.06	37.2	223	-.035	"		-13.5
275	35	295.7	1.8	.1	.089	2.26	18.61	.014	.14	16.1	229	-.036	"		-13.5
280	40	295.6	1.7	.1	.091	2.31	18.60	.006	.06	38.4	228	-.036	"		-13.5
285	45	295.5	1.6	.1	.049	1.26	19.63	.011	.11	11.4	225	-.036	"		-13.5
290	50	295.4	1.5	.1	.037	0.96	19.94	.009	.09	10.6	210	-.032	"		-13.5
295	55	295.3	1.4	.1	.096	2.43	18.48	.006	.06	40.5	224	-.035	"		-13.5
Total											(2700)	(-.423)			

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 15/16	T1 F / C 17/18	T2 F / C	T3 F / C	Stack T° 19
240	1700	N/A	N/A	N/A	N/A	N/A	N/A	N/A	83	100	224	34	84	46	84/46	80/47			259
245	05								83	100	223	34	85	46	84/46	81/47			247
250	10								83	100	223	34	85	46	84/46	82/47			277
255	15								82	99	223	34	85	46	84/46	82/47			276
260	20								83	99	222	34	85	46	84/46	83/47			258
265	25								83	98	222	34	85	46	84/46	83/47			242
270	30								83	98	222	34	85	46	84/46	83/47			236
275	35								83	98	222	35	85	46	84/46	83/47			249
280	40								83	99	222	34	85	46	84/46	83/47			255
285	45								83	99	222	34	85	46	84/46	83/47			250
290	50								83	98	222	34	85	46	84/46	83/47			226
295	55								83	98	222	35	85	47	84/46	83/47			258
Total									(995)										

Myren Consulting Inc Data Sheet #14 P 6 of 7 Unit Heat Tech MTP 26 STD Date 7/28/15 Run EPA 1

Test End Wt. _____ ΔT _____ Barometric Pressure 28.56 "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 Orifice Vac
300	1800	295.2	1.3	.1	.162	4.08	16.85	.002	.02	204.0	238	-.037	C		-13.5
305	05	295.1	1.2	.1	.109	2.76	18.16	.005	.05	55.1	236	-.038	"		-13.5
310	10	295.0	1.1	.1	.086	2.18	18.71	.010	.10	21.8	228	-.036	"		-13.5
315	15	294.9	1.0	.1	.140	3.53	17.39	.003	.03	117.7	245	-.040	"		-13.5
320	20	294.8	.9	.1	.192	4.83	16.10	.002	.02	241.5	248	-.039	"		-13.5
325	25	294.7	.8	.1	.081	2.06	18.81	.014	.14	14.7	231	-.035	"		-13.5
330	30	294.6	.7	.1	.098	2.48	18.42	.006	.06	41.3	235	-.037	"		-13.5
335	35	294.5	.6	.1	.122	3.08	17.83	.005	.05	61.6	243	-.039	"		-13.5
340	40	294.3	.4	.2	.045	1.16	19.73	.010	.10	11.6	218	-.034	"		-13.5
345	45	294.2	.3	.1	.120	3.03	17.87	.007	.07	43.3	243	-.039	"		-13.5
350	50	294.1	.2	.1	.105	2.66	18.26	.004	.04	66.4	241	-.039	"		-13.5
355	55	294.0	.1	.1	.070	1.78	19.12	.008	.08	22.3	225	-.036			-13.5
Total											2831	-.449			

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 15/16	F C 17/18	Stack T1 19
300	1800	N/A	N/A	N/A	N/A	N/A	N/A	N/A	83	98	222	35	85	47	84/46	83/47	264
305	05								83	99	222	35	85	47	84/46	83/47	263
310	10								83	98	222	35	85	47	84/46	83/47	255
315	15								83	99	222	35	86	47	85/46	83/47	274
320	20								83	99	222	35	86	47	85/46	83/47	275
325	25								83	99	223	35	86	47	85/46	83/47	264
330	30								83	99	223	35	86	47	85/46	84/47	253
335	35								83	99	223	35	86	47	85/47	84/47	275
340	40								83	98	223	35	86	47	85/47	84/47	249
345	45								83	99	222	35	86	48	85/47	84/47	274
350	50								83	99	222	35	86	48	85/47	84/47	277
355	55								83	98	221	35	86	48	85/47	83/47	256
Total									9910								

Myren Consulting Inc Data Sheet #14 P 7 of 7 Unit Heat Tech MP 26 STD Date 7/28/15 Run EPA 1

Test End Wt. _____ ΔT _____ Barometric Pressure 28.56 "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
360	1900	293.9	0	.1	.107	2.71		.006	.06		236	-.037		
365											(236)	(-.037)		
370											(21,807)	(-3,451)	Total	
375											(298.7)	(-.0473)	÷73	
380														
385														
390														
395														
400														
405														
410														
415														
Total														

C Gas Train Ave -13.5

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	T1 C	T2 F	T3 C	Stack @ 11
360	1900	N/A	N/A	N/A	N/A	N/A	N/A	N/A	83	99	220	35	86	48	85/47		83/47		257
365									(83)										
370									(5878)	Total									
375									(80.5)	÷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: 7/28/15 Analyte: CO_2

Source: Heat Tech HTD2-W Run #: FPA 1

Zero Cyl #: ITM8803/11 Conc. 00.0 % CO_2 Cyl Press: 230 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: 1205 Temp: 74 °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	4875	.496	12.4280	+0.0280	+0.23

Comments:

Post Run Audit: By: A.T. Myren Time: 1925 Temp: 75 °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	+0.08160	+0.33
Span	49.6	.496		50.0	504	12.6279	+0.2279	+1.84

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: 7/28/15 Analyte: CO

Source: Heat Tech HTP26510 Run #: EPA 1

Zero Cyl #: ITM9903/11 Conc. 00.0 % CO Cyl Press: 230 psi

Certified By: Oxarc Date: 6/11/12

Span Cyl #: EB-0019810 Conc. 2.57 % 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: A.T. Myren Time: 1205 Temp: 74 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	—	.00012	.12726	.12726	+0.25
Span	—	.257	2.57	—	.257	2.5570	-.0131	-0.50

Comments: Meter on front panel is broken

Post Run Audit: By: A.T. Myren Time: 1925 Temp: 75 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	—	.001	.0104	.0104	0.21
Span	—	.257	2.57	—	.263	2.6101	+0.04012	1.56

Comments:

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

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

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

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

Unit: HEAT Tech HTP 2650
Run #: EPA 1
Date: 1/28/15

Ambient Blank Probe Inlet Location 38 1/2 " from the bottom of the hood (Spec = ≤ 6.6') and 31 3/4 " 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.: 5.0 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 62 Dry Bulb 75 =%RH 47, %AM (% by Vol) 1.45
Avg. %RH 46, %AM (% by Vol) 1.35

Minimum Tunnel Flow For 100% Smoke Capture: Pitot Reading (Δp): .04
~ Tunnel Flow: 140.00 dscfm

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

Scale Check: Pre (Wt., #): 272.4 - 267.4 = 5.0 lbs. / 5.0 lbs. OK ✓ SB
Post (Wt.,#): 298.3 - 293.3 = 5.0 lbs. / 5.0 lbs OK ✓ SB

Scale Zero Drift: Pre: N/A lbs. Post: N/A lbs. Drift: N/A 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: VAC: 21.0 "Hg OK ✓ SB Post: 21.9 "Hg OK ✓ SB
Draft (Static [P_g]) Gauge Level and Zero Check: Pre: OK ✓ SB Post: OK ✓ SB

THERMOCOUPLE CHECK (@ Ambient):

T/C #1:	66	T/C #2:	61	T/C #3:	63	T/C #4:	—	T/C #5:	—
T/C #6:	—	T/C #7:	—	T/C #8:	—	T/C #9:	62	T/C #10:	71
T/C #11:	63	T/C #12:	32	T/C #13:	63	T/C #14:	55	T/C #15:	64
T/C #16:	55	T/C #17:	66	T/C #18:	64	T/C #19:	63	T/C #20:	—
T/C #21:	—	T/C #22:	—						

Thermocouple Readout:

Pretest Zero & Span Check and Calibration
Zero (0° F): -1.0 ° F Adj to: 0 ° F
Span (2000° F): 2000 ° F Adj to: — ° F

Post Test Zero & Span Check
0° F 1 Δ%: -0.22
Span (2000° F): 2003 Δ%: -0.12

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		

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	0		
	Pass...Fail		50		
Notes: NOT WORKING, TOOK BACK TO SHOP			100		
			300		
			500		
			0		

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	00025736A5	1000 x .1	0		0
	(Pass)...Fail		50		50.0
Notes: 1 x SMALL - CALIBRATED			100		100.0
			300		300.0
			500	500.2	500.0
			0	0	0

Equipment Mfg.	Serial Number	Specifications	Weight used	Initial Readings	Final Readings
4. PANTHER	00926516KL	1000 x .1	0	0	0
	(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
			0	0	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

K&M Company
TORRANCE, CA 90503

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. Krech
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) 334-8706
800-322-ALTEK
800-322-[illegible]
Anywhere in U.S.A.

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 #: 0011437KF 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.
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: JENCO

Model #: 768-KF02 Serial #: 900167 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			

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

Or

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

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)

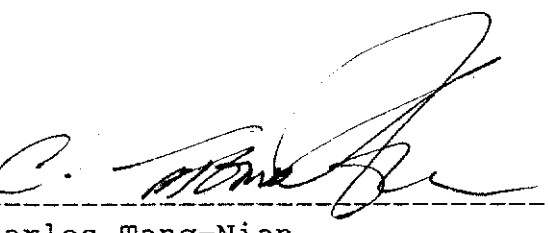
R E P O R T O F C A L I B R A T I O N

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

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

Revised 7/11

Dry Gas Meter Calibration Data

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

Calibration Meter Mfr: Rockwell SN: 1052202 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	10:59.79	-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.					

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

Meter Box: 45G-P
Date: 5/11/15
Page: 2 of 3
Rev 6-10

Meter Box Calibration Page 2

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

$$Y = \frac{(.9963)(6.813)(28.32)(703 + 460)}{(6.760)(28.32 + .80/13.6)(75.7 + 460)} = \frac{101,939.710}{102,769.142} = 0.99193$$

(530.3; 535.7)

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

(539; 528.3)

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

(542.3; 527.7)

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

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

Y Factor	Variation (± 0.02 Allowed From Average Y)
0.99193	-0.0146
1.01360	+0.0070
1.01414	+0.0076

O/C

AM

Avg Y 1.00656

3.01967

METER BOX 45G-P
DATE 5/11/15
Page 3 of 3

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

$$\Delta H@ = \frac{(0.0317)(.80)}{(28.32)(757 + 460)} \cdot \left[\frac{(70.3 + 460)(141.006)}{(.9963)(6.813)}\right]^2 = 2.0015$$
(730.3; 535.7)

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

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

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

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

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

Unit: HEAT TECH HTP 26 ST
Date: 7/29/15
Technician: ATM
WST9-Form2, Rev 6/11

45G-P (T1)

Meter Box Calibration Audit
Test Data

Run #	1	2	3	4	5	6	7	8	9	10
Avg.Δh	.90									
Max Vac	-1.5									

Avg. Test Series Δh: .90 in H_2O. Test Series Max Vac: -1.5 in Hg

Audit Dry Gas Meter Mfr: Rockwell SN: 1052202 Correction Factor (Y): .9963
Test Dry Gas Meter Mfr: Rockwell SN: 3039270 Correction Factor (Y): 1.0066

Audit Data

		Audit #1	Audit #2	Audit #3
BP ("Hg):		28.62	28.62	28.61
Vac("Hg):		-1.5	-1.5	-1.5
Audit Meter:	Final Vol	361.393	371.745	378.561
	Initial Vol	356.352	362.336	372.741
	Vol (V_c, Ft^3)	5.041	9.409	5.820
Audit Meter Temp (°F) (Tc)	Initial	62.5	64.5	64.5
	Mid	62.5	63.5	65
	Final	625	63.5	65
	Avg (°F/°A)	625 (522.5)	63.8 (523.8)	64.8 524.8
Δh("H_2O)	Initial	.90	.90	.90
	Mid	.90	.90	.90
	Final	.90	.90	.90
	Avg	.90	.90	.90
Dry Gas Meter:	Final Vol	844.026	854.776	861.868
	Initial Vol	838.800	845.000	855.800
	Vol(V_d)(ft^3)(m^3)	5.226	9.776	6.068
Dry Gas Meter Temp (°F) : Inlet (T_m)	Initial	78	78	81
	Mid	81	81	84
	Final	81	84	86
	Avg(°F/°A)	80 (540)	81 (541)	83.7 (543.7)
Dry Gas Meter Temp (°F) : Outlet (T_m)	Initial	78	78	81
	Mid	81	81	84
	Final	81	84	86
	Avg(°F/°A)	80 (540)	81 (541)	83.7 (543.7)
Avg Dry Gas Meter Temp (T_m - °F/°A)		80 (540)	81 (541)	83.7 (543.7)
Time (minutes)		9:33.37	18:13.03	11:19.00

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 = $\frac{\text{Act} - \text{Exp}}{\text{Exp}} \times 100$ HEAT TECH HTP 26 STD

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

Run 1

$Y = \frac{(5.041)(.9963)(28.62)(540)}{(5.226)(28.62 + .90/13.6)(522.5)} = \frac{77,619.389}{78,330.043} = .99093$

$\Delta\% = \frac{(.99093 - 1.01360)}{1.01360} \times 100 = -2.237\ \%$

Run 2

$Y = \frac{(9.409)(.9963)(28.62)(541)}{(9.776)(28.62 + .90/13.6)(523.8)} = \frac{145,144,470}{146,892.409} = 0.98810$

$\Delta\% = \frac{(0.98810 - 1.01360)}{1.01360} \times 100 = -2.516\ \%$

Run 3

$Y = \frac{(5.820)(.9963)(28.61)(543.7)}{(6.068)(28.61 + .90/13.6)(524.8)} = \frac{90,196.629}{91,318.894} = 0.98771$

$\Delta\% = \frac{(0.98771 - 1.01360)}{1.01360} \times 100 = -2.554\ \%$

Note: The Y Factor % Difference must be < ±5.0% to be acceptable. Avg. Δ%= -2.436

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

0.90 (A) inch H_2O Δh= 1.01360 (C) Calculated Calibration Y Factor (from Calibration) calcm 5/11/15

____ (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) ____

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

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	.543	.543		.000
TM	-17.0	.050	.050		.000

Revised 7/11

Dry Gas Meter Calibration Data

Date: 5/11/15 Technician: J.T. Myers

Calibration Meter Mfr: Rockwell SN: 10522025 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			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)		
.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
.80				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	11:37.53	0
.90	final	282.252	901.304	mid	67	71	69	11.626	0
.90				final	67	71	69		0
	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 RDG Start	MTR RDG Stop	Leak Rate	
DGM	-.165 "Hg	.303	.303	.000 cfm	Had a leak on the pump inlet. Tightened Swag fitting, all OK.
TM	-.165 "Hg	.685	.686	.001 cfm	

Meter Box: 511-M
Date: 5/11/15

Rev 6-10

Meter Box Calibration Page 2

A.T. Myren

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

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

$Y = \frac{(.9963)(6.231)(28.32)(69.5 + 460)}{(6.404)(28.32 + .90/13.6)(673 + 460)} = \frac{93,090.871}{95,855.270} = 0.97116$ ✓

527.3

529.5

$Y = \frac{(.9963)(5.498)(28.32)(695 + 460)}{(5.672)(28.32 + .75/13.6)(67 + 460)} = \frac{82,139.883}{84,817.401} = 0.96843$ ✓

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 5 11 -M
DATE 5/11/13
 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)

$$\Delta H@ = \frac{(0.0317)(\ .90\ )}{(28.32)(68.3 + 460)} \cdot \left[\frac{(67.3 + 460)(11.626)}{(.9963)(6.231)}\right]^2 = 1.8595$$
(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

Unit: Hearth Tech HTP 26 STD
Date: 7/29/15
Technician: AM
WST9-Form2, Rev 6/11

511-M (T2)

Meter Box Calibration Audit
Test Data

Run #	1	2	3	4	5	6	7	8	9	10
Avg.Δh	.75									
Max Vac	-1.0									

Avg. Test Series Δh: .750 in H_2O. Test Series Max Vac: -1.0 in Hg

Audit Dry Gas Meter Mfr: Rockwell SN: 10522202 Correction Factor (Y): .9963
Test Dry Gas Meter Mfr: Rockwell SN: 322914 Correction Factor (Y): .9685

Audit Data

		Audit #1	Audit #2	Audit #3
BP ("Hg):		28.58	28.58	28.58
Vac("Hg):		-1.0	-1.0	-1.0
Audit Meter:	Final Vol	412.005	417.503	423.374
	Initial Vol	406.738	412.408	418.289
	Vol (V_c, Ft^3)	5.267 ✓	5.095 ✓	5.085 ✓
Audit Meter Temp (°F) (Tc)	Initial	70	70	71
	Mid	70	70.5	71
	Final	70.5	71	71
	Avg (°F/°A)	70.2 ✓ (530.2) ✓	70.5 ✓ (530.5) ✓	71 ✓ (531) ✓
Δh("H_2O)	Initial	.75	.75	.75
	Mid	.75	.75	.75
	Final	.75	.75	.75
	Avg	.75 ✓	.75 ✓	.75 ✓
Dry Gas Meter:	Final Vol	343.599	349.203	355.201
	Initial Vol	338.200	344.000	350.000
	Vol(V_d)(ft^3)(m^3)	5.399 ✓	5.203 ✓	5.201 ✓
Dry Gas Meter Temp (°F) : Inlet (T_m)	Initial	72	73	74
	Mid	73	73	74
	Final	72	73	74
	Avg(°F/°A)	72.3 ✓ (532.3) ✓	73 ✓ (533) ✓	74 ✓ (534) ✓
Dry Gas Meter Temp (°F) : Outlet (T_m)	Initial	71	72	72
	Mid	71	71	72
	Final	71	72	73
	Avg(°F/°A)	71 ✓ (531) ✓	71.7 ✓ (531.7) ✓	72.3 ✓ (532.3) ✓
Avg Dry Gas Meter Temp (T_m - °F/°A)		71.7 ✓ (531.7) ✓	72.3 ✓ (532.3) ✓	73.2 ✓ (533.2) ✓
Time (minutes)		10:01.24	9:36.53	9:35.90

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 = $\frac{\text{Act} - \text{Exp}}{\text{Exp}} \times 100$ HEAT Tech HTP 26 5th 511-M

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

Run 1

$Y = \frac{(5.267)(.9963)(28.58)(531.7)}{(5.399)(28.58 + .75/13.6)(530.2)} = \frac{79,741.120}{81,969.534} = .9728$ ✓

$\Delta\% = \frac{(.9728 - .9685)}{.9685} \times 100 = +0.444$ %

Run 2

$Y = \frac{(5.095)(.9963)(28.58)(532.3)}{(5.203)(28.58 + .75/13.6)(530.5)} = \frac{77,224.127}{79,038.490} = .9770$ ✓

$\Delta\% = \frac{(.9770 - .9685)}{.9685} \times 100 = +0.878$ %

Run 3

$Y = \frac{(5.085)(.9963)(28.58)(533.2)}{(5.201)(28.58 + .75/13.6)(531)} = \frac{77,202.871}{79,082.573} = .9762$ ✓

$\Delta\% = \frac{(.9762 - .9685)}{.9685} \times 100 = +0.795$ %

Note: The Y Factor % Difference must be < ±5.0% to be acceptable. Avg. Δ%= +0.706 ✓

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

from cal dtd 5/11/15

0.75 (A) inch H_2O Δh= 0.96843 (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)

Leg 1: +8.10, +8.10, Δ 0.00 Leg 2: +7.60, +7.60, Δ 0.00

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

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	-16.5	337.990	337.992		.002
TM	-16.5	405.487	405.487		.000

Revised 7/11

RB

Dry Gas Meter Calibration Data

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

Calibration Meter Mfr: Rockwell SN: 1052202 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	315769	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			5.0229		532	535	532.7	533.8
.130	initial	329.235	127.7600	initial	71.5	75	73	9:19.31
.135	final	334.505	127.9132	mid	72	77	73	9.322
.135				final	72.5	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.				

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

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	.2263 5	.2264 5	.0001	
TM	-20.5	.1740	.1751	.011	

~~.400~~

.2

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

Meter Box Calibration Page 2

AT Myren

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

$$Y = \frac{(.9963)(5.227)(28.34)(71.8 + 460)}{(5.3643)(28.34 + .115/13.6)(72.3 + 460)} = \frac{78,485.749}{80,946.660} = .96960$$

(531.8; 532.3)

$$Y = \frac{(.9963)(5.875)(28.34)(73.8 + 460)}{(6.0229)(28.34 + .100/13.6)(72 + 460)} = \frac{88,547.523}{90,830.101} = 0.97487$$

(533.8; 532)

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

(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
 ATM yuen

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

$$\Delta H@ = \frac{(0.0317)(.115)}{(26.84)(71 + 460)} \cdot \left[\frac{(528 + 460)(9.976)}{(.9963)(5.227)}\right]^2 = .25189$$

$$\Delta H@ = \frac{(0.0317)(.100)}{(28.34)(72 + 460)} \cdot \left[\frac{(532 + 460)(12.196)}{(.9963)(5.875)}\right]^2 = .25801$$

$$\Delta H@ = \frac{(0.0317)(.133)}{(28.34)(73 + 460)} \cdot \left[\frac{(531.7 + 460)(9.329)}{(.9963)(5.270)}\right]^2 = .24859$$

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

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

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
Team

Unit: Heat Tech HTP 26 STD
Date: 7/29/15
Technician: ATM
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	-1.75									

Avg. Test Series Δh: .115 in H_2O. Test Series Max Vac: -1.75 in Hg

Audit Dry Gas Meter Mfr: Rockwell SN: 1052202 Correction Factor (Y): 0.9963
Test Dry Gas Meter Mfr: Ticmmon SN: 8000571 Correction Factor (Y): 0.9734

Audit Data

		Audit #1	Audit #2	Audit #3
BP ("Hg):		28.51	28.52	28.52
Vac("Hg):		-2.0	-2.0	-2.0
Audit Meter:	Final Vol	463.363	469.030	475.923
	Initial Vol	457.235	463.592	469.358
	Vol (V_c, Ft^3)	6.128	5.348	6.565
Audit Meter Temp (°F) (Tc)	Initial	75	75.5	76
	Mid	75	75.5	76
	Final	75.5	76.0	76
	Avg (°F/°A)	75.2 (535.2)	75.7 (535.7)	76 (536)
Δh("H_2O)	Initial	.115	.115	.115
	Mid	.115	.115	.115
	Final	.115	.115	.115
	Avg	.115	.115	.115
Dry Gas Meter:	Final Vol	138.8636	139.0274	139.2271
	Initial Vol	138.6860	138.8700	139.0370
	Vol(V_d)(ft^3)(m^3)	.1776 5.0276	.1574 5.5585	.1901 6.7133
Dry Gas Meter Temp (°F) : Inlet (T_m)	Initial	80	81	81
	Mid	82	82	83
	Final	83	83	83
	Avg(°F/°A)	81.7 (541.7)	82 (542)	82.3 (542.3)
Dry Gas Meter Temp (°F) : Outlet (T_m)	Initial	79	80	80
	Mid	79	80	80
	Final	80	80	80
	Avg(°F/°A)	79.3 (539.3)	80 (540)	80 (540)
Avg Dry Gas Meter Temp (T_m - °F/°A)		80.5 540.5	81 (541)	81.2 541.1
Time (minutes)		11:40.88	10:18.60	12:38.31

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

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

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

Heat Tech HTP 26 STD 7/29/15

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

Run 1

$Y = \frac{(6.128)(.9963)(28.51)(540.5)}{(6.2719)(28.51 + .115/13.6)(536.2)} = \frac{94,090.973}{95,728.496} = 0.98279$

$\Delta\% = \frac{(.98279 - .96960)}{.96960} \times 100 = +1.360\%$

Run 2

$Y = \frac{(5.348)(.9963)(28.52)(541)}{(5.5585)(28.52 + .115/13.6)(535.7)} = \frac{82,210.694}{84,948.854} = 0.96777$

$\Delta\% = \frac{(0.96777 - .96960)}{.96960} \times 100 = -0.189\%$

Run 3

$Y = \frac{(6.565)(.9963)(28.52)(541.1)}{(6.7133)(28.52 + .115/13.6)(536)} = \frac{100,937.354}{102,654.764} = 0.98327$

$\Delta\% = \frac{(.98327 - .96960)}{.96960} \times 100 = +1.410\%$

Note: The Y Factor % Difference must be < ±5.0% to be acceptable. Avg. Δ%= +0.8603

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

.115 (A) inch H_2O Δh= .96960 (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) ____

Start + 8.72
End + 8.72
Δ 0.00

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

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	-15.0	138.6523	138.6523	.0000	.000
TM	-15.0	457.005	457.005	—	.000

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 _____ 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)	($Q_{m(std)corr}$)
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		

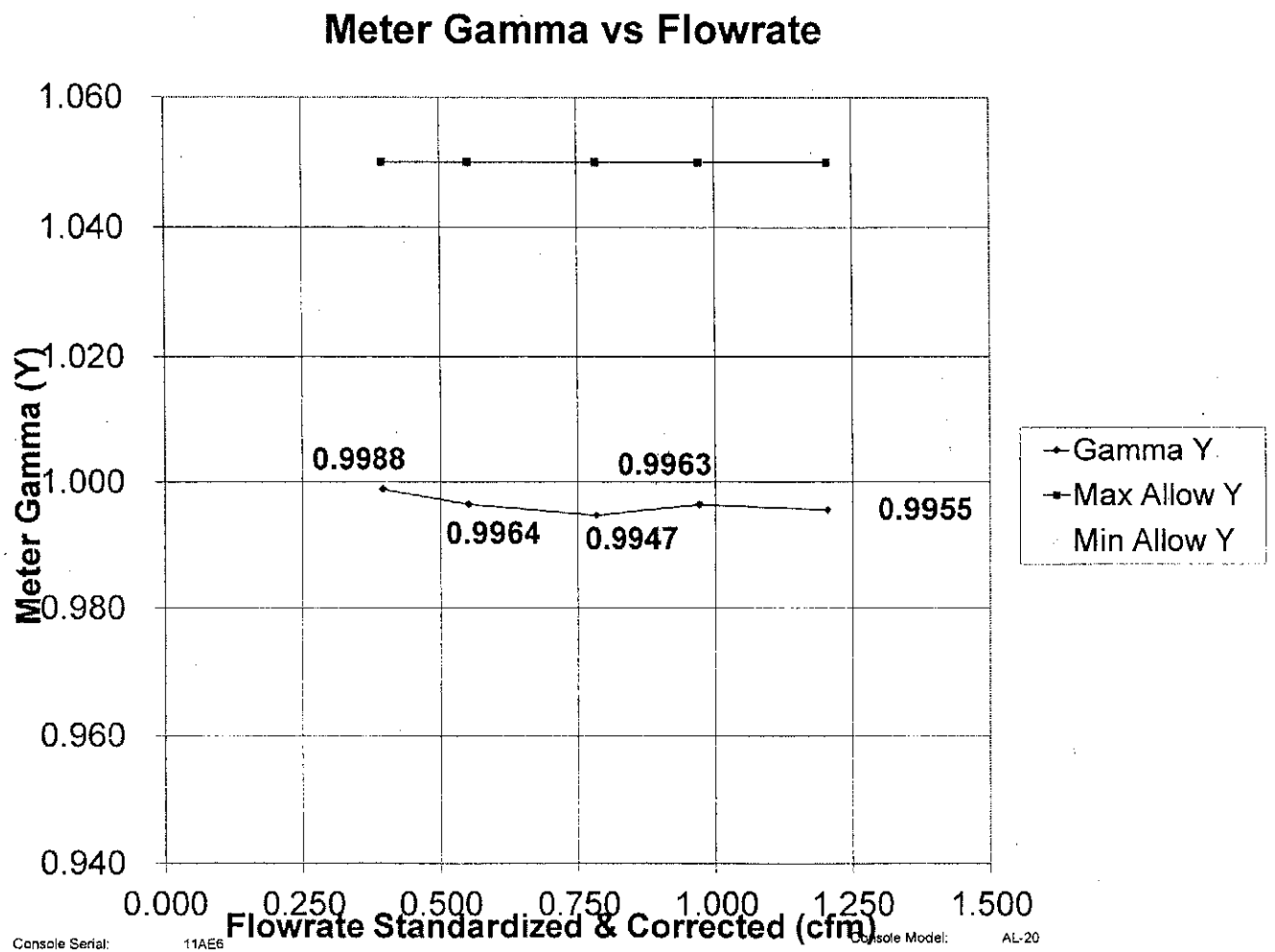
Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

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 [signature] Date 2/18/14

Calibration Date: 2-18-2014

Calibration Technician: EW

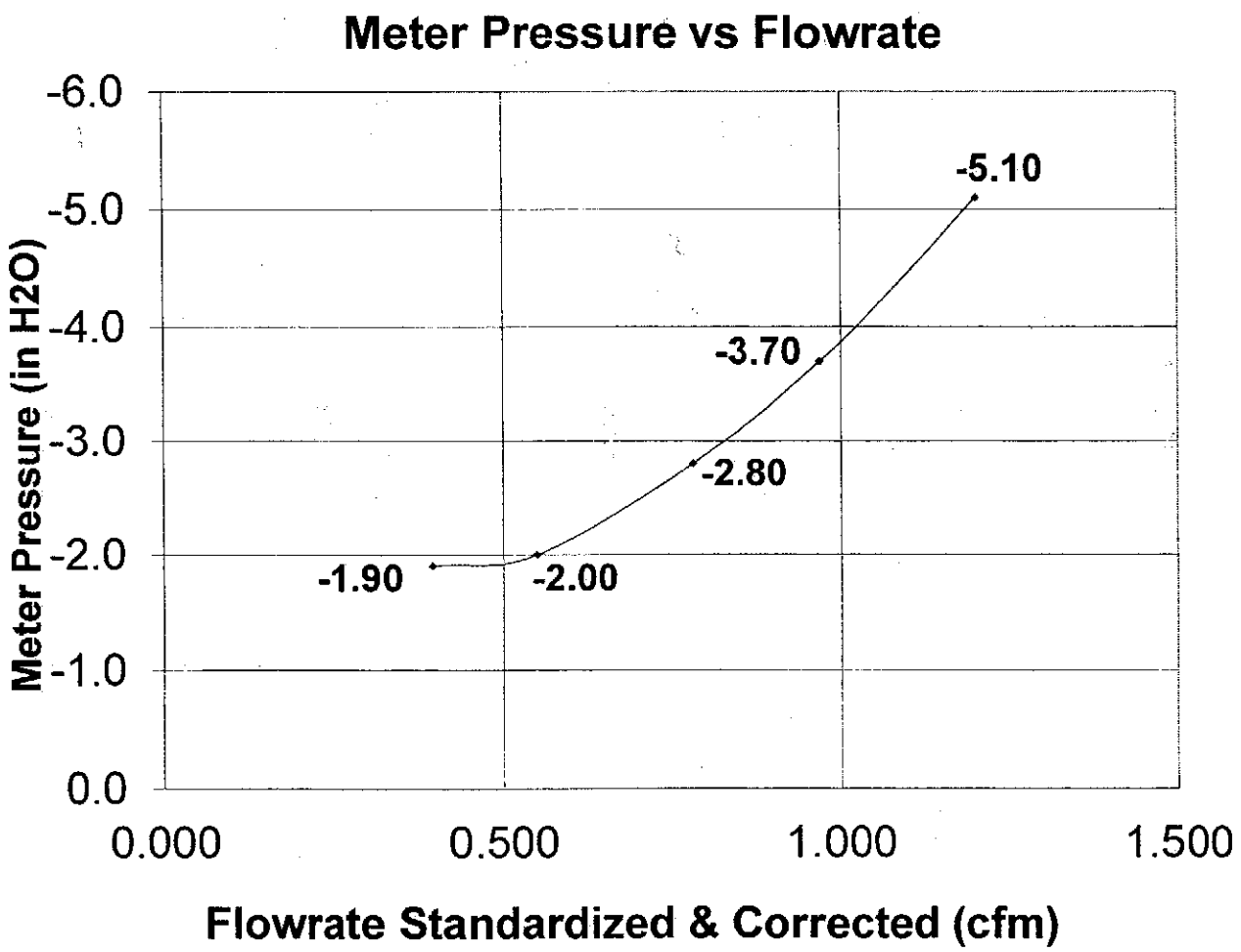


Console Serial: 11AE6

Console Model: AL-20

Calibration Date: 2-18-2014

Calibration Technician:



Console Model: AL-20

Console Serial: 11AE6

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	> 30, < 45	> 30, < 45					
95% Response Time (Seconds)	> 60 < 75	> 60 < 75	> 60 < 75	> 75 < 90	> 75 < 90	> 75 < 90					
Analyzer Flow Rate	→										

1 scfh.

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 STD

CO_2 Analyzer

Multipoint Calibration Report Form

Site: Myren Lab, Colville, WA Date: 7/28/15

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: 28.60 "Hg Instrument ID: Princo

Temp: 66 °F Instrument ID: Omega Digicator

Analyzer Last Calibrated: 7/16/15 By: A.T. Myren

Cylinders:

1. # ITM8803/11 Concentration: 0.00 %CO_2 Cyl. Press.: 230 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.: 300 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.

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	.000	.000	00.0	.000	—	—	+0.17		4.90	—
2	2	12.4	49.6	.496	50.0	.504	48.75	.496	+0.23		7.25	6.82
3	3	21.0	84.0	.840	82.25	.839			1.002			
4	4	6.04	24.2	.242	23.75	.238			-1.00			
5	1	0.00	00.0	.000	00.0	.001			+0.23			

Comments:

0.000 V = 0.0316170
0.496 V = 12.428 0009
0.839 V = 21.000500 2
0.238 V = 5.9798819
0.001 V = 0.0566097

0.500 V = 12.5279717

Linear Regression Results

Y= MX + B

Slope M= 0.0400108

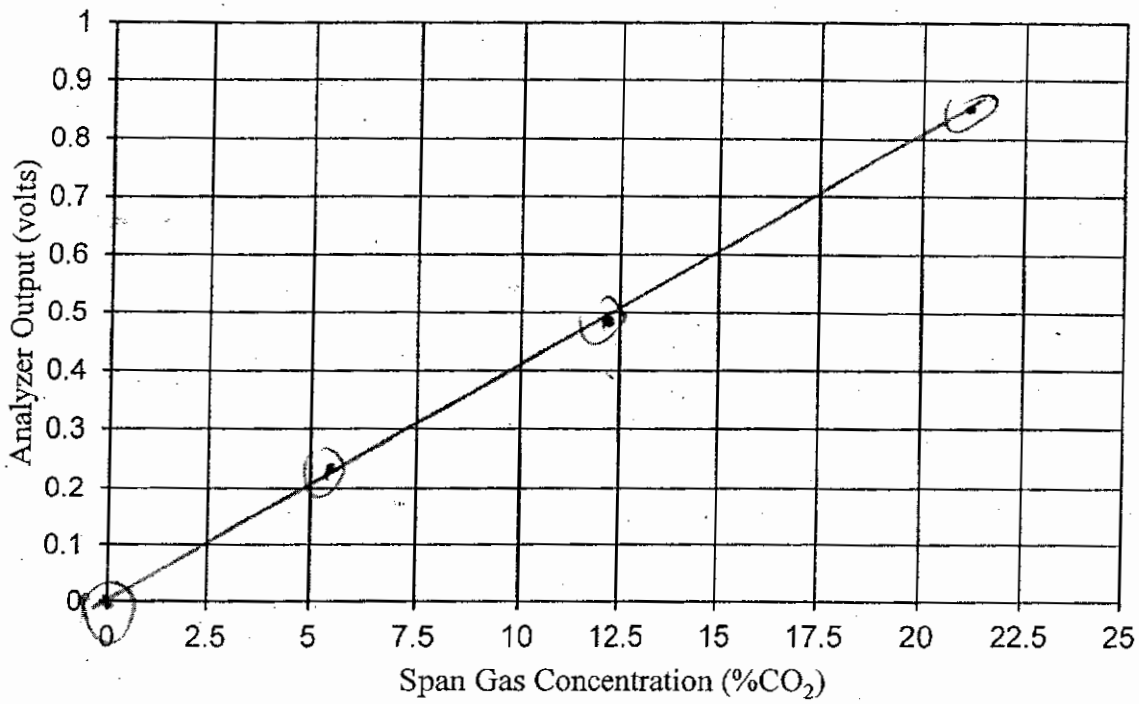
Y Intercept (B)= -0.0012563

Correlation Coefficient (r) 0.9999889

Analyzer: Horiba PIR 2000

SN: 607204

Date: 7/28/15



Comments:

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

QA WS, REV 1/10

Pre Heat Tech
HTP 26 STD

CO Analyzer

Multipoint Calibration Report Form

Site: EPA Lab, Colville, WA Date: 7/28/15

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: 28.60 "Hg Instrument ID: Princo

Temp: 66 °F Instrument ID: Omega Digicator

Analyzer Last Calibrated: 7/16/15 By: A.T. Myren

Cylinders:

1. # ITM8803/11 Concentration: 0.00 %CO Cyl. Press.: 230 psi.
   Certified By: Oxarc Date: 6/11/12
2. # 138-001981O 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.: 800 psi.
   Certified by: Oxarc Date: 8/22/97
4. # SX-40585 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.

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

Calibration Results

Point #	Cyl. #	% CO	Expected		Actual		Adj.		Curve Conc.	% Dif.	Potentiometer	
			Meter	DVM	Meter	DVM	Meter	DVM			Unadj.	Adj.
1	1	0.00	—	.000	—	.002	—	—		+0.25	—	—
2	2	2.57	—	.257	—	.265	—	.257		-0.51	—	—
3	3	4.03	—	.403	—	.409	—			+0.50		
4	4	1.29	—	.129	—	.127	—			-0.78		
5	1	0.00	—	.000	—	.000	—			+0.65		

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

-0.002 V = .0127264
.257 V = 2.5569939
.409 V = 4.0501547
.127 V = 1.2799484
.000 V = -0.0323732

Pre Heat Tech HTP 26 STD

Linear Regression Results

Y= MX + B

Slope M= 0.1017612

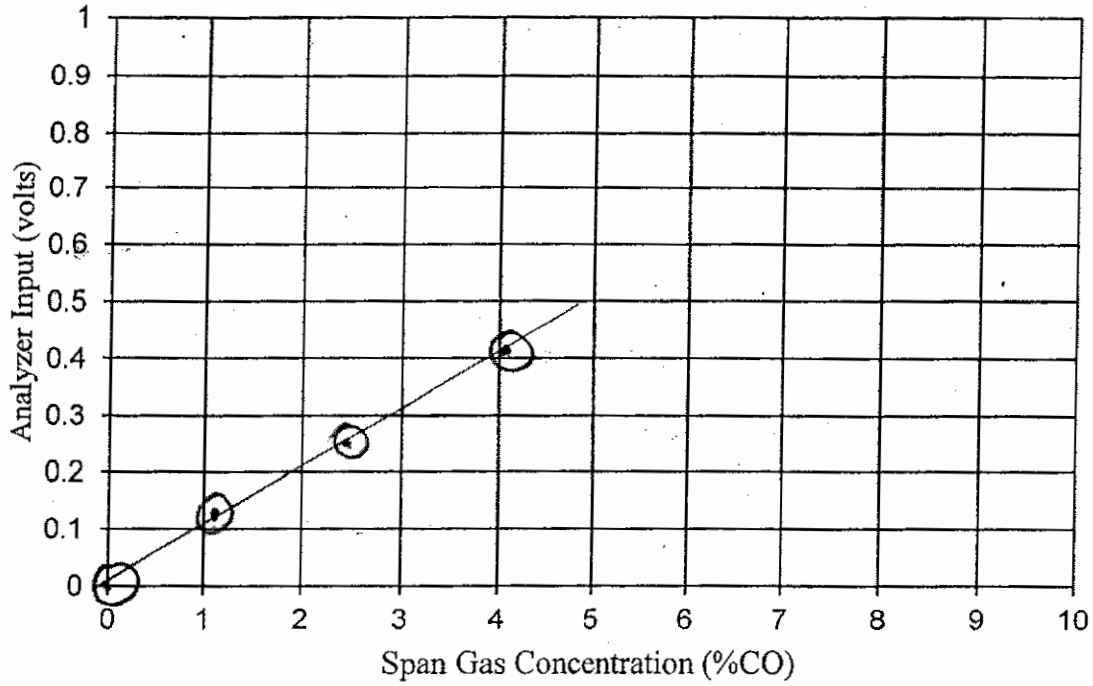
Y Intercept (B)= -0.0032240

Correlation Coefficient (r) 0.9998220

Analyzer: Horiba Mexa 311-GE

SN: GE - 30075

Date: 7/28/15



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

		Date: 3/18/2010	Date:
Component :	Oxygen	5.98%	
Certified Conc:	5.98% ± 1% REL	5.98%	
		5.99%	

		Date: 3/18/2010	Date:
Component:	Carbon Dioxide	6.03%	
Certified Conc:	6.04% ± 1% REL	6.07%	
		6.01%	

		Date: 4/2/2010	Date: 4/9/2010
Component:	Carbon Monoxide	1.30%	1.29%
Certified Conc:	1.29% ± 1% REL	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 Calibration Standards September 1997, using procedure G1 and/or G2.

Analyst Phil D. Mott Date 4/12/2010

WELDING PRODUCTS
INDUSTRIAL SUPPLIES
INDUSTRIAL GASES
MEDICAL GASES

SPECIALTY GASES
BEVERAGE SYSTEMS
SAFETY PRODUCTS
FIRE EQUIPMENT

WWW.OXARC.COM

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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) 586-9859

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

WATCHEE, WA 98801
IME 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 Travis Auger **Date** 8/25/97

Comments:

STOVE DESCRIPTION/ QC

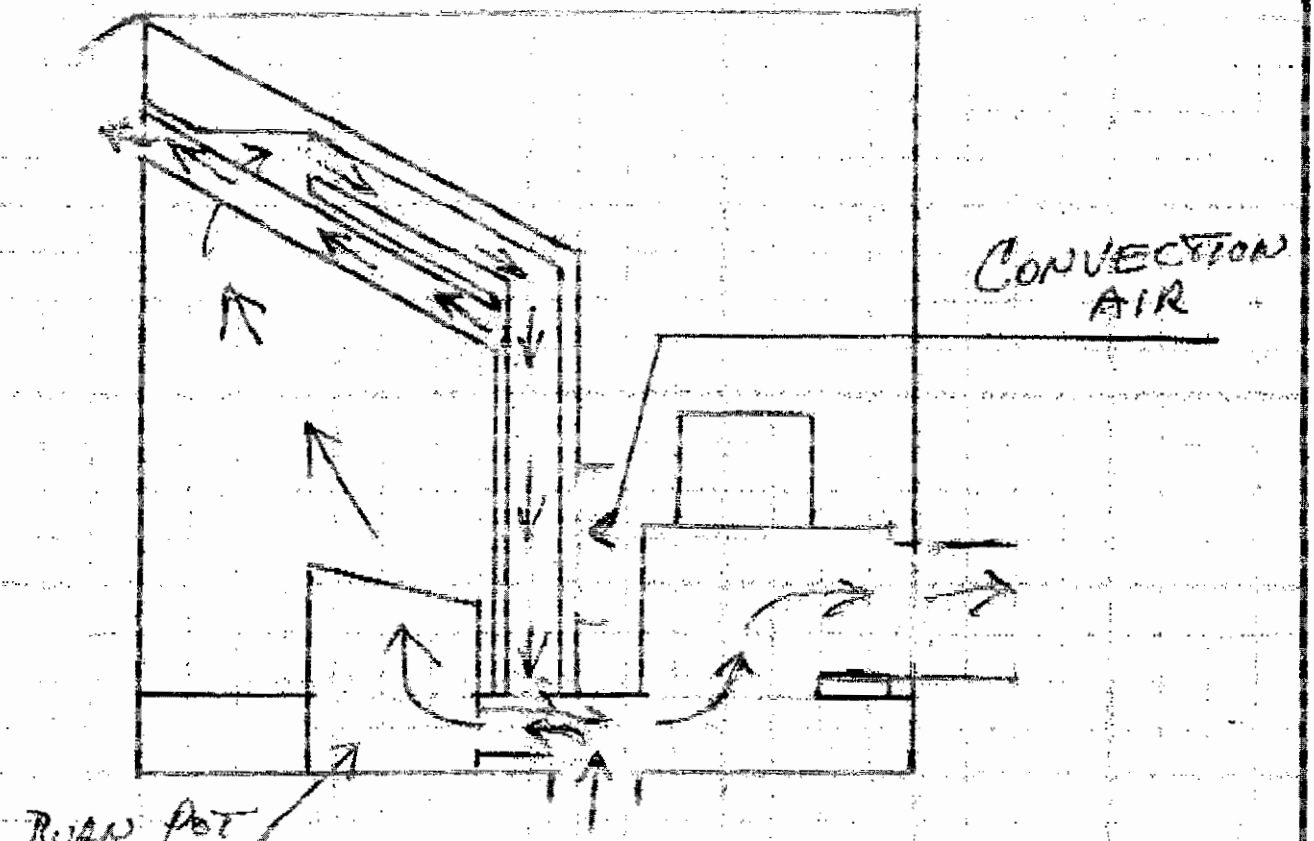
The HEAT TECH HTP 26 STANDARD pellet stove basically looks like a wood stove. It uses a top feed auger system to drop pellets down a chute into the burn pot. The operating controls are located on the side and are easy to use.

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:

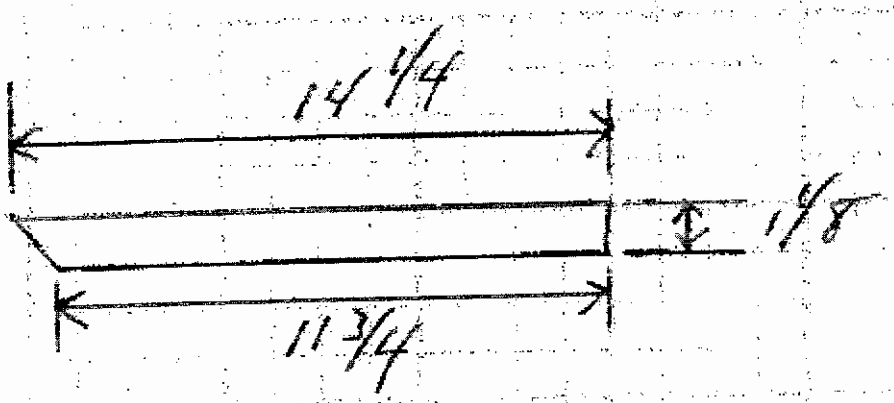
EPA CBI Office
Attn: Residential Wood Heater Compliance Program Lead
1200 Pennsylvania Ave. NW
Washington, D.C. 20004

COMP 26 STANDARD



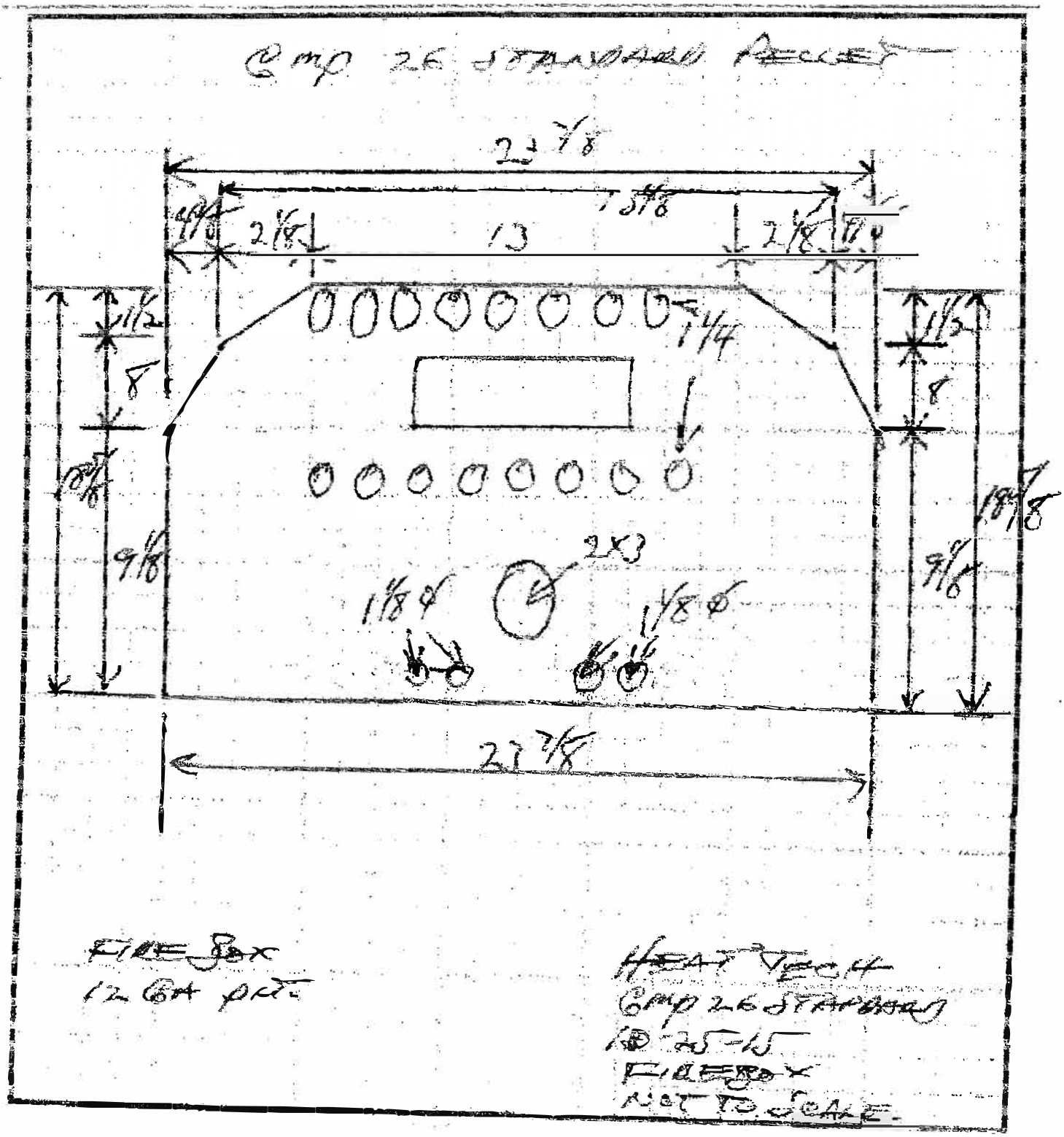
HEAT TECH
COMP 26 STANDARD
AIR FLOW (SIDE VIEW)
10-25-15
NOT TO SCALE

BMP 26 STANDARD PIECE



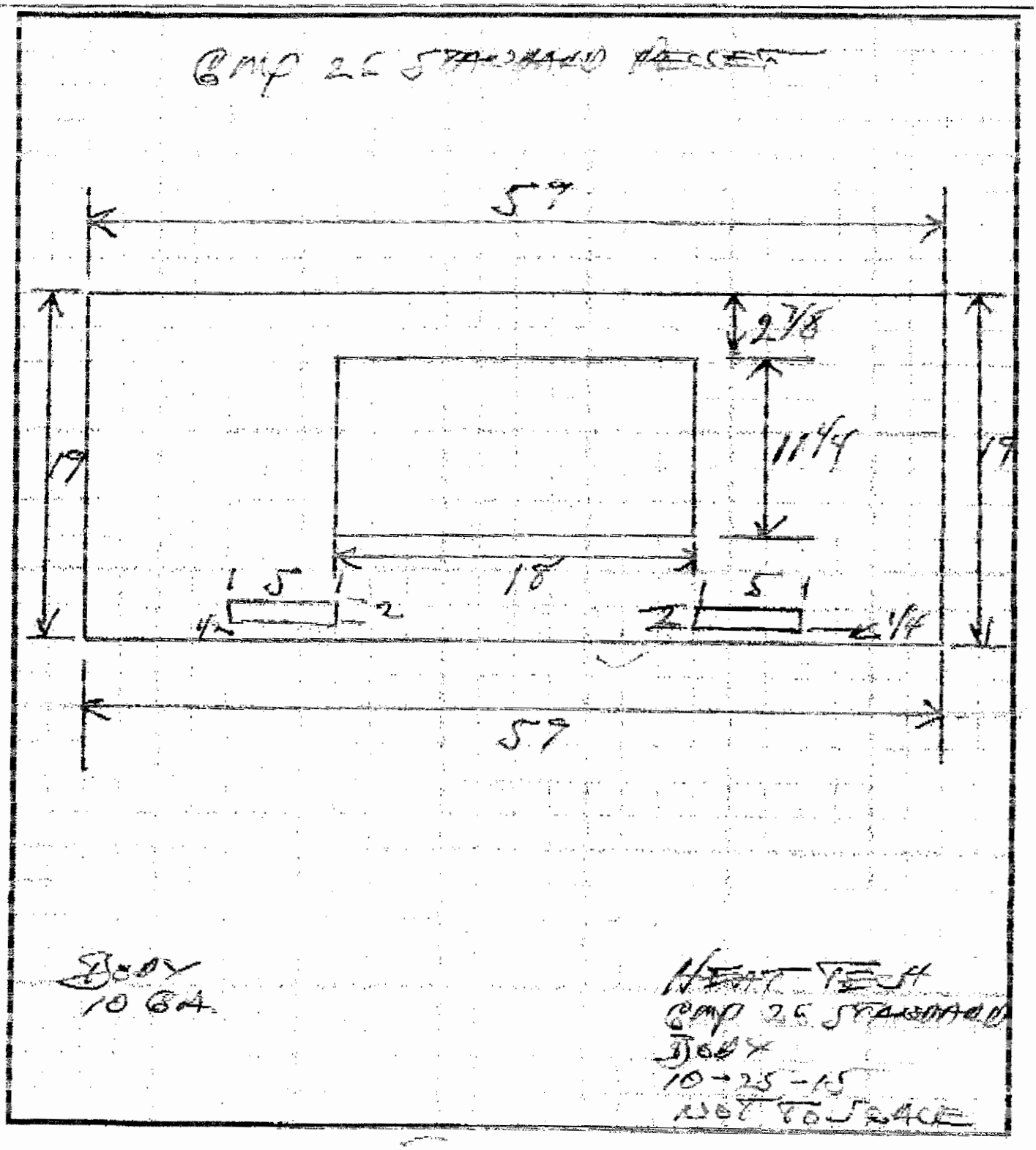
EXHAUST TUBE
1 1/8 ϕ .059 WALL

HEAT TECH
BMP 26 STANDARD
EXHAUST TUBE
10-25-05
NOT TO SCALE



FIRE BOX
12 GA pcs

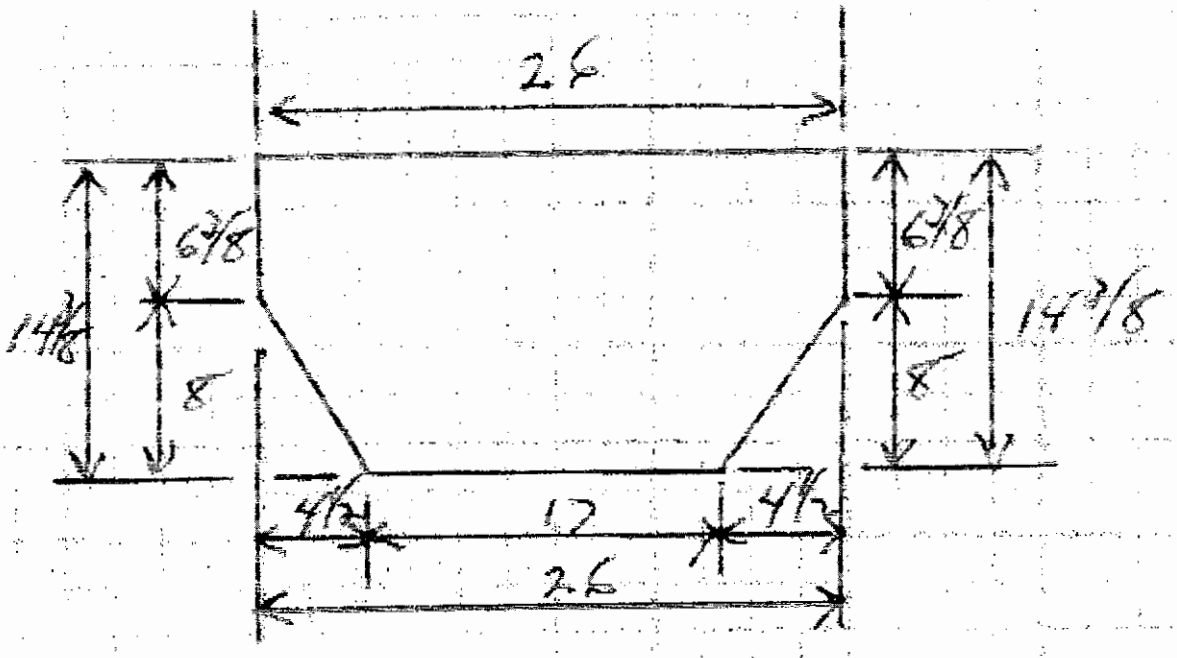
HEAT TECH
CMP 26 STANDARD
ID 25-15
FIRE BOX
NOT TO SCALE



BOX
10 GA.

HEAT TEST
CMP 25 STANDARD
BOX
10 → 25 - 15
NOT TO SCALE

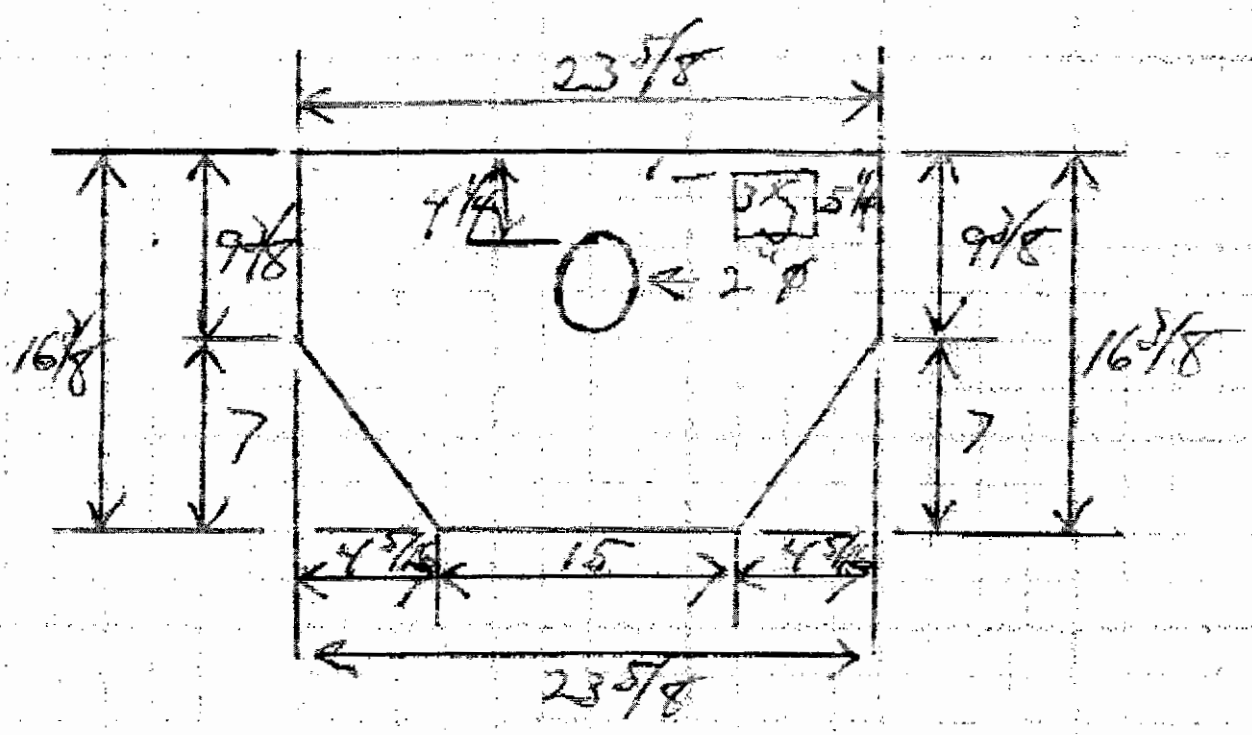
GMP 26 STANDARD PLATE



FACE TOP
12 GA.

HEAT TECH
GMP 26 STANDARD
FACE TOP
10-25-15
NOT TO SCALE

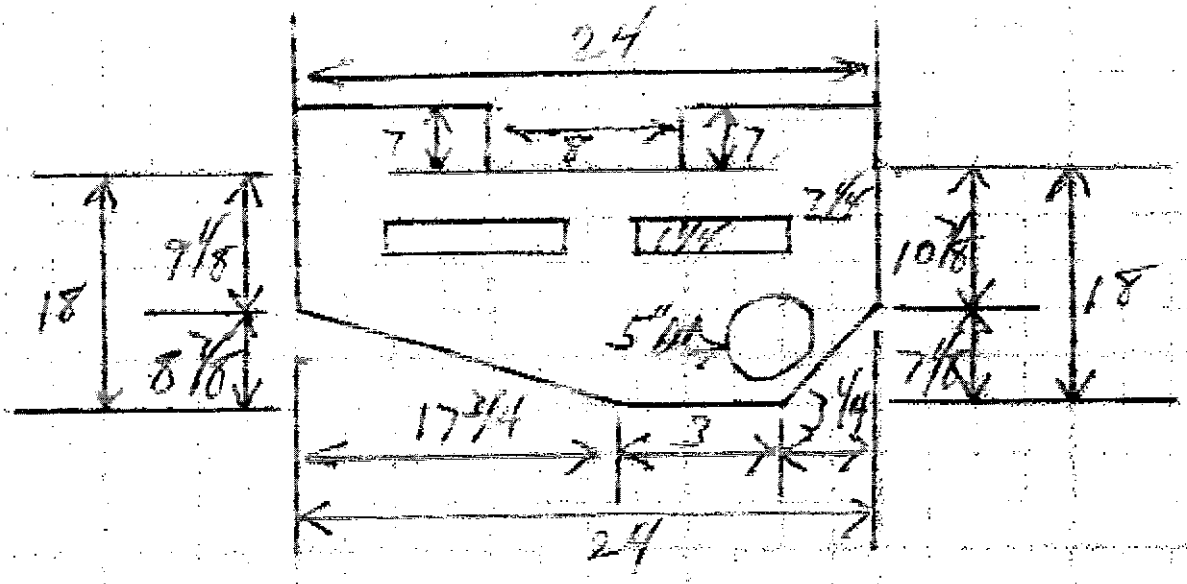
@ MP 26 STANDARD DUCT



AIR CHAMBER
12 GA.

HEAT TECH
@ MP 26 STANDARD
AIR CHAMBER
10-25-15
NOT TO SCALE

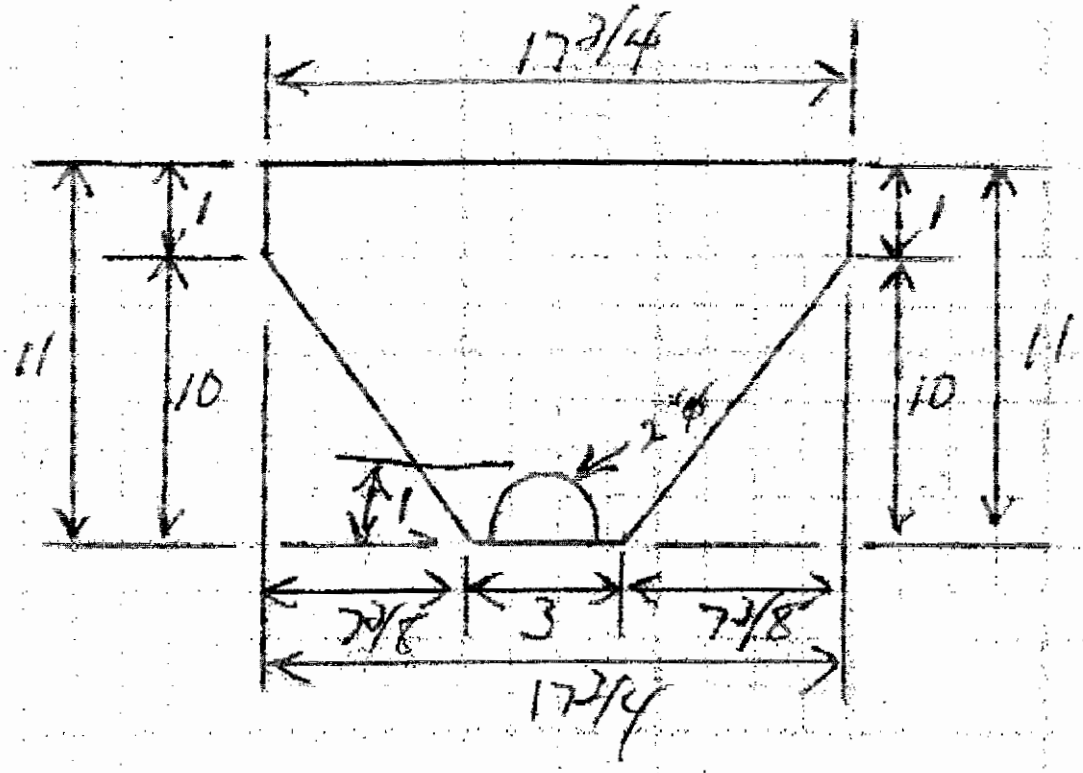
GMP 26 STANDARD PLATE



FALSE BOTTOM
12 GA PLT

HEAT TECH
GMP 26 STANDARD
FALSE BOTTOM
10-25-15
NOT TO SCALE

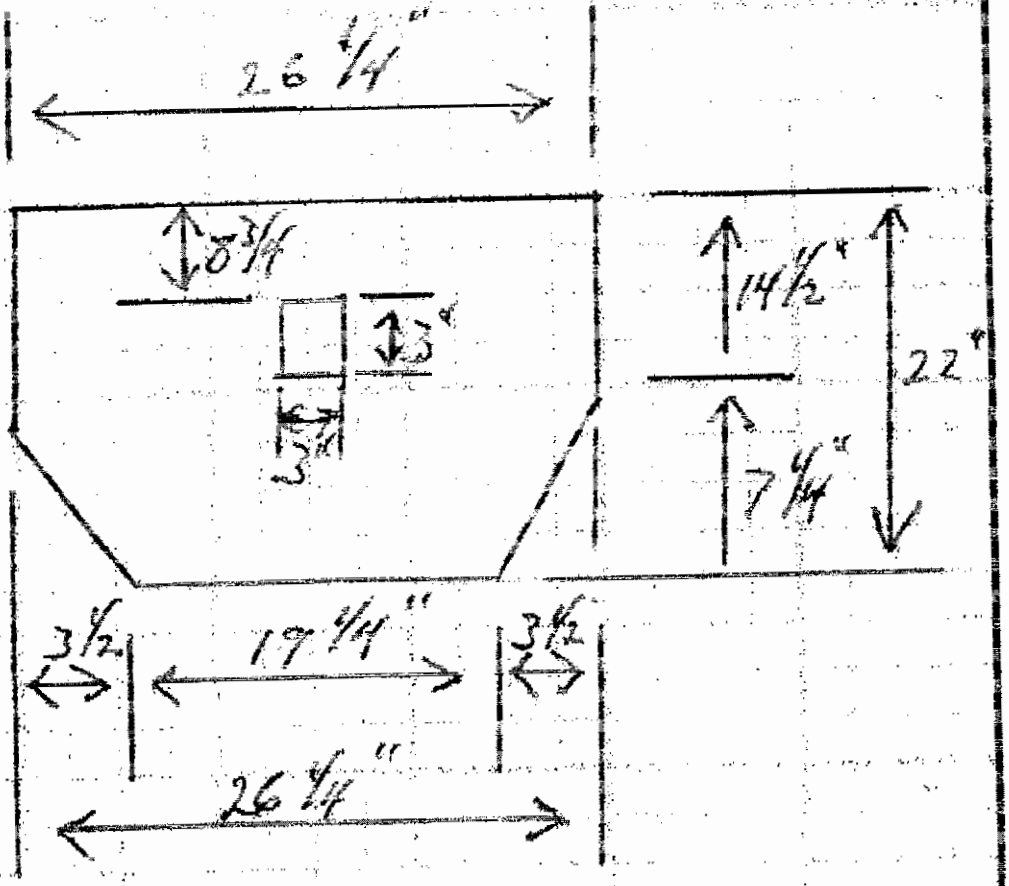
GMD 26 STANDARD PIECE



HOPPER BACK
16 GA.

HEAT TECH
GMD 26 STANDARD
HOPPER BACK
10-25-07
NOT TO SCALE

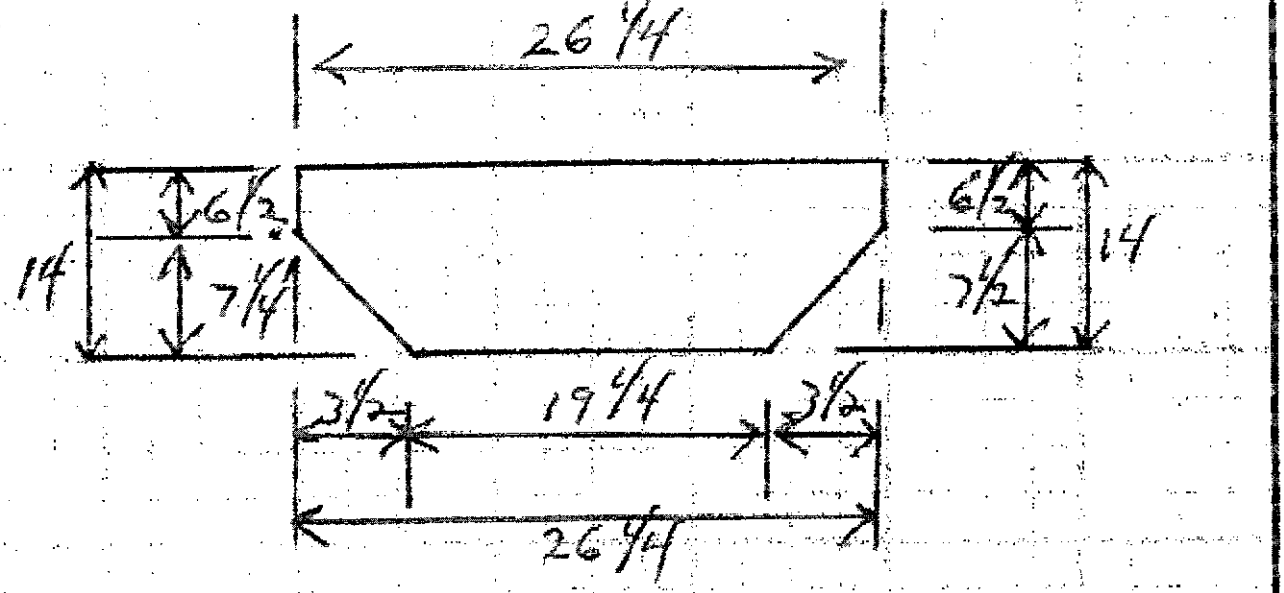
COMP 2.6 STANDARD PELLET



BOTTOM PLT
3/16 PLT.

HEAT TECH
COMP 2.6 STANDARD
BOTTOM PLT.
10-25-15
NOT TO SCALE

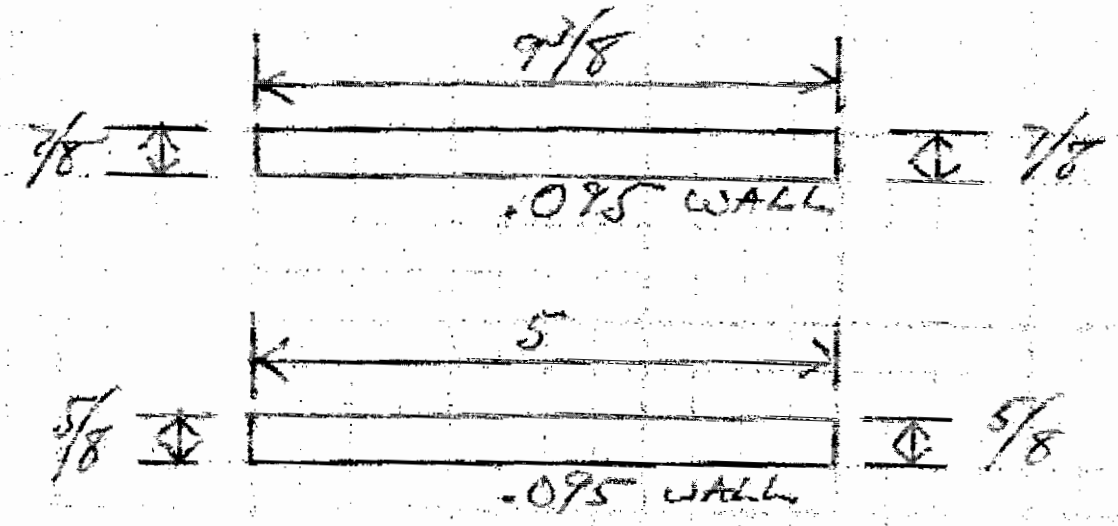
GMP 26 STANDARD PELLET



REAR TOP
12 GA.
ALL DIMENTIONS IN INCH

HEAT TECH
GMP 26 STANDARD
REAR TOP
10-25-15
NOT TO SCALE

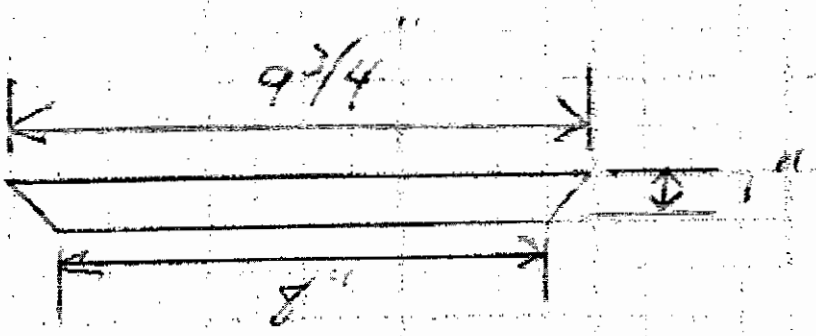
Camp 26 STANDARD Pencil



IGNITOR TUBE (OUTER)
IGNITOR TUBE (INNER)

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

Grip 26 Standard Heat

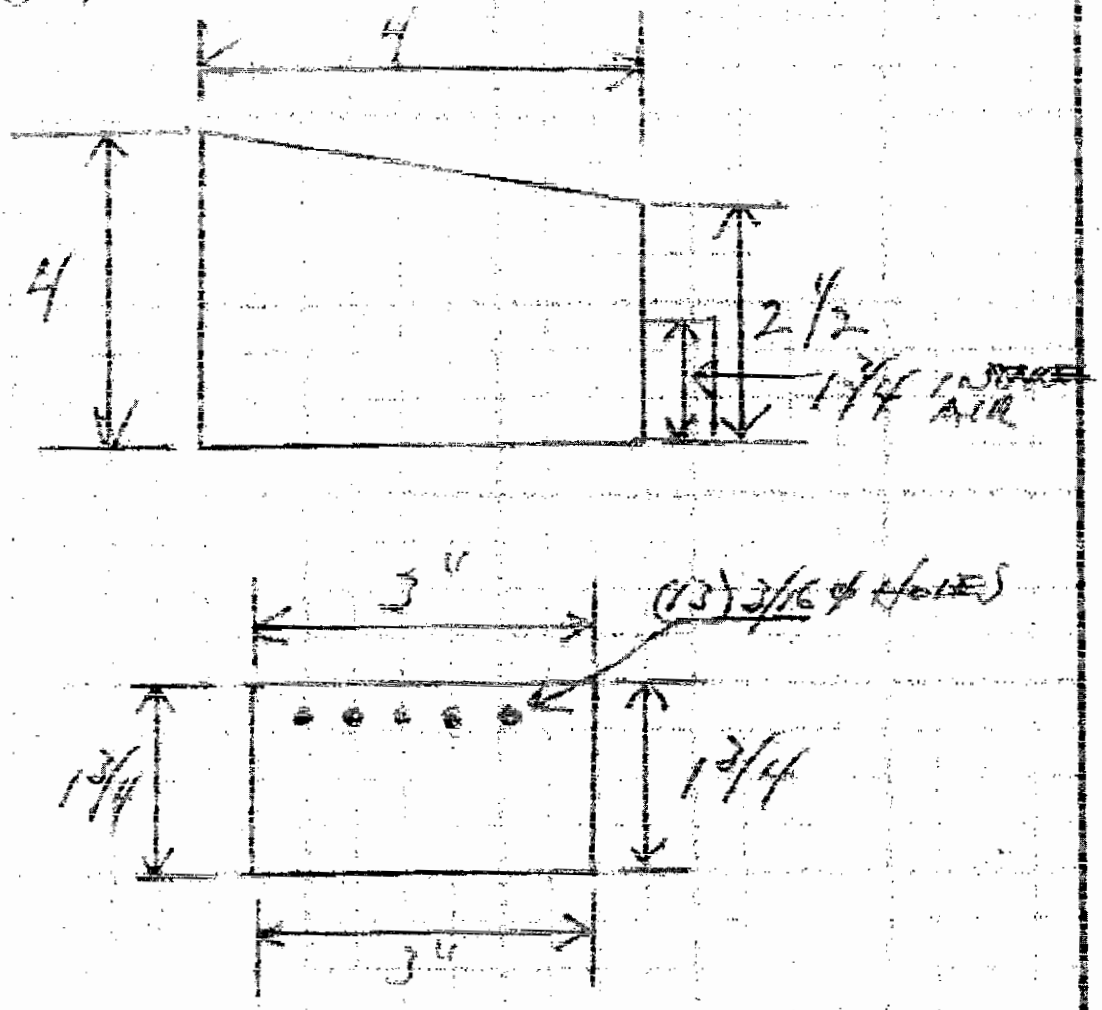


10-25-15

Heat Exchange Tube
1" ø .065 Wall

Heat Tech
Grip 26 Standard
Heat Exchange
Tube
Not to Scale

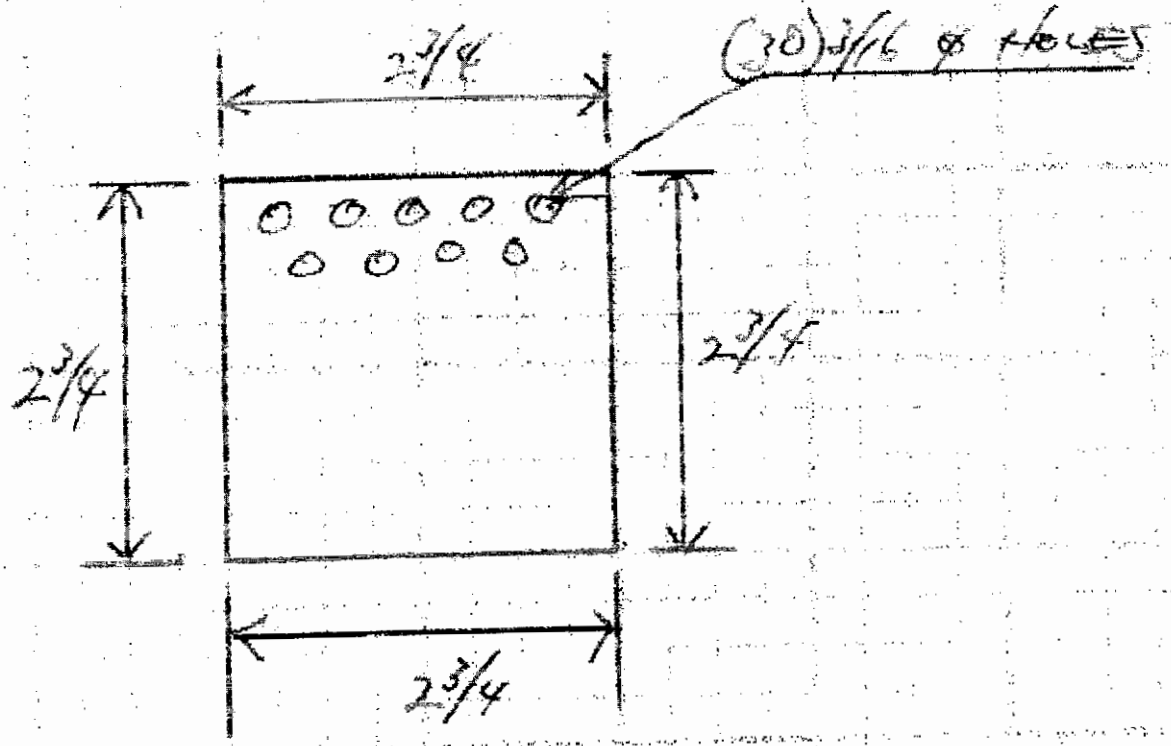
BMP 26 STANDARD PROJECT



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

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

Cap 26 Standard Pilot



Burn Pot Bottom Plt.
2 3/4 S.S.
12 GA.

HEAT TECH
Cap 26 Standard
Burner Bottom Plt.
10-25-15
NOT TO SCALE

Revised 3.10.08

WOODSTOVE DATA SHEET # 30
STOVE STORAGE

The Heat Tech HTP 26 Standard 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 Standard

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 Standard


Heat Tech
HTP 24 Standard


Heat Tech
HTP 24 Standard

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 STANDARD PELLET STOVE TO THE U.S. EPA.

Signature: Tom Dowell

Printed Name: Tom Dowell

Title: Owner

Date: 1-14-16

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

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

HEAT TECH IND. LLC

867 HWY. 99
Gridley, CA 95948
Office (530) 846-1985 Fax (530) 846-1407

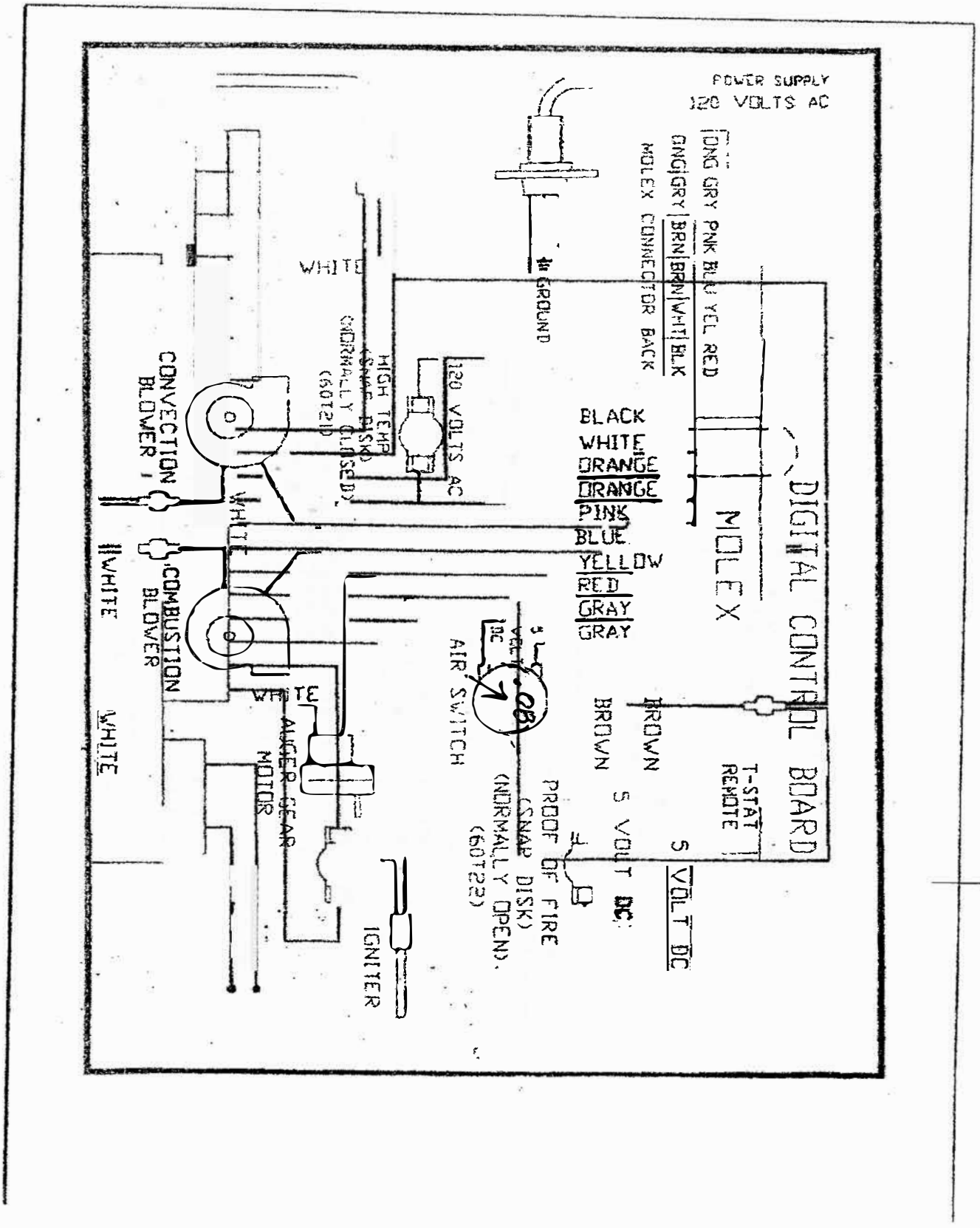
DATE: 1-14-15

TO: Dew

FROM: Tom

SUBJECT: BLUEPRINT + OWNERS MANUAL

AIR SWITCH SAY TO CONNECT WIRES. NEEDS TO BE CHANGED TO THE NEW PAGE I SENT WITH THE SCREEN ALL COVERS


POWER SUPPLY
120 VOLTS AC
ORG GRY PNK BLU YEL RED
ORG GRY BRN BRN WHT BLK
MOLEX CONNECTOR BACK
GROUND
DIGITAL CONTROL BOARD
MOLEX
T-STAT REMOTE
5 VOLT DC
BROWN
BROWN
5 VOLT DC
PROOF OF FIRE (SNAP DISK) (NORMALLY OPEN) (60122)
AIR SWITCH
IGNITER
AUGER GEAR MOTOR
COMBUSTION BLOWER
CONVECTION BLOWER
WHITE
WHITE
WHITE
WHITE
HIGH TEMP (SNAP DISK) (NORMALLY CLOSED) (60120)
120 VOLTS AC
BLACK
WHITE
ORANGE
ORANGE
PINK
BLUE
YELLOW
RED
GRAY
GRAY