Certification Test Report

England's Stove Works, Inc.

Freestanding Wood Stove

Model: 17-VL

Prepared for:	England's Stove Works, Inc. P.O. Box 206 Monroe, VA 24574
Prepared by:	OMNI-Test Laboratories, Inc. 13327 NE Airport Way Portland, OR 97230 (503) 643-3788
Test Period:	November 2-6, 2009
Report Date:	December 2009
Report Number:	428-S-02-3

AUTHORIZED SIGNATORIES

This report has been reviewed and approved by the following authorized signatories:

Paul E. Plegs, President
OMNI-Test Laboratories, Inc.

Bruce Davis, Emissions Testing Supervisor
OMNI-Test Laboratories, Inc.

Ken Morgan, Emissions Testing Technician
OMNI-Test Laboratories, Inc.

TABLE OF CONTENTS

PREFACE ..... (3 pages)

1. FUEL PHOTOGRAPHS/APPLIANCE DESCRIPTION/DRAWINGS ..... 1-1 (30 pages)
Fuel Photographs 1-3
Appliance Description 1-6
Manufacturer Design Drawings (K List) 1-7

2. QUALITY ASSURANCE/QUALITY CONTROL ..... 2-1 (50 pages)
Sample Analysis 2-3
Calibrations – Methods 28 and 5G 2-15
Example Calculations 2-41

3. OWNER'S MANUAL ..... 3-1 (30 pages)

4. TEST DATA BY RUN ..... 4-1 (48 pages)
Run 1 4-3
Run 2 4-12
Run 3 4-22
Run 4 4-31
Run 5 4-40

5. SAMPLING PROCEDURES AND TEST RESULTS ..... 5-1 (8 pages)
Introduction 5-2

Summary Tables
Table 1.1 - Particulate Emissions Results 5-3
Table 1.2 - Test Facility Conditions 5-3
Table 1.3.1 - Fuel Measurements and Crib Descriptions - Pretest 5-4
Table 1.3.2 - Fuel Measurements and Crib Descriptions - Test 5-4
Table 1.4 - Dilution Tunnel Gas Measurements and Sampling Data 5-5
Table 1.5 - Heater Operation 5-5
Table 1.6 - Pretest Configurations 5-6
Table 1.7 - Run Data 5-6
Table 1.8 - Test Configurations 5-7

Test Results and Discussion 5-8

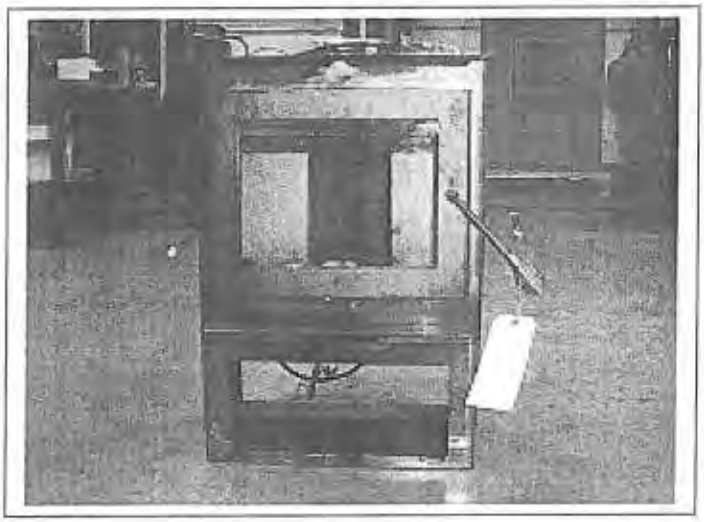
Section 1

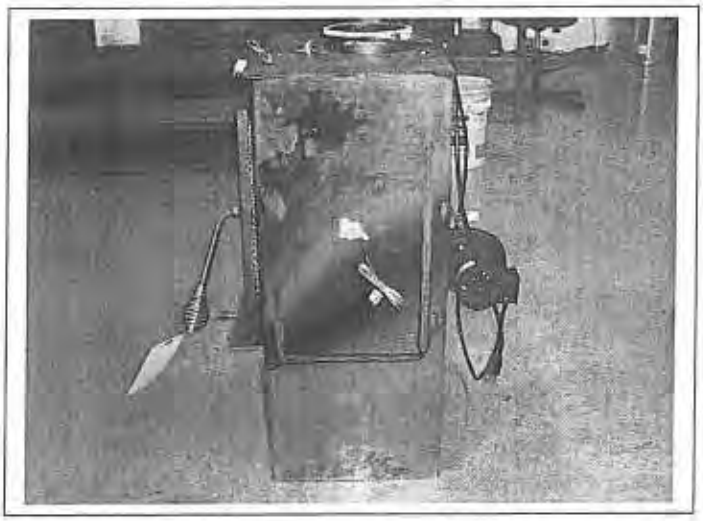
Fuel Photographs/Appliance Description/Drawings

England's Stove Works, Inc.

17-VL

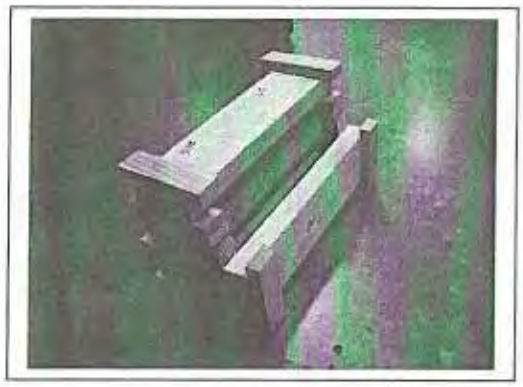
Test Dates: November 2-6, 2009



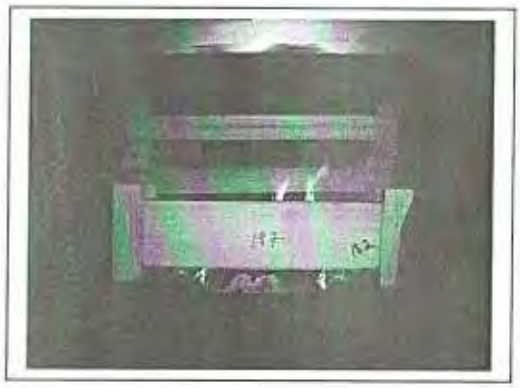


England's Stove Works, Inc.
17-VL

Run 1 – Fuel



Run 1 – Newly Loaded Stove



Run 2 – Fuel

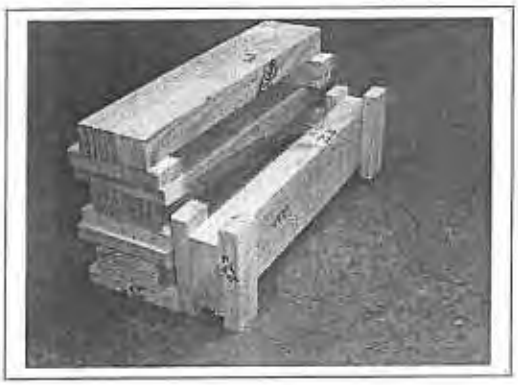
Run 2 – Newly Loaded Stove

England's Stove Works, Inc.
17-VL

Run 3 – Fuel

Run 3 – Newly Loaded Stove

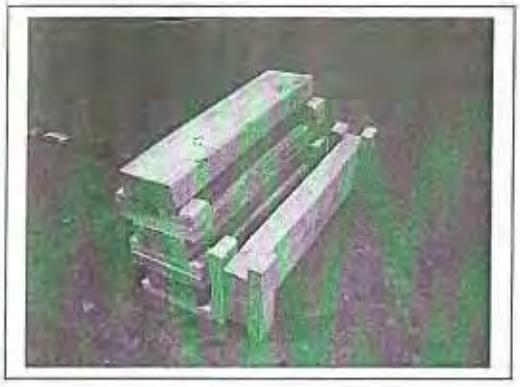
Run 4 – Fuel



Run 4 – Newly Loaded Stove

England's Stove Works, Inc.
17-VL

Run 5 – Fuel



Run 5 – Newly Loaded Stove

WOOD HEATER DESCRIPTION

Appliance Manufacturer: England's Stove Works, Inc.

Wood Stove Model: 17-VL

Type: Freestanding, radiant-type room heater

WOOD HEATER INFORMATION

Materials of Construction: The unit is constructed primarily of mild steel. The firebox is lined with vermiculite that measures 12.75" by 8.25". The feed door has a 14.5-inch by 10.75-inch glass panel and a 5/8-inch rope gasket.

Air Introduction System: Air enters the firebox through an opening located at the front of the appliance below the fuel-loading door. Secondary air enters the appliance through the bottom/back and is channeled internally to both sides of the firebox supplying two 0.875-inch diameter tubes.

Combustion Control Mechanisms: The combustion air inlet is controlled by a handle located below the fuel-loading door in the center of the appliance.

Combustor: N/A.

Internal Baffles: A refractory baffle is mounted in the upper portion of the firebox. The flame path is forced to the front of the firebox where it travels up through the opening between the baffle and primary air manifold.

Other Features: Optional fan accessory.

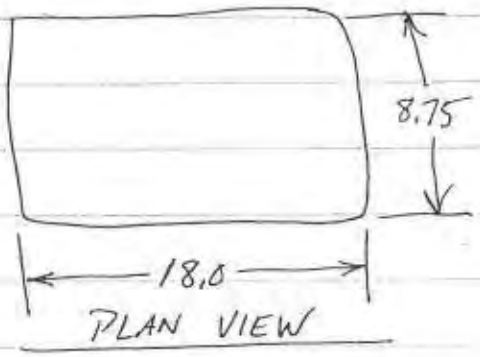
Flue Outlet: The 6-inch diameter flue outlet is located in the top of the unit.

WOOD HEATER OPERATING INSTRUCTIONS

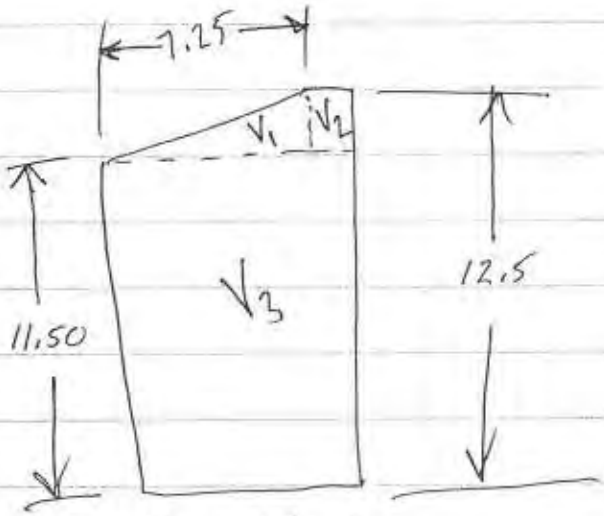
Specific Written Instructions: See Section 3 of this report. All markings and instruction materials were reviewed for content prior to printing.

Engineering Drawings/Blueprints (K List)

- FIREBOX VOLUME CALCULATION -



PLAN VIEW



SIDE VIEW

$V_1 = 1/2 \left[7.25 \times (12.5 - 11.5) \times 18.0\right] = 65.25$

$V_2 = (12.5 - 11.5) \times (8.75 - 7.25) \times 18 = 27.0$

$V_3 = 11.5 \times 8.75 \times 18.0 = 1181.25$

$V_T = V_1 + V_2 + V_3 = 1903.5 = 1.102\ ft^3$

Project# 428-S-02-3 Date 6-12-09

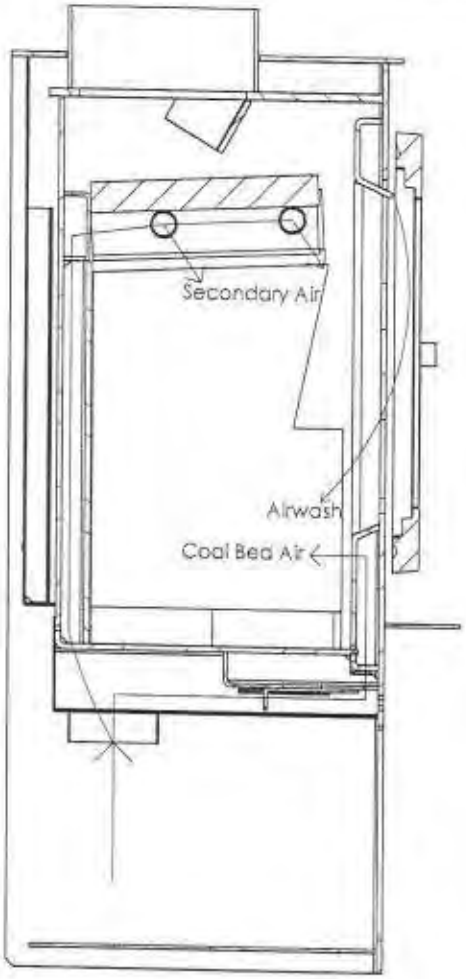
Client England's Stove Works Tracking# 1424

Model Englander 17-VL Initials JL

7.714

7.0 — 8.4

5/6 W = 15.0"



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/16 ANGULAR: BEND ± 0.5 deg TWO PLACE DECIMAL ± .01 THREE PLACE DECIMAL ± .005	DRAWN	CJP	6/16/09
			CHECKED		
			ENG APPR.	CJP	6/16/09
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

TITLE:

17-VL Airflow Cutaway

SIZE	DWG. NO.	REV
A	06162009-1	X

SCALE: 1:20

SOLID FUEL APPLIANCE COMPONENT LIST

Client:_____ Model:_____ Project #:_____ Technician:_____ Date:_____

COMPONENT	VENDOR	MODEL	PART NUMBER		DESCRIPTION	CERTIFICATION
			Vendor	Manuf.		
Blower Motor	Fasco	70214784	AC-16	AC-16	Blower assembly	UL, CSA
Blower Speed Control	N/A					
Blower Snap Disk	N/A					
Burner ON/OFF Switch	N/A					
Power Cord	Fasco	18 GA, 105°C	N/A	N/A	Power cord	UL, CSA
Door Glass	Eurokera	Keralite	AC-G40	AC-G40	5 mm Ceramic Glass	N/A
Door Glass Gasket	Amatex Corp.		R-GK-TAPE-1x3/16	R-GK-TAPE-1x3/16	Self adhesive tape gasket	N/A
Firebox Lining	Skamol	V-1100 (600)	AC-17ACB AC-17RBR AC-17RBB AC-17RBL	AC-17ACB AC-17RBR AC-17RBB AC-17RBL	Vermiculite Firebox Lining	N/A
Door Gasket	Amatex Corp.		R-GK-ROPEHD-58	R-GK-ROPEHD-58	High density, 5/8" dia. rope gasket	N/A

Englands Stove Works, Inc. 17-VL Firebox Volume Calculations

Firebox Dimensions

$hfront_{fb} := 12.5 \cdot in$ $hrear_{fb} := 12.0625 \cdot in$ $w_{fb} := 18 \cdot in$ $d_{fb} := 8.5 \cdot in$

Ashlip Dimensions (Method 28, 8.7.1)

$hfront_{al} := 3.127 \cdot in$ $hrear_{al} := 2.693 \cdot in$ $w_{al} := 18 \cdot in$ $d_{al} := .929 in$

Firebox Volume

$$v_{fb} := \left(d_{fb} \cdot w_{fb} \cdot hrear_{fb}\right) + \frac{\left(hfront_{fb} - hrear_{fb}\right) \cdot w_{fb} \cdot d_{fb}}{2} \qquad v_{fb} = 1.087\,ft^3$$

Ashlip Volume

$$v_{al} := \left(d_{al} \cdot w_{al} \cdot hrear_{al}\right) + \frac{\left(hfront_{al} - hrear_{al}\right) \cdot w_{al} \cdot d_{al}}{2} \qquad v_{al} = 0.028\,ft^3$$

Volume Comparison

$v_{\%} := \frac{v_{al}}{v_{fb}}$ $v_{\%} = 2.590\,\%$ v % > 10% $v_{fb} = 1.087\,ft^3$

Fuel Load Specifications

$l_{charge} := \frac{5}{6} \cdot w_{fb}$ $l_{charge} = 15.000 \cdot in$

$mcharge_{opt} := 7\frac{lb}{ft^3} \cdot v_{fb}$ $mcharge_{opt} = 3.453\,kg$ $mcharge_{opt} = 7.612 \cdot lb$

$mcharge_{lowtol} := mcharge_{opt} - \left(.7\frac{lb}{ft^3} \cdot v_{fb}\right)$ $mcharge_{lowtol} = 3.107\,kg$ $mcharge_{lowtol} = 6.851 \cdot lb$

$mcharge_{hightol} := mcharge_{opt} + \left(.7\frac{lb}{ft^3} \cdot v_{fb}\right)$ $mcharge_{hightol} = 3.798\,kg$ $mcharge_{hightol} = 8.373 \cdot lb$

	England's Stove Works: 17-VL Quality Control Sheet						
	A	B	C	D	E	F	G
1	Description of Parameter Inspected	Target Value	Low Tol.	Actual Value	High Tol.	Deviation	K-List
2	Firebox Volume						
3	Length (+/-.25in.)	8.500	8.250		8.750		Yes
4	Width (+/-.25in.)	18.000	17.750		18.250		Yes
5	Front Height (+/-.25in.)	12.500	12.250		12.750		Yes
6	Rear Height (+/-.25in.)	12.063	11.813		12.313		Yes
7	Air Induction System						
8	Primary Air						
9	Primary Air Inlet Area [sq. in.] (+/- 5%)	7.800	7.410		8.190		Yes
10	Airwash Gap (+/- 5%)	0.313	0.297		0.328		Yes
11	Secondary Air						
12	(Six Holes) Secondary Inlet Diameter (+/-5%)	0.375	0.356		0.394		Yes
13	Gasket						
14	Door Gasket Length (+/-.25in.)	59.000	58.750		59.250		Yes
15	Door Gasket Diameter (+/- 5%)	0.625	0.594		0.656		Yes
16	Door Gask Manufacturer - Ametec						
17	Glass Gasket Length (+/-.25 in.)	50.500	50.250		50.750		Yes
18	Glass Gasket Width (+/- 5%)	1.000	0.950		1.050		Yes
19	Glass Gasket Thickness (+/- 5%)	0.188	0.178		0.197		Yes
20	Glass Gasket Manufacturer - Ametec						
21	Flue Collar Diameter (+/- 5%)	6.000	5.700		6.300		Yes
22	Top Exit Location [From side of hole to side of stove] (+/-.25in.)	7.500	7.250		7.750		Yes
23	[From back of hole to back of stove] (+/-.25in.)	1.813	1.563		2.063		Yes
24	[From top of stove to top of flue collar] (+/-.25in.)	1.500	1.250		1.750		Yes
25	Brick						
26	Thickness (+/-.25in.)	1.250	1.000		1.500		Yes
27	Width (+/-.25in.)	4.000	3.750		4.250		Yes
28	Height (+/-.25in.)	9.000	8.750		9.250		Yes
29							
30	Paint finish						
31	All parts completely painted						
32	Door gasket rope installed properly						
33	Glass installed properly						
34	Heat shield installed properly (weld-on standard)						
35	Missed welds						
36	Burrs on handles						
37	Instructions, warranty card and spring handles in unit						
38	Proper brick in unit						
39	Vermiculite properly installed in unit						
40	Proper air control function						
41	Outside air boot installed properly						
42							
	Serial Number		Date of Manufacture				

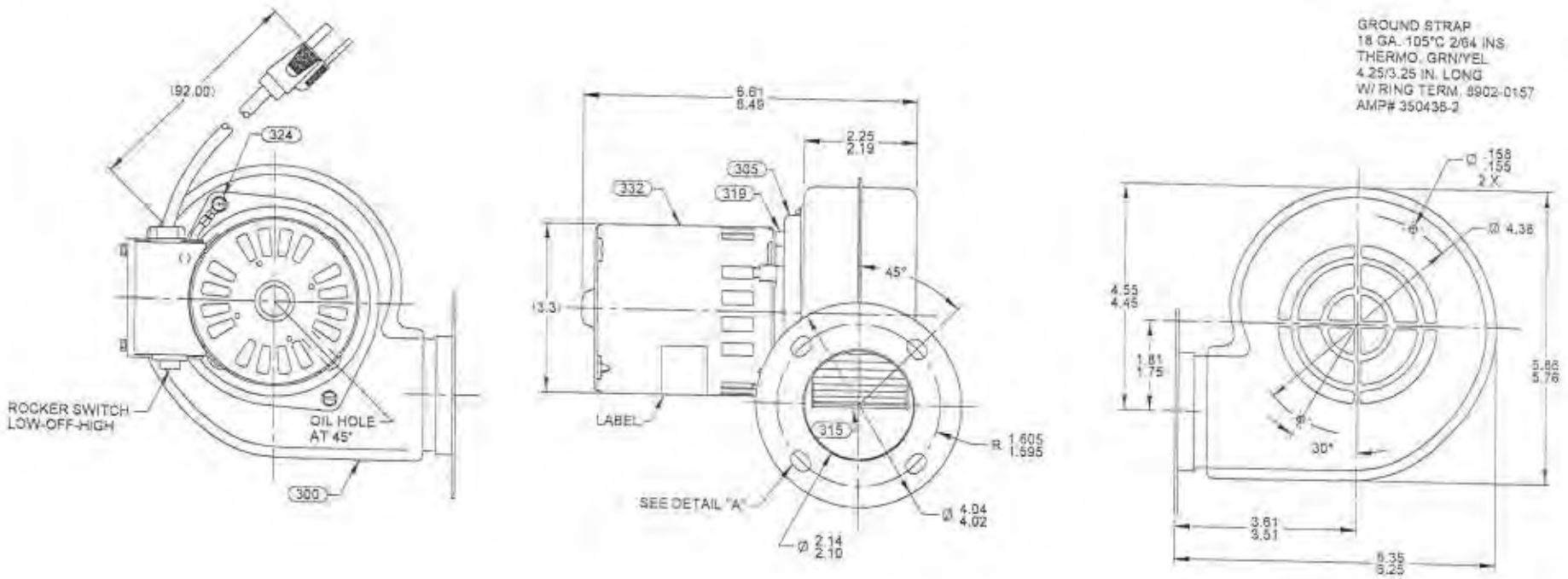
NOTES:

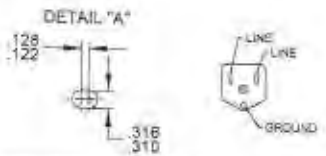
1. ASSEMBLE GROUND LEAD WITH PC 324 SCREW AS SHOWN.
2. CENTER OF HOLES IN FLANGE 90° APART.
3. LOCATE IMPELLER .180/.100 FROM MOUNTING CUP.
4. PACK 1 PER CONTAINER,8 PER MASTER CONTAINER. 192 MAX. PER PALLET, PACKING ASSY.: 8785-4000, 6 CONTAINERS PER LAYER; 4 LAYERS PER PALLET, P.S. 8883-4200 AND P.S. 8883-4406.
5. INSPECTION TEST FIXTURE IS REQUIRED.

APPLICATION	WOOD BURNING STOVE	R	rA	FR	X	S	C	F	E	A
THERMALLY PROTECTED		06	21	30	F	02	FU	6	1	4
CUSTOMER	ENGLAND STOVE WORKS									
CUSTOMER PART NO.	AC-16									

CORDSET DATA
18 GA. 105°C SJT
3 COND. BLACK
WHITE, GREEN

GROUND STRAP
18 GA. 105°C 2/64 INS.
THERMO. GRN/YEL
4.25/3.25 IN. LONG
W/ RING TERM. 8902-0157
AMP# 350436-2





TYPICAL PERFORMANCE TEST DATA BLOCK 1/2 EXHAUST OPPOSITE CUTOFF			
AT 115 VOLTS 60 HZ.			
	R.P.M.	WATTS	AMPS
HIGH	3000	67	.65
LOW	2450	58	.61
BLOWER WEIGHT 4.5 LBS			END PLAY .050/.010

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± .010, DECIMALS .XX ± .01, .XXX ± .005, ANGLES ±1°

APPROVALS		DATE
DRAWN	JMH	01/16/2006
CHECKED	BGP	01/16/2006
FINISH COLOR	FLAT BLACK	

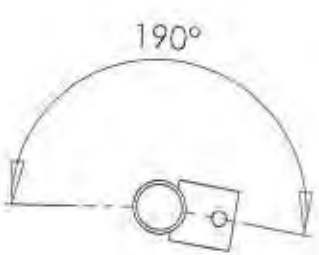
FASCO MOTORS GROUP
AC MOTOR/BLOWER DIVISION

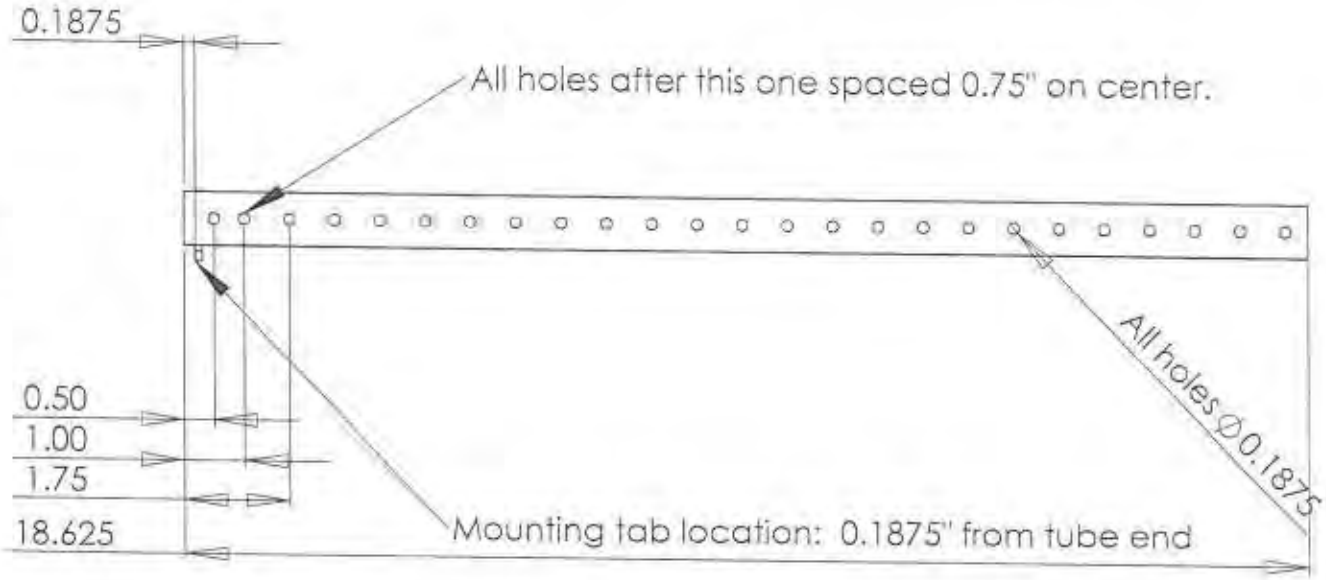
TITLE: BLOWER ASSEMBLY

SIZE	DWG NO	REV
B	7021 4784	35

DO NOT SCALE DRAWING | SHEET 1 OF 1

A-13 05 1-30





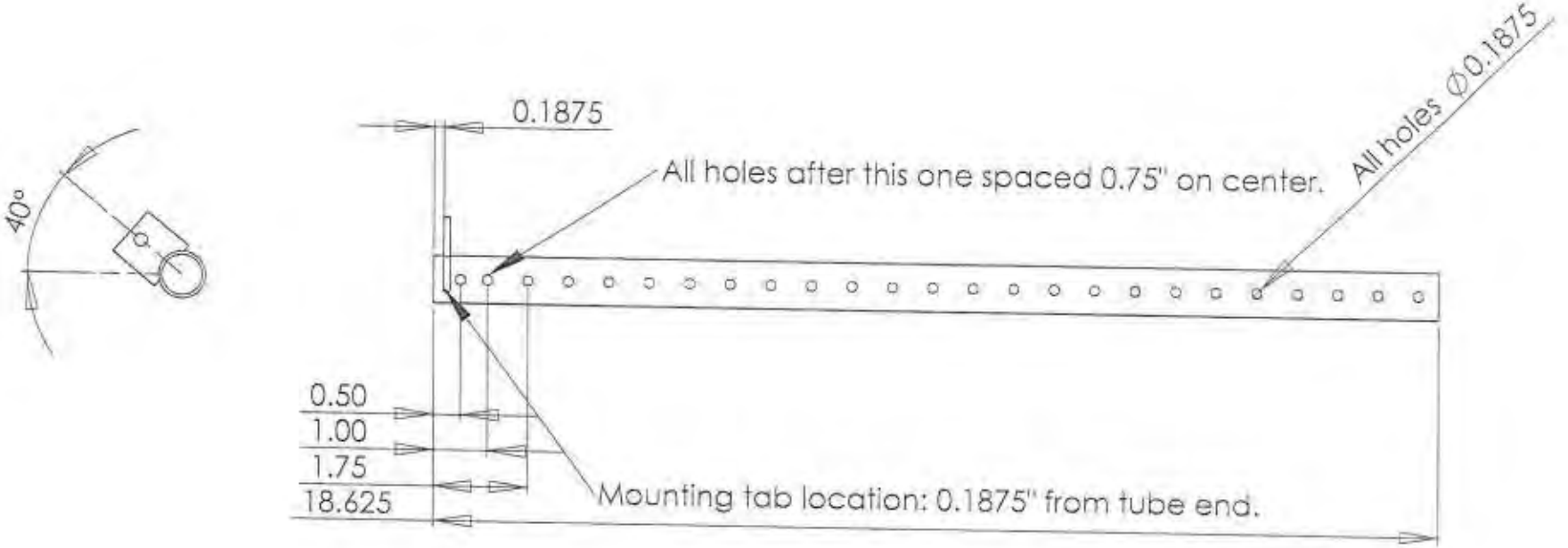
		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/16 ANGULAR: BEND ± 0.5 deg. TWO PLACE DECIMAL ± .01 THREE PLACE DECIMAL ± .005	DRAWN	CJP	6/1/09
			CHECKED		
			ENG APPR	CJP	6/1/09
			MFG APPR		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL 0.875" OD, .065" Wall .304 SS	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

TITLE:

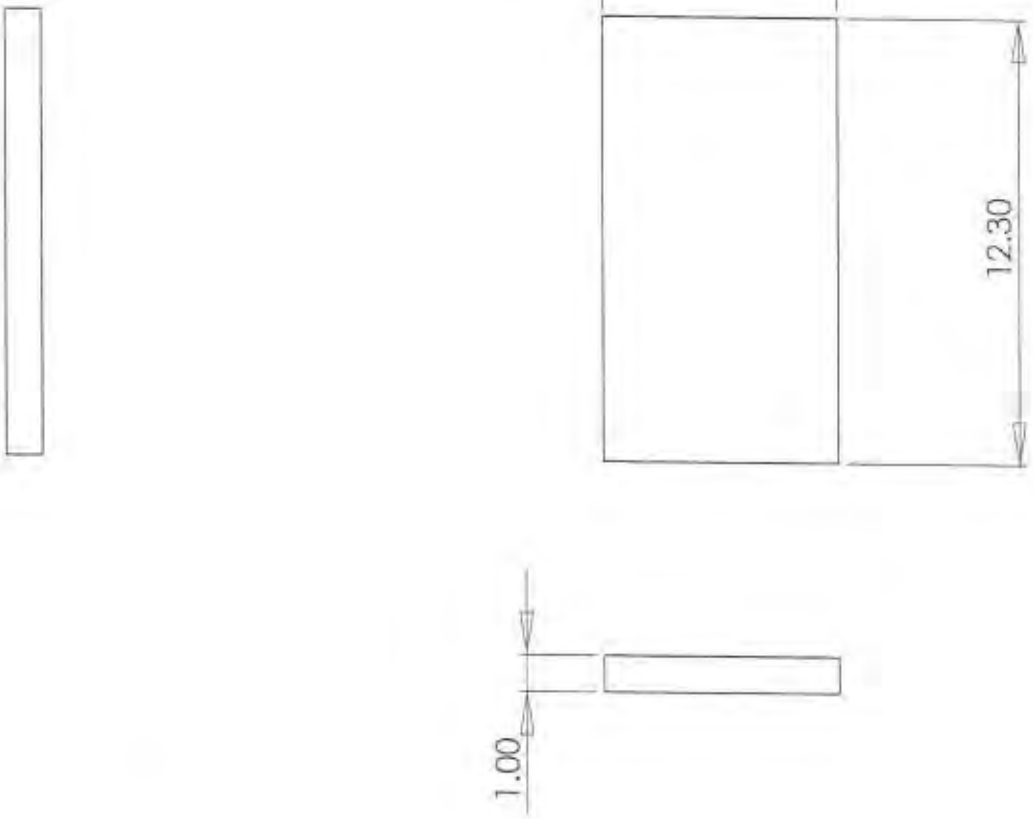
17-VL Front Secondary Tube

SIZE	DWG. NO.	REV
A	AC-17BTF	X

SCALE: 1:3



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/16 ANGULAR: BEND ± 0.5 deg. TWO PLACE DECIMAL ± .01 THREE PLACE DECIMAL ± .005	DRAWN	CJP	6/1/09	TITLE: 17-VL Rear Secondary Tube
			CHECKED			
			ENG APPR.	CJP	6/1/09	
			MFG APPR.			
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.			
		MATERIAL .875" OD, .065" Wall 304 SS	COMMENTS:			SIZE A / DWG. NO. AC-17BTR / REV X
NEXT ASSY	USED ON	FINISH				
APPLICATION		DO NOT SCALE DRAWING				SCALE: 1:3

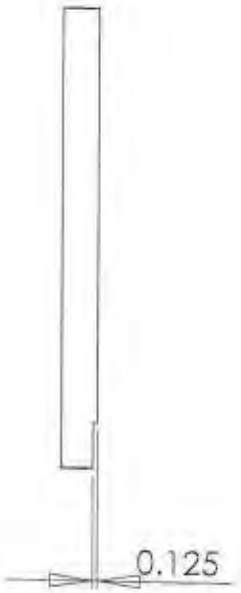


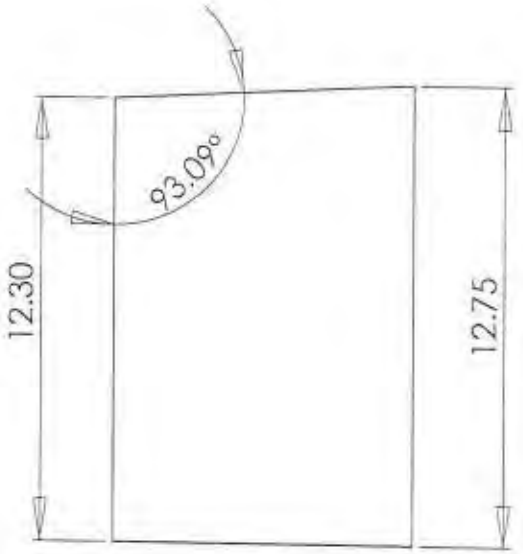
		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/16 ANGULAR: BEND ± 0.5 deg. TWO PLACE DECIMAL ± .01 THREE PLACE DECIMAL ± .005	DRAWN	CJP	6/2/09
			CHECKED		
			ENG APPR.	CJP	6/2/09
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL 600kg/m3 Skamolex	COMMENTS: Two per unit		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

TITLE:
Rear Refractory

SIZE	DWG. NO.	REV
A	06022009-5	X

SCALE: 1:5





		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/16 ANGULAR: BEND ± 0.5 deg. TWO PLACE DECIMAL ± .01 THREE PLACE DECIMAL ± .005	DRAWN	CJP	6/2/09
			CHECKED		
			ENG APPR.	CJP	6/2/09
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL 600kg/m3 Skamolex	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

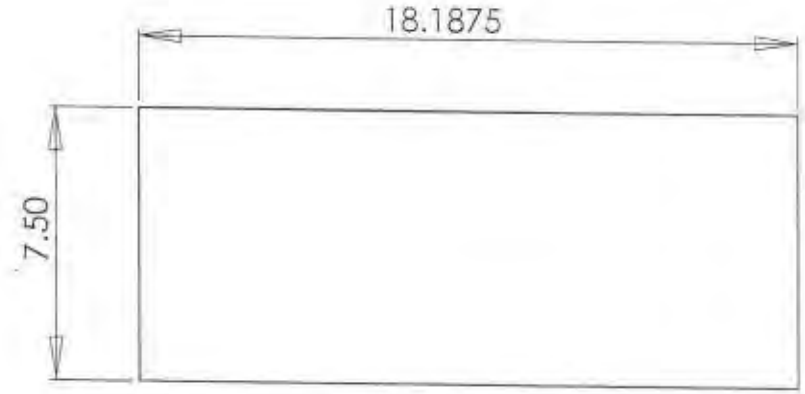
TITLE: Left Refractory

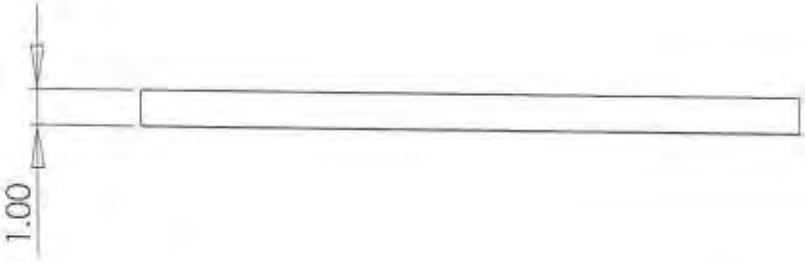
SIZE	DWG. NO.	REV
A	06022009-6	X

SCALE: 1:5

9 - 17 OF 1 - 30

5 4 3 2 1





		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/16 ANGULAR: BEND ± 0.5 deg. TWO PLACE DECIMAL ± .01 THREE PLACE DECIMAL ± .005	DRAWN	CJP	6/2/09
			CHECKED		
			ENG APPR.	CJP	6/2/09
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL 600kg/m3 Skamolex	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

TITLE:

Baffle Refractory

SIZE	DWG. NO.	REV
A	06022009-5	X

SCALE: 1:5

5 4 3 2 1

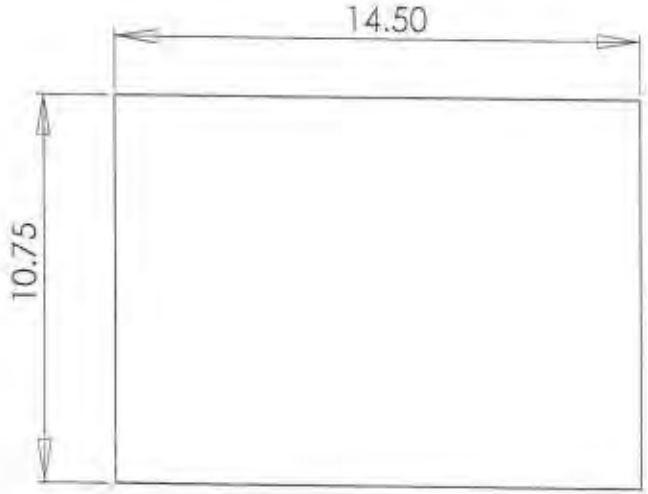
AMATEX CORPORATION

45 PRIMROSE DRIVE ▪ LACONIA, NH 03246
TELEPHONE: 866-524-2552 ▪ FAX: 866-924-3526

PRODUCT DATA SHEET

Style	10-864KR-05
Description	Thermoglass High Density Knit Rope
Diameter (inch)	5/8 Inch OD
Ft. Per Lb.	10.4 +/- 5%
Ft. per 34# Box	354
Temperature	To 1000F
Put up	34# box bulk
Availability	White Graphite Black

HOME OFFICE
1032 STANBRIDGE STREET ▪ BOX 228 ▪ NORRISTOWN, PA 19404-0228 U.S.A.
TELEPHONE: 610-277-6100 ▪ 800-441-9680 ▪ FAX: 610-277-6106
MANUFACTURERS OF INDUSTRIAL TEXTILE PRODUCTS



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/16 ANGULAR: BEND ± 0.5 deg. TWO PLACE DECIMAL ± .01 THREE PLACE DECIMAL ± .005	DRAWN	CJP	6/9/09
			CHECKED		
			ENG APPR.	CJP	6/9/09
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL 5mm Ceramic Glass	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

TITLE:

Ceramic Viewing Glass

SIZE	DWG. NO.	REV
A	AC-G40	X

SCALE: 1:5

1-20 OF 1-30

5 4 3 2 1

AMATEX CORPORATION
45 PRIMROSE DRIVE ■ LACONIA, NH 03246
TELEPHONE: 603-524-2552 ■ FAX: 603-524-3526

PRODUCT DATA SHEET

Style:	G316B11-08
Description:	Thermoglass Window Gasket
Width (Inches)	1 +/- 1/16"
Thickness (MILS)	188 +/- 1-%
Ft. Per Lb.	28.0 +/- 10%
Lbs. Per 100 FT.	3.57 +/- 10%
Ounces Per Sq. Yard	8.23 +/- 10%
Picks Per Inch(double)	12 +/- 1
Temperature	To 1000F (538C)
Put Up	25 Lbs. cartons

HOME OFFICE
1032 STANBRIDGE STREET ■ BOX 228 ■ NORRISTOWN, PA 19404-0228 U.S.A.
TELEPHONE: 610-277-6100 ■ 800-441-9680 ■ FAX: 610-277-6106
MANUFACTURERS OF INDUSTRIAL TEXTILE PRODUCTS

MATERIAL SAFETY DATA SHEET

Date 4/21/03

SECTION I - MANUFACTURER'S INFORMATION

NAME: Amatex Corp.
ADDRESS: 1032 Stanbridge St.
Norristown, PA 19404
TELEPHONE: 610-277-6100

PRODUCT: BASE MATERIAL:
Fiberglass textile; Yarn, Fabric, Braiding, Rope
COATING: None

Textile glass fibers are continuous filament strands woven, knitted, or braided into a textile product. It may be used plain, heat treated, dyed, or coated

SECTION II - OSHA HAZARDOUS SUBSTANCES

COMPONENT	Wt. %	CAS NO.	ACGIH TLV (8-hr TWA)	OSHA PEL (8-hr TWA)
Fiberglass	98 – 100%	65997-17-3		
Nonrespirable	>98%		5 mg/m^3, Inhalable fraction	15 mg/m^3, total dust
Respirable	<1%		3 mg/m^3, PNOC	5 mg/m^3, respirable
Respirable particulate with fiber like dimensions (glass shards)	<0.002%		NE	1 fiber/cc, aspect ratio >5:1
Size	0 – 2%	mixture	NE	NE
Coating	None			

TWA – time weighted average; PNOR – particles not otherwise classified
NE – none established

SECTION III - PHYSICAL DATA

Boiling Point: N/A
Melting Point: N/A
Percent Volatile: N/A
Solubility in Water: Insoluble
Specific Gravity (water=1): 2.60
Vapor Density: N/A
Vapor Pressure: N/A
Evaporation Rate: N/A
APPEARANCE AND ODOR: Base fabric – White, tan when heat treated; no odor

SECTION IV - FIRE AND EXPLOSION DATA

FLASH POINT: N/A METHOD USED: N/A
AUTO IGNITION TEMP: N/A FLAMMABILITY LIMITS: N/A
EXTINGUISHING MEDIA: Water, chemical foam, dry chemical, CO2, and/or smother
SPECIAL FIRE FIGHTING INSTRUCTIONS: N/A
UNUSUAL FIRE AND EXPLOSION HAZARDS: N/A

SECTION V - HEALTH HAZARD DATA

PRIMARY ROUTES OF EXPOSURE: Inhalation, skin, eye
HEALTH HAZARDS:
ACUTE: Possible mechanical irritation accompanied by itching or dermatitis
CHRONIC: None known.
HEALTH HAZARD EVALUATION

One of the health questions about textile glass fiber is whether or not it can cause cancer in people. The diameter of these continuous filament fibers make them too large to be inhaled into the lungs by people. No health authority has found, and no test has shown, that glass textile fibers cause cancer in people. As a result of these findings, the World Health Organization and other authoritative bodies do not classify textile glass fiber as a carcinogen.

One of the reasons that people continue to have concerns about fiberglass and cancer are studies such as the 1997 study from the Institute of Occupational Medicine (IOM) in Edinburgh, Scotland. This study found that animals exposed to an extremely high dose of a durable E glass micro fiber, with average diameters less than 1 micron, developed lung scarring and tumors, including cancer of the lining of the lung (mesothelioma). The IOM study results are consistent with previously published research indicating that high doses of durable, fine diameter fibers can cause disease in experimental animals.

Although our continuous filaments are an E glass, they are not the same as the E micro fibers tested in the IOM study.

SECTION VI - EMERGENCY AND FIRST AID PROCEDURES

INHALATION: If irritation develops move to fresh air.
SKIN CONTACT: If fibers irritate the skin wash with soap and water. To avoid further irritation do not rub or scratch.
EYE CONTACT: Flush eyes with water for 15 minutes or until fibers are removed.
INGESTION: N/A

FOR ALL CONDITIONS SEEK MEDICAL ATTENTION IF IRRITATION PERSISTS.

SECTION VII - EMPLOYEE PROTECTION

THE FOLLOWING PRECAUTIONS ARE ADVISABLE DURING CUTTING AND FABRICATION OR OTHER OPERATIONS THAT COULD GENERATE DUST WHILE USING THIS MATERIAL.

VENTILATION: General dilution and/or local exhaust ventilation should be provided as necessary to maintain exposures below occupational exposure limits (See Section II)

RESPIRATORY PROTECTION: A properly fitted NIOSH/MHSA approved dust respirator should be used when: 1) the level of dust in the air exceeds occupational exposure limits (See Section II); 2) or if irritation occurs. Use respiratory protection in accordance with

your company's respiratory protection program, and OSHA regulations under 29 CFR 1910.134.

EYE PROTECTION: Use safety glasses, goggles, or face shields, as necessary.

PROTECTIVE CLOTHING: Wear loose fitting long sleeve shirt and pants or other appropriate clothing to protect those areas where irritation is experienced. Skin irritation is known to occur at pressure points such as around neck, wrist, waist, and fingers.

WORK AND HYGIENIC PRACTICES: Handle in accordance with good industrial hygiene and safety practices.

- Remove dust and fibers from the skin after exposure. Be careful not to rub or scratch irritated areas which could force fibers into the skin. Fibers should be washed off.
- Use of barrier creams can, in some instances, can be helpful.
- Use vacuum equipment to remove fibers and dust from clothing. Wash contaminated clothing separately and wipe out washer/sink in order to prevent loose fibers and dust from contaminating other laundry.
- Use vacuum equipment to clean work surfaces.

SECTION VIII - REACTIVITY DATA

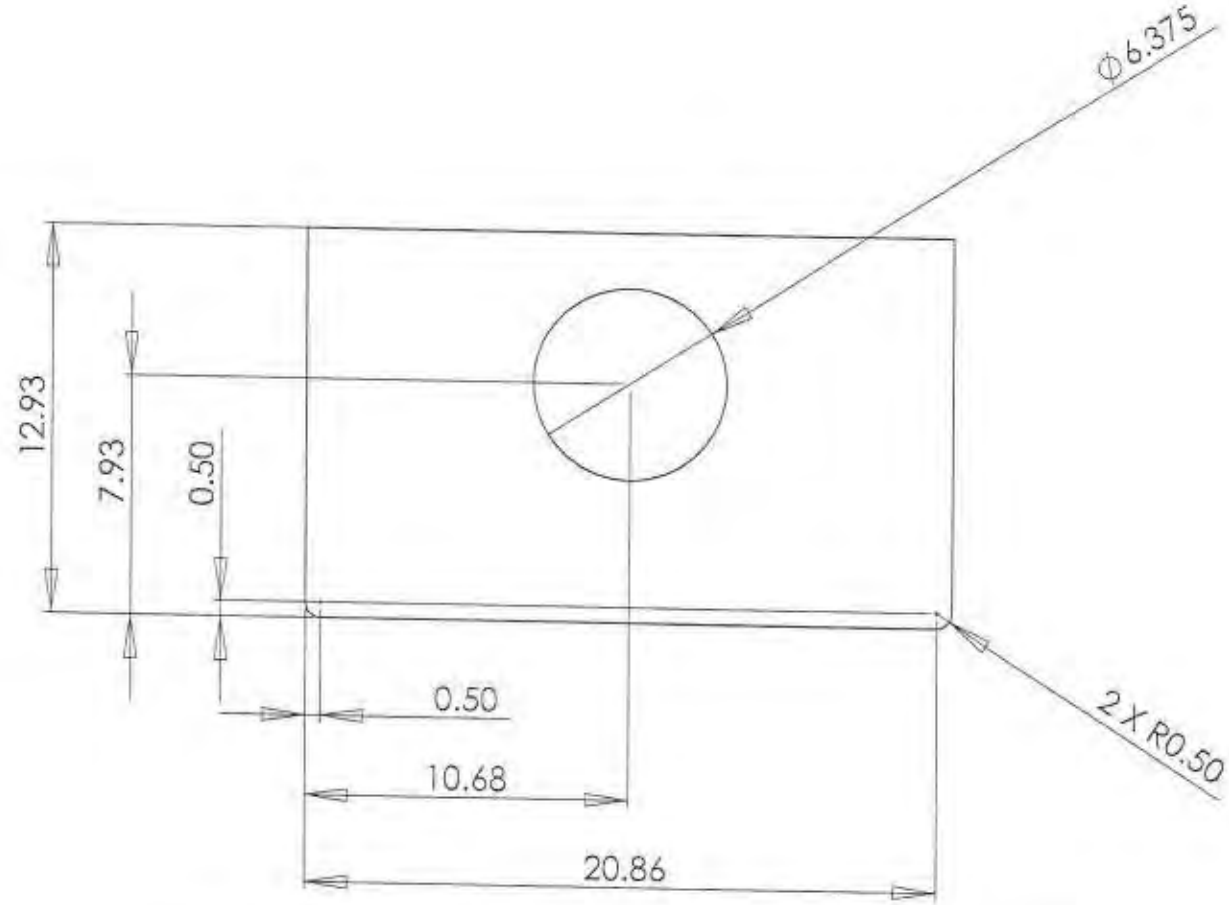
STABILITY: Product is stable.
INCOMPATIBILITY: Phosphoric acid, hydrofluoric acid, and strong hydroxides.
HAZARDOUS DECOMPOSITION PRODUCTS: CO, CO^2. Other undetermined compounds could be released in small quantities.
HAZARDOUS POLYMERIZATION: Will not occur.

SECTION IX - STORAGE PRECAUTIONS

N/A

SECTION X- ENVIRONMENTAL PROTECTION

SPILLS: N/A
WASTE DISPOSAL: Dispose as a solid non-hazardous waste, in accordance with federal, state, and local regulations.



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/16 ANGULAR: BEND ± 0.5 deg. TWO PLACE DECIMAL ± .01 THREE PLACE DECIMAL ± .005	DRAWN	CJP	05/27/09
			CHECKED		
			ENG APPR.	CJP	05/27/09
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL 7 gauge	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

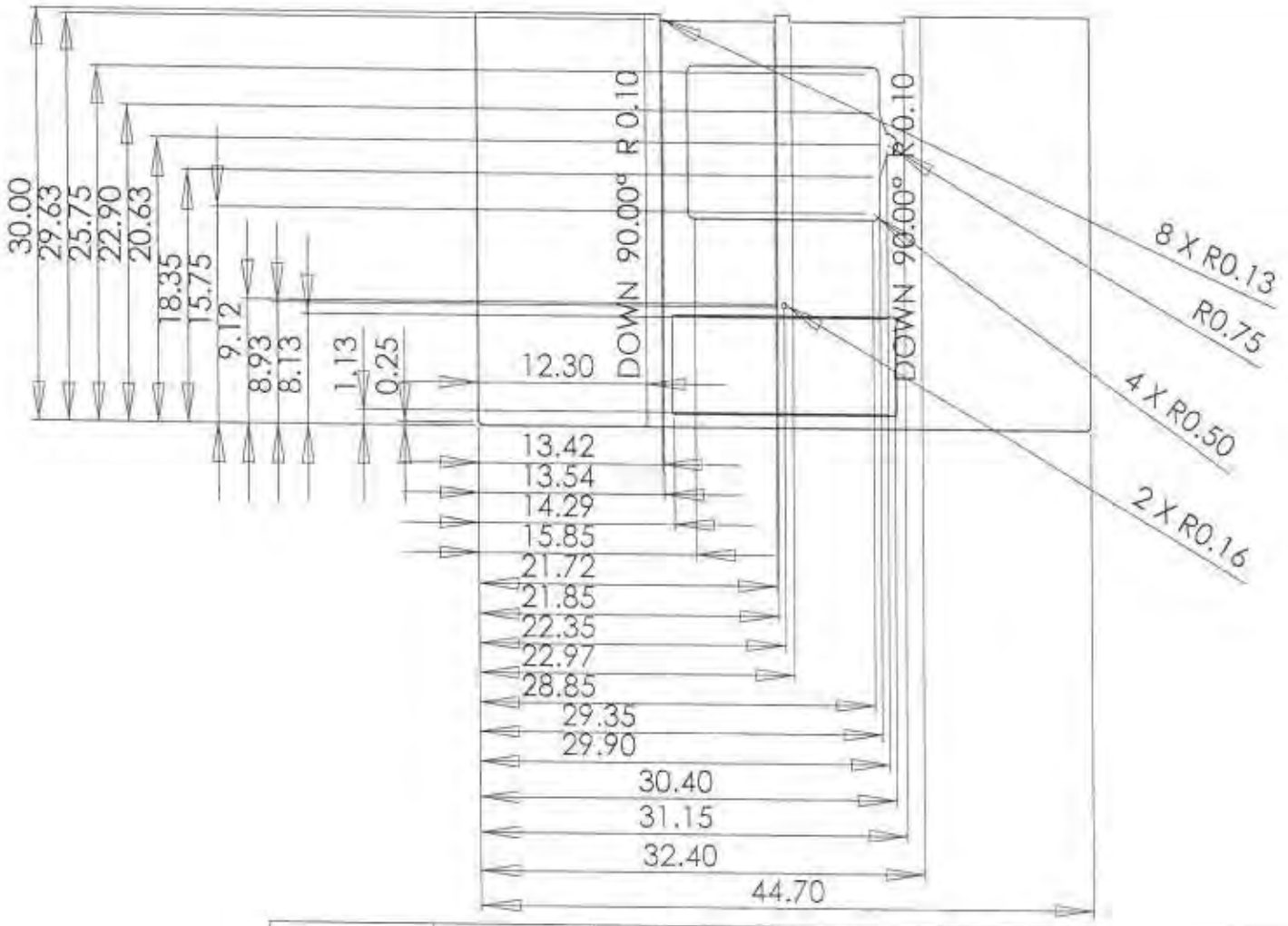
TITLE: Outer Top

SIZE	DWG. NO.	REV
A	1400	X

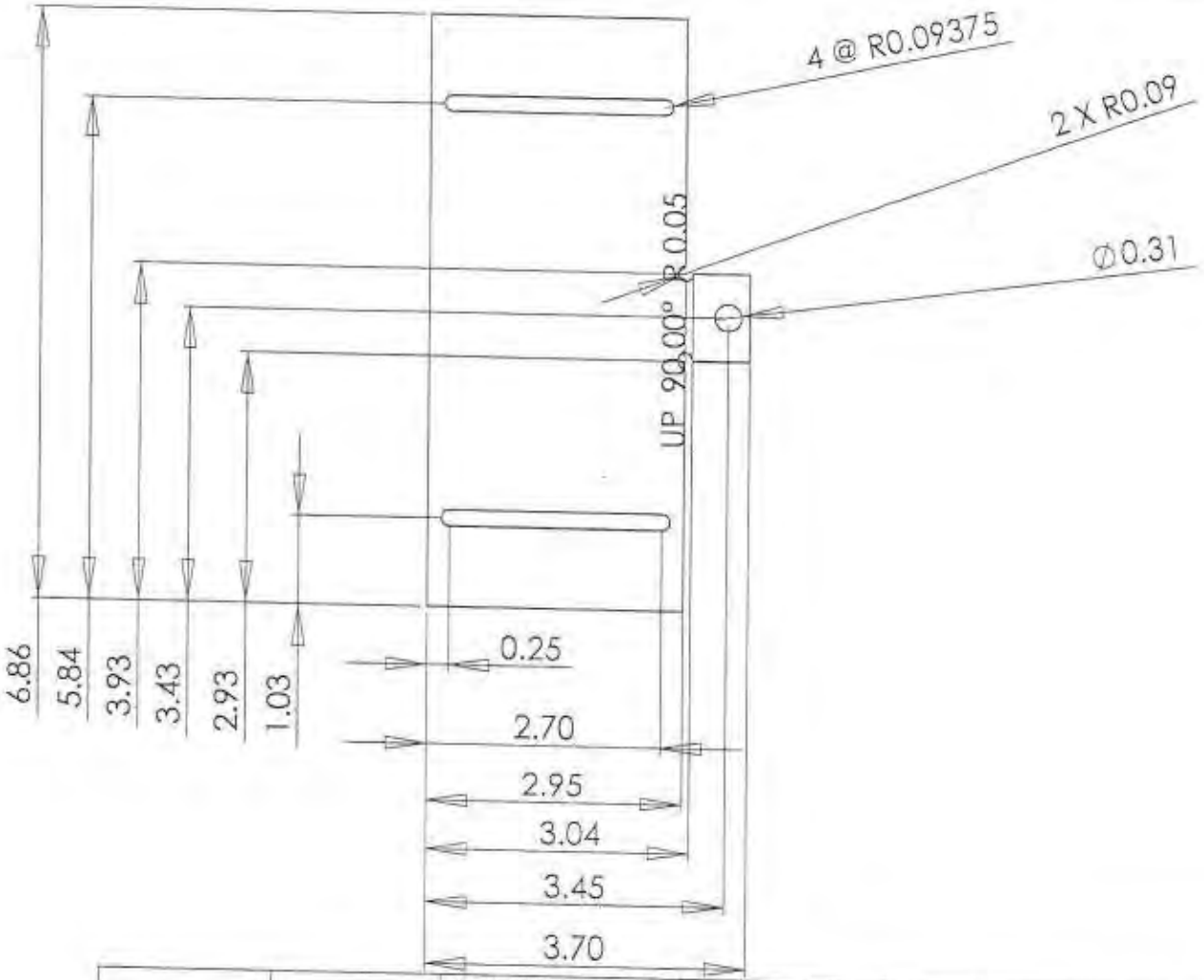
SCALE: 1:6

1-25 OF 1-30

5 4 3 2 1



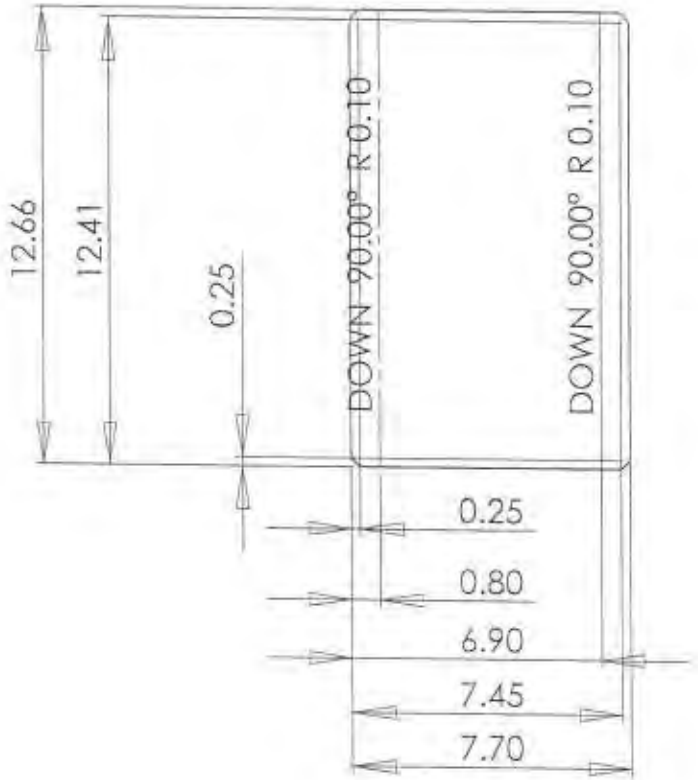
		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/16 ANGULAR: BEND ± 0.5 deg TWO PLACE DECIMAL ± .01 THREE PLACE DECIMAL ± .005	DRAWN	CJP	05/27/09	TITLE: Outer Hull
			CHECKED			
			ENG APPR.	CJP	05/27/09	
			MFG APPR.			
		INTERPRET GEOMETRIC TOLERANCING PER	Q.A.			
		MATERIAL 7 gauge	COMMENTS:			SIZE A / DWG. NO. 1401 / REV X
NEXT ASSY	USED ON	FINISH				
APPLICATION		DO NOT SCALE DRAWING				SCALE: 1:12



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/16 ANGULAR: BEND ± 0.5 deg. TWO PLACE DECIMAL ± .01 THREE PLACE DECIMAL ± .005	DRAWN	CJP	05/27/09	TITLE: Air Control Slide
			CHECKED			
			ENG APPR.	CJP	05/27/09	
			MFG APPR.			
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.			
		MATERIAL 11 gauge	COMMENTS:			SIZE A / DWG. NO. 1406 / REV X
NEXT ASSY	USED ON	FINISH				
APPLICATION		DO NOT SCALE DRAWING				SCALE: 1:2

5 4 3 2 1

6-27 OF 1-30



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/16 ANGULAR: BEND ± 0.5 deg. TWO PLACE DECIMAL ± .01 THREE PLACE DECIMAL ± .005	DRAWN	CJP	05/27/09
			CHECKED		
			ENG APPR.	CJP	05/27/09
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL 11 gauge	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

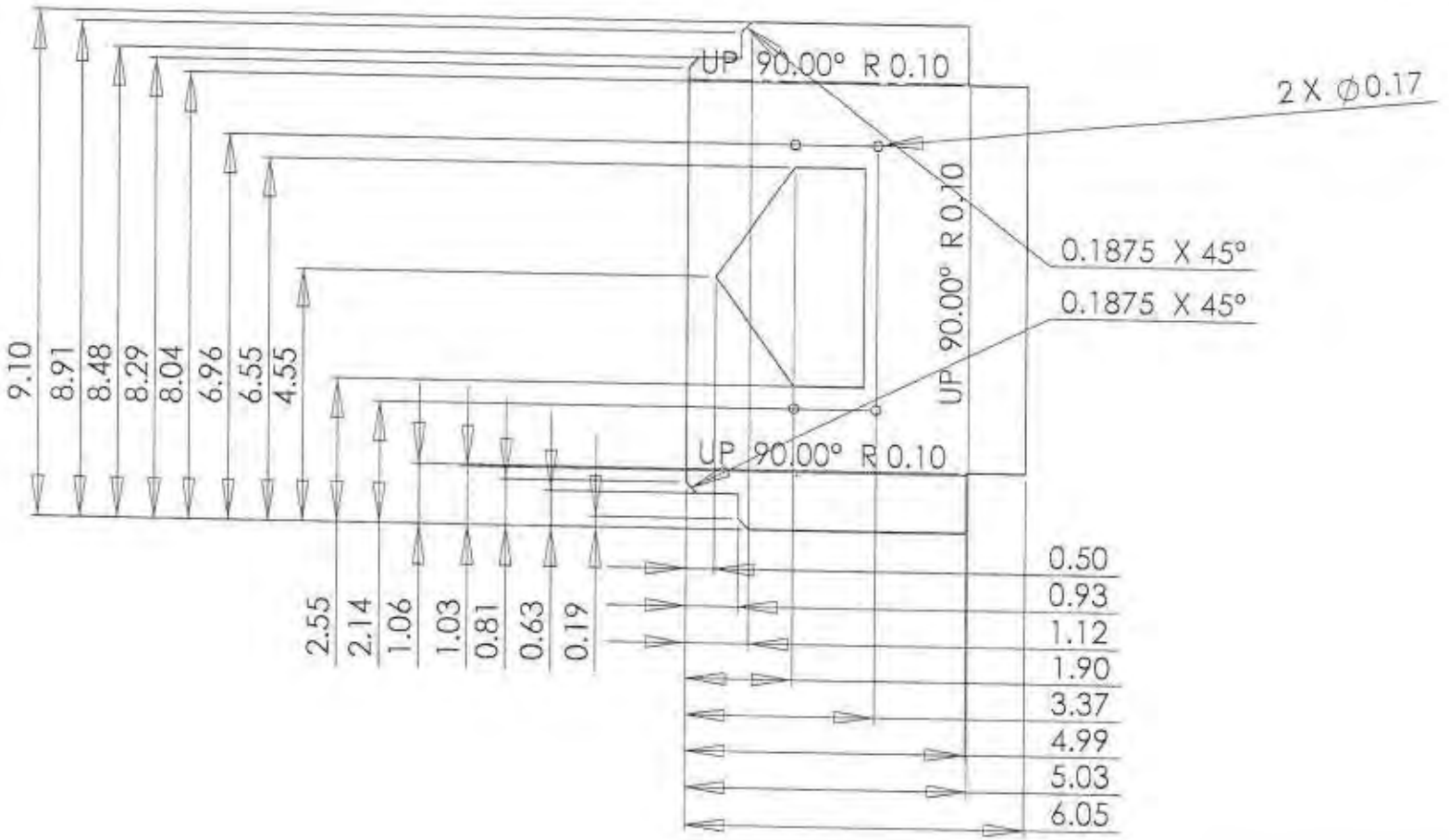
TITLE: Secondary Feed Channel

SIZE	DWG. NO.	REV
A	1417	X

SCALE: 1:5

4 - 28 OF 1 - 30

5 4 3 2 1



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL± 1/16 ANGULAR: BEND ± 0.5 deg. TWO PLACE DECIMAL ± .01 THREE PLACE DECIMAL ± .005	DRAWN	CJP	05/29/09
			CHECKED		
			ENG APPR.	CJP	05/29/09
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL 11 gauge	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

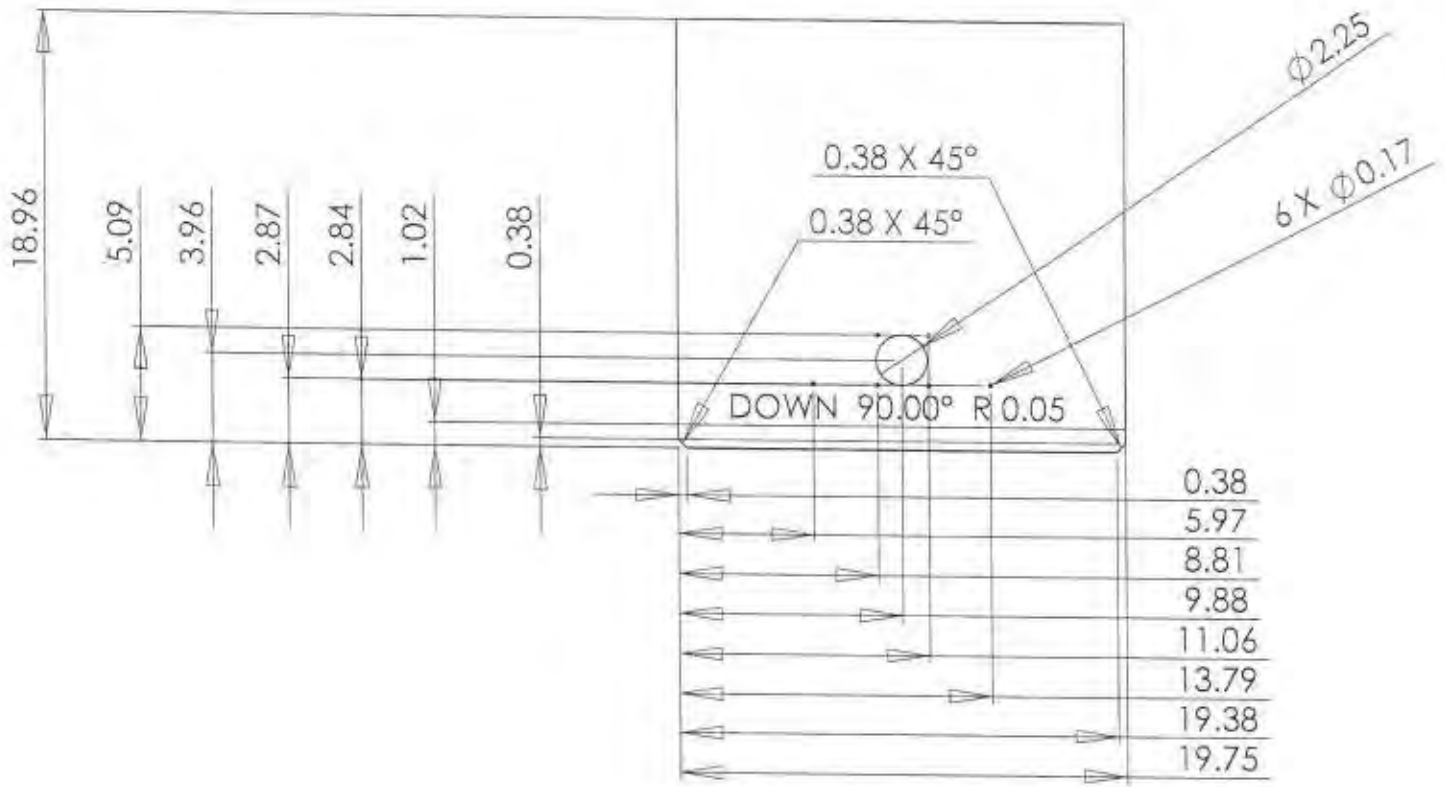
TITLE: Intake Air Channel

SIZE	DWG. NO.	REV
A	1411	X

SCALE: 1:3

9 - 29 OF 1 - 30

5 4 3 2 1



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/16 ANGULAR: BEND ± 0.5 deg. TWO PLACE DECIMAL ± .01 THREE PLACE DECIMAL ± .005	DRAWN	CJP	05/29/09	TITLE: Heat Shield
			CHECKED			
			ENG APPR.	CJP	05/29/09	
			MFG APPR.			
			Q.A.			
		INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:			
		MATERIAL: 14 gauge				SIZE: A / DWG. NO.: 1414 / REV: X
NEXT ASSY	USED ON	FINISH:				
APPLICATION		DO NOT SCALE DRAWING				SCALE: 1:8

Section 2

Quality Assurance/Quality Control

QUALITY ASSURANCE/QUALITY CONTROL

OMNI follows the guidelines of ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories," and the quality assurance/quality control (QA/QC) procedures found in *OMNI*'s Quality Assurance Manual.

OMNI's scope of accreditation includes, but is not limited to, the following:

- ANSI (American National Standards Institute) for certification of product to safety standards.
- To perform product safety testing by the International Accreditation Service, Inc. (formerly ICBO ES) under accreditation as a testing laboratory designated TL-130.
- To perform product safety testing as a "Certification Organization" by the Standards Council of Canada (SCC).
- Serving as a testing laboratory for the certification of wood heaters by the U.S. Environmental Protection Agency.

This report is issued within the scope of *OMNI*'s accreditation. Accreditation certificates are available upon request.

Sample Analysis

Analysis Worksheets
Tared Filter and Beaker Data
Solvent Blank Data

OMNI-Test Laboratories, Inc.

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: England's Stove Works
Model: 17-VL
Project #: 428-S-02-3 Tracking #: 1424
Date: 11/2/09 Test Crew: BO Davis Run #: 1
Sample Train #: A Train assembled by: BO Davis
Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI -
Audit weight ID #: OMNI – 00131 (Balance audit mfr. std; 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter	11/4/09	11:05	.6206	.5001	95	71	BL
Lab ID #	11/10/09	0920	.6160	.5001	8	71	BL
ID # N880	11/11/09	0745	.6153	.5001	6.3	71	BL
Tare wt. .3788							
D/T in desiccator 11/3/09 10:00							
Preliminary wt.: .6230							
Rear Filter	11/4/09	11:05	.5771	.5001	95	71	BL
Lab ID #	11/10/09	0920	.5767	.5001	8	71	BL
ID # N879							
Tare wt. .5748							
D/T in desiccator 11/3/09 1000							
Preliminary wt.: .5779							
Acetone Rinse	11/6/09	1615	117.3783	.5001	12	71	BL
Lab ID #	11/10/09	0920	117.3769	.5001	8	71	BL
Beaker # 2244	11/11/09	0745	117.3769	.5001	6.3	71	BL
Tare wt. 117.3698							
Volume 75 ml							
Cleaned by: BL							
Solvent #: SA081							
D/T in desiccator: 11/5/09 1545							
Preliminary wt.: 117.3790							

Technician signature: BO Date: 11/6/09

2-4 OF 2-50

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: England's Stove Works
Model: 17-VL
Project #: 428-S-02-3 Tracking #: 1424
Date: 11/3/09 Test Crew: BDAMS Run #: 2
Sample Train #: A Train assembled by: BDAMS
Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI - 342
Audit weight ID #: OMNI – 00131 (Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter Lab ID # ID # N 882 Tare wt. .5770 D/T in desiccator 11/4/09 0830 Preliminary wt.: .5837	11/5/09	1415	.5835	.5001	11	70	MK
	11/10/09	0920	.5829	.5001	8	71	BK
	11/11/09	0745	.5819	.5001	6.3	71	BK
	11/12/09	0925	.5820	.5001	7.2	71	BK
Rear Filter Lab ID # ID # N 881 Tare wt. .5771 D/T in desiccator: 11/4/09 0830 Preliminary wt.: .5762	11/5/09	1415	.5762	.5001	11	70	MK
	11/9/09	0850	.5762	.5001	9	70	MK
Acetone Rinse Lab ID # Beaker # 2097 Tare wt. 109.5745 Volume 75 ml Cleaned by: MK Solvent #: SA081 D/T in desiccator: 11/5/09 1545 Preliminary wt.: 109.5836	11/6/09	1615	109.5827	.5001	12	71	BK
	11/10/09	0920	109.5819	.5001	8	71	BK
	11/11/09	0745	109.5820	.5001	6.3	71	MK

Technician signature: BK Date: 11/11/09

2 - 5 OF 2 - 50

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: England's Stove Works
Model: 17-VL
Project #: 428-S-02-3 Tracking #: 1424
Date: 11/4/09 Test Crew: B Davis Run #: 3
Sample Train #: A Train assembled by: BS
Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI -
Audit weight ID #: OMNI – 00131 (Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter	11/5/09	16:10	.6011	.5001	12	71	BK
Lab ID #	11/10/09	0920	.5980	.5001	8	71	BK
ID # N884	11/11/09	0745	.5981	.5001	6.3	70	BK
Tare wt. .5785							
D/T in desiccator 11/4/09 1550							
Preliminary wt.: .6010							
Rear Filter	11/5/09	16:10	.5779	.5001	12	71	BK
Lab ID #	11/9/09	08:50	.5778	.5001	9	70	BK
ID # N883							
Tare wt. .5771							
D/T in desiccator: 11/4/09 1550							
Preliminary wt.: .5778							
Acetone Rinse	11/10/09	09:50	108.8696	.5001	8	71	BK
Lab ID #	11/11/09	0745	108.8698	.5001	6.3	70	BK
Beaker # 2113							
Tare wt. 108.8642							
Volume 50 ml							
Cleaned by: BS							
Solvent #: SA081							
D/T in desiccator: 11/9/09 0900							
Preliminary wt.: 108.8707							

Technician signature: B Davis Date: 11/11/09

2-6 OF 2-50

OMNI-Test Laboratories, Inc.

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: England's Stove Works
Model: 17-VL
Project #: 428-S-02-3 Tracking #: 1424
Date: 10/5/07 Test Crew: BR Run #: 4
Sample Train #: A Train assembled by: BR
Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI - 342
Audit weight ID #: OMNI – 00131 (Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter Lab ID # ID # N886 Tare wt. .5754 D/T in desiccator 11/6/09 0926 Preliminary wt.: .5878	11/7/09	10:25	.5872	.5001	10	70	BR
	11-10-09	09:20	.5860	.5001	8	71	JC
	11-11-09	07:45	.5860	.5001	6.3	71	JC
Rear Filter Lab ID # ID # N885 Tare wt. .5787 D/T in desiccator: 11/6/09 0825 Preliminary wt.: .5800	11/7/09	10:25	.5790	.5001	10	70	BR
	11-10-09	09:20	.5789	.5001	8	71	JC
Acetone Rinse Lab ID # Beaker # 855 Tare wt. 105.5962 Volume 50 ml Cleaned by: MC Solvent #: SA081 D/T in desiccator: 11/9/09 900 Preliminary wt.: 105.6019	11-10-09	09:20	105.6004	.5001	8	71	JC
	11-11-09	07:45	105.6003	.5001	6.3	71	JC

Technician signature: JC Date: 11-11-09

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: England's Stove Works
Model: 17-VL
Project #: 428-S-02-3 Tracking #: 1424
Date: 11/6/09 Test Crew: BA Jones Run #: 5
Sample Train #: A Train assembled by: BR
Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI - 342
Audit weight ID #: OMNI – 00131 (Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter Lab ID # ID # N888 Tare wt. .5246 D/T in desiccator 11/4/09 1630 Preliminary wt.: .5480	11/7/09	0900	.5478	.5001	9	70	BR
	11/10/09	0920	.5457	.5001	8	71	BR
	11/11/09	0745	.5459	.5001	6.3	71	BR
Rear Filter Lab ID # ID # 887 Tare wt. .5434 D/T in desiccator: 11/6/09 1630 Preliminary wt.: .5431	11/9/09	0900	.5427	.5001	9	72	BR
	11/10/09	0920	.5428	.5001	8	71	BR
Acetone Rinse Lab ID # Beaker # 1027 Tare wt. 106.9565 Volume 50 ml Cleaned by: BR Solvent #: S4081 D/T in desiccator: 11/9/09 0900 Preliminary wt.: 106.9622	11/10/09	0920	106.9610	5001	8	71	BR
	11/11/09	0745	106.9609	.5001	6.3	71	BR

Technician signature: BR Date: 11/11/09

2-8 OF 2-50

Filt Ires

Date/Time placed in Desiccator: 10/21/09 0810 Technician: B Davis Balance ID # 023

Thermo/Hygro meter ID #: 342 Audit Weight ID #: 131 (Balance audit mfr. Std.: 500 ± 0.72

Beaker Size/ID# (102)47mm	Date: 10/22/09 Time: 0818 RH%: 17 T (F): 70 Initials: BA	Date: 10/23/09 Time: 0930 RH%: 18 T (F): 71 Initials: BA	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
	.5001	.5001						
N866	.5719	.5720	✓		England	17-UL	428-S-02-3	
N867	.5724	.5724	✓		England	17-U7	428-S-02-3	
N868	.5724	.5723	✓					
N869	.5736	.5738	✓					
N870	.5737	.5738	✓					
N871	.5723	.5723	✓					
N872	.5717	.5719	✓					
N873	.5737	.5738	✓					
N874	.5340	.5739	✓					
N875	.5730	.5731	✓					
N876	.5737	.5739	✓					
N877	.5728	.5728	✓					
N878	.5772	.5772	✓					
N879	.5746	.5748	✓		England	17-UL	428-S-02-3	1

Final Technician signature: [signature] Date: 10/23/09

2-9 OF 2-50

Filt ares

Date/Time placed in Desiccator: 10/21/09 0810 Technician: B Davis Balance ID # 023

Thermo/Hygro meter ID #: 342 Audit Weight ID #: 131 (Balance audit mfr. Std.: 500 ± 0.72

Beaker Size/ID# 102/47mm	Date: 10/22/09 Time: 0818 RH%: 17 T (F): 70 Initials: M	Date: 10/23/09 Time: 0930 RH%: 18 T (F): 71 Initials: M	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
	.5001	.5001						
N880	.5787	.5788	✓		England Stove	17-UL	428-S-023	1
N881	.5771	.5771	✓		England Stove	17-UL	428-S-023	2
N882	.5768	.5770	✓		England Stove	17-UL	428-S02-3	2
N883	.5770	.5771	✓		England Stove	17-UL	428-S-02-3	3
N884	.5785	.5785	✓		England Stove	17-UL	428-S-02-3	3
N885	.5784	.5787	✓		England Stove	17-UL	428-S-02-3	4
N886	.5755	.5754	✓		England Stove	17-UL	428-S-02-3	4

Final Technician signature: B Davis Date: 12/14/09

2-10 OF 2-50

Filt res

Date/Time placed in Desiccator: 11/4/09 1320 Technician: B Davis Balance ID # 023

Thermo/Hygro meter ID #: 342 Audit Weight ID #: 131 (Balance audit mfr. Std.: 500 ± 0.72

Beaker Size/ID# (102/47mm)	Date: 11/5/09 Time: 1615 RH%: 14 T (F): 71 Initials: BA	Date: 11/6/09 Time: 1250 RH%: 19 T (F): 72 Initials: BA	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
N887	.5437	.5434	✓		England Stove	17-VL	428-S-02-3	5
N888	.5299	.5296	✓		England Stove	17-VL	428-S-02-3	5
N889	.5325	.5322	✓					
N890	.5336	.5338	✓					
N891	.5326	.5324	✓					
N892	.5369	.5364	✓					
N893	.5361	.5358	✓		GHP	Small	413-S-03-8.3	2
N894	.5312	.5311	✓		GHP	Small	413-S-03-8.3	2
N895	.5318	.5319	✓		GHP	Small	413-S-03-8.3	3
N896	.5306	.5303	✓		GHP	Small	413-S-03-8.3	3
N897	.5308	.5307	✓					
N898	.5352	.5349	✓					
N899	.5300	.5301	✓					
N900	.5275	.5275	✓		GREEN ENERGY	KOZ 25	438-S-02-3	7
					GHP	Small	413-S-03-8.3	5

Final Technician signature: B Davis Date: 12-14-09

2-11 OF 2-50

Beaker Tares

Date/Time placed in Desiccator: 11/4/09 1320 Technician: B Davis Balance ID # 023

Thermo/Hygro meter ID #: 342 Audit Weight ID #: 131 (Balance audit mfr. Std.: 500 ± 0.72

Beaker Size/ID# (250ml)	Date: 11/5/09 Time: 1645 RH%: 13 T (F): 71 Initials: BD	Date: 11/19/09 Time: 10:15 RH%: 12 T (F): 72 Initials: BD	Date: 11/20/09 Time: 0900 RH%: 10 T (F): 72 Initials: BD	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
2042	101.7253	101.7249 ✓						
2113	108.8646	108.8642 ✓			England Stove	17-UL	428-S-02-3	3
211	99.6131	99.6126 ✓						
2020	106.1070	106.1066 ✓						
2296	117.8237	117.8231 ✓	117.8234 ✓		GHP	Small	413-S-03-8.3	2
1027	106.9569	106.9565 ✓			England Stove	17-UL	428-S-02-3	5
2201	103.4050	103.4045 ✓			GHP	Small	413-S-03-8.3	5
T12	106.9664	106.9659 ✓			GHP	Small	413-S-03-8.3	4
T5	109.5516	109.5511 ✓			GHP	Small	413-S-03-8.3	3
1021	108.5830	108.5822 ✓	108.5826 ✓		GHP	Small	413-S-03-8.3	1
248	95.3499	95.3495 ✓						
904	101.3363	101.3360 ✓						
855	105.5967	105.5962 ✓			England Stove	17-UL	428-S02-3	4
2021	102.2152	102.2150 ✓						

Final Technician signature: B Davis Date: 12/14/09

Beaker Tares

Date/Time placed in Desiccator: 7/8/09 / 8:00 Technician: S. Bitton Balance ID # 23

Thermo/Hygro meter ID #: 343 Audit Weight ID #: 131 (Balance audit mfr. Std.: 500 ± 0.72

Beaker Size/ID# 250ml	Date: 7/10/09 Time: 9:00 RH%: 10.3 T (F): 74.1 Initials: SB	Date: 7/13/09 Time: 7:30 RH%: 20.3 T (F): 74.8 Initials: SB	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
2187	104.8864	104.8805			Health N Home	2700 I	OG1-S-526-3	3
2042	101.7242	101.7245						
2258	116.1971	116.1972			Health N Home	2700 I	OG1-S-526-3	4
2244	117.3695	117.3698			England Stove	17-UL	428-S-02.3	1
924	94.8015	94.8019			Health N Home	2700 I	OG1-S-526-3	2
2100	92.5348	92.5352			Health N Home	2700 I	OG1-S-526-3	4
1041	110.8181	110.8185						
2097	109.5745	109.5745			England Stove	17-UL	428-S-02-3	2
AB	111.2465	111.2467			Health Home	2700 I	OG1-S-526-3	1

Final Technician signature: [signature] Date: 7/13/09

2-13 OF 2-50

Acetone Solvent Blank Analysis Worksheet

Date: 9-24-08 By: K. Morgan Balance ID #: OMNI – 00023

Manuf. Lot #: E1809045P Solvent Bottle #: SA-081 Audit Weight ID #: OMNI – 00131

(Balance audit mfr. std.: 500 ± 0.72 mg)

Mls. Sample	ID No.	Tare Weight	Date & Time in Dessicator	Weighing Record				Initials	Calculations & Remarks
				Date	Time	Weight	Audit Weight		
150	2005	100.5015	9-25-08 & 07:15	9-26-08	07:15	100.5010	.5001	IL	100.5014 - 100.5015 = -0.1 mg = ϕ mg/ml
				9-26-08	14:15	100.5014	.5001	IL	
150	2169	107.4986	9-25-08 & 07:15	9-26-08	07:15	107.4987	.5001	IL	107.4991 - 107.4986 = 0.5 mg / 150 ml = .0033 mg/ml
				9-26-08	14:15	107.4991	.5001	IL	
			___ & ___						ϕ + .0033 / 2 = .0017 mg/ml

Technician Signature: K. Morgan Date: 9-26-08

Checked by: [signature] Date: 9-26-08 Approved by: [signature] Date: 9-29-08

2-14 OF 2-50

Calibrations

Methods 28 and 5G

ID #	Lab Name/Purpose	Log Name	Attachment Type
1	Dry Gas Meter	Standard Test Meter – Rockwell Int'l	Calibration Certificate
23	Scale/Analytical Balance	Analytical Balance – Mettler Instrument	Calibration Certificate
32	Vaneometer	Vaneometer/Air Velocity Meter – Dwyer	Calibration Log
131	500 mg Weight	Standard Weight, 500 mg – Ohaus	Calibration Certificate
132	10 lb Weight	Standard Weight, 10 lb.	Calibration Log
209	Barometer	Barometer – Princo	Manual Cover
287	Manometer	Microtector – Dwyer	Manual
288	Scale	Platform Scale – Weigh-Tronix	Examination Report
289	Control Module	Automated Emissions Sampling Box – Apex	Calibration Logs
342	Hygrometer/Thermometer	Digital Hygrometer – Omega	Calibration Certificate
363	Stopwatch	Stopwatch – Sportline	Calibration Log
394	Magnehelic Gauge	0-1" Magnehelic Gauge – Dwyer	Calibration Log

DICK MUNNS COMPANY

Liquid and Gas - Flowmeter Calibration Service
10572 Calle Lee - 138 • Los Alamitos, California 90720
Telephone (714) 827-1215 • Telefax (714) 827-0823

CERTIFICATE OF CALIBRATION

Client Name:	OMNI TEST LABS	Calibration Date:	06-08-2009
Reference Number:	PO# OTL-09-586	Calibration Due:	06-08-2010
Instrument Manufacturer:	ROCKWELL	Procedure:	NAVAIR-17-20MG-02
Instrument Description:	P.D. METER	Calibration Fluid:	Air @14.7PSIA 70F.
Model Number:	S-275	Standard(s) Used:	A4 DUE 2-2011
Serial Number:	6843901(ID#OMNI00001)	NIST Traceability Per:	MS13141,MS13431
Rated Uncertainty:	+/- .5% RD.	Ambient Conditions:	758 mmHGA, 49% RH, 70F
Uncertainty Given:	+/- .4898 RD.@ 95%; K=2	Certificate/File:	426663.09

	IND. SCFM	ACT. SCFM	C.FACTOR
1	0.250	0.250	1.00001
2	0.500	0.500	1.00001
3	0.751	0.750	0.99868
4	1.001	1.000	0.99901
5	1.501	1.500	0.99934
6	2.002	2.000	0.99901
7	2.504	2.500	0.99841
8	3.005	3.000	0.99835
9	3.506	3.500	0.99830
10	4.009	4.000	0.99777

Avg Y = 0.999 JL 6-11-09

** REPAIRED: NOT WORKING AS RECEIVED; INTERNAL MOVEMENT REPAIRED **

All instruments used in the performance of the above calibration have direct traceability to the National Institute of Standards and Technology (NIST). The accuracy ratio between the calibration standards used and the unit under test is a minimum of 4:1, unless otherwise noted. Calibration has been performed per the above listed procedure number, in accordance with ISO 10012:2003,17025, ANSI/NCSL-Z-540-1, and/or MIL-STD-45662A. CONDITION AS: RECEIVED(X), AS LEFT(X). MUST BE USED WITH ATTACHED DATA SHEET ( )YES, (X)NO

Calibration Performed By:

PABLO ACOSTA PA

Approved By:

R.L. MUNNS

Certificate of Calibr...ion

Certificate Number: **426976** Rev: **A**

JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

OnSite

PO: OTL-09-580
Order Date: 05/14/2009

0723.01

Property #:	OMNI-00023	Calibrated on:	05/14/2009
User:		*Recommended Due:	11/14/2009
Department:		Environment:	23 °C 39 % RH
Make:	Mettler	As Received:	Within Tolerance
Model:	AE200	As Returned:	Within Tolerance
Serial #:	E17657	Action Taken:	Calibrated
Description:	Scale 205g	Technician:	92
Procedure:	DCN 500818/500887		
Accuracy:	±0.0004g ±1 LSD		

Remarks:

Refer to attachment for measurement results.
Certificate Amended due to incorrect uncertainty calculations.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
503A	Rice Lake	1mg-200g (Class 0)	Weight Set	10/08/2009	410509

* Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired

Reviewer

Cynthia Calcote
Inspector

5 2 0 1 7 OF 2 4 5 0

Supplemental Calibration Report

Certificate Number: **426976** Rev: **A**

JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

Customer:	Omni-Test Laboratories		
Property ID:	OMNI-00023	PO:	OTL-09-580
Make:	Mettler	Order Date:	05/14/2009
Model:	AE200	Procedure:	DCN 500818/500887
Serial #:	E17657	Calibrated on:	05/14/2009
Description:	Scale 205g	Technician:	92

Parameter / Measurement Description	Range	Unit	Reference	UUT	Variance	Min	Max	Uncertainty	Accredited = ✓
Before/After									
Force									
		mg	1.00	1.0	0.00	0.5	1.5	2.6E-9	✓
		mg	10.00000	10.0000	0.00000	9.9995	10.0005	2.6E-9	✓
		mg	100.00000	100.0000	0.00000	99.9995	100.0005	2.6E-9	✓
		mg	500.00000	500.0000	0.00000	499.9995	500.0005	2.6E-9	✓
		g	1.00000	1.0000	0.00000	0.9995	1.0005	2E-6	✓
		g	20.00000	20.0000	0.00000	19.9995	20.0005	2E-6	✓
		g	50.00000	50.0000	0.00000	49.9995	50.0005	2E-6	✓
		g	100.00000	100.0000	0.00000	99.9995	100.0005	2E-6	✓
		g	150.00000	150.0001	-0.00011	149.9995	150.0005	2E-6	✓
		g	185.00000	185.0000	0.00000	184.9995	185.0005	2E-6	✓
		g	200.00000	200.0001	-0.00011	199.9995	200.0005	2E-6	✓

CALIBRATION RECORD

Vaneometer Air Velocity Meter – OMNI-00032

CALIBRATION/SERVICE RECORD			
DATE	BY	RESULTS	DATE OF NEXT CALIBRATION
3/10/98	BD	Installed new vane from factory	9/10/98
9/3/98	BD	Installed new vane from factory	3/3/99
3/8/99	JS	Installed new vane from factory	9/8/99
9/10/99	BD	Installed new vane from factory	3/10/00
3/10/00	BD	Installed new vane from factory	9/10/00
9/13/00	BD	Installed new vane from factory	3/13/01
5/4/01	BD	Installed new vane from factory	11/4/01
11/30/01	BD	Installed new vane from factory	5/30/02
3/20/02	BD	Installed new vane from factory	9/20/02
9/14/02	BD	Installed new vane from factory	3/14/03 ov
3/14/03	BD	Installed new vane from factory	9/14/03
1-19-04	BD	Installed new vane from factory	7-19-04
7-16-04	BR	Installed new vane from factory	1-16-05
1-16-05	BR	Installed new vane from factory	7-16-05
7-14-05	BR	Installed new vane from factory	1-14-06
1-14-06	CL	Installed new vane from factory	7-14-06
7-10-06	BR	Installed new vane from factory	1-10-07
1-10-07	BR	Installed new vane from factory	7-10-07
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	

Certificate of Calibration

Certificate Number: **413631**

JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: **OTL-08-490**
Order Date: 11/04/2008

ACCREDITED
0723.01

Property #: OMNI-00131
User:
Department:
Make: Ohaus
Model: 500mg
Serial #: 27503
Description: 500mg WEIGHT
Procedure: DCN 500901
Accuracy: CLASS F

Calibrated on: 11/05/2008 MRH
*Recommended Due: 11/05/~~2009~~ 2013
Environment: 18 °C 43 % RH
As Received: Within Tolerance
As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 92

Remarks:
Refer to attachment for measurement results.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
256A	Rice Lake	W0133F	WEIGHT SET	02/08/2010	406054
432A	Sartorius	C-44	Microbalance 5.1g	11/13/2008	384448

* Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired

JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement Institutes (NMI's), or by using natural physical constants, intrinsic standards or ratio calibration techniques. The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2005, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without prior written consent of JJ Calibrations, Inc. JJ Calibrations, Inc. quality system has been assessed and accredited to ISO/IEC 17025:2005

Reviewer

Inspector

5 Issued 11/05/2008 Rev # 13

2-20 OF 2-50

Supplemental Calibration Report

Certificate Number: **413631**

JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

Customer:	Omni-Test Laboratories		
Property ID:	OMNI-00131	PO:	OTL-08-490
Make:	Ohaus	Order Date:	11/04/2008
Model:	500mg	Procedure:	DCN 500901
Serial #:	27503	Calibrated on:	11/05/2008
Description:	500mg WEIGHT	Technician:	92

Parameter Measurement Description	Range	Unit	Reference	UUT	Variance	Min	Max	Uncertainty	
Before/After								Accredited = ✓	
Mass									
		mg	500.0000	500.123	-0.1230	499.28	500.72	0.00011	✓

2 - 21 OF 2 - 50

OMNI Environmental Service
OMNI-Test Laboratories, Inc.
Beaverton, OR Phone (503) 643-3788

SCALE WEIGHT CALIBRATION DATA SHEET

Weight to be calibrated: 132

ID Number: 132

Standard Calibration Weight: 274

ID Number: 274

Scale Used: ~~185~~ 1K 288

ID Number: ~~185~~ 1K 288

Date: 2-07-08 By: K. Morgan

Standard Weight (A) (Lb.)	Weight Verified (B) (Lb.)	Difference (A - B)	% Error
10.0	10.0	0	0

*Acceptable tolerance is 1%.

This calibration is traceable to NIST using calibrated standard weights.

Technician signature: K. Morgan Date: 2-07-08

OMNI 00209

Instruction Booklet

for use with

PRINCO

Fortin type mercurial

Barometers

453
National
Weather
Service
Type

469
NOVA™
Economy
Model

Manufactured by

PRINCO INSTRUMENTS, INC.
1020 Industrial Blvd.
Southampton, Pa. 18966-4095
U.S.A.

Phone: 215 355-1500
Fax: 215 355-7766

Negative Pressure or Vacuum Measurement

Zero the gage. Connect the source of vacuum or negative pressure to the right side gage connection (5) and proceed as described under Positive Pressure Measurement Section above. Remember that the pressure measured in this way is negative.

Differential Pressure Measurement

Differential pressures may be measured by connecting the higher (more positive) pressure to the left connection (2) and the lower pressure to the right connection (5).

Storage

Turn meter circuit switch to "off" position and withdraw the point well clear of fluid (by turning Micrometer counter-clockwise) when gage is not in use. This will conserve the batteries and minimize build-up of oxides, etc., on the point. Keep the unit covered and in an area free of strong solvent fumes.

Maintenance

When the meter reading becomes reduced or the pointer movement gets sluggish (with the circuit on and point in fluid), the following should be done:

1. Remove the point (by unscrewing) and clean the tip lightly using fine crocus cloth. Wipe off all grit and dirt with a clean rag, reassemble and recheck meter operation.
2. If the meter operation continues to be sluggish, replace the size AA, 1½ volt battery. (Replace the battery at least once a year to avoid deterioration of battery and damage to gage. Leakproof alkaline battery is recommended.)

To replace the battery, remove center screw (10) located in the back of the electronic enclosure. Cover (9) will come off exposing the battery. Pull the old battery out and push a new battery into the battery holder with the positive (center) terminal to the right (to the end marked with a + on the holder).

If the fluid becomes contaminated and requires replacement; empty old fluid from gage; flush out with clear water and replace with distilled water and Dwyer A126 Fluorescein Green Color Concentrate mixed 3/4 oz. concentrate to each quart of water. (CAUTION: Do not substitute other gage fluids as proper gage operation depends on use of the specified gage fluid to provide proper surface tension, wetting ability and electrolyte capability with unity specific gravity.)

If the gage bore is very dirty, a mild soap solution may be used to aid in cleaning prior to flushing with clear water. (CAUTION: Do not clean with liquid soaps, special solvent, degreasers, aromatic hydro-carbons, etc. Such cleaners and solvents frequently contain chlorine, fluorine, acetone and related compounds which will permanently damage the gage, and prevent proper operation.

If meter becomes inoperative and cannot be made to operate properly by cleaning point tip or replacing battery, return the entire gage to Dwyer Instruments, Inc., for service.

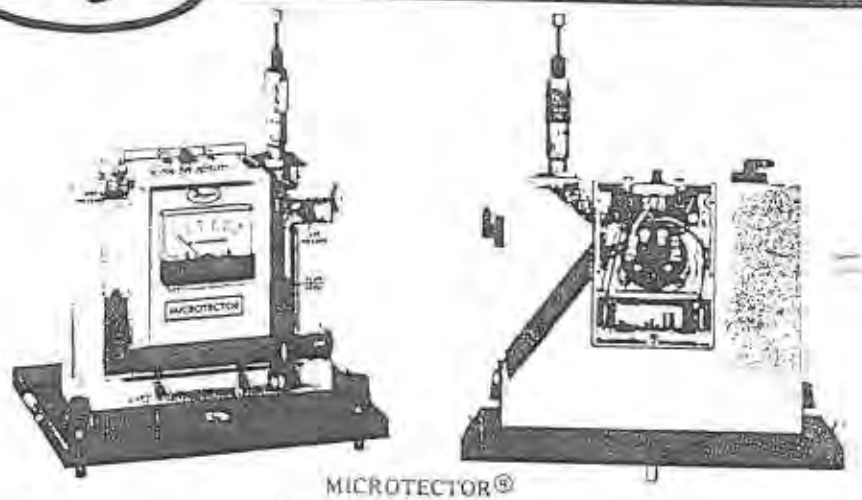
Mirrolector
A Product From
Dwyer Instruments, Inc.
The Low Pressure People

Form No. 38-440190-00
Litho in U.S.A. 1/85

DWYER INSTRUMENTS, INC.
P.O. Box 373, Michigan City, Indiana 46360, U.S.A.
Phone: 219/872-9141

2-24 OF 2-50

MICROTECTOR®
Operating and Maintenance Instructions



MICROTECTOR®
Specifications and Features*

Time Proven Hook Gage Manometer Combined with Modern Electronics For Easier, Faster, More Accurate Precision Measurements.

Accurate and Repeatable to ± .00025 inches water column.

Pressure Range 0-2" w.c. Positive, Negative or Differential Pressures.

Non Toxic and Inexpensive Gage Fluid Consists of Distilled Water Mixed with a Small amount of Fluorescein Green Color Concentrate.

Convenient, Portable, Light Weight, and Self-Contained, the Unit Requires No External Power Connections and is Operated by a 1½ Volt Penlight Cell.

A.C. Detector Current Eliminates Point Plating, Fouling and Erosion.

Micrometer Complies with Federal Specification GGG-C-105A and is Traceable to a Master at the National Bureau of Standards.

Three Point Mounting with Dual Leveling Adjustment and Circular Level Vial Assure Rapid Set Up.

Durablock® Precision Machined Acrylic Plastic Gage Body.

Sensitive 0-50 Microamp D.C. Meter Acts as Detector and Also Indicates Battery and Probe Condition.

Heavy One Half Inch Thick Steel Base Plate Provides Steady Mounting.

Top Quality Glass Epoxy Circuit Board and Solid State Integrated Circuit Electronics.

Electronic Enclosure of Tough Molded Styrene Acrylonitrile Provides Maximum Protection to Components Yet Allows Easy Access to Battery Compartment.

Rugged Sheet Steel Cover and Carrying Case Protects the Entire Unit When Not In Use.

Accessories Included are (2) 3 Foot Lengths Tygon Tubing, (2) 1/8" Pipe Thread Adapters and 3/4 oz. bottle of Fluorscein Green Color Concentrate with Wetting Agent.

Maximum Pressure 100 PSIG (With optional Pipe Thread Connections).

*Patent No. 3,726,142

DWYER INSTRUMENTS, INC.
P. O. BOX 373 • MICHIGAN CITY, INDIANA 46360, U.S.A.
Telephone 219/872-9141

Negative Pressure or Vacuum Measurement

ero the gage. Connect the source of acuum or negative pressure to the right de gage connection (5) and proceed as escribed under Positive Pressure Mea- rement Section above. Remember that e pressure measured in this way is egative.

Differential Pressure Measurement

ifferential pressures may be measured y connecting the higher (more positive) ressure to the left connection (2) and e lower pressure to the right connection 7).

Storage

urn meter circuit switch to "off" posi- on and withdraw "hook" point well ear of fluid (by turning Micrometer ounter-clockwise) when gage is not in se. This will conserve the batteries and inimize build-up of oxides, etc., on the hook." Keep the unit covered and in an ea free of strong solvent fumes.

Maintenance

/hen the meter reading becomes reduced r the pointer movement gets sluggish with circuit on and "hook" point in uid), the following should be done:

Remove the hook point (by unscrew- ing) and clean the tip lightly using fine crocus cloth. Wipe off all grit and dirt with a clean rag, reassemble and recheck meter operation.

If the meter operation continues to be sluggish, replace the size AA, 1½ volt battery. (Replace the battery at least once a year to avoid deteriora- tion of battery and damage to gage. Leakproof alkaline battery is recom- mended.)

o replace the battery, remove center rew (10) located in the back of the electronic enclosure. Cover (9) will come off exposing the battery. Pull the old battery out and push a new battery into the battery holder with the positive (cen- ter) terminal to the right (to the end marked with a + on the holder).

If the fluid becomes contaminated and requires replacement, empty old fluid from gage; flush out with clear water and replace with distilled water and Dwyer A126 Fluorescein Green Color Concen- trate mixed 3/4 oz. concentrate to each quart of water. (CAUTION: Do not substitute other gage fluids as proper gage operation depends on use of the specified gage fluid to provide proper surface tension, wetting ability and electrolyte capability with unity specific gravity.)

If the gage bore is very dirty, a mild soap solution may be used to aid in cleaning prior to flushing with clear water. (CAUTION: Do not clean with liquid soaps, special solvents, degreasers, aro- matic hydro-carbons, etc. Such cleaners and solvents frequently contain chlorine, fluorine, acetone and related compounds which will permanently damage the gage, and prevent proper operation.)

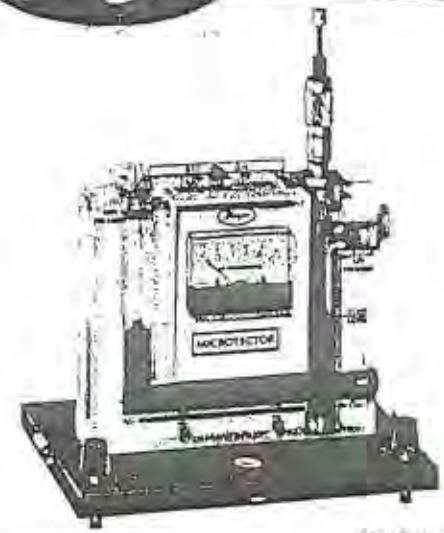
If meter becomes inoperative and cannot be made to operate properly by cleaning "hook" tip or replacing battery, return the entire gage to Dwyer Instruments, Inc., for service.

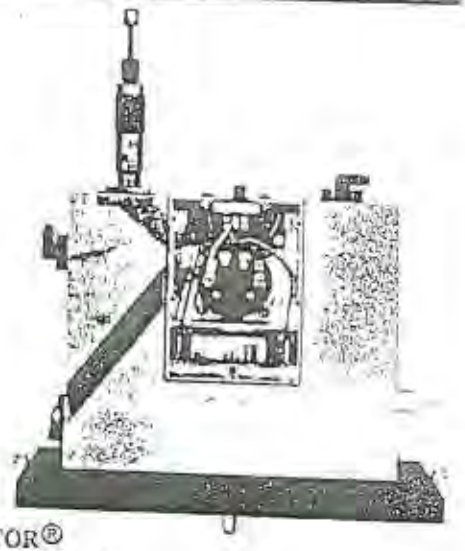
"Microtector" ®
A Product From
Dwyer Instruments, Inc.
"The Low Pressure People"

38-440190-00

DWYER INSTRUMENTS, INC.
P.O. Box 373, Michigan City, Indiana 46360 U.S.A.
Phone: Area 219/ 872-9141
Direct Chicago Line: Area 312/ 733-7883

MICROTECTOR®
Operating and Maintenance Instructions





MICROTECTOR®
Specifications and Features*

Time Proven Hook Gage Manometer Combined with Modern Electronics For Easier, Faster, more Accurate Precision Pressure Measurements.

Accurate and Repeatable to ± .0002 inches water column (.000009 P.S.I.).

Pressure Range 0-2" w.c. Positive, Negative or Differential Pressures.

Non Toxic and Inexpensive Gage Fluid Consists of Distilled Water Mixed with a Small Amount of Dwyer Color and Wetting Agent Concentrate.

Convenient, Portable, Light Weight, and Self-Contained, the Unit Requires No External Power Connections and is Operated by a 1½ Volt Penlight Cell.

A.C. Detector Current Eliminates Hook Plating, Fouling and Erosion.

Micrometer Complies with Federal Specification GGG-C-105A and is Traceable to a Master at the National Bureau of Standards.

Three Point Mounting with Dual Leveling Adjustment and Circular Level Assure Rapid Set Up.

Durablock® Precision Machined Acrylic Plastic Gage Body.

Sensitive 0-50 Microamp D.C. Meter Acts as Detector and Also Indicates Battery and Hook Probe Condition.

Heavy One Half Inch Thick Steel Base Plate Provides Steady Mounting.

Top Quality Glass Epoxy Circuit Board and Solid State-Integrated Circuit Electronics.

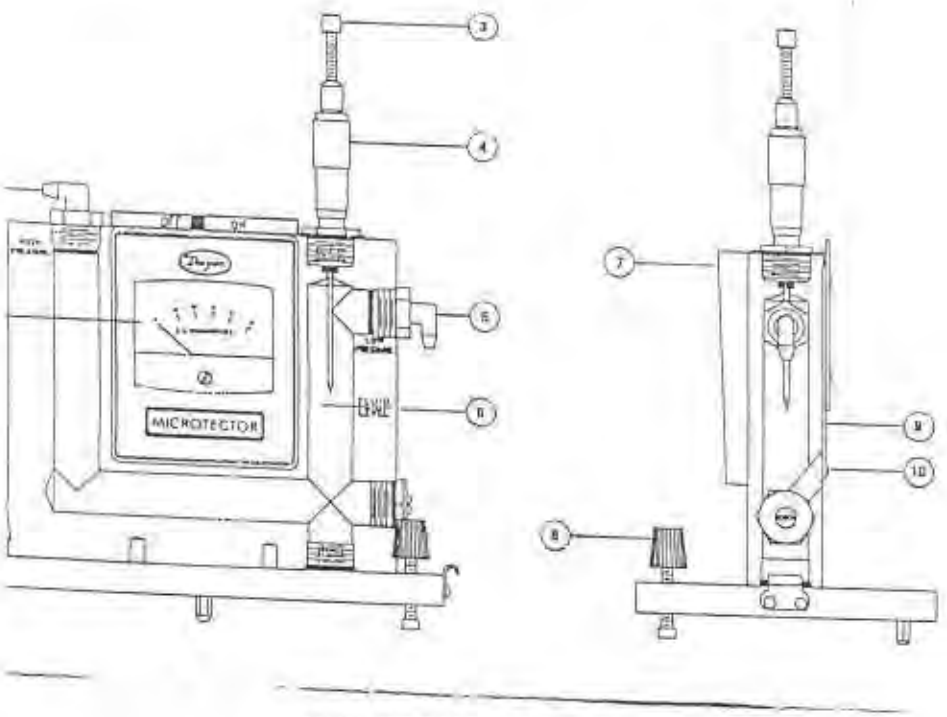
Electronic Enclosure of Tough Molded Styrene Acrylonitrile Provides Maximum Protection to Components Yet Allows Easy Access to Battery Compartment.

Rugged Sheet Steel Cover and Carrying Case Protects the Entire Unit When Not in Use.

Accessories Included are (2) 3 Foot Lengths Tygon Tubing, (2) 1/8" Pipe Thread Adapters and 3/4 oz. bottle of Fluorscein Green Color Concentrate with Wetting Agent.

*Patent Applied For

DWYER INSTRUMENTS, INC.
P.O. Box 373, Michigan City, Indiana 46360
Telephone 219/872-9141 or



MICROTECTOR® GAGE

Precision Pressure Measurement

e Dwyer Microtector® combines the ie proven principles of the Hook Gage ie manometer and modern solid state egrated circuit electronics. It provides inexpensive means of achieving ac- acy and repeatability within ± .00025 hes water column throughout its 0 to inches w.c. range. It is truly a new ndard in precision pressure measuring ices.

Principles of Operation

pressure to be measured is applied to manometer fluid which is displaced in h legs of the manometer by an amount al to ½ the applied pressure. A mi- meter mounted hook is then lowered til it contacts the manometer gage id. The instant of contact is detected completion of a low power A.C. cuit. Current for this circuit is supplied a 9½ volt penlight cell feeding two ni-conductor amplifiers which act as a s-running multivibrator operating at a quency of approximately two kilo- hertz. Completion of the A.C. circuit activates a bridge rectifier which provides the signal for indication on a sensitive (0 to 50 microamps) D.C. microammeter.

On indication of contact the operator stops lowering the hook and reads the micrometer which indicates one half the applied pressure. By reading the micrometer to the closest .000125 inches a total accuracy of .00025 inches w.c. is easily achieved. The micrometer complies with Federal Specification GGG-C-105A and is traceable to a master at the National Bureau of Standards.

Locating and Opening

Stand the Microtector and case on a firm flat level surface. Remove the cover by releasing the latches and lifting straight up. If it is necessary to move the gage without case, handle only the base plate or clear acrylic block. (CAUTION: Do not handle gage by grasping meter-electronic package housing Item 7 on drawing.)

Fluid Level

Level the gage by adjusting the two front leveling screws (Item 8 on drawing) until the bubble in the spirit level is centered in the small circle. After leveling the gage, open both rapid shut off valve tube connectors (2 and 5). Back off the Micrometer (4), if necessary, to make sure that the point or "Hook" is not immersed in the gage fluid. The fluid level in the gage should now coincide with the mark on the right hand bore plus or minus approximately 1/32 inch (6). If the level of fluid is too high, fluid can be removed with an eye dropper, pipette or carefully poured out of the right connection (5). If the level is too low, remove the top left rapid shut off valve tube connector (2), and add distilled water pre-mixed with the proper amount of Dwyer green concentrate. (See maintenance instruction for proportions.) After correcting the fluid level, reinstall the rapid shut off connectors and with them in the open position, relevel the Microtector. The gage is now ready to be zeroed.

Zeroing

Turn the Micrometer barrel (4) until its lower end just coincides with the zero mark on the internal vertical scale *and* the zero on the barrel scale coincides with the vertical line on the internal scale. Note that the internal scale is graduated every .025" from 0 to 1.00 inch and the barrel scale is graduated in one thousandths from 0 to .025." Turn the meter circuit switch at the top of gage to the "on" position. While holding the barrel at the zero position (and with the gage level), raise or lower the "hook" by turning the top knurled knob (3) until the "hook" or point is above, but near the fluid.

Check to be sure that the meter (1) registers zero. Watch the meter, hold the barrel (4) and lower the hook slowly by turning the top knurled knob (3). As the knob is turned, the point of the "hook" will contact the fluid and the meter pointer will move from zero to some upscale position. After making contact, turn the hook out of the fluid by turning the Micrometer barrel counter-clockwise to a reading of .010 or more. Again watch the meter and, this time, lower the hook by turning the Micrometer barrel. The "hook" position where the meter pointer begins to move up scale is the zero position. This position should correspond to the zero reading on the Micrometer. Adjust the hook in relation to the Micrometer barrel by turning the top knob while holding the barrel steady. Repeat lowering the hook, watching the meter for contact, and adjusting the hook until the zero position and zero reading exactly coincide. The gage is now zeroed and should not be moved.

An alternate method of zeroing and reading can be used wherein, instead of zeroing the gage completely, a zero correction reading is taken and recorded then subtracted from the final read- Comparable results can be obtained either method.

Positive Pressure Measurement

With the fluid at its proper level, a pressure of 2.0" water column maximum can be measured. Positive pressure should be applied to the top left connection (2) with the Micrometer zeroed as described above. This will permit simple direct readings to be taken.

After an unknown pressure has been applied at the top left connection, the fluid level will drop in the left bore and rise over the "hook" point in the right bore. Note the indicating meter pointer has moved upscale because the "hook" is immersed in the fluid. Turn the Micrometer counter-clockwise until the "hook" point leaves the fluid as indicated by meter pointer dropping to zero or scale. Then slowly turn the Micrometer down until its point or "hook" just touches the fluid surface causing movement of the meter pointer. Withdraw the hook and repeat several times noting each time the Micrometer reading where the meter pointer movement begins. The average of these readings multiplied by two is the pressure applied to the gage. (Avg. reading x 2 = pressure applied in inches w.c.)

When the readings are complete the pressure should be removed and the zero-setting of the Microtector® rechecked. Any change in the zero position will indicate inaccurate readings. Should this happen the zero-set and pressure measurement procedure should be repeated.

BULLETIN NO. H-11

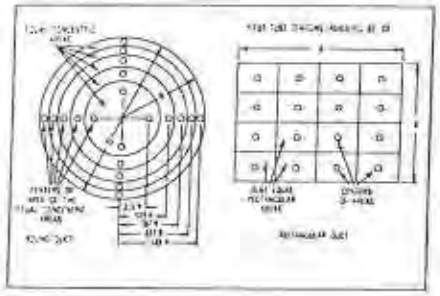
AIR VELOCITIES WITH THE DWYER PITOT TUBE

AIR VELOCITY

The total pressure of an air stream flowing in a duct is the sum of the static or bursting pressure exerted upon the sidewalls of the duct and the impact or velocity pressure of the moving air. Through the use of a pitot tube connected differentially to a manometer, the velocity pressure alone is indicated and the corresponding air velocity determined.

For accuracy of plus or minus 2%, as in laboratory applications, extreme care is required and the following precautions should be observed:

1. Duct diameter 4" or greater.
2. Make an accurate traverse per sketch at right, calculate the velocities and average the readings.
3. Provide smooth, straight duct sections a minimum of 8½ diameters in length upstream and 1½ diameters downstream from the pitot tube.
4. Provide an egg crate type straightener upstream from the pitot tube.



In making an air velocity check select a location as suggested above, connect tubing leads from both pitot tube connections to the manometer and insert in the duct with the tip directed into the air stream. If the manometer shows a minus indication reverse the tubes. With a direct reading manometer, air velocities will now be shown in feet per minute. In other types, the manometer will read velocity pressure in inches of water and the corresponding velocity will be found from the curves in this bulletin. If circumstances do not permit an accurate traverse, center the pitot tube in the duct, determine the center velocity and multiply by a factor of .9 for the approximate average velocity. Field tests run in this manner should be accurate within plus or minus 5%.

The velocity indicated is for dry air at 70°F., 29.9" Barometric Pressure and a resulting density of .075#/cu. ft. For air at a temperature other than 70°F. refer to the curves in this bulletin. For other variations from these conditions, corrections may be based upon the following data:

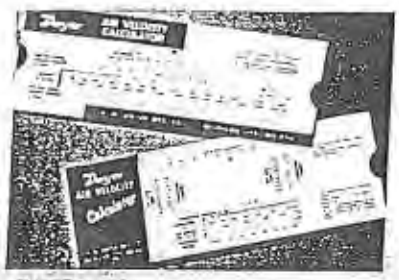
$$\text{Air Velocity} = 1096.2 \sqrt{\frac{Pv}{D}}$$

where Pv = velocity pressure in inches of water
D = Air density in #/cu. ft.

$$\text{Air Density} = 1.325 \times \frac{P_B}{T}$$

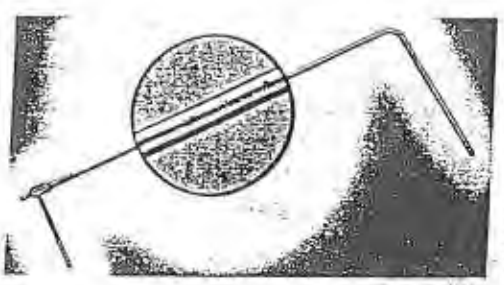
where P_B = Barometric Pressure in inches of mercury
T = Absolute Temperature (indicated temperature °F plus 460)

Flow in cu. ft. per min. = Duct area in square feet x air velocity in ft. per min.



AIR VELOCITY CALCULATOR

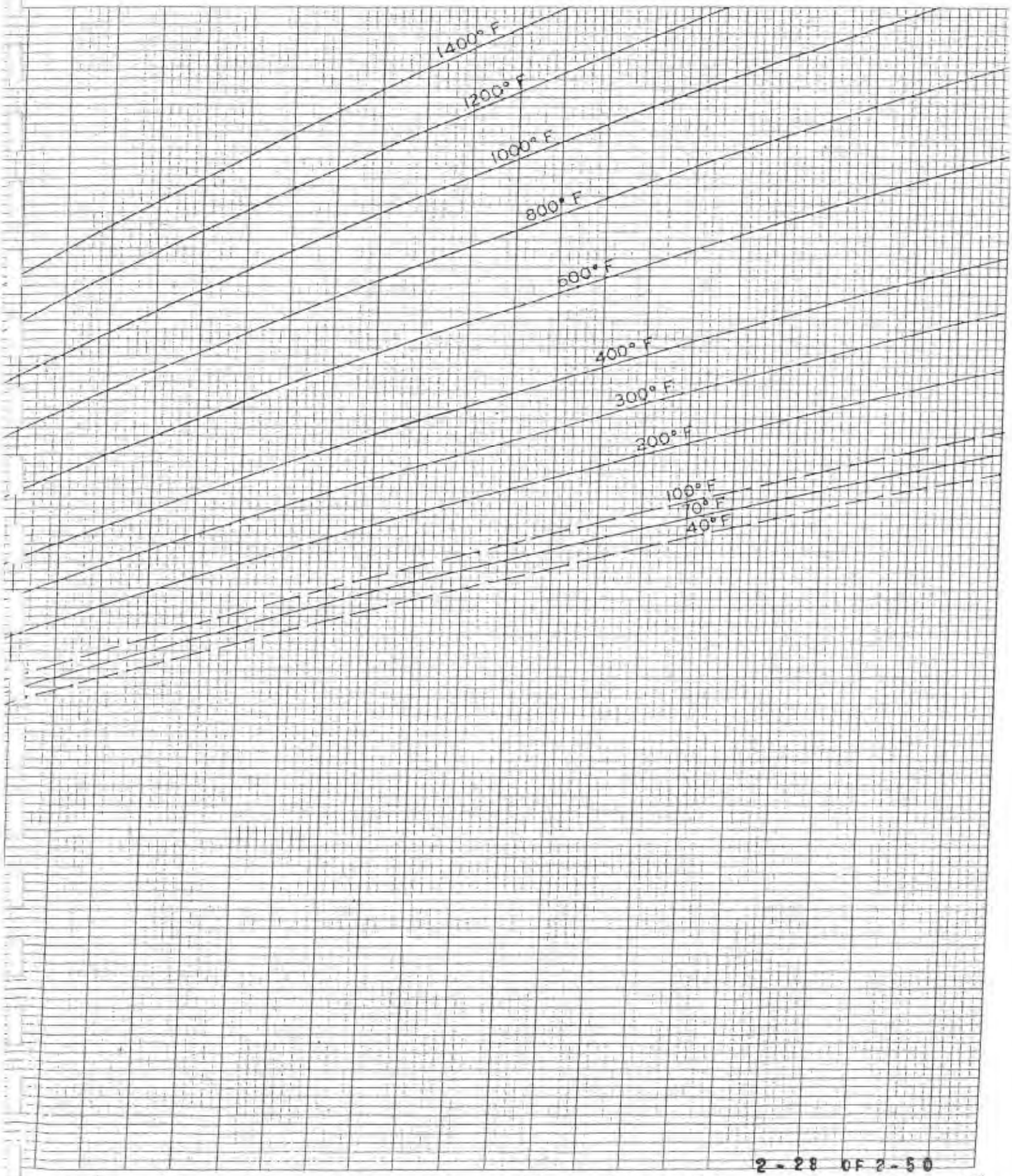
Computes velocity based on air density corrected for conditions of temperature and pressure. Eliminates tedious calculations. Ranges from .01 to 10" water corresponding to 400 to 20,000 FPM. Furnished with each pitot tube.

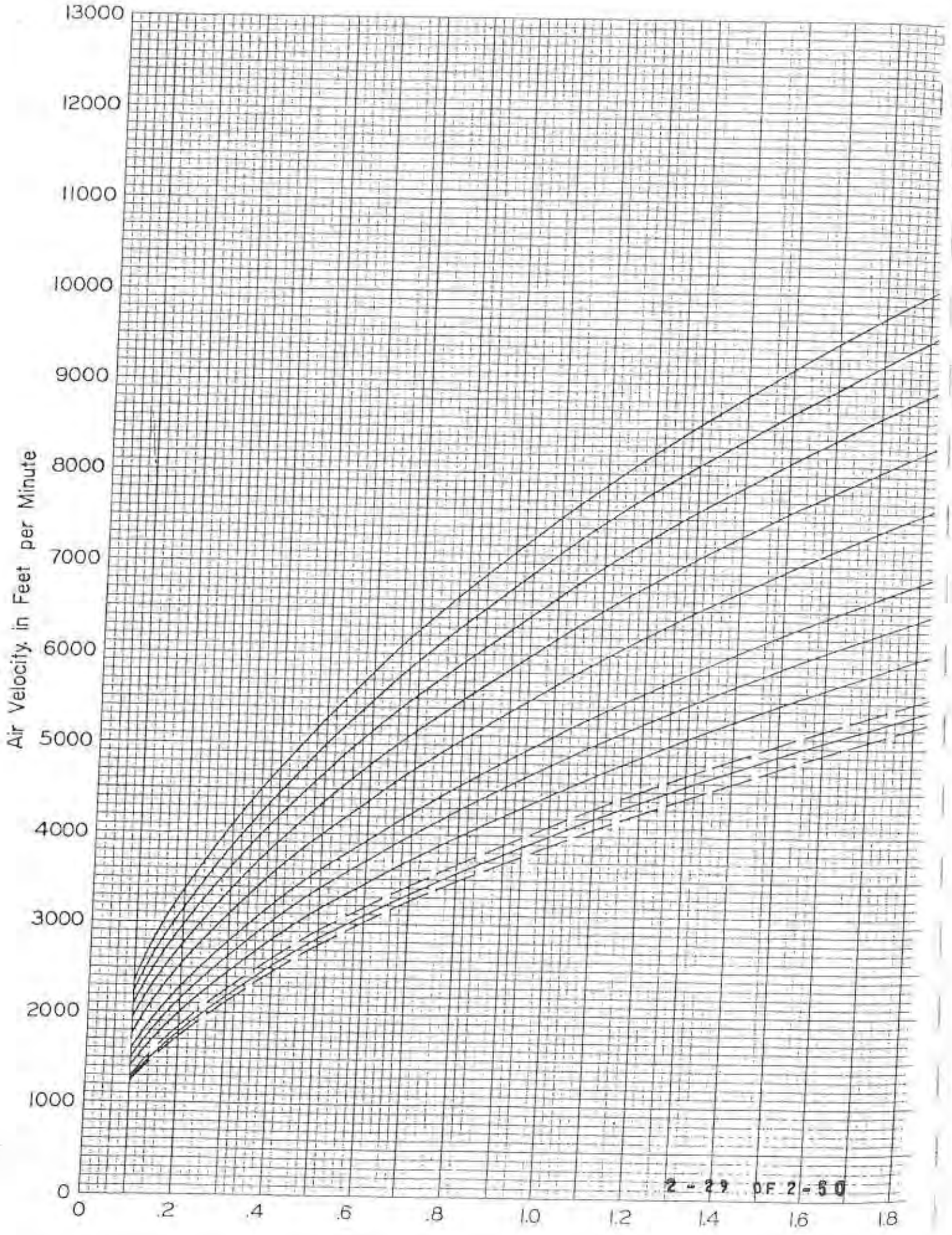


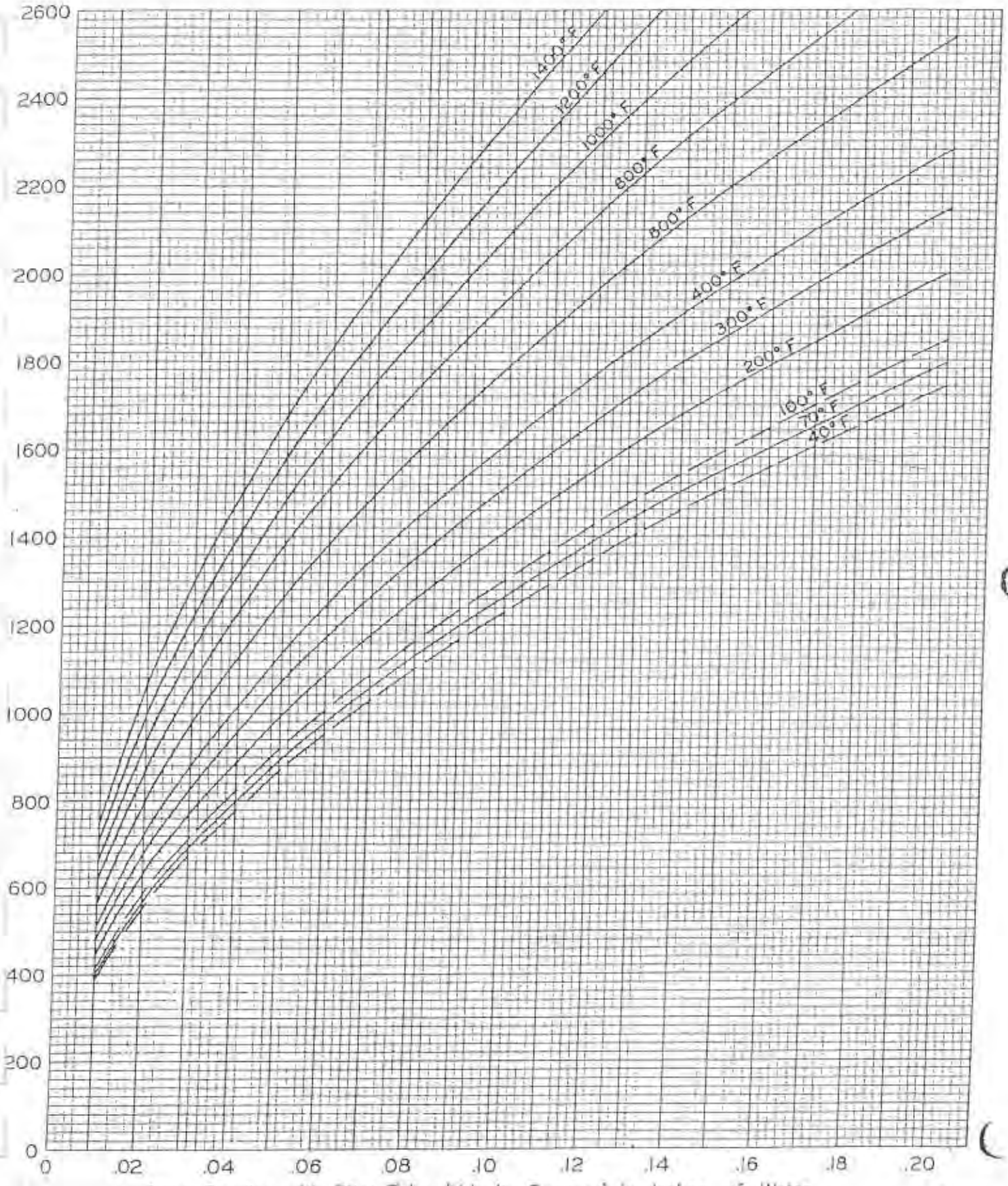
STAINLESS STEEL PITOT TUBES

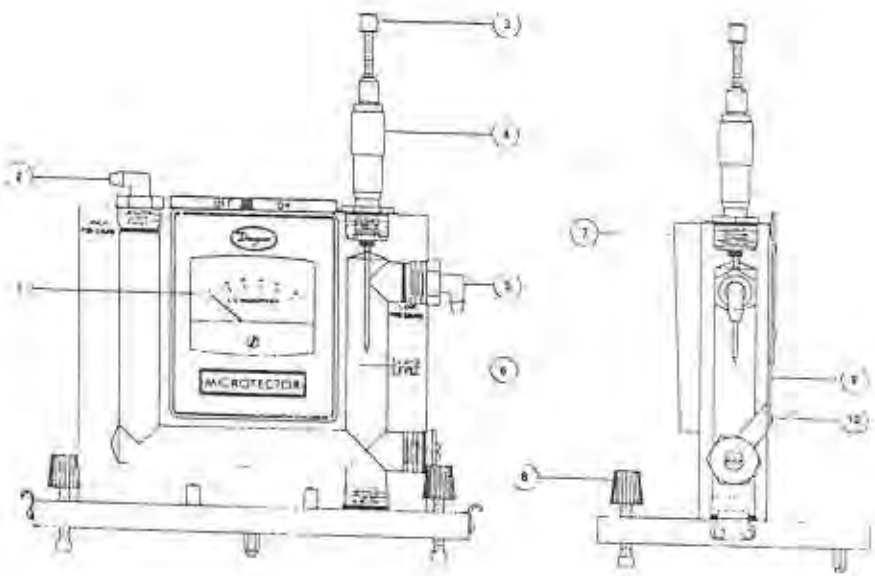
Test confirmed unity coefficient and lifetime construction of No. 304 stainless steel. Inch graduations show depth of insertion for traversing. Complies with AMCA and ASHRAE specifications. Sizes 12" to 60" long. Hand or fixed mounting types.

LITHOGRAPHED IN U.S.A. 3/84


1400° F
1200° F
1000° F
800° F
600° F
400° F
300° F
200° F
100° F
70° F
40° F
2.0
2.2
2.4
2.6
2.8
3.0
3.2
3.4
3.6
3.8
4.0


13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Air Velocity, in Feet per Minute
0
.2
.4
.6
.8
1.0
1.2
1.4
1.6
1.8


2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1400° F
1200° F
1000° F
900° F
800° F
600° F
400° F
300° F
200° F
180° F
70° F
40° F
0
.02
.04
.06
.08
.10
.12
.14
.16
.18
.20
Gage Reading with Pitot Tube (Velocity Pressure) in Inches of Water



MICROTECTOR® GAGE

Precision Pressure Measurement

The Dwyer Microtector® combines the time proven principles of the Hook Gage type manometer and modern solid state integrated circuit electronics. It provides an inexpensive means of achieving accuracy and repeatability within ± .00025 inches water column throughout its 0 to 2 inches w.c. range. It is truly a new standard in precision pressure measuring devices.

Principles of Operation

A pressure to be measured is applied to the manometer fluid which is displaced in each leg of the manometer by an amount equal to ½ the applied pressure. A micrometer mounted point is then lowered until contacts the manometer gage fluid. The instant of contact is detected by completion of a low power A.C. circuit. Current for this circuit is supplied by a 1½ volt penlight cell feeding two semiconductor amplifiers which act as a free-running multivibrator operating at a frequency of approximately two kilohertz. Completion of the A.C. circuit activates a bridge rectifier which provides the signal for indication on a sensitive (0 to 50 microamps) D.C. microammeter.

On indication of contact the operator stops lowering the point and reads the micrometer which indicates one half the applied pressure. By interpolating eight divisions, (each being .000125" w.c.) between .001 micrometer graduations, a total accuracy of .00025 can easily be achieved. The micrometer complies with Federal Specification GGG-C-105A and is traceable to a master at the National Bureau of Standards.

Locating and Opening

Stand the Microtector® and case on a firm flat level surface. Remove the cover by releasing the latches and lifting straight up. If it is necessary to move the gage without case, handle only the base plate or clear acrylic block. (CAUTION: Do not handle gage by grasping meter-electronic package housing Item 7 on drawing.)

Fluid Level

Level the gage by adjusting the two front leveling screws (Item 8 on drawing) until the bubble in the spirit level is centered in the small circle. After leveling the gage, open both rapid shut off valve tube connectors (2 and 5). Back off the Micrometer (4), if necessary, to make sure that the point is not immersed in the gage fluid. The fluid level in the gage should now coincide with the mark on the right hand bore plus or minus approximately 1/32 inch (6). If the level of fluid is too high, fluid can be removed with an eye dropper pipette or carefully poured out of the right connection (5). If the level is too low, remove the top left rapid shutoff valve tube connector (2), and add distilled water pre-mixed with the proper amount of Dwyer green concentrate. (See maintenance instruction for proportions.) After correcting the fluid level, reinstall the rapid shut off connectors and with them in the open position, relevel the Microtector®. The gage is now ready to be zeroed.

Zeroing

Turn the Micrometer barrel (4) until its lower end just coincides with the zero mark on the internal vertical scale *and* the zero on the barrel scale coincides with the vertical line on the internal scale. Note that the internal scale is graduated every .025" from 0 to 1.00 inch and the barrel scale is graduated in one thousandths from 0 to .025." Turn the meter circuit switch at the top of gage to the "on" position. While holding the barrel at the zero position (and with the gage level), raise or lower the point by turning the top knurled knob (3) until the point is above, but near the fluid.

Check to be sure that the meter (1) registers zero. Watch the meter, hold the barrel (4) and lower the point slowly by turning the top knurled knob (3). As the knob is turned, the point will contact the fluid and the meter pointer will move from zero to some upscale position. After making contact, turn the point out of the fluid by turning the Micrometer barrel counter-clockwise to a reading of .010 or more. Again watch the meter and, this time, lower the point by turning the Micrometer barrel. The point position where the meter pointer begins to move up scale is the zero position. This position should correspond to a zero reading on the Micrometer. Adjust the point in relation to the Micrometer barrel by turning the top knob while holding the barrel steady. Repeat lowering the point, watching the meter for contact, and adjusting the point until the zero position and zero reading exactly coincide. The gage is now zeroed and should not be moved.

An alternate method of zeroing and reading can be used wherein, instead of zeroing the gage completely, a zero correction reading is taken and recorded then subtracted from the final reading. Comparable results can be obtained with either method.

Positive Pressure Measurement

With the fluid at its proper level, a pressure of 2.0" water column maximum can be measured. Positive pressure should be applied to the top left connection (2) with the Micrometer zeroed as described above. This will permit simple direct reading to be taken.

After an unknown pressure has been applied at the top left connection, the fluid level will drop in the left bore and rise over the point in the right bore. Note the indicating meter point has moved upscale because the point is immersed in the fluid. Turn the Micrometer counter-clockwise until the point leaves the fluid as indicated by the meter pointer dropping to zero or scale. Then slowly turn the Micrometer down until its point just touches the fluid surface causing movement of the meter pointer. Withdraw the point and repeat several times noting each time the Micrometer reading where the meter pointer movement begins. The average of these readings multiplied by two is the pressure applied to the gage. (Avg. reading x 2 = pressure applied in inches w.c. The degree of uncertainty for the operator and instrument is indicated by the difference in these readings.)

When the readings are complete the pressure should be removed and the zero-setting of the Microtector® rechecked. Any change in the zero position will indicate inaccurate readings. Should this happen the zero-set and pressure measurement procedure should be repeated.

STATE OF OREGON
Department of Agriculture
MEASUREMENT STANDARDS DIVISION
635 Capitol Street NE
Salem, Oregon 97301-2532

SCALE EXAMINATION REPORT

LA
COL
Retest

Date: 11-18-03	Time: 10 AM/PM		Duration: .3
License Status	Number Issued	Number Required: OB	Number Tested: OB

Firm Name: OMNI TECH LABORATORIES
Mailing Address:
City / State / Zip Code: SAME
County No.
Operator / Corporation Name: JOHN VANDERS
Device Location: 5415 SW WESTERN AVE
Previous Firm Name:
City / State / Zip Code: RENTON OR 97075
County No: 34
Seasonal Months: _____ to _____
Phone Number: 503-643-3788

Direct:_____ # Indirect:_____ # Class Exempt:_____ # Packaging:_____ # Postal:_____ #Scanners:_____

DESCRIPTION OF EQUIPMENT			LICENSE / IDENTIFICATION INFORMATION				ACTION TAKEN		
SCALE MAKE	SCALE TYPE	SCALE LOCATION	MFR'S RATED CAP'Y	ORE. LIC. TYPE	SERIAL NUMBER	ZERO BAL. COND.	OK / *Rejected	REPAIR TAG or NNC NUMBER(S)	# DAYS FOR REPAIR
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									
11.		TEST							
12.									
13.									
14.									
15.	NO								
16.									
17.									
18.									
19.									
20.									

* REJECTION CODES ON REVERSE SIDE

REMARKS: NOT CHANGED AS APPLICATION FOR LAB TESTING OF FURNACE UNIT - NO CONFIRMATION BY MTD RECEIVED

DEPARTMENT REPRESENTATIVE: JOHNSON

OPERATOR COPY RECEIVED BY:

Posted ☐ Insp. Type: 1

For Information By Phone: SALEM (503) 986-4670 / FAX: (503) 986-4784 / Hearing Impaired: (503) 986-4762

White Report = OFFICE Yellow Report = INSPECTOR Pink Report = OPERATOR Form 2858 Rev. 9/01

Thermal Metering System Calibration
Y and dH@

Manufacturer: APEX
Model: 563
Serial Number: NA
OMNI Tracking No.: 289

Average Orifice Meter dH@	Average Gas Meter y Factor
2.306	0.990

Calibration Date: 11/19/09
Calibrated by: B. Davis
Calibration Frequency: 17-VL post test
Next Calibration Due: 05/20/10
Instrument Range: 1.000 cfm
Standard Temp.: 68 oF
Standard Press.: 29.92 "Hg
Barometric Press.: 29.92 "Hg
Signature/Date: B. D. 11/19/09

Previous Calibration Comparision

Date	10/12/2009	Acceptable	
dH@ Value	NA	Deviation (5%)	Deviation
y Factor	0.996	0.0498	0.006
Acceptance	Acceptable		

Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.002
Acceptable dH@ Deviation	0.200
Maximum dH@ Deviation	0.015
Acceptance	Acceptable

Reference Standard *			
Standard Calibrator	Model	Standard Test Meter	
	S/N	00141	
	Calib. Date	18-Jun-09	
	Calib. Value	0.9990	y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Vacuum ("Hg)	0.00	0.00	
dH ("H2O)	1.15	1.15	1.15
Initial Reference Meter	91.005	103.62	114.695
Final Reference Meter	103.62	114.695	121.522
Initial DGM	0	0	0
Final DGM	12.741	11.183	6.906
Temp. Ref. Meter (°F), Tr	65.0	65.0	65.0
Temperature DGM (°F), Td	67.0	68.0	67.0
Time (Minutes)	24.0	21.0	13.0
Net Volume Ref. Meter, Vr	12.615	11.075	6.827
Net Volume DGM, Vd	12.741	11.183	6.906
Gas Meter y Factor =	0.990	0.992	0.989
Gas Meter y Factor Deviation (from avg.)	0.000	0.002	0.002
Orifice dH@	2.31	2.29	2.32
Orifice dH@ Deviation (from avg.)	0.005	0.015	0.009

where:

1. Deviation = |Average value for all runs - current run value|
2. y = [Vr x (y factor (ref)) x (Pb) x (Td + 460) / [Vd x (Pb + (dH / 13.6)) x (Tr + 460]
3. dH@ = 0.0317 x dH / (Pb (Td + 460)) x [(Tr + 460) x time) / Vr]^2

* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272

Thermal Metering System Calibration
Y and dH@

Manufacturer:	APEX
Model:	563
Serial Number:	NA
OMNI Tracking No.:	289

Average Orifice Meter dH@	Average Gas Meter y Factor
2.677	0.986

Calibration Date:	10/12/09
Calibrated by:	B. Davis
Calibration Frequency:	Six Month
Next Calibration Due:	04/12/10
Instrument Range:	1.000 cfm
Standard Temp.:	68 oF
Standard Press.:	29.92 "Hg
Barometric Press.:	29.77 "Hg
Signature/Date:	10/12/09

Previous Calibration Comparision

Date	4/10/2008	Acceptable Deviation (5%)	Deviation
dH@ Value	NA		
y Factor	0.986	0.0493	0.000
Acceptance	Acceptable		

Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.008
Acceptable dH@ Deviation	0.200
Maximum dH@ Deviation	1.127
Acceptance	Out of Limits

Reference Standard *			
Standard Calibrator	Model	Standard Test Meter	
	S/N	1	
	Calib. Date	08-Jun-09	
	Calib. Value	0.9990	y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Vacuum ("Hg)	0.00	0.00	0.00
dH ("H2O)	3.00	1.20	0.70
Initial Reference Meter	905.686	916.905	928.085
Final Reference Meter	916.715	927.878	943.482
Initial DGM	0	0	0
Final DGM	11.046	11.178	15.769
Temp. Ref. Meter (°F), Tr	68.0	68.0	68.0
Temperature DGM (°F), Td	70.0	71.0	72.0
Time (Minutes)	12.0	20.0	48.0
Net Volume Ref. Meter, Vr	11.029	10.973	15.397
Net Volume DGM, Vd	11.046	11.178	15.769
Gas Meter y Factor =	**0.994**	**0.983**	**0.981**
Gas Meter y Factor Deviation (from avg.)	0.008	0.003	0.005
Orifice dH@	**1.99**	**2.23**	**3.80**
Orifice dH@ Deviation (from avg.)	0.683	0.444	1.127

where:

1. Deviation = |Average value for all runs - current run value|
2. y = [Vr x (y factor (ref)) x (Pb) x (Td + 460) / [Vd x (Pb + (dH / 13.6)) x (Tr + 460]
3. dH@ = 0.0317 x dH / (Pb (Td + 460)) x [(Tr + 460) x time) / Vr]^2

* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272

DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET
0-0.25" Magnehelic Gauge

Range: 0-0.25" WC ID Number: 289 D ΔP

Calibration Instrument: Digital Manometer ID Number: OMNI- 396

Date: 10/12/09 By: B Davis

This form is to be used only in conjunction with Standard Procedure C-SPC.

Range of Calibration Point ("WC)	Digital Manometer (A) ("WC)	Magnehelic Gauge (B) ("WC)	Difference (A - B)	% Error of Full Span*
0.00 - 0.05	.006	.006	0.0	0.0
0.05 - 0.10	.098	.097	.001	0.4
0.10 - 0.15	.117	.117	0.0	0.0
0.15 - 0.20	.152	.149	.003	1.2
0.20 - 0.25	.238	.236	.002	0.8

*Acceptable tolerance is 4%.

The uncertainty of measurement is ±0.01" WC. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Technician signature: B D Date: 10/12/09

Reviewed by: Pat Kirk Date: 10/19/09

DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET
0-0.25" Magnehelic Gauge

Range: 0-0.25" WC ID Number: 289B Stack draft

Calibration Instrument: Digital Manometer ID Number: OMNI-

Date: 10/12/09 By: B Davis

This form is to be used only in conjunction with Standard Procedure C-SPC.

Range of Calibration Point ("WC)	Digital Manometer (A) ("WC)	Magnehelic Gauge (B) ("WC)	Difference (A - B)	% Error of Full Span*
0.00 - 0.05	.005	.007	.002	0.8
0.05 - 0.10	.076	.076	.000	0.0
0.10 - 0.15	.108	.105	.003	1.2
0.15 - 0.20	.136	.134	.002	0.8
0.20 - 0.25	.203	.202	.001	0.4

*Acceptable tolerance is 4%.

The uncertainty of measurement is ±0.01" WC. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Technician signature: [signature] Date: 10/12/09

Reviewed by: [signature] Date: 12/14/09

Temperature Calibration
EPA Method 28 and 5G

BOOTH: E2	TEMPERATURE MONITOR TYPE:	IDENTIFICATION NUMBER:
Emissions	Data Logger	289

REFERENCE TEMPERATURE MONITOR TYPE:	IDENTIFICATION NUMBER:
OMEGA Calibrator Model CL300	Serial Number 506

CALIBRATION PERFORMED BY:	DATE:	AMBIENT TEMPERATURE:	BAROMETRIC PRESSURE:
B Davis	10/12/09	68	29.78

Reference Point Source	Temperature Monitor (EF)					
		Method 5G Dilution Tunnel				
OMEGA Thermocouple Simulator Serial #506	Method 28 Room	Meter (Tm)	Filters (Tf)	Tunnel (Tt)	Dryer (Ts)	DB
0	-1	-1	-1	-1	-1	-1
100	99	99	99	99	99	99
300	299	297	299	299	299	299
500	499	499	499	499	499	499
700	700	700	700	699	700	700

Technician signature: B Davis Date: 10/12/09

Certificate of Calibration

Certificate Number: **435614**

JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

0723.01

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: **OTL-09-634**
Order Date: 09/15/2009
Authorized By:

Property #: OMNI-00342
User:
Department:
Make: Omega
Model: RH81
Serial #: 9480241
Description: THERMO HYGROMETER
Procedure: DCN 401013/403410
Accuracy: RH +/-3% TEMP ±1°C(±1.8°F)

Calibrated on: 09/16/2009
*Recommended Due: 09/16/2010
Environment: 23 °C 46 % RH
As Received: Within Tolerance
As Returned: Within Tolerance
Action Taken: Calibrated w/Parts
Technician: 112

Remarks: * Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired

Replaced 2AAA batteries.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
464A	General Eastern	M4-RH/D2	HUMIDITY STANDARD	04/30/2010	425773
437A	Hart Scientific	1502A	DIGITAL THERMOMETER, MULTI-PROBE	09/08/2010	434684
601A	Burns Engineering	200G05B085	INDUSTRIAL PRT	02/20/2010	392474

Measurement Data

Parameter / Measurement Description	Range	Unit	Reference	UUT	Variance	Min	Max	Uncertainty	Accredited = ✓
Before/After									
Relative Humidity									
		%	25.00	25.7	-0.70	22	28	0.25	✓
		%	50.10	51.3	-1.20	47.1	53.1	0.25	✓
		%	75.0	77	-2.0	72	78	0.26	✓
Temperature / Ambient									
		°F	53.0	52	1.0	51	55	0.2	✓
Temperature									
		°F	75.0	74	1.0	73	77	0.2	✓

JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement Institutes (NMI's), or by using natural physical constants, intrinsic standards or ratio calibration techniques. The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2005, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless otherwise stated, a test accuracy ratio (TAR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without prior written consent of JJ Calibrations, Inc.
JJ Calibrations, Inc. quality system has been assessed and accredited to ISO/IEC 17025:2005.

Reviewer

5 Issued 09/17/2009 Rev # 14

Inspector

NIST Stopwatch Calibration, Time Proficiency Testing Procedure and Data Sheet

Date: 2/03/09 User/Technician: KEN MORGAN ☐ Pass ☐ Fail

NIST traceable stop watch OMNI Tracking Number: 292 363 IC Last Cal: 1-13-09 2-08-09 IC

Stopwatch to be tested for time proficiency OMNI Tracking Number: 363

1. Start the NIST traceable stopwatch; at a predetermined time (i.e., 1.00 minutes), the technician shall start the watch being tested. When 15.00 seconds have passed (i.e., the NIST traceable stopwatch reads 1 minute, 15 seconds), the technician shall stop the watch being tested. Record the target time interval (i.e., 15.00 seconds). Repeat this step twice and record the data.

2. Repeat step #1 for each of the following target time intervals: 30.00 seconds, 10.00 minutes, and 30 minutes.

3. If the delta between the target time and measured time is less than 5% of the target time interval or 2.00 seconds (whichever is less), then the technician has demonstrated proficiency with the specific instrument utilized in the proficiency test. The proficiency is valid for a period of twelve months.

4. Archive the proficiency test data and information, including the effective date and expiration date of the proficiency, in the equipment record for the instrument involved.

Target time: 15.00 seconds #1 Measured time: 14.98 #2 Measured time: 15.07 #3 Measured time: 15.16

Target time: 30.00 seconds #1 Measured time: 30.00 #2 Measured time: 30.14 #3 Measured time: 30.11

Target time: 10.00 minutes #1 Measured time: 10:00.28 #2 Measured time: 10:00.01 #3 Measured time: 10:00.02

Target time: 30.00 minutes #1 Measured time: 30:00.06 #2 Measured time: 30:00.01 #3 Measured time: 30:00.07

The uncertainty of measurement is ±1 sec. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Technician Signature: K. J. Morgan Date: 2-03-09

Reviewed by: [signature] Date: 2/12/09

DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET
0-1" Magnehelic Gauge

Range: 0-1" WC ID Number: 394 (B)

Calibration Instrument: Digital Manometer (A) ID Number: OMNI- 315

Date: 8/4/09 By: J. STENERT

This form is to be used only in conjunction with Standard Procedure C-SPC.

Range of Calibration Point ("WC)	Digital Manometer (A) ("WC)	Magnehelic Gauge (B) ("WC)	Difference (A - B)	% Error of Full Span*
0.0 – 0.2	.172	.180	.008	.8%
0.2 – 0.4	.300	.320	.020	2%
0.4 – 0.6	.508	.524	.012	1.2%
0.6 – 0.8	.769	.78	.011	1.1%
0.8 – 1.0	.95	.96	.01	1%

*Acceptable tolerance is 4%.

The uncertainty of measurement is ±0.1" WC. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Technician signature: _____ Date: 8/4/09

Reviewed by: _____ Date: 8/5/09

Example Calculations

Note: OMNI uses the Lotus 1-2-3 computer program for all Method 5G and 5H calculations. The program automatically carries 14 decimal points in all calculations. The numbers on the printouts have been rounded for display only.

Equations and Sample Calculations - Method 5G

Equations used to calculate the parameters listed below are described in this appendix. Sample calculations are provided for each equation. The raw data and printout results from a sample run are also provided for comparison to the sample calculations.

BR	Dry burn rate, kg/hr
m_n	Total particulate matter collected, mg
$V_{m(std)}$	Volume of gas sampled corrected to standard conditions, dscf
v_s	Average dilution tunnel gas velocity, ft/sec
C_s	Particulate concentration, g/dscf
Q_{sd}	Average dilution tunnel gas flow rate, dscf/min
E	Particulate emission rate, lbs/hr
PR	Proportional rate variation, %

Dry Burn Rate

Using equation 28-3:

$$BR = \frac{60 \times W_{wd}}{\theta} \times \frac{100 - \%M_w}{100}$$

Where,

BR	=	Dry burn rate, lb/hr
W_{wd}	=	Mass of wood burned (wet basis) during test run, lb
θ	=	Total time of test run, minutes
$\%M_w$	=	Average moisture content of test fuel charge, wet basis percent

Sample Calculation:

Dry basis moisture of fuel = 20.03%

Using the equation 28-2 for converting dry basis moisture to wet basis moisture,

$$\%M_w = \frac{20.03 \times 100}{20.03 + 100}$$

$$\%M_w = 16.69\%$$

The wet weight of the fuel charge was 7.8 pounds. Converting pounds to kilograms yields a weight of 3.538 kg. The run time for this run was 180 minutes. Therefore, the burn rate equation appears thus:

$$BR = \frac{60 \times 3.538 \times (100 - 16.69)}{180 \times 100}$$

$$BR = 0.98\ kg/hr = 2.17\ lb/hr$$

Total Particulate Matter Collected

$$m_n = F_1 + F_2 + R - (V_a \times B_a)$$

Where:

m_n	=	Total particulate matter collected, mg
F_1	=	Particulate matter collected on front filter, mg
F_2	=	Particulate matter collected on rear filter, mg
R	=	Residue from evaporated probe and filter holder acetone rinse, mg
V_a	=	Volume of acetone evaporated probe and filter holder actone rinse, ml
B_a	=	Acetone blank value, mg/ml

Sample Calculation:

$m_n = 12.6 - 0.4 + 4.7 - (180 \times 0.0040)$

$m_n = 16.2$ mg

Volume of Gas Sampled Corrected to Dry Standard Conditions

Using equation 5-1:

$$V_{m(std)} = V_m \times Y \times \left(\frac{T_{std}}{P_{std}}\right) \times \frac{\left(P_b + \frac{\Delta H}{13.6}\right)}{T_m}$$

Where:

K	=	17.64 °R/in. Hg
T_{std}	=	528 °R
P_{std}	=	29.92 in. Hg
V_m	=	Volume of gas sample measured at the dry gas meter, dcf
Y	=	Dry gas meter calibration factor, dimensionless
P_b	=	Barometric pressure at the testing site, in. Hg
ΔH	=	Average pressure differential across the orifice meter, in. H_2O
T_m	=	Absolute average dry gas meter temperature, °R

Sample Calculation:

$$V_{m(std)} = 98.434 \times 1.01 \times \left(\frac{528}{29.92}\right) \times \frac{30.03 + \frac{0.7}{13.6}}{532.5}$$

$$V_{m(std)} = 99.116\ ft^3$$

Dilution Tunnel Gas Velocity

Using equations 2-7 and 2-6, calculated at each recorded interval:

$$v_s = k_p \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{T_{s(avg)}}{P_s \times M_s}}$$

$$M_s = M_d \times (1 - B_{ws}) + 18.0 \times B_{ws}$$

Where:

v_s = Average dilution tunnel gas velocity, ft/sec

k_p = Pitot tube constant: $85.49 \frac{ft}{sec} \left[\frac{(lb/lb\text{-}mole) \times (inches\ Hg)}{(^{\circ}R) \times (inches\ H_2O)}\right]^{\frac{1}{2}}$

C_p = Pitot tube coefficient (0.99 for standard pitot tube; 0.84 may be used for S-type pitot tubes constructed according to Method 2 procedures), unitless

ΔP = ΔP measured during the pre-test flow traverse of the dilution tunnel; the square root of the ΔP values are averaged for this calculation, in. H_2O

P_b = Barometric pressure at test site, in. Hg

P_g = Static Pressure of tunnel, in. Hg

P_s = Absolute tunnel pressure, = $P_b + P_g$

M_s = Molecular weight of tunnel gas; assume M_d =29 lb/lb-mole (per method 5G)

B_{ws} = Moisture content of dilution tunnel gas, ratio; assume 4% (per method 5G)

T_s = Dilution tunnel temperature, °R; (°R = °F + 460)

Sample calculation:

$$M_s = 29 \times (1 - 0.04) + 18.0 \times 0.04 = 28.56$$

$$v_s = 85.49 \times 0.99 \times \sqrt{0.0351} \times \sqrt{\frac{(548)}{(30.03 + \frac{-0.45}{13.6}) \times (28.56)}}$$

$$v_s = 12.69 \frac{ft}{sec}$$

Particulate Concentration

Using equation 5G-2:

$$C_s = 0.001 \frac{g}{mg} \times \frac{m_n}{V_{m(std)}}$$

Where:

C_s	=	Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscf
m_n	=	Total mass of particulate matter collected in the sampling train, mg
$V_{m(std)}$	=	Volume of gas sampled corrected to dry standard conditions, dscf

Sample calculation:

$$C_s = \frac{0.001 \times 16.2}{99.116}$$

$$C_s = 0.000163 \ g/dscf$$

Average Dilution Tunnel Gas Flow Rate

Using equation 2-8, calculated at each recorded interval:

$$Q_{sd} = 3600 \times (1 - B_{ws}) \times v_s \times A \times \frac{T_{std}}{T_{s(avg)}} \times \frac{P_s}{P_{std}}$$

Where:

Q_{sd}	=	Gas flow rate corrected to dry, standard conditions, dscf/hr
3600	=	Conversion from seconds to hours
B_{ws}	=	Moisture content of dilution tunnel gas, ratio; assume 4% (per method 5G)
v_s	=	Average dilution tunnel gas velocity, ft/sec
A	=	Cross sectional area of dilution tunnel, ft^2
T_{std}	=	Standard absolute temperature, 538°R
$T_{s(avg)}$	=	Average absolute dilution tunnel temperature, °R, (°R = °F + 460)
P_b	=	Barometric pressure at test site, in. Hg
P_g	=	Dilution tunnel static pressure, in. Hg
P_s	=	Absolute dilution tunnel gas pressure, in Hg, (Hg = $P_b + P_g$)
P_{std}	=	Standard absolute pressure, 29.92 in Hg

Sample calculation:

$$Q_{sd} = 3600 \times (1 - 0.04) \times 12.69 \times \frac{(\pi \times 3^2)}{144} \times \frac{528}{548} \times \frac{30.03 + \frac{-0.45}{13.6}}{29.92}$$

$$Q_{sd} = 8313.36\ dscf/hr = 138.56\ dscf/min$$

Particulate Emission Rate

Using equation 5G-3 and 5G-4:

$$E = C_s \times Q_{sd}$$

$$E_{adj} = K_3 \times E^{0.83}$$

Where:

E = Particulate emission rate, g/hr

E_{adj} = Particulate emission rate, adjusted, g/hr

C_s = Concentration of particulate matter in the stack, corrected to dry, standard conditions, g/dscf

Q_{sd} = Average dilution tunnel gas flow rate, dscf/hr

K_3 = Constant, 1.82 for metric units, 0.643 for English units

Sample calculation:

$$E = 0.000163 \times 8313.36$$

$$E = 1.36\ g/hr$$

$$E_{adj} = 1.82 \times 1.36^{0.83}$$

$$E = 2.35\ g/hr$$

Proportional Rate Variation

Using equation 5H-9, calculated at each recorded interval:

$$PR = \frac{\theta \times (V_{mi} \times V_s \times T_m \times T_{si})}{10 \times (V_m \times V_{si} \times T_s \times T_{mi})} \times 100$$

Where:

PR	=	Percent proportional rate
θ	=	Time of test, min
S_i	=	Measured tracer gas concentration for the "i^{th}" interval, in this case, the inverse of the calculated flow in the stack based on CO_2 concentrations in the stack and in the dilution tunnel
$V_{mi(std)}$	=	Volume of gas sample measured by the dry gas meter during the "i^{th}" 10 minute interval, dscf
V_m	=	Volume of gas sample as measured by dry gas meter, dscf
V_{si}	=	Average gas velocity in the dilution tunnel during each 10 minute interval, i, of the test run, m/sec
V_s	=	Average gas velocity in the dilution tunnel, m/sec
T_{mi}	=	Absolute average dry gas meter temperature during each 10 minute interval, i, of the test run, °R
T_m	=	Absolute average dry gas meter temperature, °R
T_{si}	=	Absolute average gas temperature in the dilution tunnel during each 10 minute interval, i, of the test run, °R
T_s	=	Absolute average gas temperature in the dilution tunnel, °R

Sample calculation (for the reading at 50 minutes into test run 1):

$$PR = \frac{180 \times 5.6 \times 12.69 \times 533 \times 552}{10 \times 98.434 \times 12.63 \times 548 \times 532} \times 100$$

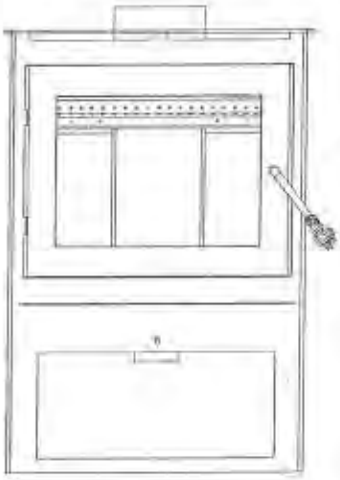
$$PR = 103.8\%$$

Section 3

Owner's Manual

TRANQUILITY WOOD STOVE

INSTALLATION & OPERATION MANUAL
17-VL, 50-SVL17 & 50-TVL17



Tested & Listed By O-TL Portland Oregon USA
c us
OMNI-Test Laboratories, Inc.

NFI NATIONAL FIREPLACE INSTITUTE

Manufactured By:
England's Stove Works, Inc.
PO Box 206
Monroe, VA 24574

CAUTION

Please read this entire manual before installation and use of this pellet fuel-burning appliance. Keep children, furniture, fixtures and all combustibles away from any heating appliance.

SAFETY NOTICE

Failure to follow these instructions can result in property damage, bodily injury or even death. For your safety and protection, follow the installation instructions outlined in this manual. Contact your local building or fire officials about restrictions and installation inspection requirements (including permits) in your area.

SAVE THESE INSTRUCTIONS

IMPORTANT: IF YOU HAVE A PROBLEM WITH THIS UNIT, DO NOT RETURN IT TO THE DEALER. CONTACT TECHNICAL SUPPORT @ 1-800-245-6489

Mobile Home Use:
This freestanding wood unit is approved for mobile home or doublewide installation with the outside combustion air hook-up. See the "Installation" section of this manual for details pertaining to mobile home installations. Mobile home installation must be in accordance with the Manufactured Home and Safety Standard (HUD), CFR 3280, Part 24.

Retain for your files

Model Number_____
Date of Purchase_____
Date of Manufacture_____
Serial Number_____

* This information can be found on the safety tag attached to the rear of the unit. Have this information on hand if you phone the factory or your dealer regarding this product.

CAUTION

- Keep children away.
- Supervise children in the same room as this appliance.
- Alert children and adults to the hazards of high temperatures.
- Do NOT operate with protective barriers open or removed.
- Hot while in operation! Keep clothing, furniture, draperies and other combustibles away.
- Installation MUST comply with local, regional, state and national codes and regulations.
- Consult local building, fire officials or authorities having jurisdiction about restrictions, installation inspection, and permits.

TABLE OF CONTENTS

Introduction
- Introduction 4

Specifications
- Heating Specifications 5
- Dimensions 5
- EPA Compliance 5

Installation
- Installation Overview 6
- Clearances to Combustibles 7
- Venting Introduction 8
- Venting Guidelines 8
- Additional Venting Information ... 9
- Wall Pass-Throughs 10
- Approved Venting Methods
  - Through the Wall 11
  - Through the Ceiling 12
  - Masonry Chimney 13
- Mobile Home Installation 14
- Outside Air Hook-Up 14
- Floor Protection 15
- R value Calculations 16

Operation
- Break In Fires 17
- Lighting a Fire 17
- Continuous Operation 18
- Safety Notes 19

Maintenance
- Important Notes 20
- Inspecting Gaskets 21
- Glass and Gasket Replacement .. 22

Troubleshooting Guide
- Troubleshooting 23

Illustrated Parts Detail
- Exploded Parts Diagram 24
- Parts List 25

Optional Accessories
- AC-16 Blower 25

Warranty
- Warranty Details 26-27
- Warranty Reg. Form 28-29

DO NOT CONNECT TO ANY DISTRIBUTION DUCT OR SYSTEM.

DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.

DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA OR ENGINE OIL.

INTRODUCTION

Thank you for purchasing this fine product from England's Stove Works!

England's Stove Works was started, and is still owned by, a family that believes strongly in a "Do It Yourself" spirit; that's one reason you found this product at your favorite "Do It Yourself" store.

We intentionally design and build our stoves so that any homeowner can maintain their unit with basic tools, and we're always more than happy to show you how to do the job as easily and as inexpensively as possible. However, while remaining simple, our stoves are designed to perform extremely efficiently, helping deliver more heat from less fuel.

Please look at our vast Help section on our website and call our Technical Support Department at (800) 245-6489 if you need any help with your unit. We are nearly always able to "walk you through" any installation issues, repairs, problems or other questions that you may have.

Wishing you years of efficient, quality and "comfy" heating,

EVERYONE AT ENGLAND'S STOVE WORKS

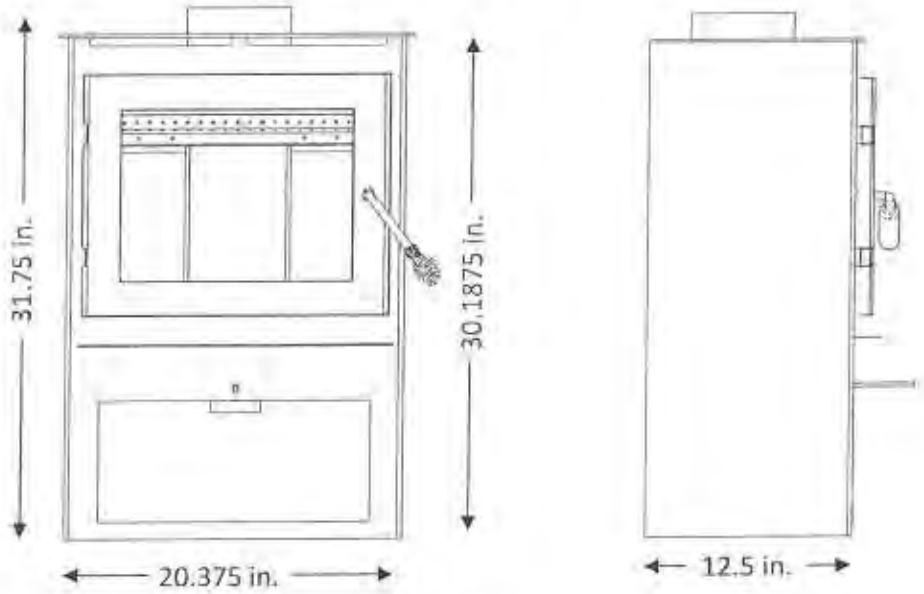
Please Note: While information obtained from our web site and through our Technical Support line is always free of charge, there will be a service charge incurred with any "on-site" repairs or maintenance that we may arrange.

SPECIFICATIONS

Heating Specifications

- Heat Output Range** ..... 10,700 BTU/hr – 25,100 BTU/hr
- Maximum Burn Time** ..... 6 hours
- Approximate Square Footage Heated*** ..... 500 - 1000 sq. ft.
- Firebox Capacity ..... 45 pounds
- Flue Collar ..... 6.0 in. round

Dimensions



EPA and Safety Compliance Specifications

- EPA Compliance ..... Certified
- Particulate Emissions ..... #.## grams/hr
- Efficiency* 63%
- Tested To ..... UL 1482, ULC S627

*- This unit was not tested for efficiency; the efficiency shown is a default value normally attained by similar, certified non-catalytic wood burning appliances.

** - Heat output, burn rate and maximum burn time are heavily dependent on the type of wood burned in the stove; as such, these numbers may vary.

*** - The maximum heating capacity of this unit can vary greatly based on climate, construction style, insulation and a myriad of other factors. Use this information in conjunction with a BTU loss calculation for your home to determine if this unit will be sufficient for your needs.

INSTALLATION

Installation Overview

When choosing a location for your new stove, there are a multitude of factors that should be taken into account before beginning the installation.

1. Traffic Patterns – To help prevent accidents, the stove should be placed in a location where it is out of the way of normal travel through the home.

2. Heat Flow – When deciding on a location for the stove, consider the way heat moves throughout your home. Install the stove where you need the heat; basement installations often do not allow sufficient heat to flow to the upper floors and a top floor installation will not allow any heat to reach the floors below. Always consider that heat rises and will take the path of least resistance while it is still hot.

3. Exhaust Location – The engine which drives a wood stove is the chimney system, so it is important to consider precisely how the chimney system will be integrated into the stove installation. Ideally, a wood stove chimney will run completely vertical from the flue collar of the unit all the way to the termination point above the roof line. Keeping the entire chimney system inside the heated envelope of the home will ensure a strong, easy to initiate draft in the chimney. Although exterior chimney systems often function properly, they are more likely to suffer from cold down drafts at start up or provide weak draft to the unit. Also, consider the cross-sectional area of the chimney; although existing masonry chimneys can often be used, a large external masonry chimney will result in a unit that is difficult or impossible to operate properly. In that case, an insulated chimney liner will often be required to supply the necessary draft.

4. Wall Construction – Locating the stove so that the exhaust system can pass between studs will simplify the installation and eliminate the need to reframe any sections of the wall or ceiling to accommodate the wall thimble or ceiling box.

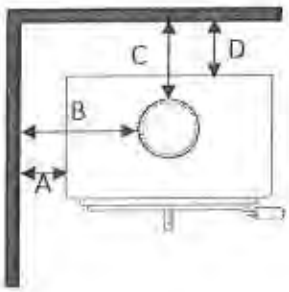
WARNING

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Do Not Over-fire – If any external part starts to glow, you are over-firing. Reduce intake air supply. Over-firing will void your warranty.
- Comply with all minimum clearances to combustibles as specified. Failure to comply may result in a house fire.
- Tested and approved for **cordwood only**. Burning any other fuel will void your warranty.

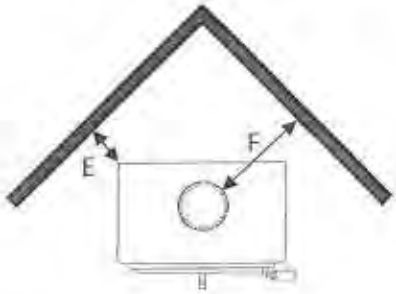
INSTALLATION

Clearances to Combustibles

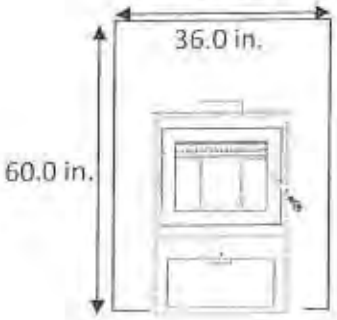
Parallel Wall Installation



Corner Installation



Wall Protector



	Unit to Side Wall	Chimney Connector to Side Wall	Chimney Connector to Rear Wall	Unit to Rear Wall	Unit to Corner	Chimney Connector to Corner
	A	B	C	D	E	F
	in.	in.	in.	in.	in.	in.
Single Wall Chimney Connector Unprotected Surface	20	14.5	14.5	20	16	14.5
Double Wall Chimney Connector Unprotected Surface	20	12.5	12.5	20	16	12.5
Single Wall Chimney Connector NFPA 211 Protected Surfaces	12	10.5	10.5	12	8	10.5

1. Wall shields should be constructed of 24 gauge or heavier sheet metal, or another noncombustible material such as 1/2" insulation board or common brick "laid on flat," with the 3½" side down. Shields must be spaced out from the combustible surface 1" on noncombustible spacers. The spacers should not be directly behind the stove or chimney connector. Air must be able to flow between the wall and the shield. At least 50% of the bottom 1" of the shield should be open and the shield must be open at the top. The clearances listed are from the unit to the wall shield.

2. There is no additional clearance reduction beyond the listed Double Wall Chimney Connector Unprotected Surface clearances when this unit is installed with double wall chimney connector and NFPA 211 Wall Shields.

INSTALLATION

Venting Introduction

This wood stove operates on a natural draft system, in which the chimney system pulls air through the stove. This unit must be installed in accordance with the following detailed descriptions of venting techniques; not installing the stove in accordance with the details listed here can result in poor stove performance, property damage, bodily injury or death. Avoid make-shift compromises when installing the venting system. England's Stove Works is not responsible for any damage incurred due to a poor or unsafe installation.

Be certain that all aspects of the venting system are installed to the venting manufacturer's instructions, particularly the required clearances to combustibles. Also, be certain to use an attic radiation shield to prevent insulation from contacting a chimney which passes through an attic.

The chimney system is the "engine" which drives a wood stove, so it is imperative for proper unit function that the venting system be installed exactly as described in the following section.

If questions arise pertaining to the safe installation of the stove, our Technical Support line (800-245-6489) is available. Contact your local code official to be certain your installation meets local and national fire codes, and if you're uncertain about how to safely install the stove, we strongly recommend contacting a local NFI certified installer to perform the installation.

Venting Guidelines

- **ALWAYS** install vent pipe in strict adherence to the instructions and clearances included with your venting system.
- **DO NOT** connect this wood stove to a chimney flue which also serves another appliance.
- **DO NOT** install a flue pipe damper or any other restrictive device in the exhaust venting system of this unit.
- **USE** an approved wall thimble when passing through a wall and a ceiling support/fire stop when passing through a ceiling.
- **INSTALL** three sheet metal screws at every chimney connector joint.
- **AVOID** excessive horizontal runs and elbows, as both will reduce the draft of the venting system and will result in poor stove performance.
- **INSPECT** your venting system often, to be certain it is clear of creosote, fly-ash and other restrictions.
- **CLEAN** the venting system as detailed in the maintenance section of this manual.
- **ADHERE** to the 10-3-2 rule regarding chimney terminations.
- **INSTALL** single wall chimney connector with the male end **down** to prevent creosote leakage. Follow double wall chimney connector manufacturer's instructions regarding proper pipe installation.

WARNING: Venting system surfaces get HOT, and can cause burns if touched. Noncombustible shielding or guards may be required.

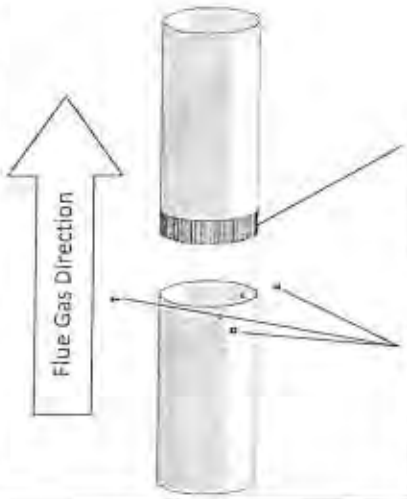
INSTALLATION

Additional Venting Information

- Do not mix and match components from different pipe manufacturers when assembling your venting system (i.e. Do **NOT** use venting pipe from one manufacturer and a thimble from another).
- We **require** a minimum chimney height of 15.0 ft. Chimney systems shorter than this may not create the amount of draft which is required to operate this wood burning unit.
- Do not make makeshift compromises when installing the venting system; have existing chimney systems inspected before use and be certain all new chimney systems are installed to the manufacturer's specifications and with only UL listed components.
- Prefabricated venting systems used for this stove must be listed to ULC S629 (Canada) and UL 103HT (US).
- Never install a draft inducer or any other system which increases the natural draft of the chimney; similarly, do not install a barometric or stovepipe damper with this unit.
- Never use single wall or double chimney connector as a chimney system; never pass either type of chimney connector through a combustible wall without carefully following the manufacturer's instructions and those listed in the following page on Wall Pass-Throughs. NEVER pass chimney connector through an attic, floor, closet or roof.
- Only use 24 gauge MSG black single wall chimney connector or UL Listed double wall chimney connector.

Single Wall Chimney Connector Installation

The male end of single wall chimney connector is installed facing down so that any liquid creosote in the flue will run into the unit instead of onto the outside of the pipe (the natural draft in the chimney system will prevent smoke leakage at the joints).



Crimped or male end of single wall chimney connector must face down.

Fasten each single wall chimney connector joint with three sheet metal screws.

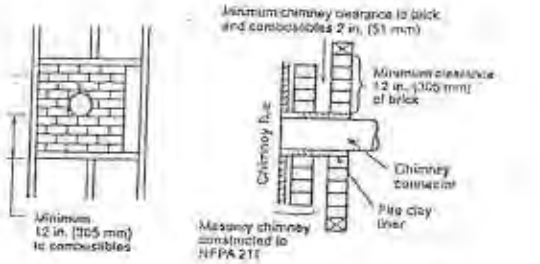
WARNING

- INSTALL VENT AT CLEARANCES SPECIFIED BY THE VENT MANUFACTURER.
- HOT! Do not touch! Severe burns or clothing ignition may result.
- Glass and other surfaces are hot during operation.

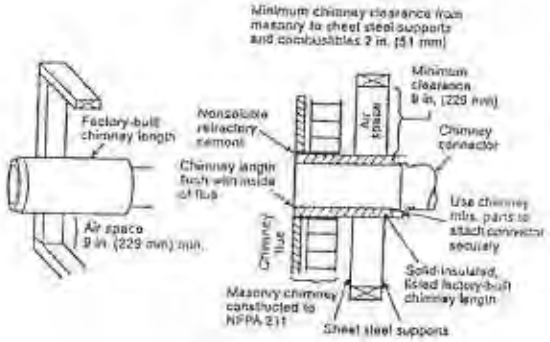
INSTALLATION

Wall Pass-Throughs

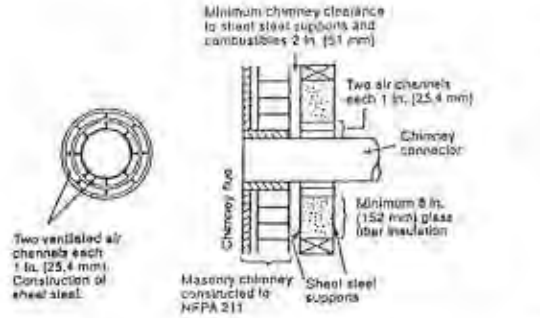
Chimney Connector Systems and Clearances from Combustible Walls for Residential Heating Appliances



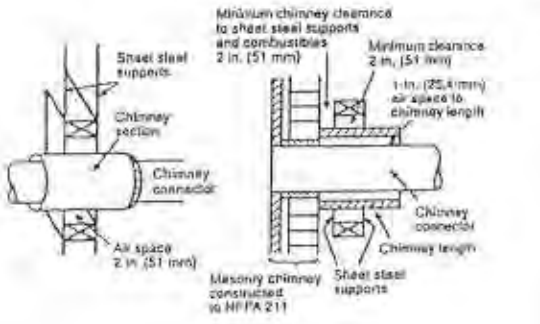
A Minimum 3.5-in thick brick masonry all framed into combustible wall with a minimum of 12-in brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.



B Solid-insulated, listed factory-built chimney length of the same inside diameter as the chimney connector and having 1-in. or more of insulation with a minimum 9-in. air space between the outer wall of the chimney length and combustibles.



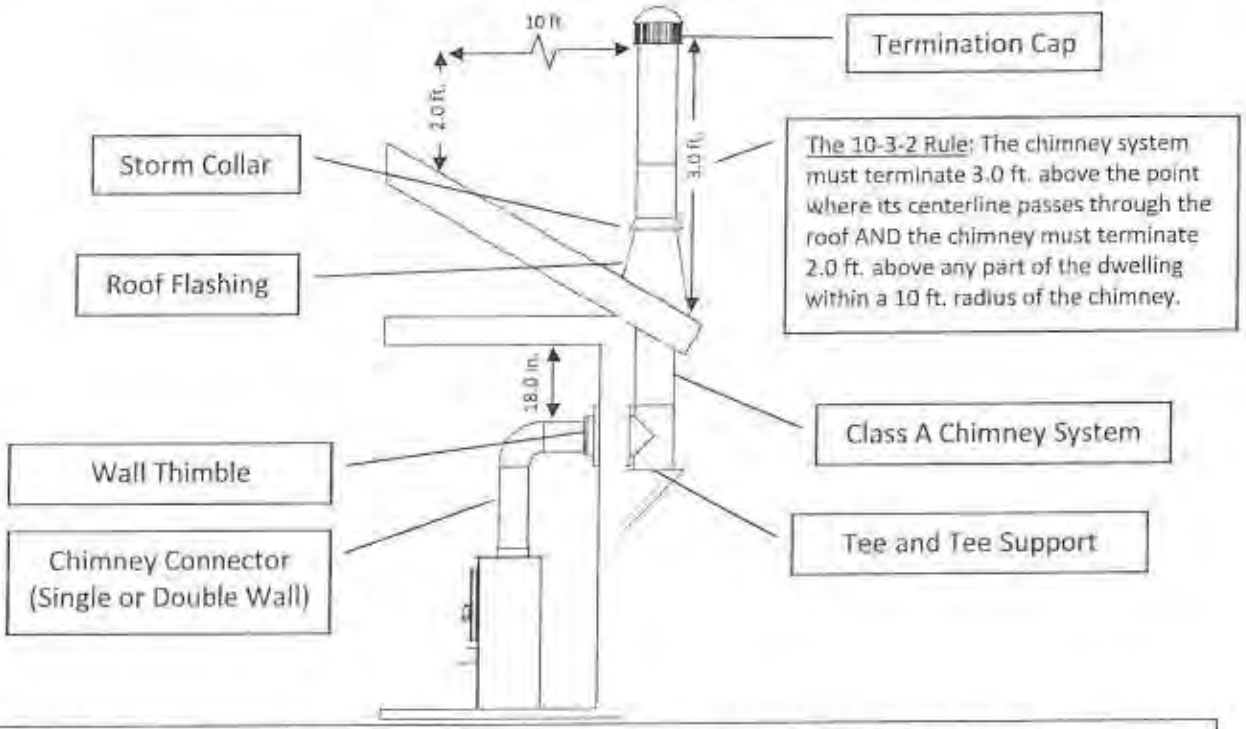
C Sheet steel chimney connector, minimum 24 gauge in thickness, with a ventilated thimble, minimum 24 gauge in thickness, having two 1-in. air channels, separated from combustibles by a minimum of 6-in. of glass fiber insulation. Opening shall be covered, and thimble supported with a sheet steel support, minimum 24 gauge in thickness.



D Solid insulated, listed factory-built chimney length with an inside diameter 2-in. larger than the chimney connector and having 1-in. or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gauge thickness, with a minimum 2-in. air space between the outer wall of chimney section and combustibles. Minimum length of chimney section shall be 12-in. chimney section spaced 1-in. away from connector using sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel supports securely fastened to wall surfaces of minimum 24 gauge thickness. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

INSTALLATION

Approved Venting Method 1: Through the Wall Factory Built Chimney

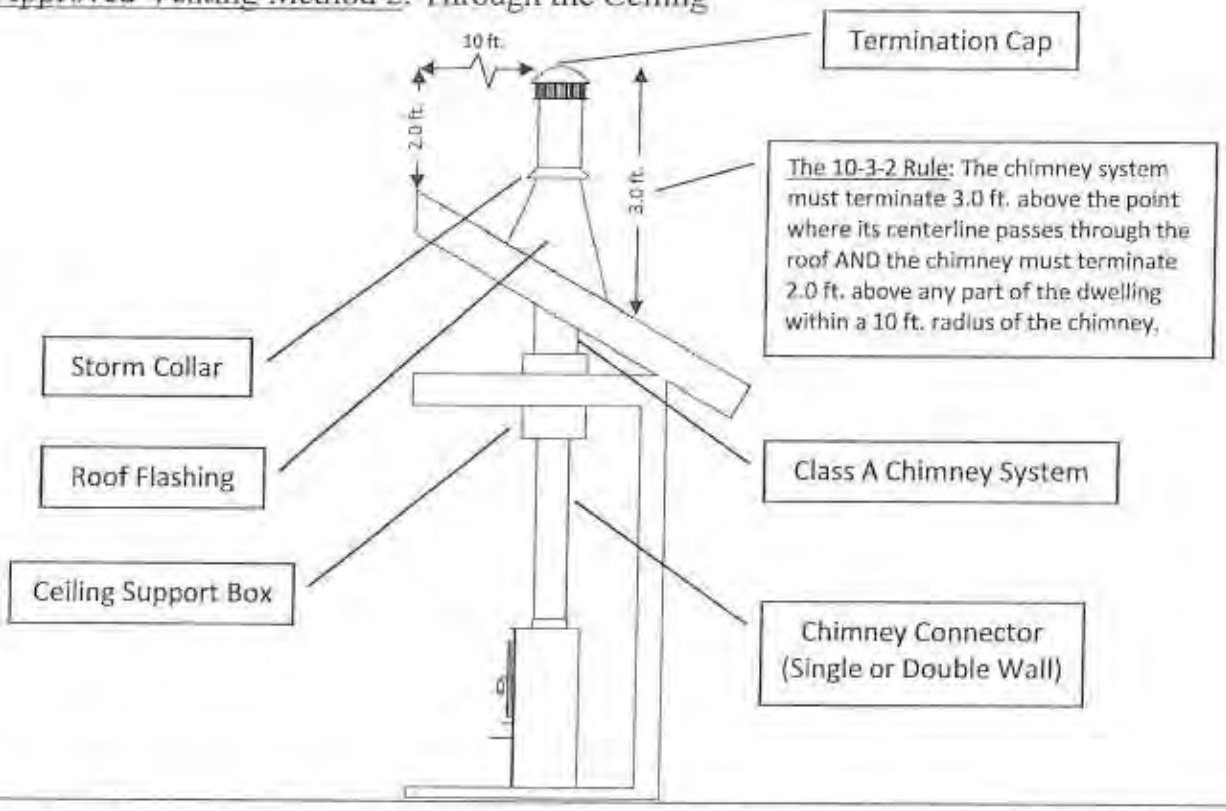


- Prefabricated chimney systems must conform to UL-103HT (2100 °F) for the U.S. and ULC-S-629 (650°C) for Canada.
- This wood burning unit is only listed for installation with 6.0" diameter chimney connector and chimney systems. Installing this unit on prefabricated chimneys larger than 6.0" diameter will result in decreased draft and the potential for poor unit performance.
- Follow all venting system manufacturer's installation requirements and required clearances.
- Use three sheet metal screws at each single wall chimney connector joint (check manufacture's recommendations when double wall chimney connector is used).
- Drill three holes in the flue collar of the unit and attach the chimney connector to the unit using sheet metal screws.
- Properly attach the prefabricated chimney system to the home in strict accordance with the prefabricated chimney system manufacturer's instructions.
- Avoid numerous elbows and excessive horizontal runs as both will lead to poor draft and increased creosote accumulation. Horizontal runs of chimney connector must never exceed 4.0 ft. and the overall length of the chimney connector must not exceed 8.0 ft.
- Special adapters and slip connectors are available to eliminate the need to cut single wall chimney connector. Double wall chimney connector must be used with these slip connectors, as it cannot be trimmed to length.

Please Note:
Installation diagrams are for reference purposes only and are not drawn to scale, nor meant to be used as plans for each individual installation. Please follow all venting system requirements, maintain the required clearances to combustibles, and follow all local codes.

INSTALLATION

Approved Venting Method 2: Through the Ceiling



- Prefabricated chimney systems must conform to UL-103HT (2100 °F) for the U.S. and ULC-S-629 (650°C) for Canada.
- This wood burning unit is only listed for installation with 6.0" diameter chimney connector and chimney systems. Installing this unit on prefabricated chimneys larger than 6.0" diameter will result in decreased draft and the potential for poor unit performance.
- Follow all venting system manufacturer's installation requirements and required clearances.
- Use three sheet metal screws at each single wall chimney connector joint (check manufacture's recommendations when double wall chimney connector is used).
- Drill three holes in the flue collar of the unit and attach the chimney connector to the unit using sheet metal screws.
- Properly attach the prefabricated chimney system to the home in strict accordance with the prefabricated chimney system manufacturer's instructions.
- The overall length of the chimney connector must not exceed 8.0 ft. In the case of cathedral ceilings, the prefabricated chimney system should extend to 8.0 ft. from the top of the unit.
- Special adapters and slip connectors are available to eliminate the need to cut single wall chimney connector. Double wall chimney connector must be used with these slip connectors, as it cannot be trimmed to length.

Please Note:
Installation diagrams are for reference purposes only and are not drawn to scale, nor meant to be used as plans for each individual installation. Please follow all venting system requirements, maintain the required clearances to combustibles, and follow all local codes.

INSTALLATION

Approved Venting Method 3: Internal or External Masonry Chimney System

Chimney liner cross-sectional area (Length x Width) must be no larger than twice the cross-sectional area of the flue collar ($2 \times 28.27\ in^2 = 56.55\ in^2$). If chimney liner is larger than $56.55\ in^2$, relining with a 5.5" or 6.0" liner is required

The 10-3-2 Rule: The chimney system must terminate 3.0 ft. above the point where its centerline passes through the roof AND the chimney must terminate 2.0 ft. above any part of the dwelling within a 10 ft. radius of the chimney.

Chimney Connector (Single or Double Wall)

Masonry Thimble with proper clearance to combustibles

Ash Cleanouts must have an airtight seal to prevent weak draft.

- Follow the rules listed above concerning maximum permissible flue liner size; installing this unit on masonry chimneys exceeding $56.55\ in^2$ in cross-sectional area will result in decreased draft and the potential for poor unit performance.
- Use three sheet metal screws at each single wall chimney connector joint (check manufacture's recommendations when double wall chimney connector is used).
- Drill three holes in the flue collar of the unit and attach the chimney connector to the unit using sheet metal screws.
- Avoid numerous elbows and excessive horizontal runs as both will lead to poor draft and increased creosote accumulation. Horizontal runs of chimney connector must never exceed 4.0 ft. and the overall length of the chimney connector must not exceed 8.0 ft.
- A tight seal at the thimble is crucial for proper unit performance and to create a safe installation. Use the proper adapter designed for connecting single or double wall chimney connector to a masonry thimble.
- Have existing masonry chimneys inspected for safety and proper clearances to combustibles before putting them into service; a qualified chimney sweep can perform this inspection.
- External masonry chimneys often suffer cold downdrafts and poor draft performance even when they meet the cross-sectional area rules. In this case, a 6.0" insulated liner may be necessary.

Please Note:
Installation diagrams are for reference purposes only and are not drawn to scale, nor meant to be used as plans for each individual installation. Please follow all venting system requirements, maintain the required clearances to combustibles, and follow all local codes.

INSTALLATION

WARNING
DO NOT INSTALL IN A SLEEPING ROOM.

CAUTION

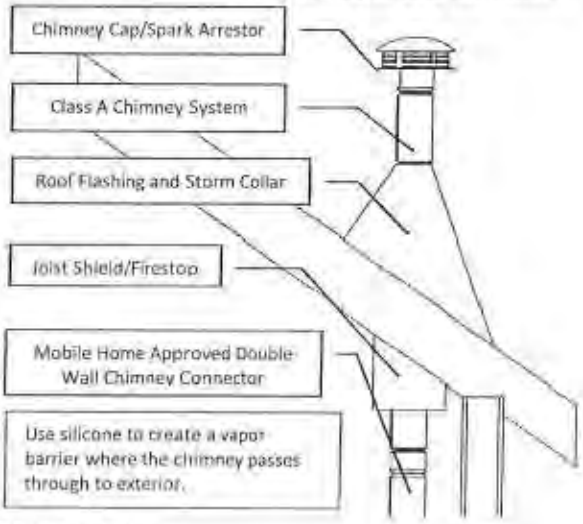
THE STRUCTURAL INTEGRITY OF THE MANUFACTURED HOME FLOOR, WALL AND CEILING/ROOF MUST BE MAINTAINED.

Caution

NEVER draw outside combustion air from:
Wall, floor or ceiling cavity.
Enclosed space such as an attic, garage or crawl space.

Mobile Home Installation

- The wood stove **MUST** be secured to the floor of the mobile home using lag bolts and the holes provided in the bottom of the unit for this purpose.
- The wood stove must be connected to the chimney system with double wall chimney connector which is UL listed for use in mobile and manufactured homes.
- Carefully follow all clearances listed in the appropriate section of this manual AND follow the venting manufacturer's minimum clearance requirements. Similarly, be certain the venting system used is approved for mobile home use.
- Installation must be accordance with Manufacturers Home & Safety Standard (HUD) CFR 3280, Part 24 as well as any applicable local codes.

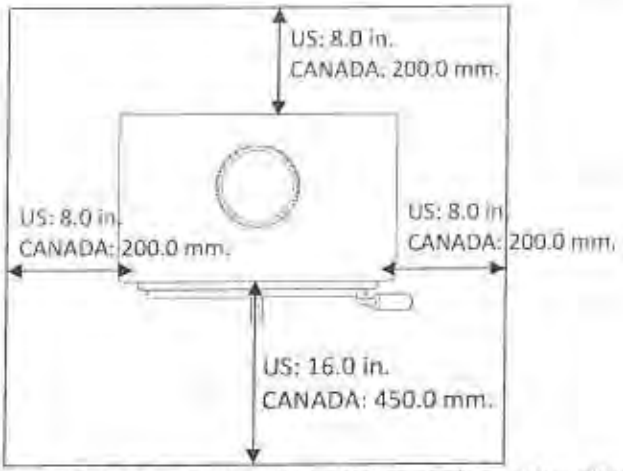


Outside Combustion Air

- The use of outside combustion air is **mandatory** when installing this wood stove in a mobile or manufactured home.
- The outside air connection pipe protrudes from the bottom center of the stove; a kit is available from England's Stove Works, Inc. designed for connecting this unit to outside combustion air. [Part No. AC-OAK3]
- If it is not feasible to use the AC-OAK3 outside air hookup kit in your stove installation, other materials may be used, provided the following rules are followed:
    - The pipe used for outside air hookup must be metal, with a minimum thickness of .0209in. (25 gauge mild steel) or greater and an inside diameter of approximately 3.0in.
    - Keep pipe runs short and use a mechanical fastener at each pipe joint.
    - A screen or other protection device must be fitted over the outside air termination point to prevent rain, debris and nuisance animals from entering the piping system. Inspect the outside combustion air inlet for block and debris monthly.

FLOOR PROTECTION

- This wood stove requires a non-combustible floor protector if the stove is to be installed on a combustible floor. If the floor the stove is to be installed on is already non-combustible (i.e. a concrete floor in a basement), no floor protection is needed (although a decorative floor protector can still be used for aesthetic reasons).
- When using any floor protector, consider that this stove is not only heavy but will induce heating and cooling cycles on the floor protector which can damage tile and loosen mortar and grout joints located near the stove.
- The floor protector should be UL approved or equivalent and must be noncombustible with an R value of 0.5. Since the majority of the heat from this unit is radiant, the floor protector not only serves to keep ashes and sparks from landing on combustible flooring near the unit but also protects the combustible floor from the heat of the unit. A hearth rug is NOT an approved substitute for a proper hearth pad.
- For the US: The floor protector must extend at least 16 in. from the front of the fuel opening, 8 in. from the sides of the door opening and 8 in. from the rear of the unit.
- For Canada: The floor protector must extend at least 450.0 mm from the front of the fuel opening, 200.0 mm from the sides of the door opening and 200.0 mm from the rear of the unit.



- The non-combustible floor protector must extend 2 in. (50.8 mm.) on either side of any horizontal venting runs and extend directly underneath any vertical venting pipe.
- Please see the following page for instructions on calculating R values, to be certain that the planned floor protection is adequate for this stove.

CAUTION

NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR "FRESHEN UP" A FIRE IN THIS HEATER. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE HEATER WHILE IN USE. ADDITIONALLY, NEVER APPLY FIRE-STARTER TO ANY HOT SURFACE OR EMBERS IN THE STOVE.

FLOOR PROTECTION

R Value Calculation

An easy means of determining if a proposed alternate floor protector meets requirements is to follow this procedure:

1) Convert specification to R-value:
   - i R-value is given – no conversion is needed
   - ii k-factor is given with a required thickness (T) in inches: $R = 1/k \times T$
   - iii C-factor is given: $R = 1/C$
2) Determine the R-value of the proposed alternate floor protector:
   - i Use the correct formula given in step 1 (above) to convert values not expressed as "R."
   - ii For multiple layers, add R-values of each layer to determine overall R-value.
3) If the overall R-value of the system is greater than the R-value of the specified floor protector, the alternate is acceptable.

EXAMPLE:

The specified floor protector should be ¾" thick material with a k-factor of 0.84. The proposed alternate is 4" brick with a C-factor of 1.25 over 1/8" mineral board with a k-factor of 0.29.

Step (a): Use formula above to convert specification to R-value.
$R = 1/k \times T = 1/0.84 \times .75 = 0.893$

Step (b): Calculate R of proposed system.

4" brick of C = 1.25, therefore R brick = 1/C =1/1.25 = 0.80

1/8" mineral board of k = 0.29, therefore Rmin.bd. = 1/0.29 x 0.125 = 0.431

Total $R = R_{brick} + R_{mineral\ board} = 0.8 + 0.431 = 1.231$

Step (c): Compare proposed system of R of 1.231 to specified R of 0.893. Since proposed system R is greater than required, the system is acceptable.

Definitions:

Thermal conductance $= C = \dfrac{Btu}{(hr)(ft^2)(deg\ F)} = \dfrac{W}{(m^2)(deg\ K)}$

Thermal conductivity $= k = \dfrac{(Btu)(inch)}{(hr)(ft^2)(deg\ F)} = \dfrac{W}{(m)(deg\ K)} = \dfrac{Btu}{(hr)(ft)(deg\ F)}$

Thermal resistance $= R = \dfrac{(ft^2)(hr)(deg\ F)}{Btu} = \dfrac{(m^2)(deg\ K)}{W}$

OPERATION

Break In Fires

- This wood burning unit is constructed of heavy gauge steel and cast iron and is built to last a long time. However, in order to ensure no excessive thermal stresses are induced on the metal during the first fire, three break-in fires should be burned, each one slightly hotter than the last. These break-in fires will not only help the stove body acclimate to the high temperatures of the fire, but will also slowly cure the high temperature stove paint, which will ensure the high quality finish lasts for years.
- This stove has a single air control rod which regulates the wood burn rate; when the primary air control slide is pulled all the way out of the unit, the stove will burn more slowly and put out heat over a longer time period. Conversely, when the air control slide is pushed all the way in, the unit will burn more quickly and put out a larger amount of heat over a relatively shorter time period. Do not attempt to modify the range of air control adjustment for any reason.
- The first break-in fire should be just a large kindling fire, getting the stove to about 300°F as measured by a magnetic thermometer on the right or left side of the stove, above the door. Once this temperature has been reached, allow the fire to die out with the air control open. The second and third break-in fires should be a bit larger, with some small dry splits added to the kindling load. The temperature goal during these fires is about 350°F – 450°F; don't let the fire get hotter than that.

Continuous Operation

- After the break-in fires are complete, this unit is ready for continuous operation. When burning the stove continuously, do not allow ash and coal to accumulate higher than 1.0" below the door opening. Excessive coaling is often a result of burning wood at too high a burn rate, and the coal bed should be allowed to burn down before reloading the stove with fresh wood.
- Combustion air is delivered to the stove at two locations: The majority of the primary combustion air enters the firebox via the air-wash system which keeps the glass clean and feeds the primary combustion flames on the top surfaces of the wood; some primary combustion air is bled off into the coal bed via bleed holes in the bottom rail of the air-wash system. Every effort must be taken to maintain the area in front of these holes free of ash.
- When loading the stove for a long term burn, it is most useful to rake a "v" in the center of the coal bed, to allow the primary air bleed holes to push air all the way to the rear of the unit.
- After loading the stove with a full firebox of fresh wood, it is important to operate the unit with the air control in the full open position to properly char the wood load and drive off the initial moisture in the fresh wood. Once the wood has been properly charred and is completely ignited, the air control can then be set to the desired heat output level.

In the event of a creosote or soot fire (chimney fire), close the air control on the stove, contact the local fire department and get out! Do not throw water on the fire! Contact your local fire authority for more information on how to handle a chimney fire and develop a safe evacuation plan for you and your family in the event of a chimney fire.

OPERATION

- England's Stove Works, Inc. always recommends the use of a magnetic stove thermometer, so that the temperature of the unit can be monitored. When using a magnetic stove thermometer, locate the thermometer above the door on either the left or ride side of the stove and use the following temperatures as rough guidelines to determine the burn rate and heat output level of the stove:
    - Normal wood stove operation should occur between 350°F and 550°F, with 350°F to 450°F being a low to medium heat output level and 450°F to 550°F being a medium to high heat output level. Operating the stove at 600°F would be considered the maximum continuous operating temperature permissible and unit damage may result from operating at that high of a burn rate for extended time periods. Allowing the unit to reach 650°F or higher is defined as over-firing and will result in unit damage.
- The optional room air convection blower was designed to extract the maximum amount of heat from the stove, for the highest possible heat transfer into the room. Since the blower is so efficient at removing heat from the unit, it is very important to only operate the room air blower after a fresh wood load has been allowed to burn for at least thirty (30) minutes. Allowing a fresh load of wood to burn without the blower on ensures that the entire unit reaches proper operation temperatures and that the secondary combustion system is functioning properly. Additionally, follow the guidelines below for acceptable blower speeds.
- When using the optional room air convection blower (Part No. AC-16), the blower should be operated as follows depending on heat output level:

Burn rate	High	Medium High	Medium	Medium Low	Low
Blower Speed	High	Low	Low	Low	Off

Creosote – Formation and Need for Removal

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited, this creosote makes an extremely hot fire. The chimney and chimney connector should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If creosote has accumulated, it should be removed to reduce the risk of chimney fire.

DO NOT USE GRATE OR ELEVATE FIRE – BUILD WOOD FIRE DIRECTLY ON HEARTH
DO NOT OPERATE WITH THE MAIN DOOR OPEN – OPERATING THE STOVE WITH THE MAIN DOOR OPEN WILL CREATE AN OVER-FIRE

OPERATION

Additional Safety Guidelines

- The installation of smoke detectors is highly recommended when installing this or any other solid fuel burning appliance. Smoke detectors should be located near or in every room of the home, particularly sleeping rooms.
- A smoke detector can be installed in the same room as this cordwood burning unit; installing the smoke detector too close to the unit can lead to nuisance alarms due to slight wisps of smoke emitted during the fire starting or reloading process. Due to this, the smoke detector in same room as the unit will be most useful if it is located as far from the unit as the room will permit.
- This stove is meant for burning cordwood only; never burn pressure treated wood, kiln dried wood, creosote treated wood (railroad ties), ice covered or wet wood, green wood, drift wood, charcoal, coal, coke or ANY other fuel.
- Burning fuels other than cordwood, particularly coal and charcoal, can result in hazardous concentrations of carbon monoxide being emitted into the dwelling. Installing a carbon monoxide detector and being aware of the symptoms of carbon monoxide poisoning can help reduce the risk of carbon monoxide related issues. For these reasons, NEVER burn coal or charcoal in this cordwood stove.
- This unit was designed for operation only with the loading door closed and tightly latched. Operating this unit with the loading door latched loosely or open will allow excessive combustion air to reach the fire and will result in dangerously high unit temperatures. High unit temperatures can damaged the unit, void the warranty or ignite creosote deposited in the chimney system by previous, slow burning fires.
- The natural draft that pulls air through this unit and allows the fire to burn uses the indoor air of the dwelling for combustion, unless the unit is connected to an outside combustion air source. Kitchen range vent hoods, furnaces and other air movement appliances in the home are often also removing air from the dwelling; if the amount of air filtration or leakage back into the home is exceed by the air being removed, negative pressure may be created in the home.
- Since this is a natural draft appliance, it will often be the first appliance to have problems related to negative pressure. If smoke is forced out the chimney connector joints or out of the air induction system of the unit, the unit is likely fighting negative pressure in the dwelling. Cracking a window or door near the appliance can help equalize the negative pressure; ultimately, an unrestricted source of outside combustion may be necessary for proper unit function.
- If the unit is connected to outside air, be certain to monitor the exterior inlet to the combustion system for icing or snow accumulation. Allowing the outside air connection to become restricted will result in air starvation to the unit.

DO NOT STORE FUEL CLOSER THAN SPECIFIED CLEARANCES TO COMBUSTIBLES OR WITHIN THE SPACE NEEDED FOR LOADING THE STOVE AND FOR ASH REMOVAL.

MAINTENANCE

Daily Maintenance

- Inspect the firebox for ash accumulation; remove excess ash and follow instructions below regarding disposal. Ash should not be allowed to accumulate in the stove to the point that it covers the coal bed air inlets.

Monthly Maintenance

- Check the blower for dust accumulation (if installed); check the door handle for proper operation and to be certain an airtight seal is still being made by the door.
- Inspect the chimney system and chimney connector and sweep if necessary. Although cleaning may be required less than monthly, ALWAYS inspect the venting system monthly to decrease the chance of a chimney fire.
- Visually inspect the vermiculite insulating boards in the firebox for cracks and/or breakage. Slight surface cracks will not affect the performance of the boards, but cracked or crumbling boards should be replaced immediately.
- Visually inspect the secondary combustion tubes for cracks, warping and corrosion. Although these tubes are constructed from stainless steel, they operate at very high temperatures and can eventually wear out from normal use.

Yearly Maintenance

- Check all gaskets (window and door) for wear and to be certain they still maintain an airtight seal. See the following page for instructions.
- Thoroughly clean the chimney system and the chimney connector system. Since the chimney connector is generally exposed to high exhaust temperatures, inspect it carefully for leaks and weak spots; replace any questionable pieces. [In the case of straight through the roof chimney system, be certain to remove the vermiculite baffle **before** pushing the chimney sweeping brush down into the firebox. Forcefully hitting the top of the baffle with a cleaning brush or rod can damage or destroy the baffle.]
- Remove all ash from the stove, including the ash which accumulates on the top of the firebox baffle. Leave the air control open during the non-heating months to allow some air to flow through the stove to help prevent corrosion. A small open container of cat litter in the stove can help prevent corrosion during the humid summer months; be certain to remove it before building a fire in the fall.

IMPROPER GASKET MAINTENANCE, INCLUDING FAILURE TO REPLACE GASKETS, CAN CAUSE AIR LEAKS RESULTING IN AN UNCONTROLLABLE UNIT.

Disposal of Ashes – Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have been thoroughly cooled.

MAINTENANCE

Inspecting Gaskets

An airtight seal at the door opening is crucial to proper stove performance. Any air leakage at this area can not only cause an over-fire situation and is therefore a serious safety threat. Because of this, gaskets should always be maintained in good condition. Gasket tightness can be checked using the "dollar-bill" method:

- Place a dollar bill between the gasket and the stove body (at the location where the gasket meets the stove).
- Tighten the latching mechanism down and attempt to pull the dollar bill out. If the dollar bill slides in and out easily, the gasket needs to be replaced. This test should be repeated around the entire gasket perimeter, as gaskets will sometimes seal tightly on one side, but will be worn and seal poorly on another side.
- Perform this test around the entire perimeter of the door, and visually inspect the window gasket for any leaks. Leaks in the window gasket can generally be located by following the prevailing soot trails left on the window after burning the unit.
- If any area fails the test, the entire gasket should be replaced. The part number appropriate to the gasket being replaced can be found in the "Illustrated Parts" section of this manual.
- Gaskets should only be replaced with equivalent fiberglass gaskets purchased from England's Stove Works ® specifically for this unit.

Gaskets

1. Door - This unit comes with a $^{5}/_{8}$" rope gasket around the door that should be replaced at least every two years. To replace the door gasket (Part # AC-DGKNC), the old gasket must first be removed entirely — prior to adding the new adhesive, you may have to scrape the old cement from the door channel. Once the cement and gasket have been added, the door should be closed and latched for twenty-four hours to allow the cement to harden.
2. Window - If you are replacing the window gasket (Part # AC-GGK), the new gasket will already have adhesive on one side. Remove the paper on the adhesive side and place the gasket around the outside edge of the glass, centered over the edge. Fold the gasket edges over on the glass, forming a "U" shape.

Finish

This new unit has been painted with High-Temperature Paint that should retain its original look for years. If the unit should get wet and rust spots appear, the spots can be sanded with fine steel wool and repainted. It is crucial that only High-Temperature Spray Paint is used (Part # AC-MBSP), as others may not adhere to the surface or withstand the high temperatures. Similarly, some brands of paint will not adhere to different brands of paint, so we highly recommend using our proprietary High-Temperature Spray Paint.

REPLACING COMPONENTS

Glass

This unit has a one ceramic glass panel (Part No. AC-G40) in the viewing door; self adhesive window gasket is included with replacement windows purchased directly from England's Stove Works. Never replace ceramic glass with tempered or any other type of glass and never operate this unit with cracked or broken glass.

- Glass Size: 14.5 in. (368.3 mm) x 10.75 in. (273.05 mm)
- Glass Type: 5mm Ceramic Glass (Keralite Pyroceram)
- Glass Manufacturer: Eurokera

Glass Precautions

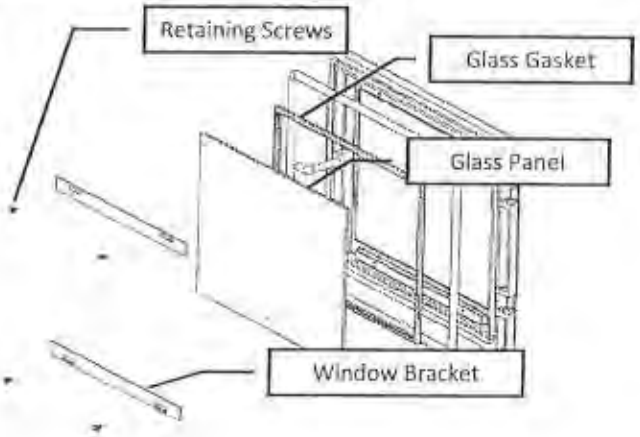
1. Never replace ceramic glass with tempered or any other type of glass.
2. Never operate this unit with cracked or broken glass.
3. Do not slam the door or strike the glass with any objects.
4. Do not build the fire directly against the glass.

Glass Cleaning

1. Be certain the stove **and** the glass are completely cool.
2. The build-up on the glass will generally be light and water is normally sufficient to remove the deposits. If stubborn soot persists, use a cleaner made specifically for this purpose. Do not scrape the glass or use abrasive cleaners.
3. Rinse the glass with clean water and dry the glass before resuming normal operation.

Glass Replacement

1. Remove the door from the stove and rest it face down on a firm work surface.
2. Using a 5/16" wrench, remove the eight (8) window bracket retaining screws [A].
3. Remove the two (2) window brackets from the door. Take extra care to avoid shards of glass if the glass window has been broken.
4. Lift the old glass panel out of the door and discard.
5. The new glass panel must be wrapped with a self-adhesive fiberglass tape gasket (AC-GGK). This gasket serves to cushion the glass from the cast iron door.
6. Reinstall the window retaining brackets using the four (4) screws previously removed. Do not over-tighten the screws.



TROUBLESHOOTING

Issue	Cause	Solution(s)
Stove smokes into room	1. Weak Draft	1.1 Be certain chimney is sufficiently tall to meet the 10-3-2 rule.
		1.2 Add additional height to the chimney.
	2. Negative Pressure in the Home	2.1 Add an outside combustion air hookup to the unit.
Fire is hard to start	3. Weak Draft	3.1 Be certain chimney is sufficiently tall to meet 10-3-2 rule.
		3.2 Add additional height to the chimney system.
	4. Cold Chimney	4.1 Heat the flue first by burning crumbled newspaper in the stove.
		4.2 Install an insulated chase around external chimneys.
	5. Downdraft in Chimney	5.1 Be certain chimney is sufficiently tall to meet 10-3-2 rule.
		5.2 Try heating the flue with a hair-dryer to correct the draft.
Glass is dirty	6. Wet or Green Wood	6.1 Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow.
	7. Operating Stove at Low Burn Rate	7.1 Operate the stove at higher burn rates to allow the air-wash system to keep the glass clean.
	8. Wood Loaded Too Close to Glass	8.1 Never load wood so that it is touching the ceramic glass viewing window.
Coals build up in firebox	9. Operating Stove at High Burn Rates	9.1 Reduce combustion air control and allow coals to burn down before reloading.
Fire burns out of control	10. Excessive Draft	10.1 Reduce chimney height.
	11. Air Leakage	11.1 Inspect window and door gaskets and replace if necessary.
	12. Burning Excessively Dry Wood	12.1 Only burn seasoned cord wood. Do not burn kiln dried wood or pallet wood.
Excessive smoke from stack	13. Operating Stove at Low Burn Rate	13.1 Operate the stove at a higher burn rate which will create secondary combustion.
	14. Wet or Green Wood	14.1 Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow.
	15. Not Charring Fresh Wood Load	15.1 Char the fresh wood load until it is completely ignited and active secondary combustion is present in the firebox.

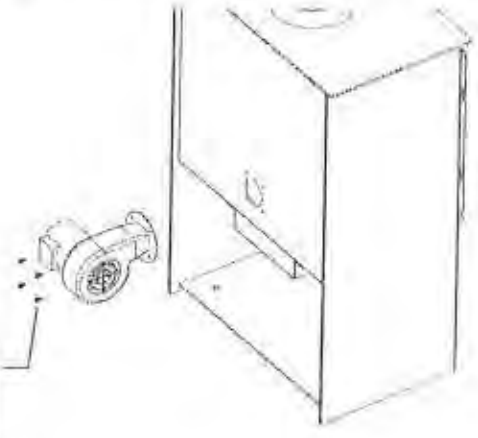
REPLACEMENT PARTS LIST

Diagram No.	Description	Part No.	Quantity Per Stove
1	Air Control Slide	AC-17ACS	1
2	Outside Air Connection Box	AC-17ACB	1
3	Right Refractory Panel	AC-17RBR	1
4	Rear Refractor Panel	AC-17RBB	2
5	Left Refractory Panel	AC-17RBL	1
6	9" x 4" x 1.25"Firebrick	AC-SB	4
7	Refractory Baffle	AC-17RBT	1
8	Door Gasket [5/8" HD]	AC-DGKNC	1
9	Window Gasket	AC-GGK	1
10	Ceramic Glass Panel	AC-G40	1
11	Window Retaining Brackets	AC-GS16	2
12	Cast Iron Door	CA-16	1
13	Front Secondary Tube	AC-17BTF	1
14	Rear Secondary Tube	AC-17BTR	1
Not Shown	Large Spring Handle	AC-SH (Brass)	1
		AC-SHN (Nickel)	
Not Shown	Air Control Spring Handle	AC-SH4 (Nickel)	1
		AC-SH4N (Nickel	
Not Shown	Optional Window Trim	AC-122 (Brass)	Optional
		AC-122BN (Nickel)	
Not Shown	Optional Lip Trim	AC-123 (Brass)	Optional
		AC-123BN (Nickel)	

OPTIONAL ACCESSORIES

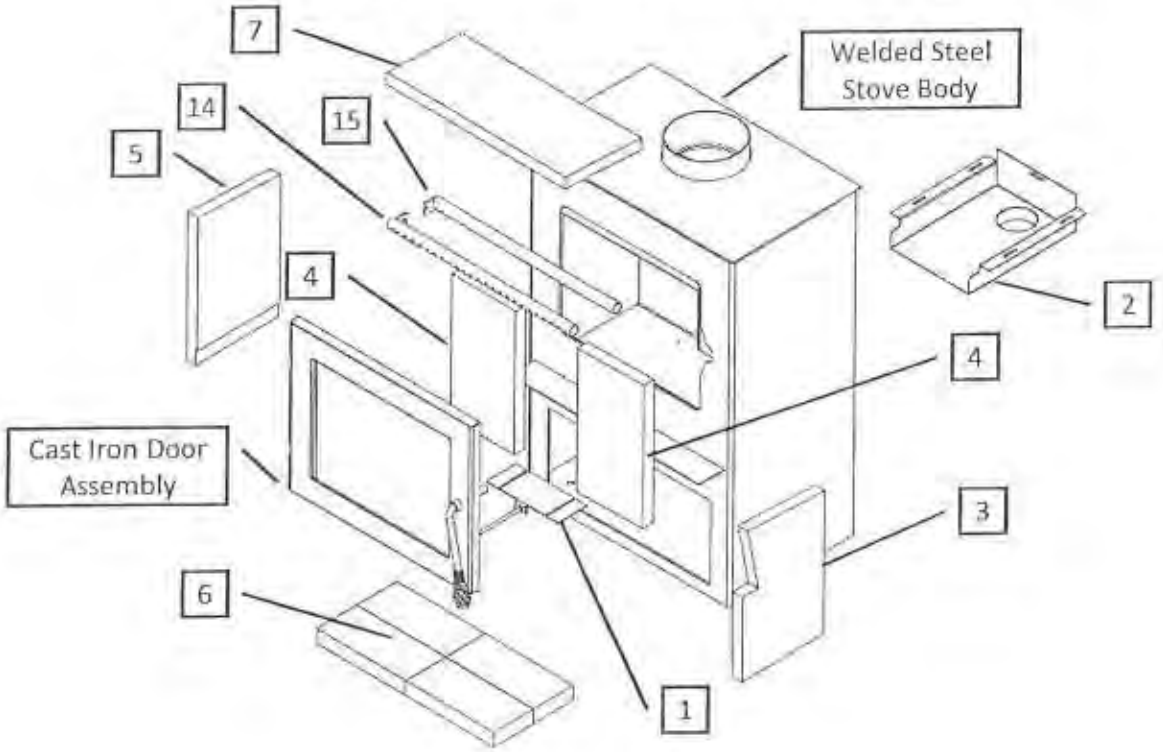
AC-16 Convection Blower

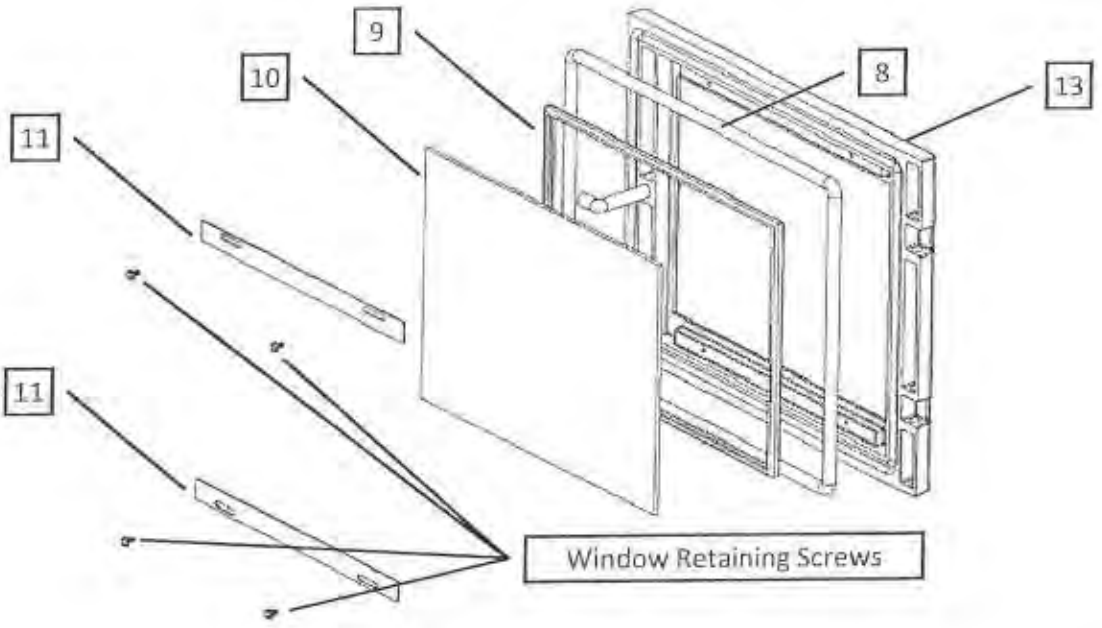
- The Tranquility wood stove was also designed for use with a convection blower for additional heat circulation. The stove is constructed with rear and top convection channels which allow the room air blower to pick up heat from the hottest regions of the stove and transfer it into the home. The mounting screws for the blower are installed into the rear convection channel at the factory; mounting the blower only requires a 5/16" open end or socket wrench to remove these screws and install the blower. When routing the power cord, take care to keep away from hot areas of the unit. Please see the diagram below for clarification on the room air blower installation.



(4) 5/16" head, self tapping screws (pre-installed in unit).

ILLUSTRATED PARTS DIAGRAM





LIMITED FIVE (5) YEAR WARRANTY

From the date of purchase to the original owner

The manufacturer extends the following warranties:

Five Year Period:

1. Carbon steel and welded seams in the firebox are covered for five (5) years against splitting.
2. The cast iron door and hinges are covered for five (5) years against cracking.

One Year Period:

1. Electrical components, accessory items, glass and the painted surface of the stove are covered for one (1) year from the date of purchase.

Conditions and Exclusions

1. Damage resulting from over-firing will void your warranty.
2. This warranty does not apply if damage occurs because of an accident, improper handling, improper installation, improper operation, abuse or unauthorized repair made or attempted to be made.
3. The manufacturer is not liable for indirect, incidental, or consequential damages in connection with the product including any cost or expense, providing substitute equipment or service during periods of malfunction or non-use.*
4. All liability for any consequential damage for breach of any written or implied warranty is disclaimed and excluded.
5. This warranty does not cover internal wear parts of the combustion system, including the vermiculite firebox lining and gaskets.

* Some states do not allow the exclusion of limitations of incidental or consequential damages, so the above may not apply to you.

Procedure

Purchaser must give notice of claim of defect within the warranty period and pay transportation to and from a service center designated by the manufacturer. The dealer from which the unit was purchased or the factory, at our option, will perform the warranty service.

Other Rights

This warranty gives you specific legal rights; you may also have other rights, which may vary from state to state.

Please Note: This warranty is null and void if the attached warranty registration AND a copy of the sales receipt is not returned within thirty (30) days from the date of purchase.

Warranty is not transferable.

WARRANTY REGISTRATION for England's Stove Works®

Purchaser Information

I. Purchased By (Name) _____

II. Address _____

III. City_____ State_____ Zip Code _____

IV. Telephone Number_____

V. Email Address _____

Dealer Information

VI. Purchased From _____

VII. Address _____

VIII. City_____ State_____ Zip Code_____

Unit Information

*Refer to the sticker on the back of the manual or box to complete this section.

IX. Model Number_____ Purchase Date_____

X. Purchase Price_____

XI. Serial Number_____ Mfg. Date_____

Purchase Questions

How did you first hear about our product? (Please check one)

Word of Mouth ____ Burn Trailer Demonstration____ Internet____

Other: _____

Where did you receive information about our product?

Via Telephone____ Dealer (Name of dealer) _____ Internet____

Other: _____

Important Notice

This registration information **MUST** be on file for this warranty to be valid. Please mail this information within thirty (30) days from the original date of purchase.

Use any of these three easy ways to send your warranty information in!

Mailing Address

England's Stove Works, Inc.
Technical Support Department
P.O. Box 206
Monroe, Virginia 24574

Fax Number

(434) 929-4810 – Twenty-four hours a day.

Online Registration

Visit our warranty registration website at:

http://www.englanderstoves.com/warranty/warranty.html

Section 4

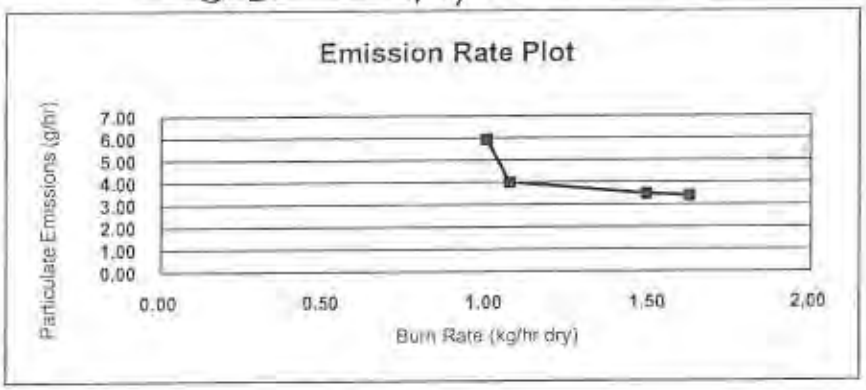
Test Data by Run

EPA Weighted Average Emissions
EPA Method 28

Client: England's Stove Work
Stove Model: 17-VI.
Test Dates: 11/02/09 - 11/06/09
Project Number: 428-S-02-3
Tracking Number: 1424
Signature/Date: BD 12/3/09

Status: Final
Stove Type: Non-Catalytic Stove

Weighted Average (g/hr)
4.3



Run #	1	
Burn Rate (dry kg/hr)	1.00	
Category	2	
Overall Efficiency (%)	63%	
Emissions (g/hr)	5.93	
Cap (g/hr)	15	
Weighting Factor	0.428	29.94%
Heat Output (BTU/hr)	11875	

Run #	3	
Burn Rate (dry kg/hr)	1.07	
Category	2	
Overall Efficiency (%)	63%	
Emissions (g/hr)	3.99	
Cap (g/hr)	15	
Weighting Factor	0.364	25.48%
Heat Output (BTU/hr)	12706	

Run #	4	
Burn Rate (dry kg/hr)	1.49	
Category	3	
Overall Efficiency (%)	63%	
Emissions (g/hr)	3.48	
Cap (g/hr)	15	
Weighting Factor	0.382	26.70%
Heat Output (BTU/hr)	17694	

Run #	2	
Burn Rate (dry kg/hr)	1.62	
Category	3	
Overall Efficiency (%)	63%	
Emissions (g/hr)	3.39	
Cap (g/hr)	18	
Weighting Factor	0.256	17.87%
Heat Output (BTU/hr)	19238	

Run 1

Run Information

Run Number	Date	Tracking Number	Fuel Load (lbs)
1H	10/2/09	1424	8.00

Manufacturer	Project Number	Coal Bed Range (lbs)
England Stove Works	428-S-02-3	1.60 to 2.00

Model	Technician	Actual Coal Bed (lbs)
17-VL	B. Davis	1.6

FINAL

Test Booth	Data Collection Program
E2	SG_Logger_07_31_07.vi

Velocity Traverse Data

	Pt.1	Pt. 2	Pt. 3	Pt. 4	Pt. 5	Pt. 6	Pt. 7	Pt. 8	
Initial dP	.034	.036	.04	.034	.032	.038	.038	.032	In-H2O
Intitial Temp	77	77	77	77	77	77	77	77	Deg F

	Begin	Middle	End	Avg	
Barometric Pressure	30.35	30.34	30.34	30.343	In-Hg

PM Control Module	289		Tunnel Velocity	12.66	ft/sec	Avg Prop Rate	101.622	
Dilution Tunnel MW(dry)	29	lb/lb-mole	Initial Tunnel Flow	141.1	scfm	Firebox Surface Temp Change	-34.9	
Dilution Tunnel MW(wet)	28.56	lb/lb-mole	Average Tunnel Flow	141.58	scfm			
Dilution Tunnel H2O	4	percent	Tunnel Area	.196	ft2	Filter Holder #	A	
Dilution Tunnel Static	-.39	in. H2O	Post-Test Leak Check	.006@5	cfm@" Hg	Total Particulate	45.4	mg
Pitot Tube Cp	.99		Fuel Moisture(dry basis)	20.55	%			
Meter Box "Y" Factor	.986		Fuel Consumed	8.000	lbs	Run Time	180	Minutes

Notes

B-4 OF 4-48

Signature/Date: 12/4/07

Emissions Results

Burn Rate	1.00	kg/hr dry	Adjusted Emissions	5.93	grams/hour

Particulate Concentration(dry standard)	0.00049	grams/dscf
Particulate Emission Rate	4.15	grams/hour
Average Tunnel Temp	82	Degrees Fahrenheit
Average Delta p	0.036	Inches H20
Total Sample Volume-Vm	93.688	Cubic Feet
Average Gas Meter Temperature	74	Degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel-vs	12.71	Feet/Second
Average Gas Flow Rate in Dilution Tunnel Qsd	8494.77	DSCF/Hour
Total Sample Volume (Standard Conditions) Vms	92.886	DSCF
Total Particulates- mn	45.4	Mg
Average Delta H	1.14	Inches H20
Total Time	180	Minutes

A-5 of 4-98

Signature/Date: 12/4/09

Fuel Data

OMNI EQUIPMENT ID #

FUEL: DOUGLAS-FIR SPECIES,UNTREATED,AIR-DRIED,STANDARD GRADE OR BETTER,DIMENSIONAL LUMBER.

PRE-BURN FUEL

MOISTURE-CONTENT (METER-DRY BASIS)

CALIBRATION: CALIBRATION VALUE (1) = 12% ACTUAL READING ----- 12
CALIBRATION VALUE (2) = 22% ACTUAL READING ----- 22

AVG PRE-BURN LOAD MOISTURE 21.17 %

PIECE	LENGTH	% MOISTURE READINGS			FUEL TYPE
1	8 ft	19.5	22.4	21.6	2X4
2	0 ft	0	0	0	
3	0 ft	0	0	0	

PIECE LENGTH NOTES:

TIME (24 HR) 09:05 ROOM TEMPERATURE (F) 67

TEST FUEL

FUEL PIECE LENGTH: 14.5 IN
CALCULATED FUEL LOAD: 0 LBS

FUEL TYPE - PIECE QUANTITY

4	2 X 4 PIECES	0	4 X 4 PIECES
8	LBS	0	LBS

FUEL LOAD PIECE COUNT 4 PIECES
ACTUAL LOAD WEIGHT: 8 LBS

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE#	READINGS			TYPE	PIECE#	READINGS			TYPE
1	19.3	21.3	21.6	2X4	6	0	0	0	
2	20.3	22	19.8	2X4	7	0	0	0	
3	19.3	20.8	18.9	2X4	8	0	0	0	
4	21.1	20.2	22	2X4	9	0	0	0	
5	0	0	0		10	0	0	0	

TIME (24 HR CLOCK) 12:15 ROOM TEMPERATURE (F) 68

AVERAGE FUEL LOAD MOISTURE 20.55 %

A-6 OF A-48

Signature/Date: 12/4/09

MFG: England Stove Works
Model # :17-VL

Run #: 1H

Project #: 428-S-02-3
Run Date:10/2/09

Pre-Burn Time	ET	Scale (lbs)	Weight Change	FB Top (oF)	FB Bot (oF)	FB Back (oF)	FB Left (oF)	FB Right (oF)	FB Int (oF)	Avg Surf (oF)	Stack (oF)	AMB (oF)	Draft (In-H2O)	Cat Temp (oF)	O2 (%)	CO2 (%)	CO (%)	CO Ratio
1217	0	3.4	0.000	487	319	337	412	428	3218	396.6	460	70	-0.085	3218	20.80	0.00	-0.00	-44.87
1227	10	2.6	-0.656	362	339	266	440	447	3218	370.8	336	69	-0.069	3218	20.79	0.00	-0.00	-32.68
1237	20	2.4	-0.419	281	343	240	439	429	3218	346.3	278	68	-0.055	3218	20.80	0.00	-0.00	-32.68
1247	30	2.2	-0.162	220	354	224	420	399	3218	323.3	226	68	-0.044	3218	20.80	0.00	-0.00	-32.68
1257	40	2.0	-0.149	185	365	211	402	376	3218	307.7	200	68	-0.036	3218	20.80	0.00	-0.00	-32.68
1307	50	1.9	-0.144	166	370	199	377	361	3218	294.7	184	67	-0.033	3218	20.79	0.01	-0.00	-11.63
1317	60	1.8	-0.120	155	375	189	356	345	3218	284.1	173	67	-0.032	3218	20.79	0.01	-0.00	-11.63
1327	70	1.6	-0.182	141	374	186	341	331	3218	274.7	166	67	-0.030	3218	20.79	0.00	-0.00	-39.91

A-7 OF A-48

Signature/Date: 12/4/09

MFG: England Stove Works
Model # :17-VL

Run #: 1H

Project #: 428-S-02-3
Run Date:10/2/09

Test Time	ET	Gas Meter (ft3)	Sample Rate (cfm)	Orifice dH	Meter (deg F)	Meter Vac	Dil Tun Temp	Dil Tunn dP	Pro Rate (10%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int	Avg Surf	Stack	Filter	Imping Exit	AMB	Draft
1333	0	0.000	0.000	1.26	71	1.01	81	0.032	0.0	8.0	7.97	146	369	215	332	324	3218	277.2	175	72	67	66	-0.028
1343	10	5.292	0.529	1.11	71	1.33	87	0.044	106.9	7.0	-0.99	193	345	268	316	315	3218	287.3	271	72	67	68	-0.059
1353	20	10.485	0.519	1.15	72	1.38	89	0.031	92.3	5.9	-1.05	240	332	274	308	302	3218	291.3	295	72	67	68	-0.064
1403	30	15.651	0.517	1.15	72	1.38	86	0.038	106.1	5.0	-0.92	277	313	246	318	315	3218	293.5	275	72	68	68	-0.059
1413	40	20.764	0.514	1.13	73	1.34	93	0.039	97.3	3.9	-1.06	232	295	185	318	322	3218	270.3	359	72	68	68	-0.072
1423	50	25.949	0.516	1.11	74	1.37	95	0.034	96.7	2.7	-1.26	265	277	205	348	359	3218	290.7	367	73	68	69	-0.078
1433	60	31.151	0.520	1.13	74	1.34	92	0.034	103.7	1.3	-0.78	279	278	221	372	386	3218	307.0	332	73	69	69	-0.063
1443	70	36.344	0.519	1.11	75	1.29	86	0.038	103.3	1.6	-0.31	245	300	217	375	391	3218	305.6	253	73	69	69	-0.050
1453	80	41.548	0.520	1.18	75	1.27	93	0.035	98.0	1.4	-0.20	201	317	217	376	387	3218	299.5	219	73	69	69	-0.043
1503	90	46.739	0.519	1.13	75	1.36	80	0.036	102.2	1.2	-0.20	175	323	207	370	379	3218	290.6	201	72	68	69	-0.038
1513	100	51.912	0.517	1.13	75	1.29	79	0.039	99.9	1.0	-0.18	165	326	200	363	368	3218	284.5	191	72	68	69	-0.035
1523	110	57.148	0.524	1.11	75	1.28	78	0.034	98.3	0.8	-0.12	156	325	194	354	360	3218	277.9	184	72	68	69	-0.033
1533	120	62.370	0.522	1.12	75	1.31	78	0.038	103.0	0.7	-0.18	152	326	188	347	354	3218	273.3	180	71	67	68	-0.033
1543	130	67.563	0.522	1.11	75	1.29	77	0.036	98.7	0.6	-0.15	149	325	182	338	346	3218	268.1	174	71	67	68	-0.030
1553	140	72.820	0.523	1.15	75	1.35	76	0.034	98.6	0.4	-0.14	145	324	177	330	340	3218	263.3	170	71	66	67	-0.029
1603	150	77.994	0.517	1.11	75	1.26	76	0.032	103.4	0.3	-0.13	142	325	177	322	334	3218	259.9	167	70	66	67	-0.028
1613	160	83.218	0.522	1.17	74	1.33	76	0.034	107.1	0.2	-0.12	139	322	175	316	326	3218	255.6	163	70	66	68	-0.029
1623	170	88.456	0.524	1.14	74	1.33	75	0.031	104.0	0.1	-0.10	136	317	174	308	316	3218	250.3	157	70	66	68	-0.027
1633	180	93.669	0.523	1.11	74	1.28	74	0.034	108.8	0.0	-0.11	132	307	171	297	304	3218	242.3	152	69	66	67	-0.026
AVG	NA	NA	0.520	1.137	73.895	1.303	82.158	0.036	101.622	NA	NA	187.865	318.211	204.895	337.105	343.579	3218.000	NA	225.526	71.579	67.368	68.211	-0.043

4-8 OF 4-8

Signature/Date: 12/4/09

Final Laboratory Report - Method 5G
Dilution Tunnel Particulate Calculations

Client Name: Englands Stove Works
Model: 17-VL
Project No.: 428-S-02-3
Tracking No.: 1424
Equipment Numbers:
Run #: 1
Date: 11/02/09

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N880	615.3	578.8		36.5
B. Rear filter catch	Filter	N879	576.7	574.8		1.9
C. Rinse of probe and filter assembly	Acetone	75	117376.9	117369.8	0.0017	7.0

Total Particulate, mg :	45.4

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Rinse of probe and filter assembly	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Analyst: BD Date: 12/4/09

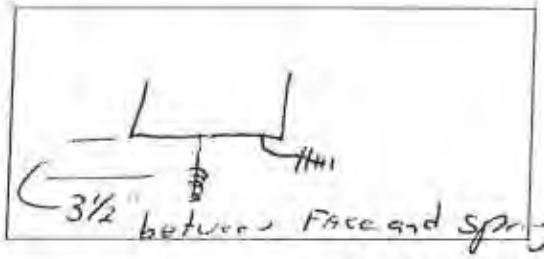
Run Notes

Client: England's Stove Works
Model: Englander 17-VL
Project #: 428-S-02-3
Tracking #: 1424
Run #: 1 Date: 11/2/09
Test Crew: B Davis
OMNI Equipment ID #(s):

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCABLE)

PRIMARY:



SECONDARY: fixed

TERTIARY: NA

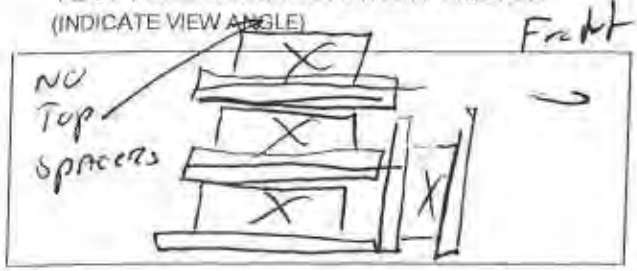
FAN: on low

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
Ø	Test setting					
71	→				X	→

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: NA
FUEL LOADING: By 50 sec.
DOOR: Closed by 2:00 min
PRIMARY AIR: fully open until 4:45 Then set to test setting
OTHER: NA

DESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)
PRIMARY:

Same As Above

SECONDARY: fixed

TERTIARY: NA

FAN: off for first 30 min Then turned to Low

Technician signature: [signature] Date: 11/2/09

4-10 OF 4-48

Supplemental Data EPA 5G/5H

Client: England's Stove Works

Model: Englander 17-VL

Project #: 428-S-02-3 Tracking #: 1424

Date: 11/2/09 Run #: 1 Booth: B2

Test Crew: BOAZ Start Time: ~~12:12~~ 13:33 Stop Time: 16:35

OMNI Equipment #(s):

Gas Analyzer Train Leak Check:

Stack: Initial: NA Final:

Dilution Tunnel (Method 5G Only): Initial: Final:

Calibrations: Span Gas CO_2: O_2: CO: CO_2(DT):

	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span
Time	NA						
O_2							
CO_2							
CO							
CO_2 (DT)							

Stack Diameter (inches): 6"

Air Velocity (ft/min): Initial: <50 Final: <50

Scale Audit (lbs): Pretest: 10.0 Post Test: 10.0

Induced Draft: 0.0 %Smoke Capture: 100 %

Pitot Tube Leak Test: Pre: 0.0 Post: 0.0

Flue Pipe Cleaned Prior to First Test in Series: Date: 10-29-09 Initials: JH

	Initial	Middle	Ending
Pb (in/Hg)	30.35	30.35	30.35
Room Temp (°F)	68	69	67

Technician signature: Date: 11/2/09

4-11 OF 4-48

Run 2

Run Information

Run Number	Date	Tracking Number	Fuel Load (lbs)
2Ga	11/3/09	1424	7.20

Manufacturer	Project Number	Coal Bed Range (lbs)	
Englan's Stove Works	428-S-02-3	1.44 to 1.80	FINAL

Model	Technician	Actual Coal Bed (lbs)
17-VL	B. Davis	1.7

Test Booth	Data Collection Program
E2	5G_Logger_07_31_07.vi

Velocity Traverse Data

	Pt.1	Pt. 2	Pt. 3	Pt. 4	Pt. 5	Pt. 6	Pt. 7	Pt. 8	
Initial dP	.036	.04	.042	.036	.034	.036	.040	.036	In-H2O
Intitial Temp	108	108	108	108	108	108	108	108	Deg F

Barometric Pressure	Begin	Middle	End	Avg	
	30.12	30.12	30.12	30.12	In-Hg

PM Control Module	289		Tunnel Velocity	14.04	ft/sec	Avg Prop Rate	99.653	
Dilution Tunnel MW(dry)	29	lb/lb-mole	Initial Tunnel Flow	140.5	scfm	Firebox Surface Temp Change	-94.8	
Dilution Tunnel MW(wet)	28.56	lb/lb-mole	Average Tunnel Flow	150.28	scfm			
Dilution Tunnel H2O	4	percent	Tunnel Area	.196	ft2	Filter Holder #		
Dilution Tunnel Static	-.44	in. H2O	Post-Test Leak Check	.008@6	cfm@" Hg	Total Particulate	12.0	mg
Pitot Tube Cp	.99		Fuel Moisture(dry basis)	21.30	%			
Meter Box "Y" Factor	.986		Fuel Consumed	7.200	lbs	Run Time	100	Minutes

Notes

A-13 OF 4-88

Signature/Date: 12/4/09

MFG: Englan's Stove Works
Model # :17-VL

Run #: 2Ga

Project #: 428-S-02-3
Run Date:11/3/09

Emissions Results

Burn Rate	1.62	kg/hr dry	Adjusted Emissions	3.39	grams/hour

Particulate Concentration(dry standard)	0.00023	grams/dscf
Particulate Emission Rate	2.11	grams/hour
Average Tunnel Temp	99	Degrees Fahrenheit
Average Delta p	0.042	Inches H2O
Total Sample Volume-Vm	52.028	Cubic Feet
Average Gas Meter Temperature	75	Degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel-vs	13.99	Feet/Second
Average Gas Flow Rate in Dilution Tunnel Qsd	9000.91	DSCF/Hour
Total Sample Volume (Standard Conditions) Vms	51.107	DSCF
Total Particulates- mn	12	Mg
Average Delta H	1.12	Inches H2O
Total Time	100	Minutes

4-14 OF 4-48

Signature/Date: 12/4/09

Fuel Data

OMNI EQUIPMENT ID #

FUEL: DOUGLAS-FIR SPECIES,UNTREATED,AIR-DRIED,STANDARD GRADE OR BETTER,DIMENSIONAL LUMBER.

PRE-BURN FUEL

MOISTURE-CONTENT (METER-DRY BASIS)

CALIBRATION: CALIBRATION VALUE (1) = 12% ACTUAL READING ----- 12

CALIBRATION VALUE (2) = 22% ACTUAL READING ----- 22

AVG PRE-BURN LOAD MOISTURE 21.5 %

PIECE	LENGTH	% MOISTURE READINGS			FUEL TYPE
1	8 ft	22.5	22.6	19.4	2X4
2	0 ft	0	0	0	
3	0 ft	0	0	0	

PIECE LENGTH NOTES:

TIME (24 HR)

ROOM TEMPERATURE (F) 0

TEST FUEL

FUEL TYPE - PIECE QUANTITY

FUEL PIECE LENGTH: 15 IN

4 2 X 4 PIECES 0 4 X 4 PIECES

CALCULATED FUEL LOAD: 0 LBS

7.2 LBS 0 LBS

FUEL LOAD PIECE COUNT 4 PIECES

ACTUAL LOAD WEIGHT: 7.2 LBS

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE#	READINGS			TYPE	PIECE#	READINGS			TYPE
1	22.5	21.5	22	2X4	6	0	0	0	
2	20.6	19.9	22	2X4	7	0	0	0	
3	22.5	18.1	23.8	2X4	8	0	0	0	
4	22.2	20.5	20	2X4	9	0	0	0	
5	0	0	0		10	0	0	0	

TIME (24 HR CLOCK) 13:45 ROOM TEMPERATURE (F) 68

AVERAGE FUEL LOAD MOISTURE 21.3 %

A-15 OF A-98

Signature/Date: 12/4/09

MFG: England Stove Works
Model # :17-VL

Run #: 2G

Project #: 428-S-02-3
Run Date:11/3/09

Pre-Burn Time	ET	Scale (lbs)	Weight Change	FB Top (oF)	FB Bot (oF)	FB Back (oF)	FB Left (oF)	FB Right (oF)	FB Int (oF)	Avg Surf (oF)	Stack (oF)	AMB (oF)	Draft (in-H2O)	Cat Temp (oF)	O2 (%)	CO2 (%)	CO (%)	CO Ratio
1323	0	10.3	0.000	275	335	353	335	363	3218	332.3	309	87	-0.056	3218	20.65	-0.00	-0.00	27.87
1333	10	9.6	-0.713	279	328	327	331	350	3218	323.1	287	66	-0.066	3218	20.65	-0.00	-0.00	30.21
1343	20	8.3	-1.267	281	323	299	298	356	3218	311.6	426	66	-0.076	3218	20.65	0.00	-0.00	-44.67
1353	30	6.6	-1.760	378	327	311	316	400	3218	346.2	514	67	-0.065	3218	20.65	-0.00	-0.00	30.21
1403	40	4.7	-1.825	472	336	370	374	450	3218	400.8	537	68	-0.065	3218	20.64	0.00	-0.00	-39.97
1413	50	3.2	-1.501	518	355	433	423	491	3218	444.2	498	69	-0.081	3218	20.64	-0.00	-0.00	30.21
1423	44760	3.0	-0.275	524	363	448	435	499	3218	453.7	461	69	-0.079	3218	20.64	-0.00	-0.00	30.21
1426	44763	2.7	-0.282	512	371	464	444	504	3218	455.1	439	69	-0.078	3218	20.64	-0.00	-0.00	24.15

See page 2

Signature/Date: 12/4/09

MFG: Englan's Stove Works
Model # :17-VL

Run #: 2Ga

Project #: 428-S-02-3
Run Date:11/3/09

Pre-Burn Time	ET	Scale (lbs)	Weight Change	FB Top (oF)	FB Bot (oF)	FB Back (oF)	FB Left (oF)	FB Right (oF)	FB Int (oF)	Avg Surf (oF)	Stack (oF)	AMB (oF)	Draft (In-H2O)	Cat Temp (oF)	O2 (%)	CO2 (%)	CO (%)	CO Ratio
1429	0	2.5	0.000	500	377	475	451	505	3218	461.4	425	68	-0.076	3218	20.65	-0.00	-0.00	30.21
1439	60	2.0	-0.524	462	402	509	467	497	3218	467.5	374	68	-0.058	3218	20.63	-0.00	-0.00	30.21
1449	70	1.7	-0.309	305	421	313	466	462	3218	397.3	319	68	-0.058	3218	20.63	-0.00	-0.00	32.96

4-17 of 4-18

Signature/Date: 12/4/09

MFG: Englan's Stove Works
Model # :17-VL

Run #: 2Ga

Project #: 428-S-02-3
Run Date:11/3/09

Test Time	ET	Gas Meter (ft3)	Sample Rate (cfm)	Orifice dH	Meter (deg F)	Meter Vac	Dil Tun Temp	Dil Tunn dP	Pro Rate (10%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int	Avg Surf	Stack	Filter	Imping Exit	AMB	Draft
1451	0	0.000	0.000	1.04	72	-3.04	102	0.043	0.0	7.2	7.24	280	426	301	462	476	3218	369.0	306	70	65	58	-0.057
1501	10	5.264	0.526	1.14	72	1.31	106	0.037	93.6	5.8	-1.37	231	389	210	415	423	3218	335.5	446	70	63	58	-0.063
1511	20	10.423	0.516	1.15	73	1.31	113	0.040	103.9	4.2	-1.68	269	379	201	400	407	3218	331.5	476	70	64	59	-0.078
1521	30	15.546	0.512	1.06	74	1.29	115	0.047	99.6	2.6	-1.56	302	371	225	413	419	3218	346.0	502	71	64	70	-0.086
1531	40	20.689	0.514	1.14	75	1.35	111	0.041	94.4	1.4	-1.22	327	369	263	435	448	3218	368.5	456	72	64	70	-0.078
1541	50	25.790	0.510	1.14	76	1.36	98	0.044	99.5	1.0	-0.37	276	375	311	458	466	3218	377.4	350	72	64	69	-0.063
1551	50	30.892	0.510	1.06	76	1.37	93	0.041	97.4	0.8	-0.22	222	379	277	451	458	3218	357.0	313	72	64	69	-0.059
1601	70	36.164	0.527	1.15	76	1.43	90	0.045	103.7	0.6	-0.23	196	374	253	432	440	3218	338.9	293	72	64	69	-0.055
1611	80	41.480	0.532	1.23	76	1.36	87	0.041	99.7	0.4	-0.20	181	371	228	413	421	3218	322.9	276	72	63	69	-0.051
1621	90	46.793	0.531	1.10	76	1.35	86	0.043	104.1	0.2	-0.21	168	364	208	394	401	3218	307.0	264	71	63	68	-0.050
1631	100	52.028	0.523	1.14	76	1.43	85	0.045	100.6	0.0	-0.18	160	358	195	374	384	3218	294.2	256	71	63	68	-0.047
AVG:	NA	NA	0.520	1.123	74.727	1.229	96.909	0.042	99.650	NA	NA	237.455	378.545	242.909	422.455	431.182	3218.000	NA	358.000	71.182	63.818	68.909	-0.065

A - 18 OF A - 48

Signature/Date: 12/4/09

Final Laboratory Report - Method 5G
Dilution Tunnel Particulate Calculations

Client Name: Englands Stove Works
Model: 17-VL
Project No.: 428-S-02-3
Tracking No.: 1424
Equipment Numbers:
Run #: 2
Date: 11/03/09

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N882	582.0	577.0		5.0
B. Rear filter catch	Filter	N881	576.7	577.1		-0.4
C. Rinse of probe and filter assembly	Acetone	75	109582.0	109574.5	0.0017	7.4

Total Particulate, mg :	12.0

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Rinse of probe and filter assembly	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Analyst: BD Date: 12/4/09

Run Notes

Client: England's Stove Works
Model: Englander 17-VL
Project #: 428-S-02-3
Tracking #: 1424
Run #: 2 Date: 11/3/09
Test Crew: B Davis
OMNI Equipment ID #(s):

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCABLE)

PRIMARY:

fully open

SECONDARY: fixed

TERTIARY: NA

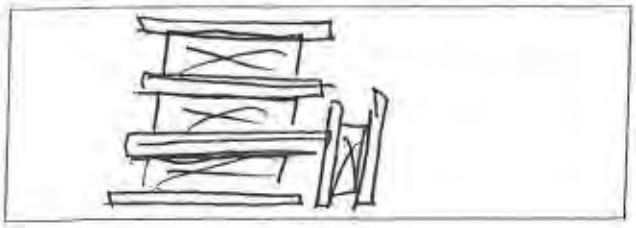
FAN: on High

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
Ø	Test setting					

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: NA
FUEL LOADING: By 45 seconds
DOOR: Closed by 75 seconds
PRIMARY AIR: Fully open full size
OTHER: NA

DESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)
PRIMARY:

fully open

SECONDARY: fixed

TERTIARY: NA

FAN: on High extra test

Technician signature: Date: 11/3/09

4-20 OF 4-48

Supplemental Data EPA 5G/5H

Client: England's Stove Works

Model: Englander 17-VL

Project #: 428-S-02-3 Tracking #: 1424

Date: 11/3/09 Run #: 2 Booth: E2

Test Crew: D Davis Start Time: 1457 Stop Time: 1631

OMNI Equipment #(s): _____

Gas Analyzer Train Leak Check:

Stack: Initial: NA Final: _____

Dilution Tunnel (Method 5G Only): Initial: _____ Final: _____

Calibrations: Span Gas CO_2: _____ O_2: _____ CO: _____ CO_2(DT): _____

	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span
Time	NA						
O_2							
CO_2							
CO							
CO_2 (DT)							

Stack Diameter (inches): 6"

Air Velocity (ft/min): Initial: <50 Final: <50

Scale Audit (lbs): Pretest: 10.0 Post Test: 10.0

Induced Draft: 0.0 %Smoke Capture: 100

Pitot Tube Leak Test: Pre: 0.0 Post: 0.0

Flue Pipe Cleaned Prior to First Test in Series: Date: 10/29/09 Initials: JR

	Initial	Middle	Ending
Pb (in/Hg)	30.12	30.12	30.12
Room Temp (°F)	68	69	68

Technician signature: _____ Date: 12/14/09

Run 3

Run Information

Run Number	Date	Tracking Number	Fuel Load (lbs)
3G	11/4/09	1424	7.60

Manufacturer	Project Number	Coal Bed Range (lbs)	
England's Stove Works	428-S-02-3	1.52 to 1.90	FINAL

Model	Technician	Actual Coal Bed (lbs)
17-VL	B. Davis	1.6

Test Booth	Data Collection Program
E2	5G_Logger_07_31_07.vi

Velocity Traverse Data

	Pt.1	Pt. 2	Pt. 3	Pt. 4	Pt. 5	Pt. 6	Pt. 7	Pt. 8	
Initial dP	.031	.034	.034	.032	.034	.036	.036	.032	In-H2O
Intitial Temp	84	84	84	84	84	84	84	84	Deg F

	Begin	Middle	End	Avg	
Barometric Pressure	30.12	30.12	30.12	30.12	In-Hg

PM Control Module	289		Tunnel Velocity	12.67	ft/sec	Avg Prop Rate	101.71	
Dilution Tunnel MW(dry)	29	lb/lb-mole	Initial Tunnel Flow	136.0	scfm	Firebox Surface Temp Change	-40.1	
Dilution Tunnel MW(wet)	28.56	lb/lb-mole	Average Tunnel Flow	138.30	scfm			
Dilution Tunnel H2O	4	percent	Tunnel Area	.196	ft2	Filter Holder #	A	
Dilution Tunnel Static	-.41	in. H2O	Post-Test Leak Check	.006@10	cfm@" Hg	Total Particulate	25.8	mg
Pitot Tube Cp	.99		Fuel Moisture(dry basis)	21.16	%			
Meter Box "Y" Factor	.986		Fuel Consumed	7.600	lbs	Run Time	160	Minutes

Notes

A-23 OF A-98

Signature/Date: 12/4/09

Emissions Results

Burn Rate	1.07	kg/hr dry	Adjusted Emissions	3.99	grams/hour

Particulate Concentration(dry standard)	0.00031	grams/dscf
Particulate Emission Rate	2.58	grams/hour
Average Tunnel Temp	88	Degrees Fahrenheit
Average Delta p	0.035	Inches H2O
Total Sample Volume-Vm	84.761	Cubic Feet
Average Gas Meter Temperature	76	Degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel-vs	12.64	Feet/Second
Average Gas Flow Rate in Dilution Tunnel Qsd	8299.03	DSCF/Hour
Total Sample Volume (Standard Conditions) Vms	83.11	DSCF
Total Particulates- mn	25.8	Mg
Average Delta H	1.15	Inches H2O
Total Time	160	Minutes

4-24 OF 4-48

Signature/Date: 12/4/09

Fuel Data

OMNI EQUIPMENT ID #

FUEL: DOUGLAS-FIR SPECIES,UNTREATED,AIR-DRIED,STANDARD GRADE OR BETTER,DIMENSIONAL LUMBER.

PRE-BURN FUEL

MOISTURE-CONTENT (METER-DRY BASIS)

CALIBRATION: CALIBRATION VALUE (1) = 12% ACTUAL READING ----- 12

CALIBRATION VALUE (2) = 22% ACTUAL READING ----- 22

AVG PRE-BURN LOAD MOISTURE 22.93 %

PIECE	LENGTH	% MOISTURE READINGS			FUEL TYPE
1	8 ft	23.6	22.4	22.8	2X4
2	0 ft	0	0	0	
3	0 ft	0	0	0	

PIECE LENGTH NOTES:

TIME (24 HR) 09:40 ROOM TEMPERATURE (F) 67

TEST FUEL

FUEL PIECE LENGTH: 14.5 IN

CALCULATED FUEL LOAD: 0 LBS

FUEL TYPE - PIECE QUANTITY

2 X 4 PIECES	4 X 4 PIECES
4	0
7.6 LBS	0 LBS

FUEL LOAD PIECE COUNT 4 PIECES

ACTUAL LOAD WEIGHT: 7.6 LBS

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE#	READINGS			TYPE	PIECE#	READINGS			TYPE
1	20	19.8	21	2X4	6	0	0	0	
2	22.5	21.9	21.7	2X4	7	0	0	0	
3	20.6	21.5	19.5	2X4	8	0	0	0	
4	22.6	22.8	20	2X4	9	0	0	0	
5	0	0	0		10	0	0	0	

TIME (24 HR CLOCK) 12:10 ROOM TEMPERATURE (F) 68

AVERAGE FUEL LOAD MOISTURE 21.16 %

A-25 OF A-48

Signature/Date: 12/4/09

MFG: England's Stove Works
Model # :17-VL

Run #: 3G

Project #: 428-S-02-3
Run Date:11/4/09

Pre-Burn Time	ET	Scale (lbs)	Weight Change	FB Top (oF)	FB Bot (oF)	FB Back (oF)	FB Left (oF)	FB Right (oF)	FB Int (oF)	Avg Surf (oF)	Stack (oF)	AMB (oF)	Draft (In-H2O)	Cat Temp (oF)	O2 (%)	CO2 (%)	CO (%)	CO Ratio
1158	0	4.0	0.000	338	333	252	379	415	3218	343.5	506	71	-0.083	3218	20.50	0.00	-0.00	-32.68
1208	10	3.1	-0.848	319	356	261	413	421	3218	357.6	381	70	-0.075	3218	20.49	0.00	-0.00	-32.68
1218	20	2.5	-0.622	271	365	263	420	446	3218	352.9	339	71	-0.062	3218	20.49	0.00	-0.00	-29.97
1228	30	2.2	-0.281	231	375	266	420	435	3218	345.3	278	71	-0.052	3218	20.49	0.00	-0.00	-29.97
1238	40	2.0	-0.173	198	381	243	406	411	3218	327.9	246	71	-0.047	3218	20.49	0.00	-0.00	32.96
1248	50	1.9	-0.183	176	384	222	386	390	3218	311.6	229	70	-0.043	3218	20.48	0.00	-0.00	-32.68
1258	60	1.7	-0.179	163	380	202	371	371	3218	297.5	219	70	-0.040	3218	20.48	-0.00	-0.00	36.27
1303	65	1.6	-0.081	160	378	195	365	364	3218	292.9	215	70	-0.039	3218	20.48	0.00	-0.00	27.67

A-26 OF A-48

Signature/Date: 12/4/09

MFG: England's Stove Works
Model # :17-VL

Run #: 3G

Project #: 428-S-02-3
Run Date:11/4/09

Test Time	ET	Gas Meter (ft3)	Sample Rate (cfm)	Orifice dH	Meter (deg F)	Meter Vac	Dil Tun Temp	Dil Tunn dP	Pro Rate (10%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int	Avg Surf	Stack	Filter	Imping Exit	AMB	Draft
1305	0	0.000	0.000	1.40	73	-0.06	87	0.035	0.0	7.6	7.64	164	379	228	364	364	3218	299.7	215	73	58	70	-0.039
1315	10	5.262	0.528	1.09	73	1.34	90	0.034	99.2	6.9	-0.76	205	372	279	341	341	3218	307.6	275	73	64	70	-0.061
1325	20	10.516	0.525	1.12	74	1.34	93	0.037	101.1	5.8	-0.96	248	359	280	328	333	3218	309.5	322	74	64	70	-0.063
1335	30	15.718	0.520	1.09	74	1.26	99	0.039	97.4	4.7	-1.18	316	343	301	337	353	3218	330.1	368	75	64	70	-0.071
1345	40	20.900	0.518	1.09	75	1.26	103	0.031	96.1	3.5	-1.26	299	336	225	364	376	3218	319.9	423	78	64	71	-0.074
1355	50	26.134	0.523	1.12	76	1.26	102	0.034	100.8	2.3	-1.13	308	334	240	392	401	3218	335.2	416	76	64	71	-0.076
1405	60	31.434	0.530	1.13	77	1.33	96	0.039	102.6	1.7	-0.66	280	342	244	412	415	3218	340.8	349	76	64	72	-0.064
1415	70	36.740	0.531	1.14	77	1.34	91	0.036	97.1	1.4	-0.33	245	354	224	413	420	3218	331.3	283	76	64	72	-0.053
1425	80	42.055	0.531	1.12	77	1.33	86	0.035	101.5	1.2	-0.17	203	361	202	401	399	3218	313.1	240	76	64	71	-0.046
1435	90	47.373	0.532	1.13	78	1.27	84	0.033	102.0	1.0	-0.19	178	359	204	387	374	3218	300.5	226	75	64	71	-0.042
1445	100	52.699	0.533	1.15	77	1.36	83	0.038	104.9	0.8	-0.17	167	352	208	378	380	3218	292.9	219	75	64	71	-0.041
1455	110	58.029	0.533	1.12	77	1.25	82	0.034	96.9	0.5	-0.16	160	351	202	369	350	3218	286.3	212	74	64	71	-0.040
1505	120	63.368	0.534	1.17	77	1.35	80	0.035	103.8	0.5	-0.17	157	351	192	355	340	3218	278.9	210	73	64	69	-0.039
1515	130	68.712	0.534	1.22	77	1.29	80	0.035	102.8	0.3	-0.13	152	359	162	346	338	3218	275.2	201	72	64	69	-0.038
1525	140	74.059	0.535	1.15	76	1.35	79	0.031	102.6	0.2	-0.15	148	360	177	339	332	3218	268.9	198	72	64	68	-0.035
1535	150	79.410	0.535	1.14	76	1.36	79	0.033	108.0	0.1	-0.13	145	353	174	324	326	3218	264.4	191	72	64	68	-0.035
1545	160	84.761	0.535	1.17	76	1.32	79	0.038	104.6	-0.0	-0.07	141	346	173	318	319	3218	259.6	185	71	63	68	-0.033
AVG	NA	NA	0.530	1.150	75.882	1.234	87.824	0.035	101.713	NA	NA	207.412	353.588	219.705	362.471	361.235	3218.000	NA	267.706	74.059	64.176	70.118	-0.050

A - 27 OF 4 - 48

OMNI Test Laboratories Inc.

Signature/Date: 12/4/09

OMNI-Test Laboratories, Inc.

Final Laboratory Report - Method 5G
Dilution Tunnel Particulate Calculations

Client Name: Englands Stove Works
Model: 17-VL
Project No.: 428-S-02-3
Tracking No.: 1424
Equipment Numbers:
Run #: 3
Date: 11/04/09

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N884	598.1	578.5		19.6
B. Rear filter catch	Filter	N883	577.8	577.1		0.7
C. Rinse of probe and filter assembly	Acetone	50	108869.8	108864.2	0.0017	5.5

Total Particulate, mg :	25.8

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Rinse of probe and filter assembly	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Analyst: BD Date: 12/4/09

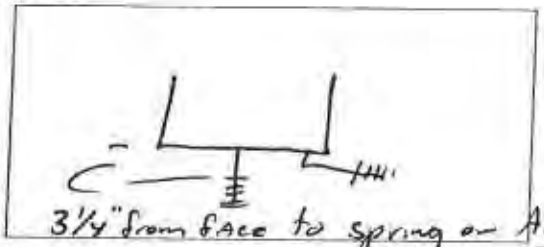
Run Notes

Client: England's Stove Works
Model: Englander 17-VL
Project #: 428-S-02-3
Tracking #: 1424
Run #: 3 Date: 11/4/09
Test Crew: B Davis
OMNI Equipment ID #(s):

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW
(SETTINGS MUST BE ACCURATE AND REPRODUCABLE)

PRIMARY:



SECONDARY: fixed

TERTIARY: NA

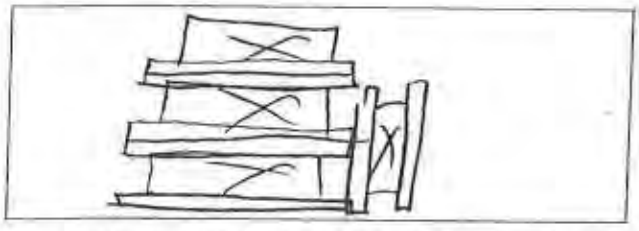
FAN: on High

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
Ø	Test Setting					
81	→	→	→	→	X	→

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: NA
FUEL LOADING By 40 sec.
DOOR: cracked open until 3:00
PRIMARY AIR: fully open ~~full~~ until 4:45 then set to test setting
OTHER: NA

DESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)
PRIMARY:

Same as Above

SECONDARY: fixed

TERTIARY: NA

FAN: off for first 30 min Then turned to Low

Technician signature: BD Date: 11/4/09

4-29 OF 4-48

Supplemental Data EPA 5G/5H

Client: England's Stove Works

Model: Englander 17-VL

Project #: 428-S-02-3 Tracking #: 1424

Date: 11/4/09 Run #: 3 Booth: E2

Test Crew: B Davis Start Time: 1451 Stop Time: 1631

OMNI Equipment #(s): _____

Gas Analyzer Train Leak Check:

Stack: Dilution Tunnel (Method 5G Only):

Initial: NA Initial: _____

Final: _____ Final: _____

Calibrations: Span Gas CO_2: _____ O_2: _____ CO: _____ CO_2(DT): _____

	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span
Time	NA						
O_2							
CO_2							
CO							
CO_2 (DT)							

Stack Diameter (inches): 6"

Air Velocity (ft/min): Initial: 250 Final: 250

Scale Audit (lbs): Pretest: 10.0 Post Test: 10.0

Induced Draft: 0.0 %Smoke Capture: 100 %

Pitot Tube Leak Test: Pre: 0.0 Post: 0.0

Flue Pipe Cleaned Prior to First Test in Series: Date: 10/29/09 Initials: BS

	Initial	Middle	Ending
Pb (in/Hg)	30.12	30.12	30.12
Room Temp (°F)	~~68~~ 70	69	68

Technician signature: _____ Date: 11/4/09

Run 4

Run Information

Run Number	Date	Tracking Number	Fuel Load (lbs)
4H	11/5/09	1424	7.30

Manufacturer	Project Number	Coal Bed Range (lbs)	
Englands Stove Works	428-S-02-3	1.46 to 1.82	FINAL

Model	Technician	Actual Coal Bed (lbs)
17-VL	B. Davis	1.8

Test Booth	Data Collection Program
E2	5G_Logger_07_31_07.vi

Velocity Traverse Data

	Pt.1	Pt. 2	Pt. 3	Pt. 4	Pt. 5	Pt. 6	Pt. 7	Pt. 8	
Initial dP	.036	.038	.04	.032	.03	.034	.038	.034	In-H2O
Intitial Temp	92	92	92	92	92	92	92	92	Deg F

	Begin	Middle	End	Avg	
Barometric Pressure	29.82	29.80	29.80	29.806	In-Hg

PM Control Module	289		Tunnel Velocity	13.16	ft/sec	Avg Prop Rate	100.548	
Dilution Tunnel MW(dry)	29	lb/lb-mole	Initial Tunnel Flow	137.5	scfm	Firebox Surface Temp Change	-47.2	
Dilution Tunnel MW(wet)	28.56	lb/lb-mole	Average Tunnel Flow	139.86	scfm			
Dilution Tunnel H2O	4	percent	Tunnel Area	.196	ft2	Filter Holder #	A	
Dilution Tunnel Static	-.38	in. H2O	Post-Test Leak Check	.009@6	cfm@" Hg	Total Particulate	14.8	mg
Pitot Tube Cp	.99		Fuel Moisture(dry basis)	21.53	%			
Meter Box "Y" Factor	.986		Fuel Consumed	7.300	lbs	Run Time	110	Minutes

Notes

A-32 OF 4-08

Signature/Date: 12/4/09

Emissions Results

Burn Rate	1.49	kg/hr dry	Adjusted Emissions	3.48	grams/hour

Particulate Concentration(dry standard)	0.00026	grams/dscf
Particulate Emission Rate	2.18	grams/hour
Average Tunnel Temp	98	Degrees Fahrenheit
Average Delta p	0.037	Inches H2O
Total Sample Volume-Vm	58.675	Cubic Feet
Average Gas Meter Temperature	75	Degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel-vs	13.19	Feet/Second
Average Gas Flow Rate in Dilution Tunnel Qsd	8412.22	DSCF/Hour
Total Sample Volume (Standard Conditions) Vms	57.041	DSCF
Total Particulates- mn	14.8	Mg
Average Delta H	1.15	Inches H2O
Total Time	110	Minutes

Signature/Date: 12/4/09

Fuel Data

OMNI EQUIPMENT ID #

FUEL: DOUGLAS-FIR SPECIES,UNTREATED,AIR-DRIED,STANDARD GRADE OR BETTER,DIMENSIONAL LUMBER.

PRE-BURN FUEL

MOISTURE-CONTENT (METER-DRY BASIS)

CALIBRATION: CALIBRATION VALUE (1) = 12% ACTUAL READING ----- 12
CALIBRATION VALUE (2) = 22% ACTUAL READING ----- 22

AVG PRE-BURN LOAD MOISTURE 20.53 %

PIECE	LENGTH	% MOISTURE READINGS			FUEL TYPE
1	8 ft	19	21.2	21.4	2X4
2	0 ft	0	0	0	
3	0 ft	0	0	0	

PIECE LENGTH NOTES:

TIME (24 HR) 09:24 ROOM TEMPERATURE (F) 68

TEST FUEL

FUEL TYPE - PIECE QUANTITY

FUEL PIECE LENGTH: 15 IN — 4 2 X 4 PIECES — 0 4 X 4 PIECES

CALCULATED FUEL LOAD: 0 LBS — 7.3 LBS — 0 LBS

FUEL LOAD PIECE COUNT 4 PIECES

ACTUAL LOAD WEIGHT: 7.3 LBS

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE#	READINGS			TYPE	PIECE#	READINGS			TYPE
1	23.2	22.7	23.1	2X4	6	0	0	0	
2	20.2	20.2	19	2X4	7	0	0	0	
3	19.5	22.3	23	2X4	8	0	0	0	
4	22	22.1	21	2X4	9	0	0	0	
5	0	0	0		10	0	0	0	

TIME (24 HR CLOCK) 11:00 ROOM TEMPERATURE (F) 68

AVERAGE FUEL LOAD MOISTURE 21.53 %

A - 34 OF A - 48

Signature/Date: 12/4/09

MFG: Englands Stove Works
Model # :17-VL

Run #: 4H

Project #: 428-S-02-3
Run Date:11/5/09

Pre-Burn Time	ET	Scale (lbs)	Weight Change	FB Top (oF)	FB Bot (oF)	FB Back (oF)	FB Left (oF)	FB Right (oF)	FB Int (oF)	Avg Surf (oF)	Stack (oF)	AMB (oF)	Draft (In-H2O)	Cat Temp (oF)	O2 (%)	CO2 (%)	CO (%)	CO Ratio
1031	0	9.7	0.000	289	313	290	330	358	3218	316.1	388	66	-0.070	3218	20.42	-0.00	-0.00	24.15
1041	10	8.4	-1.289	322	303	282	314	362	3218	314.5	455	67	-0.078	3218	20.40	-0.00	-0.00	24.15
1051	20	6.7	-1.594	402	309	311	344	385	3218	350.5	547	67	-0.089	3218	20.40	-0.00	-0.00	30.21
1101	30	4.9	-1.794	432	324	247	393	428	3218	364.6	559	70	-0.091	3218	20.39	-0.00	-0.00	30.21
1111	40	3.5	-1.377	375	339	265	424	454	3218	371.3	478	69	-0.082	3218	20.39	-0.00	-0.00	27.67
1121	50	2.6	-0.860	317	360	290	442	461	3218	374.1	436	71	-0.075	3218	20.39	-0.00	-0.00	30.21
1131	60	2.2	-0.387	262	383	306	452	460	3218	372.5	339	70	-0.053	3218	20.39	-0.00	-0.00	32.99
1141	70	2.0	-0.226	215	397	266	436	443	3218	351.2	286	71	-0.056	3218	20.39	-0.00	-0.00	36.27
1151	80	1.8	-0.200	188	401	237	410	416	3218	330.9	270	70	-0.053	3218	20.37	-0.00	-0.00	32.99

A-35 OF 4-98

Signature/Date: 12/4/09

MFG: Englands Stove Works
Model # :17-VL

Run #: 4H

Project #: 428-S-02-3
Run Date:11/5/09

Test Time	ET	Gas Meter (ft3)	Sample Rate (cfm)	Orifice dH	Meter (deg F)	Meter Vac	Dil Tun Temp	Dil Tunn dP	Pro Rate (100%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int	Avg Surf	Stack	Filter	Imping Exit	AMB	Draft
1154	0	0.000	0.000	1.19	72	1.30	97	0.034	0.0	7.3	7.26	182	404	228	403	411	3218	325.7	259	70	56	70	-0.049
1204	10	5.357	0.536	1.10	72	1.32	102	0.037	102.7	6.2	-1.09	173	382	162	383	389	3218	293.8	378	73	64	70	-0.066
1214	20	10.592	0.524	1.09	73	1.22	110	0.034	97.4	4.7	-1.52	210	388	181	348	359	3218	282.7	440	74	64	69	-0.080
1224	30	15.762	0.517	1.11	74	1.30	115	0.037	100.4	3.0	-1.64	254	358	202	364	378	3218	311.3	470	76	64	71	-0.076
1234	40	20.960	0.520	1.13	75	1.33	112	0.041	97.9	1.9	-1.17	291	359	228	392	411	3218	336.2	441	77	64	72	-0.078
1244	50	26.325	0.536	1.19	76	1.35	105	0.037	98.6	1.2	-0.70	273	359	237	412	426	3218	341.5	389	77	64	72	-0.071
1304	70	37.094	0.539	1.12	76	1.33	92	0.039	99.5	0.6	-0.34	237	361	257	425	423	3218	340.7	312	77	64	71	-0.056
1314	80	42.487	0.539	1.12	76	1.27	89	0.036	100.1	0.4	-0.20	180	355	223	401	397	3218	311.1	259	75	64	71	-0.054
1324	90	47.881	0.539	1.14	76	1.27	87	0.034	102.9	0.3	-0.17	164	342	207	380	381	3218	294.7	244	75	64	70	-0.050
1334	100	53.276	0.539	1.21	76	1.33	87	0.037	105.1	0.1	-0.18	160	339	196	364	368	3218	285.3	242	74	64	70	-0.047
1344	110	58.675	0.540	1.25	76	1.30	86	0.036	101.9	-0.0	-0.08	155	337	188	354	359	3218	278.5	236	74	64	70	-0.044
AVG	NA	NA	0.533	1.147	74.833	1.269	98.250	0.037	100.536	NA	NA	205.667	360.250	214.500	395.250	391.417	3218.000	NA	328.667	74.833	64.167	70.500	-0.060

428-S-02-3 DF 4-4-8

Signature/Date: 12/4/09

Final Laboratory Report - Method 5G
Dilution Tunnel Particulate Calculations

Client Name: Englands Stove Works
Model: 17-VL
Project No.: 428-S-02-3
Tracking No.: 1424
Equipment Numbers:
Run #: 4
Date: 11/05/09

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N886	586.0	575.4		10.6
B. Rear filter catch	Filter	N885	578.9	578.7		0.2
C. Rinse of probe and filter assembly	Acetone	50	105600.3	105596.2	0.0017	4.0

Total Particulate, mg :	14.8

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Rinse of probe and filter assembly	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Analyst: BO Date: 12/4/09

Run Notes

Client: England's Stove Works
Model: Englander 17-VL
Project #: 428-S-02-3
Tracking #: 1424
Run #: 4 Date: 11/5/09
Test Crew: BDavis
OMNI Equipment ID #(s):

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCABLE)

PRIMARY: Fully open

SECONDARY: fixed

TERTIARY: NA

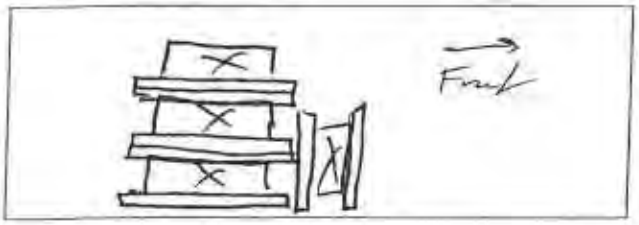
FAN: on High

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT	RAKE COAL	COMMENT
Ø	Test setting				X	→
81						

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: NA
FUEL LOADING By 50 seconds
DOOR: closed open until 3:00
PRIMARY AIR: fully open 8-11 5:00

OTHER: NA

DESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)
PRIMARY: Same as Above

SECONDARY: fixed

TERTIARY: NA

FAN: on High on the test

Technician signature: BD Date: 11/5/09

4-38 OF 4-48

Supplemental Data EPA 5G/5H

Client: England's Stove Works

Model: Englander 17-VL

Project #: 428-S-02-3 Tracking #: 1424

Date: 11/5/09 Run #: 4 Booth: E2

Test Crew: B Davis Start Time: 11:54 Stop Time: 1344

OMNI Equipment #(s): _____

Gas Analyzer Train Leak Check:

Stack: Initial: NA Final: _____

Dilution Tunnel (Method 5G Only): Initial: _____ Final: _____

Calibrations: Span Gas CO_2: _____ O_2: _____ CO: _____ CO_2(DT): _____

	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span
Time	NA						
O_2							
CO_2							
CO							
CO_2 (DT)							

Stack Diameter (inches): 6"

Air Velocity (ft/min): Initial: ∠50 Final: ∠50

Scale Audit (lbs): Pretest: 10.0 Post Test: 10.0

Induced Draft: 0.0 %Smoke Capture: 100 %

Pitot Tube Leak Test: Pre: OK Post: OK

Flue Pipe Cleaned Prior to First Test in Series: Date: 10/29/09 Initials: BA

	Initial	Middle	Ending
Pb (in/Hg)	29.82	29.80	29.80
Room Temp (°F)	70	71	70

Technician signature: _____ Date: 11/5/09

Run 5

Run Information

Run Number	Date	Tracking Number	Fuel Load (lbs)
5	11/6/09	1424	7.80

Manufacturer	Project Number	Coal Bed Range (lbs)	
England's Stove Works	428-S02-3	1.56 to 1.95	FINAL

Model	Technician	Actual Coal Bed (lbs)
17-VL	B. Davis	1.9

Test Booth	Data Collection Program
E2	SG_Logger_07_31_07.vi

Velocity Traverse Data

	Pt.1	Pt. 2	Pt. 3	Pt. 4	Pt. 5	Pt. 6	Pt. 7	Pt. 8	
Initial dP	.034	.036	.036	.032	.034	.036	.038	.034	In-H2O
Intitial Temp	85	85	85	85	85	85	85	85	Deg F

	Begin	Middle	End	Avg	
Barometric Pressure	30.11	30.10	30.10	30.103	In-Hg

PM Control Module	289		Tunnel Velocity	13.06	ft/sec	Avg Prop Rate	100.798	
Dilution Tunnel MW(dry)	29	lb/lb-mole	Initial Tunnel Flow	138.6	scfm	Firebox Surface Temp Change	-7.9	
Dilution Tunnel MW(wet)	28.56	lb/lb-mole	Average Tunnel Flow	141.53	scfm			
Dilution Tunnel H2O	4	percent	Tunnel Area	.196	ft2	Filter Holder #	A	
Dilution Tunnel Static	-.41	in. H2O	Post-Test Leak Check	.010@12	cfm@" Hg	Total Particulate	20	mg
Pitot Tube Cp	.99		Fuel Moisture(dry basis)	21.10	%			
Meter Box "Y" Factor	.986		Fuel Consumed	7.800	lbs	Run Time	140	Minutes

Notes

Signature/Date: 12/4/09

MFG: England's Stove Works
Model # :17-VL

Run #: 5

Project #: 428-S02-3
Run Date:11/6/09

Emissions Results

Burn Rate	1.25	kg/hr dry	Adjusted Emissions	3.73	grams/hour

Particulate Concentration(dry standard)	0.00028	grams/dscf
Particulate Emission Rate	2.37	grams/hour
Average Tunnel Temp	94	Degrees Fahrenheit
Average Delta p	0.037	Inches H2O
Total Sample Volume-Vm	73.119	Cubic Feet
Average Gas Meter Temperature	77	Degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel-vs	13.07	Feet/Second
Average Gas Flow Rate in Dilution Tunnel Qsd	8484.17	DSCF/Hour
Total Sample Volume (Standard Conditions) Vms	71.521	DSCF
Total Particulates- mn	20	Mg
Average Delta H	1.14	Inches H2O
Total Time	140	Minutes

4-428-OF4-48

Signature/Date: 12/4/09

Fuel Data

OMNI EQUIPMENT ID #

FUEL: DOUGLAS-FIR SPECIES,UNTREATED,AIR-DRIED,STANDARD GRADE OR BETTER,DIMENSIONAL LUMBER.

PRE-BURN FUEL

MOISTURE-CONTENT (METER-DRY BASIS)

CALIBRATION: CALIBRATION VALUE (1) = 12% ACTUAL READING ----- 12

CALIBRATION VALUE (2) = 22% ACTUAL READING ----- 22

AVG PRE-BURN LOAD MOISTURE 22.67 %

PIECE	LENGTH	% MOISTURE READINGS			FUEL TYPE
1	8 ft	23.4	23	21.6	2X4
2	0 ft	0	0	0	
3	0 ft	0	0	0	

PIECE LENGTH NOTES:

TIME (24 HR) 09:40 ROOM TEMPERATURE (F) 68

TEST FUEL

FUEL TYPE - PIECE QUANTITY

FUEL PIECE LENGTH: 15 IN

CALCULATED FUEL LOAD: 0 LBS

4 2 X 4 PIECES 0 4 X 4 PIECES

7.8 LBS 0 LBS

FUEL LOAD PIECE COUNT 4 PIECES

ACTUAL LOAD WEIGHT: 7.8 LBS

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE#	READINGS			TYPE	PIECE#	READINGS			TYPE
1	21.5	22.3	21.4	2X4	6	0	0	0	
2	20.8	19.3	19.5	2X4	7	0	0	0	
3	21.7	21.7	21.2	2X4	8	0	0	0	
4	22.3	20.5	21	2X4	9	0	0	0	
5	0	0	0		10	0	0	0	

TIME (24 HR CLOCK) 11:20 ROOM TEMPERATURE (F) 68 **AVERAGE FUEL LOAD MOISTURE** 21.1 %

4 - 43 OF 4 - 48

Signature/Date: 12/4/09

MFG: England's Stove Works
Model # :17-VL

Run #: 5

Project #: 428-S02-3
Run Date:11/6/09

Pre-Burn Time	ET	Scale (lbs)	Weight Change	FB Top (oF)	FB Bot (oF)	FB Back (oF)	FB Left (oF)	FB Right (oF)	FB (int (oF)	Avg Surf (oF)	Stack (oF)	AMB (oF)	Draft (In-H2O)	Cat Temp (oF)	O2 (%)	CO2 (%)	CO (%)	CO Ratio
1206	0	4.2	0.000	490	331	386	395	495	3218	407.6	508	72	-0.083	3218	20.53	0.02	-0.00	-6.44
1216	10	3.2	-1.015	515	340	419	426	466	3218	431.4	383	73	-0.074	3218	20.53	0.02	-0.00	-6.33
1226	20	2.7	-0.471	470	345	418	437	456	3218	425.8	320	73	-0.063	3218	20.53	0.02	-0.00	-6.44
1236	30	2.5	-0.213	404	358	401	428	445	3219	407.2	272	72	-0.050	3218	20.53	0.02	-0.00	-6.33
1246	40	2.3	-0.190	350	377	386	409	424	3218	389.3	242	73	-0.048	3218	20.53	0.02	-0.00	-6.22
1256	50	2.1	-0.169	312	385	376	397	408	3218	375.7	226	72	-0.045	3218	20.53	0.01	-0.00	-10.60
1306	60	2.0	-0.090	293	385	365	389	400	3218	366.2	215	72	-0.042	3218	20.53	0.01	-0.00	-11.27
1309	60	1.9	-0.136	275	383	349	374	388	3218	353.9	210	71	-0.041	3218	20.53	0.01	-0.00	-10.60

A-44 OF A-48

Signature/Date: 12/4/09

MFG: England's Stove Works
Model # :17-VL

Run #: 5

Project #: 428-S02-3
Run Date:11/6/09

Test Time	ET	Gas Meter (ft3)	Sample Rate (cfm)	Orifice dH	Meter (deg F)	Meter Vac	Dil Tun Temp	Dil Tunn dP	Pro Rate (10%)	Scale Reading	Weight Change	FB Top	FB Bot	FB Back	FB Left	FB Right	FB Int	Avg Surf	Stack	Filter	Imping Exit	AMB	Draft
1309	0	0.000	0.000	1.44	74	1.26	91	0.037	0.0	7.6	7.79	272	364	348	372	385	3218	352.1	213	71	69	71	-0.041
1319	10	5.361	0.536	1.13	74	1.24	97	0.042	97.7	6.6	-1.16	277	364	315	351	360	3218	333.5	338	73	65	70	-0.054
1329	20	10.612	0.525	1.13	74	1.29	102	0.036	96.9	5.4	-1.27	316	348	309	341	351	3218	333.3	381	75	64	72	-0.072
1339	30	15.815	0.520	1.10	75	1.24	107	0.035	102.9	4.0	-1.37	382	336	336	355	370	3218	356.8	423	76	65	71	-0.076
1349	40	20.988	0.517	1.08	76	1.29	110	0.034	102.8	2.5	-1.44	463	327	379	368	403	3218	392.1	447	77	65	72	-0.081
1409	50	26.069	0.508	1.16	77	1.30	107	0.039	101.3	1.6	-0.98	507	331	443	419	435	3218	426.8	406	79	65	71	-0.074
1419	60	31.159	0.509	1.08	78	1.26	98	0.037	95.3	1.2	-0.33	462	358	480	452	461	3218	442.3	314	78	65	72	-0.061
1429	70	36.409	0.525	1.19	78	1.29	94	0.034	101.3	1.0	-0.22	396	376	467	456	480	3218	431.4	281	78	65	71	-0.056
1439	80	41.633	0.522	1.17	79	1.24	91	0.039	105.2	0.8	-0.17	350	385	440	449	450	3218	415.0	261	77	65	71	-0.052
1449	100	52.127	0.525	1.16	78	1.31	88	0.037	99.2	0.5	-0.13	309	390	400	419	425	3218	388.8	243	76	65	71	-0.049
1459	110	57.392	0.526	1.11	78	1.28	86	0.035	101.7	0.4	-0.17	294	387	383	408	417	3218	377.7	236	75	65	70	-0.047
1509	120	62.606	0.521	1.08	78	1.23	83	0.037	103.0	0.2	-0.14	285	378	380	392	402	3218	363.6	227	75	66	70	-0.046
1519	130	67.829	0.522	1.14	78	1.22	84	0.034	100.7	0.1	-0.14	274	372	346	379	390	3218	352.2	223	74	64	70	-0.044
1529	140	73.119	0.529	1.10	77	1.23	84	0.034	106.2	-0.0	-0.10	267	370	334	370	380	3218	344.2	219	74	64	70	-0.044
AVG	NA	NA	0.522	1.145	76.867	1.261	94.200	0.037	100.753	NA	NA	345.800	366.267	383.933	399.067	408.267	3218.000	NA	297.467	75.600	65.000	70.800	-0.057

4-45-01-4-48

Signature/Date: 12/4/09

Final Laboratory Report - Method 5G
Dilution Tunnel Particulate Calculations

Client Name: Englands Stove Works
Model: 17-VL
Project No.: 428-S-02-3
Tracking No.: 1424
Equipment Numbers:
Run #: 5
Date: 11/06/09

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N888	545.9	529.6		16.3
B. Rear filter catch	Filter	N887	542.8	543.4		-0.6
C. Rinse of probe and filter assembly	Acetone	50	106960.9	106956.5	0.0017	4.3

Total Particulate, mg	20.0

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Rinse of probe and filter assembly	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Analyst: BD Date: 12/4/09

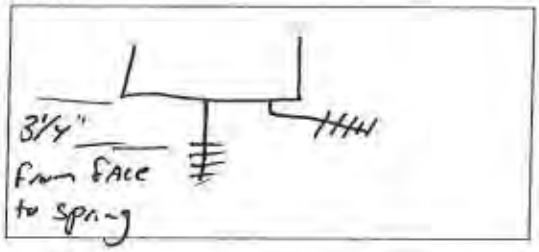
Run Notes

Client: England's Stove Works
Model: Englander 17-VL
Project #: 428-S-02-3
Tracking #: 1424
Run #: 5 Date: 11/6/09
Test Crew: B Davis
OMNI Equipment ID #(s):

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCABLE)

PRIMARY:



SECONDARY: fixed

TERTIARY: NA

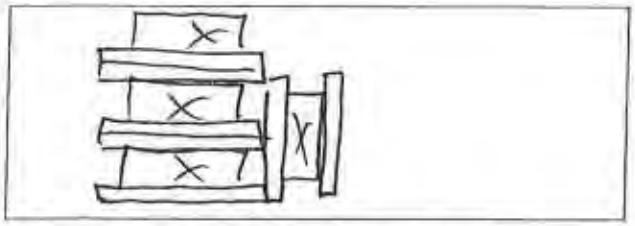
FAN: FAN Confirmation

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
Ø	Test Setting					

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: NA
FUEL LOADING by 45 Seconds
DOOR: cracked open until 3:10
PRIMARY AIR: fully open until 4:45 then Set to test Setting
OTHER: NA

DESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)
PRIMARY:

same as Above

SECONDARY: fixed

TERTIARY: NA

FAN: off

Technician signature: B Davis Date: 11/6/09

4-47 OF 4-48

Supplemental Data EPA 5G/5H

Client: England's Stove Works

Model: Englander 17-VL

Project #: 428-S-02-3 Tracking #: 1424

Date: 11/4/09 Run #: 5 Booth: E2

Test Crew: B Davis Start Time: 1309 Stop Time: 1529

OMNI Equipment #(s): _____

Gas Analyzer Train Leak Check:

Stack: Dilution Tunnel (Method 5G Only):

Initial: N/A Initial: _____

Final: _____ Final: _____

Calibrations: Span Gas CO_2: _____ O_2: _____ CO: _____ CO_2(DT): _____

	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span	N_2 Span
Time	NA						
O_2							
CO_2							
CO							
CO_2 (DT)							

Stack Diameter (inches): 6"

Air Velocity (ft/min): Initial: 250 Final: 250

Scale Audit (lbs): Pretest: 10.0 Post Test: 10.0

Induced Draft: 0.0 %Smoke Capture: 100 %

Pitot Tube Leak Test: Pre: 0.0 Post: 0.0

Flue Pipe Cleaned Prior to First Test in Series: Date: 10/29/09 Initials: BD

	Initial	Middle	Ending
Pb (in/Hg)	30.11	30.10	30.10
Room Temp (°F)	71	71	70

Technician signature: _____ Date: 11/4/09

4-48 OF 4-48

Section 5

Sampling Procedures and Test Results

INTRODUCTION

England's Stove Works, Inc. retained *OMNI* to perform U.S. Environmental Protection Agency (EPA) certification testing on the 17-VL wood stove. The 17-VL wood stove is a non-catalytic, freestanding, radiant-type room heater. The firebox is constructed of mild steel. Usable firebox volume was measured to be 1.1 cubic feet and the stove is vented through a 6-inch diameter flue collar located at the top of the unit.

The testing was performed at *OMNI*'s testing facility in Portland, Oregon. The altitude of the laboratory is 30 feet above sea level. The unit was received in good condition and logged in on September 25, 2009, then assigned and labeled with *OMNI* ID #1424. *OMNI* representative Bruce Davis conducted the certification testing and completed all testing by November 6, 2009. The EPA was notified of the testing dates in a letter dated October 14, 2009. A testing contract, including provisions for Random Compliance Audit (RCA) testing, has been signed by Corie Podschelne of England's Stove Works, Inc. and is on file at *OMNI*'s testing facility.

The 17-VL wood stove was tested in accordance with the U.S. EPA 40 CFR Part 60, Subpart AAA – Standard of Performance for Residential Wood Heaters (Appendix A, Methods 28 and 5G). Particulate emissions were measured using a Method 5G sampling train consisting of two filters (front and back). The weighted average emissions of the four test runs included in the results indicate a particulate emission level of 4.3 grams per hour. Run #5, a fan confirmation test run, was performed and was not used in the weighted average emission results. Test runs were conducted in each of three burn rate categories (0.80-1.25 kg/hr, 1.25-1.90 kg/hr, and maximum). Emissions for each of their individual test runs did not exceed the cap. The 17-VL results are within the emission limit of 7.5 grams per hour for non-catalytic affected facilities manufactured on or after July 1, 1990, or sold at retail on or after July 1, 1992.

The wood heater was sealed after completion of testing in compliance with the EPA regulation as follows:

- "DO NOT TAMPER" labels were placed on the door and on all other openings.
- Plastic material sealed with "DO NOT TAMPER" labels and tape was wrapped around the unit.
- The unit was sealed in a wood box constructed for the unit and secured with steel banding.
- "DO NOT TAMPER" labels were placed on all outer surfaces of the box.

This report is organized in accordance with the EPA-recommended outline and is summarized in the Table of Contents immediately preceding this report. The results in this report are limited to the item submitted.

Table 1.1 – Particulate Emissions

Run	Burn Rate (kg/hr dry)	Method 5G Emissions (g/hr)
1	1.00	5.93
2	1.62	3.39
3	1.07	3.99
4	1.49	3.48
Weighted particulate emission average of four test runs: 4.3 grams per hour.		

Table 1.2 – Test Facility Conditions

Run	Room Temperature (°F)		Barometric Pressure (Hg)		Air Velocity (ft/min)	
	Before	After	Before	After	Before	After
1	68	67	30.35	30.34	<50	<50
2	68	68	30.12	30.12	<50	<50
3	70	68	30.12	30.12	<50	<50
4	70	70	29.82	29.80	<50	<50

Table 1.3.1 – Fuel Measurement and Crib Description Summary – PRETEST

Run	Pretest Fuel Weight (Starting weight in lbs)	Pretest Moisture (Dry basis - %)	Coal Bed Weight (lbs)
1	3.4	21.2	1.6
2	10.3	21.5	1.7
3	4.0	22.9	1.6
4	9.7	20.5	1.8

Table 1.3.2 – Fuel Measurement and Crib Description Summary – TEST

Run	Test Fuel Wet Basis (lbs)	Firebox Volume (ft^3)	Fuel Loading Density Wet Basis (lbs/ft^3)	Fuel Moisture Content Dry (%)	Piece Length (in)	2x4s Used	4x4s Used
1	8.0	1.1	7.27	20.6	14.5	4	0
2	7.2	1.1	6.55	21.3	15	4	0
3	7.6	1.1	6.91	21.2	14.5	4	0
4	7.3	1.1	6.64	21.5	15	4	0

Table 1.4 – Dilution Tunnel Gas Measurements and Sampling Data Summary

Run	Length of Test (min)	Average Dilution Tunnel Gas Measurements		
		Velocity (ft/sec)	Flow Rate (dscf/min)	Temperature (°F)
1	180	12.71	141.6	82.2
2	100	13.99	150.3	98.9
3	160	12.64	138.3	87.8
4	110	13.19	139.9	98.3

Table 1.5 - Heater Operation Data (Average Temperature Data)

Run	Beginning Surface Temperature Average[a]	Ending Surface Temperature Average[a]	Surface Delta T[b]
1	277.2	242.3	35
2	389.0	294.2	95
3	299.7	259.6	40
4	325.7	278.5	47
a. All temperatures are in degrees F.			
b. Represents the difference between beginning and ending average surface temperatures.			

Table 1.6 – Pretest Configuration

Run	Combustion Air (in)	Fuel Added	Fuel Removed	Time (min)
1	3.5" Between Face and Spring	3.4 lbs at start; no addition; coal bed 1.6 lbs	0.0	70
2	Fully Open	2.5 lbs at start; no addition; coal bed 1.7 lbs	0.0	70
3	3.25" Between Face and Spring	4.0 lbs at start; no addition; coal bed 1.6 lbs	0.0	65
4	Full Open	9.7 lbs at start; no addition; coal bed 1.8 lbs	0.0	80

Table 1.7 – Run Data

Run	Average Dry Burn Rate (kg/hr)	Initial (Induced) Draft (H_2O)	Primary Air Setting (in)	Run Time (min)	Average Draft (H_2O)
1	1.00	0	3.5" Between Face and Spring	180	-0.043
2	1.62	0	Fully Open	100	-0.065
3	1.07	0	3.25" Between Face and Spring	160	-0.050
4	1.49	0	Full Open	110	-0.060

Table 1.8 – Test Configurations

Run	Five-Minute Startup	Combustion Air
1	Bypass: N/A. Fuel Loading: Loaded by 50 seconds. Door: Closed at 2.0 minutes. Primary Air: Fully open for 4 minutes 45 seconds, then set to test setting. Other: N/A. Secondary: Fixed. Tertiary: N/A. Fan: Off for first 30 minutes, then set to low.	3.5" Between Face and Spring
2	Bypass: N/A. Fuel Loading: Loaded by 45 seconds. Door: Closed at 75 seconds. Primary Air: Fully open for 5.0 minutes. Other: N/A. Secondary: Fixed. Tertiary: N/A. Fan: On high for duration of test.	Fully Open
3	Bypass: N/A. Fuel Loading: Loaded by 40 seconds. Door: Cracked open until 3.0 minutes. Primary Air: Fully open for 4 minutes 45 seconds, then set to test setting. Other: N/A. Secondary: Fixed. Tertiary: N/A. Fan: Off for first 30 minutes, then set to low.	3.25" Between Face and Spring
4	Bypass: N/A. Fuel Loading: Loaded by 50 seconds. Door: Cracked open until 3.0 minutes. Primary Air: Fully open for 5.0 minutes. Other: N/A. Secondary: Fixed. Tertiary: N/A. Fan: On high for duration of test.	Full Open

TEST RESULTS AND DISCUSSION

A total of five test runs were performed on the 17-VI. wood stove. Four test runs were conducted in the following categories and included in the weighted average emission level results: two in the 0.80 to 1.25 kg/hr dry category; one in the 1.25 to 1.90 kg/hr dry category; and one at maximum.

The weighted particulate emission level was measured to be **4.3 g/hr**.

The proportionality results for all five test runs were acceptable. Quality check results for each test run are presented in Section 2 of this report.