

# TEST REPORT

Intertek

REPORT NUMBER: G100167575 PRT-001  
REPORT DATE: August 28, 2010

## EVALUATION CENTER

Intertek Testing Services NA Inc.  
2595 SW 153<sup>rd</sup> Drive  
Beaverton, OR 97006

## RENDERED TO

Hearth & Home Technologies  
1445 N. Highway  
Colville Washington 99114

## PRODUCT EVALUATED:

MODEL Voyageur SOLID FUEL ROOM HEATER FIREPLACE INSERT

Report of Testing Model Voyageur Wood Fuel Room Heater Fireplace Insert for compliance as an "Affected Facility" with the applicable requirements of the following criteria: EPA Method 28 "Certification and Auditing of Wood Heaters" and EPA Method 5H "Determination of Particulate Matter Emissions from Wood Heaters".

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## I. INTRODUCTION

Intertek Testing Services NA (Intertek) has conducted testing for Hearth & Home Technologies, on model VOYAGEUR Solid Fuel Room Heater Fireplace Insert, to evaluate all applicable performance requirements included in EPA Method 28 "Certification and auditing of wood heaters" and Method 5H "Determination of particulate matter emissions from wood heaters."

### I.A PURPOSE OF TEST

The test was conducted to determine if the unit is in accordance with U.S EPA requirements under 40 CFR 60 SUBPART AAA, NSPS for Residential Wood Heaters. This evaluation was conducted on July 27 through July 30, 2010.

### I.B LABORATORY

The test on the VOYAGEUR Solid Fuel Room Heater Fireplace Insert was conducted at the Hearth & Home testing facility located in Colville Washington. The laboratory elevation is 1635 feet above sea level and is accredited by the U.S. EPA through approval of on-site testing conducted by test engineer Bruce Davis of Intertek.

### I.C DESCRIPTION OF UNIT

The model VOYAGEUR Solid Fuel Room Heater Fireplace Insert is constructed of carbon steel. The firebox inside dimensions is 15.4 inches deep, 13 inches high and 21.5 inches wide across the front. The unit has a door located on the front with a viewing glass for loading the fuel. Combustion air is controlled by a handle located on the front of the appliance. A second control located on the front of the appliance activates a timer providing additional air to the lower primary air orifice for a predetermined length of time. Secondary air is supplied by a third opening that has no user control.

(See product drawings.)

### I.D REPORT ORGANIZATION

This report includes summaries of all data necessary to determine compliance with the regulations. Raw data, calibration records, intermediate calculations, drawings, specifications and other supporting information are contained in appendices to this report.

## SUMMARIZATION

### II.A PRETEST INFORMATION

A sample was submitted to Intertek directly from the client. The sample was not independently selected for testing. The unit was inspected upon receipt and found to be in good condition. The unit was set up following the manufacturer's instructions without difficulty.

Following assembly, the unit was placed on the test stand and instrumented with thermocouples in the specified locations. Prior to beginning the emissions tests the unit had been operated for a minimum of 10 hours at high-to-medium burn rates to break in the stove. The unit was found to be operating satisfactory during this break-in.

Following the pre-burn break-in process the unit was allowed to cool. The unit's chimney system and laboratory dilution tunnels were cleaned using standard wire brush chimney cleaning equipment.

### II.B INFORMATION LOG

#### TEST STANDARD

From July 27 through July 30, the unit was tested for EPA emissions using method 5H.

#### Deviation from Standard Method

No deviations from the standards were performed, however, only the applicable sections from each standard were used during all testing.

### II.C SUMMARY OF TEST RESULTS

RUN #1 July 27, 2010: Test fuel was loaded by 50 seconds, the door was open for 1 minute, and then closed. Air control set at 0.7 inches from the control rod to the bottom of the opening in the cast iron. Burn time was 310 minutes with a category 2 burn rate of 0.945 kg/hr. The primary air control was at test setting full 5:00. Timed air control was pushed at start of test. The fan was turned off at start of test and back on high at 30 minutes.

RUN #2 July 28, 2010: Test fuel was loaded by 45 seconds, the door was open for 1 minute, and then closed. Air control set at 1.0 inches from the control rod to the bottom of the opening in the cast iron. Burn time was 300 minutes with a category 2 burn rate of 0.945 kg/hr. The primary air control was at test setting full 5:00. Timed air control was pushed at start of test. The fan was turned off at start of test and back on high at 30 minutes.

RUN #3 July 29, 2010: Test fuel was loaded by 65 seconds, the door was open for 80 seconds, and then closed. Air control set at 1.125 inches from the control rod to the bottom of the opening in the cast iron. Burn time was 230 minutes with a category 2 burn rate of 1.23 kg/hr. The primary air control was at test setting full 5:00. Timed air control was pushed at start of test. The fan was turned off at start of test and back on high at 30 minutes.

RUN #4 July 30, 2010: Test fuel was loaded by 45 seconds, the door was open for 1 minute, and then closed. Air control set at full open position entire test. Burn time was 150 minutes with a category 4 burn rate of 1.98 kg/hr. The primary air control was at test setting full 5:00. Timed air control was locked open the entire test. The fan was on high the entire test.

RUN #5 July 30, 2010: Test fuel was loaded by 49 seconds, the door was open for 60 seconds, and then closed. Air control set fully open for the entire test. Burn time was 210 minutes with a category 3 burn rate of 1.44 kg/hr. The primary air control was at test setting full 5:00. Timed air control was pushed at start of test. The fan was on high the entire test.

## II.D SUMMARY OF OTHER DATA

### EMISSIONS

| Run Number | Test Date | Burn Rate (kg/hr) | Emission Rate (g/hr) | Heating Efficiency % LHV* | Heating Efficiency % HHV* |
|------------|-----------|-------------------|----------------------|---------------------------|---------------------------|
| 1          | 7/27/10   | .945              | 5.63                 | 76.4                      | 70.7                      |
| 2          | 7/28/10   | .945              | 8.24                 | 77.6                      | 71.8                      |
| 3          | 7/29/10   | 1.23              | 3.79                 | 77.4                      | 71.6                      |
| 4          | 7/30/10   | 1.98              | 3.04                 | 77.6                      | 71.8                      |
| 5          | 7/30/10   | 1.44              | 2.95                 | 77.3                      | 71.5                      |

\* Heating efficiency was calculated by the stack loss method per CSA B415.1-2009 (Draft) and is provided for information.

### WEIGHTED AVERAGE CALCULATION

| Test No.   | Burn Rate | (E)<br>Average<br>Emission<br>Rate g/hr | Heat<br>Output<br>(Btu/hr) | Probability | (K)<br>Weighting<br>Factor | (KxE) |
|--|-----------|---|----------------------------|-------------|----------------------------|-------|
| 1  | .945      | 5.63                                    | 11,163                     | .322        | .559                       | 3.15  |
| 2  | .945      | 8.24                                    | NA                         | NA          | NA                         | NA    |
| 3  | 1.23      | 3.79                                    | 14,488                     | .559        | .394                       | 1.49  |
| 5  | 1.44      | 2.95                                    | 17,100                     | .717        | .351                       | 1.03  |
| 4  | 1.98      | 3.04                                    | 23,513                     | .910        | .283                       | .86   |
| Totals:  |           |   |                            |             | 1.587                      | 6.54  |
| Note: Run 2 was omitted on a two for one basis and not included in the weighted average. |           |   |                            |             |                            |       |
| Weighted average emission rate:  |           |   |                            |             |                            | 4.12  |

### TEST FACILITY CONDITIONS

| Run | Room Temp.<br>°F before | Room Temp.<br>°F after | Baro. Pres.<br>In. Hg before | Baro. Pres.<br>In. Hg after | Air Vel.<br>Ft/min before | Air Vel.<br>Ft/min after |
|-----|-------------------------|------------------------|------------------------------|-----------------------------|---------------------------|--------------------------|
| 1   | 79                      | 78                     | 28.40                        | 28.41                       | <50                       | <50                      |
| 2   | 77                      | 83                     | 28.37                        | 28.45                       | <50                       | <50                      |
| 3   | 77                      | 82                     | 28.55                        | 28.51                       | <50                       | <50                      |
| 4   | 74                      | 83                     | 28.37                        | 28.35                       | <50                       | <50                      |
| 5   | 82                      | 80                     | 28.35                        | 28.34                       | <50                       | <50                      |

### DILUTION TUNNEL FLOW RATE MEASUREMENTS AND SAMPLING DATA (5H)

| Run No. | Burn Time<br>(min) | Velocity<br>(ft/sec) | Volumetric Flow Rate<br>(dscf/min) | Total Temp.<br>(°R) | Stack Flow Rate<br>DSCFM | Particulate Catch<br>(mg) |
|---------|--------------------|----------------------|------------------------------------|---------------------|--------------------------|---------------------------|
| 1       | 310                | 12.29                | 126.26                             | 552                 | 3.85                     | 5.63                      |
| 2       | 300                | 12.92                | 131.75                             | 555                 | 4.39                     | 8.24                      |
| 3       | 230                | 12.54                | 127.76                             | 558                 | 4.88                     | 3.79                      |
| 4       | 150                | 13.55                | 132.97                             | 576                 | 6.95                     | 3.04                      |
| 5       | 210                | 13.15                | 133.43                             | 572                 | 5.61                     | 2.95                      |

### GENERAL SUMMARY OF RESULTS

| Run No. | Burn Rate<br>(kg/hr) | Change In Surface Temp (°F) | Run Time (min) | Average Draft (in/H <sub>2</sub> O) |
|---------|----------------------|-----------------------------|----------------|-------------------------------------|
| 1       | .95                  | 70                          | 310            | -.031                               |
| 2       | .95                  | 83                          | 300            | -.033                               |
| 3       | 1.23                 | 56                          | 230            | -.041                               |
| 4       | 1.98                 | 43                          | 150            | -.059                               |
| 5       | 1.44                 | 61                          | 210            | -.049                               |

### III. PROCESS DESCRIPTION

#### III.A TEST SET-UP DESCRIPTION

A standard 6" diameter single wall pipe and insulated chimney system was installed to 15' above floor level. The unit controls were adjusted to achieve the four individual burn rates. Rate of combustion was observed by monitoring fuel weight consumption displayed by a platform scale. All sampling equipment was built and maintained as described in EPA Methods 28 and 5H.

### **III.B AIR SUPPLY SYSTEM**

Combustion air enters the firebox through an opening on the side of the firebox. This air is controlled by a sliding damper, which covers the inlet hole. The lever is located on the upper right side of the appliance. All gases exit through the 6" flue

## **IV. SAMPLING SYSTEMS**

### **IV.A. SAMPLING LOCATIONS**

Particulate samples are collected from the appliance flue pipe at an elevation of eight feet above the platform scale. Combustion gasses and gas temperature in the flue are also sampled at eight feet above the scale.

Sample probes in the dilution tunnel include a temperature probe, combustion gas probe and a standard pitot tube.

Figure 1 shows an example of a dilution tunnel and sample locations.

#### IV.A.(1) DILUTION TUNNEL

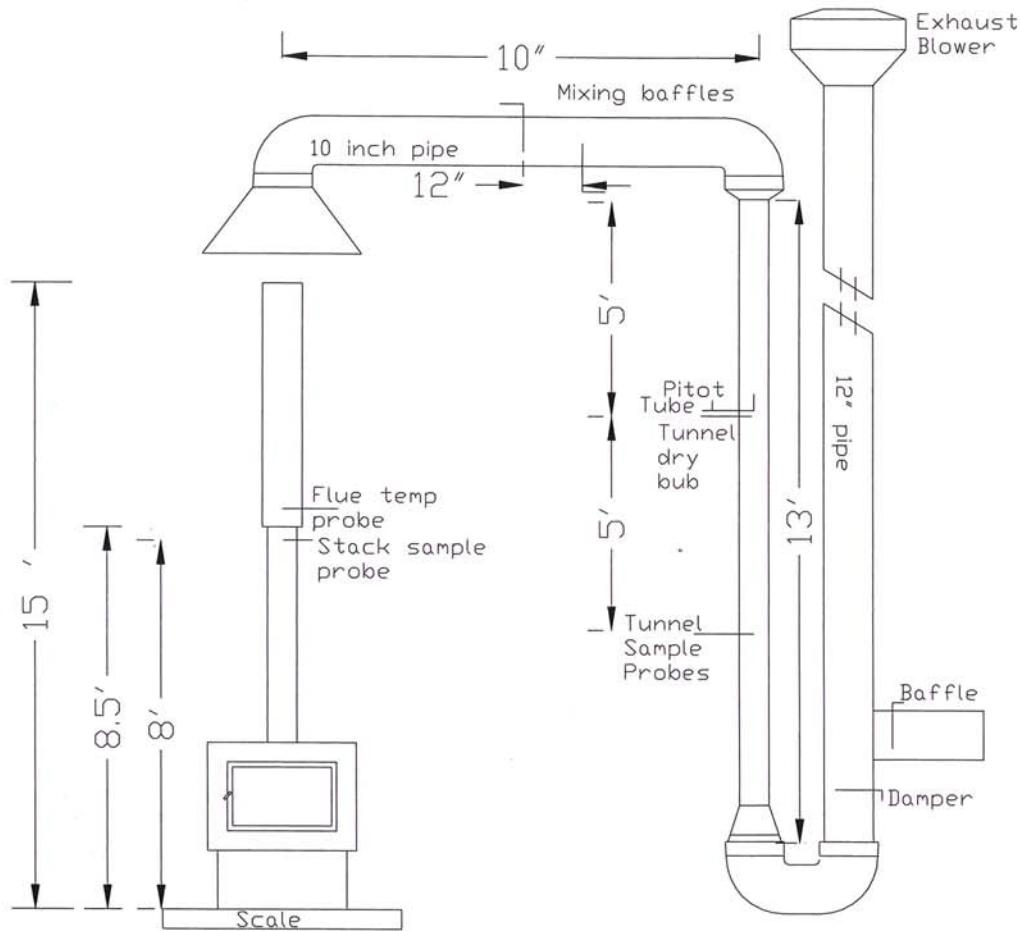


FIGURE 1

## SAMPLING METHODS

### V.A. PARTICULATE SAMPLING

Particulates were sampled in strict accordance with EPA Method 5H. This method uses a sampling system described in EPA method 5 with the addition of a rear filter. Components in the sampling system include a heated front filter, four impingers and a rear filter between number three and four impingers.

## VI. QUALITY ASSURANCE

### VI.A. INSTRUMENT CALIBRATION

#### VI.A. (1). DRY GAS METERS

At the conclusion of each test program the dry gas meter is checked against a standard dry gas meter. Three runs are made on each dry gas meter used during the test program. The average calibration factors obtained are then compared with the six-month calibration factor and, if within 5%, the six-month factor is used to calculate standard volumes. Results of this calibration are contained in Appendix E.

An integral part of the post test calibration procedure is a leak check of the pressure side of the dry gas meter. This is done by plugging the system exhaust and pressurizing the system to 10" W.C. The system is judged to be leak free if it retains the pressure for at least 10 minutes.

The standard dry gas meter is calibrated every 6 months using a Spirometer designed by the EPA Emissions Measurement Branch. The process involves sampling the train operation for 1 cubic foot of volume. With readings made to .001 ft<sup>3</sup>, the resolution is .1%, giving accuracy higher than the ±2% required by the standard.

#### VI.A.(2). GAS ANALYZERS

The continuous analyzers are zeroed and spanned before each test with appropriate gases. A mid-scale multi-component calibration gas is then analyzed (values are recorded). At the conclusion of a test, the instruments are checked again with zero, span and calibration gases (values are recorded only). The drift in each meter is then calculated and must not exceed 5% of the scale used for the test.

- On a semi annual schedule a multi point calibration is conducted. This calibration check must meet accuracy requirements of the applicable

standards. Consistent deviations between analyzer readings and calibration gas concentrations are used to correct data before computer processing. Data is also corrected for interferences as prescribed by the instrument manufacturer's instructions.

## VI.B. TEST METHOD PROCEDURES

### VI.B.(1). LEAK CHECK PROCEDURES

Before and after each test, each sample train is tested for leaks. Leakage rates are measured and must not exceed 0.02 CFM or 4% of the sampling rate. Leak checks are performed checking the entire sampling train, not just the dry gas meters. Pre-test and post-test leak checks are conducted with a vacuum of 10 inches of mercury. Vacuum is monitored during each test and the highest vacuum reached is then used for the post test vacuum value. If leakage limits are not met, the test run is rejected.

### VI.B.(2). TUNNEL VELOCITY/FLOW MEASUREMENT

The tunnel velocity is calculated from an average point that is calculated from an eight point traverse. Final tunnel velocities and flow rates are calculated from EPA Method 2, Equation 6.9 and 6.10. (Tunnel cross sectional area is the average from both lines of traverse.)

Pitot tubes are cleaned before each test and leak checks are conducted after each test.

### VI.B.(3). PM SAMPLING PROPORTIONALITY

Proportionality was calculated in accordance with EPA Method 5H. The data and results are included in Appendix G.

## VII. CONCLUSION

These tests demonstrate that this unit is an affected facility under the definition given in the regulation. The weighted average emission rate of 4.1 g/hr meets the requirements for the US Environmental Protection Agency New Source Performance Standard.

## VII.A RESULTS AND OBSERVATIONS

The Model VOYAGEUR Solid Fuel Room Heater Fireplace Insert has been found to be in compliance with the applicable performance and construction requirements of the following criteria: EPA Method 28 "Certification and auditing of wood heaters" and Method 5H Determination of particulate matter emissions from wood heaters."

## INTERTEK TESTING SERVICES NA

Reported by:



Bruce Davis  
Test Engineer

Reviewed by:

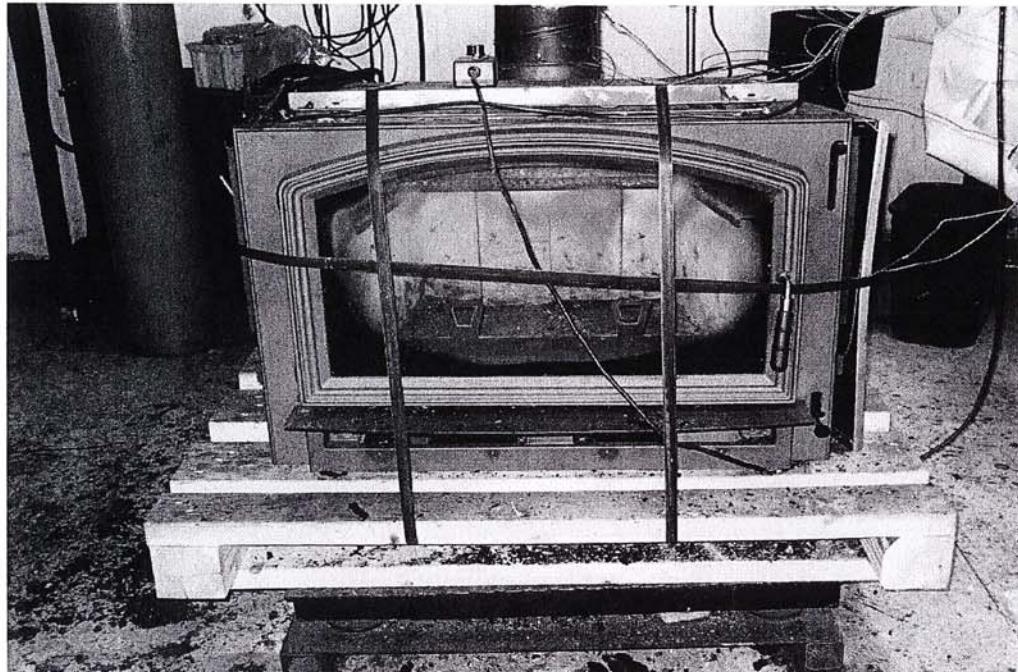


John Voorhees  
Senior Staff Engineer

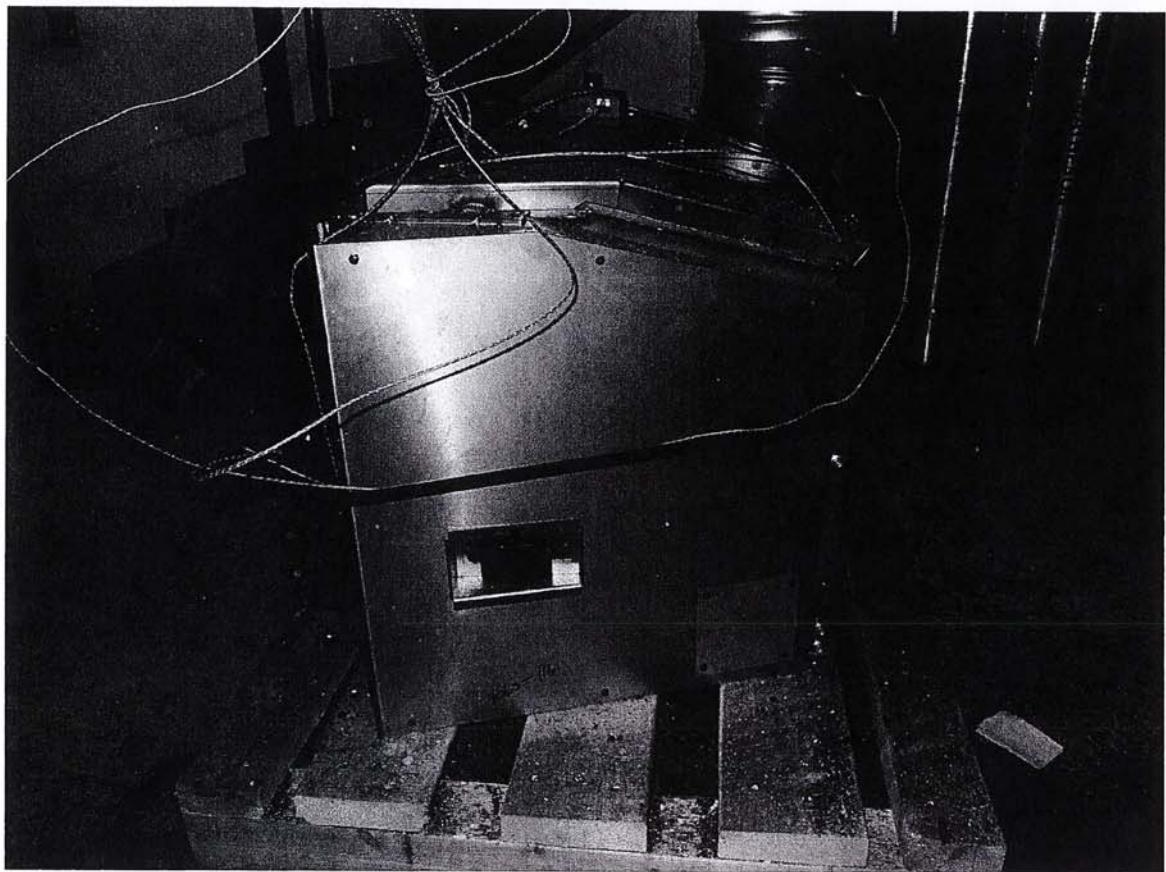
## **Appendix G**

### **Test Data**

Hearth & Home Technologies  
Voyageur  
**G100167575 –PRT-001**



Front view



Side view

**Intertek****EPA Method 5H Spreadsheet**

Manufacturer: Hearth &amp; Home Technologies

Tech: B. Davis

Model: Voyageur

Date: 7/27/2010

Run: 1

Control #: G100167575

V1.2 R. Curkeet 2/18/2010

| Elapsed Time (min) | Fuel Weight (lbs) | Stack Gas Comp. (%) |                 |                | Tunnel CO <sub>2</sub> Temp. (F) | Room Flue Temp. (F) | Tunnel Tunnel Pitot (in. w.c.) | Appliance Firebox Temperatures (F) |       |       | DGM Te In |
|--------------------|-------------------|---------------------|-----------------|----------------|----------------------------------|---------------------|--------------------------------|------------------------------------|-------|-------|-----------|
|                    |                   | CO                  | CO <sub>2</sub> | O <sub>2</sub> |                                  |                     |                                | top                                | back  | right |           |
| 0                  | 13                | 0.97                | 5.52            | 14.5           | 0.32                             | 158                 | 79                             | 88                                 | 0.031 | 228   | 275       |
| 10                 | 12.5              | 0.59                | 3.74            | 16.57          | 0.26                             | 200                 | 77                             | 91                                 | 0.031 | 330   | 366       |
| 20                 | 11.8              | 0.56                | 6.46            | 13.88          | 0.48                             | 266                 | 77                             | 94                                 | 0.031 | 416   | 380       |
| 30                 | 11                | 0.59                | 8.8             | 11.51          | 0.64                             | 324                 | 78                             | 100                                | 0.031 | 553   | 338       |
| 40                 | 10.1              | 0.63                | 9.34            | 10.93          | 0.71                             | 310                 | 77                             | 98                                 | 0.031 | 417   | 275       |
| 50                 | 9.1               | 0.9                 | 12.58           | 7.42           | 0.83                             | 361                 | 78                             | 103                                | 0.031 | 533   | 255       |
| 60                 | 8                 | 0.7                 | 12.03           | 8.17           | 0.8                              | 354                 | 78                             | 104                                | 0.031 | 563   | 246       |
| 70                 | 6.8               | 1.73                | 11.22           | 7.95           | 0.76                             | 537                 | 79                             | 105                                | 0.031 | 557   | 238       |
| 80                 | 5.8               | 1.89                | 10.52           | 8.49           | 0.7                              | 314                 | 80                             | 103                                | 0.031 | 513   | 235       |
| 90                 | 4.7               | 2.92                | 10.76           | 7.22           | 0.71                             | 309                 | 80                             | 103                                | 0.031 | 498   | 230       |
| 100                | 3.9               | 1.58                | 9.56            | 9.76           | 0.6                              | 273                 | 80                             | 99                                 | 0.031 | 448   | 228       |
| 110                | 3.2               | 1.71                | 8.7             | 10.49          | 0.6                              | 252                 | 80                             | 96                                 | 0.031 | 386   | 226       |
| 120                | 2.8               | 1.51                | 7.28            | 12.11          | 0.49                             | 214                 | 81                             | 94                                 | 0.031 | 316   | 227       |
| 130                | 2.4               | 1.61                | 7.5             | 11.79          | 0.45                             | 203                 | 81                             | 92                                 | 0.031 | 291   | 228       |
| 140                | 2.2               | 1.57                | 6.7             | 12.63          | 0.4                              | 192                 | 80                             | 90                                 | 0.031 | 275   | 226       |
| 150                | 2                 | 1.5                 | 6.74            | 12.66          | 0.37                             | 184                 | 80                             | 89                                 | 0.031 | 262   | 222       |
| 160                | 1.8               | 1.48                | 7.28            | 12.14          | 0.39                             | 179                 | 80                             | 89                                 | 0.031 | 252   | 217       |
| 170                | 1.7               | 1.65                | 7.22            | 12.03          | 0.37                             | 173                 | 81                             | 89                                 | 0.031 | 245   | 213       |
| 180                | 1.5               | 2.2                 | 6.28            | 12.42          | 0.32                             | 170                 | 81                             | 88                                 | 0.031 | 243   | 214       |
| 190                | 1.4               | 2.14                | 6.14            | 12.62          | 0.32                             | 166                 | 81                             | 88                                 | 0.031 | 236   | 216       |
| 200                | 1.2               | 2.07                | 6.04            | 12.79          | 0.3                              | 162                 | 81                             | 88                                 | 0.031 | 230   | 215       |
| 210                | 1.1               | 1.99                | 5.9             | 13.01          | 0.29                             | 160                 | 80                             | 87                                 | 0.031 | 225   | 213       |
| 220                | 1                 | 1.9                 | 5.92            | 13.08          | 0.3                              | 157                 | 80                             | 87                                 | 0.031 | 221   | 211       |
| 230                | 0.9               | 1.89                | 5.72            | 13.29          | 0.28                             | 155                 | 80                             | 86                                 | 0.031 | 214   | 207       |
| 240                | 0.7               | 1.88                | 5.8             | 13.22          | 0.28                             | 153                 | 80                             | 86                                 | 0.031 | 210   | 204       |
| 250                | 0.6               | 1.73                | 5.86            | 13.31          | 0.27                             | 148                 | 79                             | 86                                 | 0.031 | 204   | 203       |
| 260                | .0.5              | 1.77                | 5.76            | 13.37          | 0.25                             | 145                 | 79                             | 85                                 | 0.031 | 201   | 202       |
| 270                | 0.4               | 1.72                | 5.54            | 13.64          | 0.25                             | 143                 | 79                             | 85                                 | 0.031 | 195   | 201       |
| 280                | 0.3               | 1.53                | 5.66            | 13.71          | 0.24                             | 140                 | 78                             | 84                                 | 0.031 | 191   | 200       |
| 290                | 0.2               | 1.6                 | 5.42            | 13.88          | 0.23                             | 138                 | 79                             | 84                                 | 0.031 | 188   | 198       |
| 300                | 0.1               | 1.59                | 5.44            | 13.87          | 0.24                             | 137                 | 78                             | 84                                 | 0.031 | 182   | 197       |
| 310                | 0                 | 1.67                | 5.52            | 13.71          | 0.25                             | 135                 | 78                             | 83                                 | 0.031 | 179   | 195       |

B - 8/11/10  
JW



## Manufacturer: Hearth &amp; Home Technologies

Model: Voyageur

Date: 7/27/2010

Run: 1

Control #: G100167575

Tech: B. Davis

| C <sub>f</sub>     | 1.0000                   | Pilot Center Correction (Tunnel Traverse) | P <sub>g</sub>                            | -0.368 (Tunnel Traverse)           |
|--------------------|--------------------------|---|---|------------------------------------|
| k <sub>p</sub>     | 85.49                    | N <sub>c</sub>                            | 0.0425                                    |                                    |
| C <sub>p</sub>     | 0.99                     | HC  | 0.0132                                    |                                    |
| M <sub>s</sub>     | 28.56                    | B <sub>ws</sub>                           | 0.04                                      |                                    |
| CO <sub>2amb</sub> | 0.034                    | Tunnel Area                               | 0.19635 ft <sup>2</sup> (Tunnel Traverse) |                                    |
| K <sub>2</sub>     | 384.8                    |   |   |                                    |
| 12.292             | 126.258                  | 5.088                                     | 0.997                                     | 0.361                              |
| V                  | Q <sub>tunnel</sub> scfm | Q <sub>stack</sub> scfm                   | Q <sub>new</sub> /<br>Q <sub>init</sub>   | Target<br>ΔH (in H <sub>2</sub> O) |
| ft/min             | ft/min                   | ft/min                                    |   | lb/h dry                           |
| 12.292             | 127.046                  | 1.000                                     | 0.3268                                    | 2.9005                             |
| 12.292             | 126.354                  | 11.9806                                   | 0.997                                     | 0.4781                             |
| 12.292             | 125.670                  | 11.3629                                   | 0.995                                     | 0.6159                             |
| 12.292             | 124.323                  | 10.11248                                  | 0.989                                     | 0.6034                             |
| 12.292             | 124.769                  | 10.79209                                  | 0.991                                     | 0.6698                             |
| 12.292             | 123.661                  | 9.147351                                  | 0.987                                     | 0.5055                             |
| 12.292             | 123.441                  | 10.59921                                  | 0.986                                     | 0.5111                             |
| 12.292             | 123.223                  | 11.38451                                  | 0.985                                     | 0.5261                             |
| 12.292             | 123.661                  | 9.860218                                  | 0.987                                     | 0.5047                             |
| 12.292             | 123.661                  | 9.927925                                  | 0.987                                     | 0.4970                             |
| 12.292             | 124.546                  | 8.692186                                  | 0.990                                     | 0.4449                             |
| 12.292             | 125.218                  | 8.07899                                   | 0.993                                     | 0.5404                             |
| 12.292             | 125.670                  | 5.356312                                  | 0.995                                     | 0.5026                             |
| 12.292             | 126.125                  | 5.191977                                  | 0.996                                     | 0.3954                             |
| 12.292             | 126.584                  | 2.823374                                  | 0.998                                     | 0.3861                             |
| 12.292             | 126.814                  | 2.832234                                  | 0.999                                     | 0.3221                             |
| 12.292             | 126.814                  | 2.686127                                  | 0.999                                     | 0.3097                             |
| 12.292             | 126.814                  | 1.328565                                  | 0.999                                     | 0.2800                             |
| 12.292             | 127.046                  | 2.762873                                  | 1.000                                     | 0.2690                             |
| 12.292             | 127.046                  | 1.410217                                  | 1.000                                     | 0.2815                             |
| 12.292             | 127.046                  | 2.871279                                  | 1.000                                     | 0.2517                             |
| 12.292             | 127.278                  | 1.469933                                  | 1.001                                     | 0.2453                             |
| 12.292             | 127.278                  | 1.48119                                   | 1.001                                     | 0.2630                             |
| 12.292             | 127.511                  | 1.516022                                  | 1.002                                     | 0.2415                             |
| 12.292             | 127.511                  | 3.008462                                  | 1.002                                     | 0.2348                             |
| 12.292             | 127.511                  | 1.519425                                  | 1.002                                     | 0.2121                             |
| 12.292             | 127.745                  | 1.529726                                  | 1.003                                     | 0.1843                             |
| 12.292             | 127.745                  | 1.577865                                  | 1.003                                     | 0.1993                             |
| 12.292             | 127.980                  | 1.590844                                  | 1.004                                     | 0.1742                             |
| 12.292             | 127.980                  | 1.623271                                  | 1.004                                     | 0.1718                             |
| 12.292             | 127.980                  | 1.621327                                  | 1.004                                     | 0.1887                             |
| 12.292             | 128.215                  | 1.590844                                  | 1.005                                     | 0.2019                             |

| Proportional Rate Calculation |  |        |            |                |
|-------------------------------|--|--------|------------|----------------|
|                               | Sum S <sub>i</sub> x V <sub>m(std)</sub> | PR     | Qty tracer | 1/Qf by tracer |
|                               | 13.989                                   | 100.1% | 6.56       | 6.623          |
| Sum Si x Vm                   |  |        |            | 0.151          |
|                               |  |        |            | 0.130          |
|                               |  |        |            | 0.115          |
|                               |  |        |            | 0.116          |
|                               |  |        |            | 0.110          |
|                               |  |        |            | 0.127          |
|                               |  |        |            | 0.125          |
|                               |  |        |            | 0.127          |
|                               |  |        |            | 0.128          |
|                               |  |        |            | 0.135          |
|                               |  |        |            | 0.135          |
|                               |  |        |            | 0.161          |
|                               |  |        |            | 0.169          |
|                               |  |        |            | 0.174          |
|                               |  |        |            | 0.181          |
|                               |  |        |            | 0.184          |
|                               |  |        |            | 0.194          |
|                               |  |        |            | 0.208          |
|                               |  |        |            | 0.200          |
|                               |  |        |            | 0.213          |
|                               |  |        |            | 0.215          |
|                               |  |        |            | 0.205          |
|                               |  |        |            | 0.198          |

B - J.W. - 8/31/10

**Intertek**

# EPA Method 5H Spreadsheets

| V1.2          |                                |                 |                 |                |           |           |            |       |                | R. Curkeet | Pitot Location           |           |
|---------------|--------------------------------|-----------------|-----------------|----------------|-----------|-----------|------------|-------|----------------|------------|--------------------------|-----------|
|               |                                |                 |                 |                |           |           |            |       |                | Center     | Point of Ave.            |           |
|               |                                |                 |                 |                |           |           |            |       |                | X          | X                        |           |
| (ENTER X)     | Cat                            | Non Cat         | Pellet          |                |           |           |            |       |                |            |                          |           |
|               |                                | X               |                 |                |           |           |            |       |                |            |                          |           |
| Initial Delta | 0.32                           |                 |                 |                |           |           |            |       |                |            |                          |           |
| Delta H @     | 1.937                          |                 |                 |                |           |           |            |       |                |            |                          |           |
| Baro:         | 28.405 in Hg (Tunnel Traverse) |                 |                 |                |           |           |            |       |                |            |                          |           |
| DGM Cal       | 0.9974                         | Y               |                 |                |           |           |            |       |                |            |                          |           |
| Averages      | 1.55313                        | 7.28            | 12.06781        | 0.428125       | 676       | 539.34375 | 551.50     | 0.031 | 542.21875      | 542.21875  | 910.911                  | 0.578     |
|               |                                |                 |                 |                |           |           |            |       |                |            |                          | -0.027    |
| Time          | Weight                         | Stack Gas Comp. | Tunnel          | Flue           | Room      | Tunnel    | Tunnel     | Pitot | DGM Temps. (R) | DGM Vol.   | Orifice Meter            | Tunnel SP |
|               |                                | CO              | CO <sub>2</sub> | O <sub>2</sub> | Temp. (R) | Temp. (R) | (in. w.c.) | In    | "              | "          | ΔH (in H <sub>2</sub> O) | (in Hg)   |
| 0             | 13.00                          | 0.97            | 5.52            | 14.5           | 0.32      | 618       | 539        | 548   | 0.0310         | 539        | 856.070                  | 0.350     |
| 10            | 12.50                          | 0.59            | 3.74            | 16.57          | 0.26      | 660       | 537        | 551   | 0.0310         | 540        | 859.200                  | 0.480     |
| 20            | 11.80                          | 0.56            | 6.46            | 13.88          | 0.48      | 726       | 537        | 554   | 0.0310         | 540        | 862.970                  | 0.620     |
| 30            | 11.00                          | 0.59            | 8.8             | 11.51          | 0.64      | 784       | 538        | 560   | 0.0310         | 540        | 867.030                  | 0.600     |
| 40            | 10.10                          | 0.63            | 9.34            | 10.93          | 0.71      | 770       | 537        | 558   | 0.0310         | 540        | 871.350                  | 0.670     |
| 50            | 9.10                           | 0.9             | 12.58           | 7.42           | 0.83      | 821       | 538        | 563   | 0.0310         | 540        | 875.580                  | 0.510     |
| 60            | 8.00                           | 0.7             | 12.03           | 8.17           | 0.8       | 814       | 538        | 564   | 0.0310         | 540        | 879.480                  | 0.510     |
| 70            | 6.80                           | 1.73            | 11.22           | 7.95           | 0.76      | 997       | 539        | 565   | 0.0310         | 541        | 883.370                  | 0.530     |
| 80            | 5.80                           | 1.89            | 10.52           | 8.49           | 0.7       | 774       | 540        | 563   | 0.0310         | 541        | 887.090                  | 0.500     |
| 90            | 4.70                           | 2.92            | 10.76           | 7.22           | 0.71      | 769       | 540        | 563   | 0.0310         | 541        | 891.050                  | 0.500     |
| 100           | 3.90                           | 1.58            | 9.56            | 9.76           | 0.6       | 733       | 540        | 559   | 0.0310         | 541        | 894.720                  | 0.440     |
| 110           | 3.20                           | 1.71            | 8.7             | 10.49          | 0.6       | 712       | 540        | 556   | 0.0310         | 542        | 898.320                  | 0.540     |
| 120           | 2.80                           | 1.51            | 7.28            | 12.11          | 0.49      | 674       | 541        | 554   | 0.0310         | 542        | 902.360                  | 0.500     |
| 130           | 2.40                           | 1.61            | 7.5             | 11.79          | 0.45      | 663       | 541        | 552   | 0.0310         | 542        | 906.220                  | 0.400     |
| 140           | 2.20                           | 1.57            | 6.7             | 12.63          | 0.4       | 652       | 540        | 550   | 0.0310         | 543        | 909.650                  | 0.390     |
| 150           | 2.00                           | 1.5             | 6.74            | 12.66          | 0.37      | 644       | 540        | 549   | 0.0310         | 543        | 913.020                  | 0.320     |
| 160           | 1.80                           | 1.48            | 7.28            | 12.14          | 0.39      | 639       | 540        | 549   | 0.0310         | 543        | 916.250                  | 0.310     |
| 170           | 1.70                           | 1.65            | 7.22            | 12.03          | 0.37      | 633       | 541        | 549   | 0.0310         | 543        | 919.180                  | 0.280     |
| 180           | 1.50                           | 2.2             | 6.28            | 12.42          | 0.32      | 630       | 541        | 548   | 0.0310         | 543        | 922.090                  | 0.270     |
| 190           | 1.40                           | 2.14            | 6.14            | 12.62          | 0.32      | 626       | 541        | 548   | 0.0310         | 543        | 925.020                  | 0.280     |
| 200           | 1.20                           | 2.07            | 6.04            | 12.79          | 0.3       | 622       | 541        | 548   | 0.0310         | 544        | 927.670                  | 0.250     |
| 210           | 1.10                           | 1.99            | 5.9             | 13.01          | 0.29      | 620       | 540        | 547   | 0.0310         | 544        | 930.340                  | 0.250     |
| 220           | 1.00                           | 1.9             | 5.92            | 13.08          | 0.3       | 617       | 540        | 547   | 0.0310         | 544        | 933.080                  | 0.260     |
| 230           | 0.90                           | 1.89            | 5.72            | 13.29          | 0.28      | 615       | 540        | 546   | 0.0310         | 544        | 935.930                  | 0.240     |
| 240           | 0.7                            | 1.88            | 5.8             | 13.22          | 0.28      | 613       | 540        | 546   | 0.031          | 544        | 938.870                  | 0.230     |
| 250           | 0.6                            | 1.73            | 5.86            | 13.31          | 0.27      | 608       | 539        | 546   | 0.031          | 544        | 941.670                  | 0.210     |
| 260           | 0.5                            | 1.77            | 5.76            | 13.37          | 0.25      | 605       | 539        | 545   | 0.031          | 544        | 944.260                  | 0.180     |
| 270           | 0.4                            | 1.72            | 5.54            | 13.64          | 0.25      | 603       | 539        | 545   | 0.031          | 544        | 946.720                  | 0.200     |
| 280           | 0.3                            | 1.53            | 5.66            | 13.71          | 0.24      | 600       | 538        | 544   | 0.031          | 543        | 949.210                  | 0.170     |
| 290           | 0.2                            | 1.6             | 5.42            | 13.88          | 0.23      | 598       | 539        | 544   | 0.031          | 543        | 951.420                  | 0.170     |
| 300           | 0.1                            | 1.59            | 5.44            | 13.87          | 0.24      | 597       | 538        | 544   | 0.031          | 543        | 953.750                  | 0.190     |
| 310           | 0                              | 1.67            | 5.52            | 13.71          | 0.25      | 595       | 538        | 543   | 0.031          | 543        | 956.220                  | 0.200     |

B D - 8/31/10  
JW

## EPA Method 5H Spreadsheet

## INPUT DATA

|                             |       |          |
|-----------------------------|-------|----------|
| Load Weight (lbs wet)       | 13.00 | $W_{wd}$ |
| Load Weight (kg wet)        | 5.898 |          |
| Total Test Duration (min)   | 310   | $\Theta$ |
| Total Test Duration (hours) | 5.167 |          |
| Wood Moisture (Dry Basis)   | 20.8  | %        |
| Wood Moisture (Wet Basis)   | 17.22 | %        |

Manufacturer: Hearth & Home Technologies  
 Model: Voyageur  
 Date: 7/27/2010  
 Run: 1  
 Control #: G100167575  
 Tech: B. Davis

|               |       |           |
|---------------|-------|-----------|
| Dry Burn Rate | 0.945 | Dry kg/hr |
|               | 2.083 | Dry Lb/hr |

| PARTICULATE CATCH        | Tare or<br>Final Wt. | Net Catch<br>Initial Wt. (mg) |    |
|--------------------------|----------------------|-------------------------------|----|
| Front Filter             | 1.0946               | 0.6375                        | F1 |
| Rear Filter              | 0.4444               | 0.1633                        | F2 |
| Probe/Front Half Rinse   | 102.2394             | 101.9228                      | R1 |
| Impinger H2O +Back Rinse | 144.1745             | 143.6758                      | R2 |
| Meth Chlor. Extraction   | 111.8555             | 111.4124                      | R3 |
| Back Half Acetone Rinse  | 105.3297             | 105.0665                      | R4 |

|                             |        |    |
|-----------------------------|--------|----|
| Total Particulate Collected | 2255.3 | mg |
|-----------------------------|--------|----|

| Solvent Volumes (ml)               |     |
|------------------------------------|-----|
| Acetone Front Half Rinse           | 155 |
| Acetone Back Half Rinse            | 155 |
| Water- Impingers + Back Half Rinse | 325 |
| Methylene Chloride Extraction      | 150 |
|                                    |     |

| Blinks (mg/ml)     |       |
|--------------------|-------|
| Acetone            | 0     |
| Water              | 0.01  |
| Methylene Chloride | 0.008 |

Total Particulate Collected 2255.35 mg

## Weighing Record

| PER-TEST INITIAL/TARE WEIGHTS |  |  |  |          |
|-------------------------------|--|--|--|----------|
| DATE                          |  |  |  | Stable   |
| TIME                          |  |  |  | Weights  |
| Front Filter                  |  |  |  | 0.6375   |
| Rear Filter                   |  |  |  | 0.1633   |
| Probe/Front Half Rinse        |  |  |  | 101.9228 |
| Impinger H2O +Back Rinse      |  |  |  | 143.6758 |
| Meth Chlor. Extraction        |  |  |  | 111.4124 |
| Back Half Acetone Rinse       |  |  |  | 105.0665 |

| POST-TEST FINAL WEIGHTS  |  |  |  |          |
|--------------------------|--|--|--|----------|
| DATE                     |  |  |  | Stable   |
| TIME                     |  |  |  | Weights  |
| Front Filter             |  |  |  | 1.0946   |
| Rear Filter              |  |  |  | 0.4444   |
| Probe/Front Half Rinse   |  |  |  | 102.2394 |
| Impinger H2O +Back Rinse |  |  |  | 144.1745 |
| Meth Chlor. Extraction   |  |  |  | 111.8555 |
| Back Half Acetone Rinse  |  |  |  | 105.3297 |

Test Engineer 

**Intertek**

V1.2                    R. Curkeet                    2/18/2010

**Emissions Tunnel Traverse Worksheet**Static Pressure: **-0.368** in H<sub>2</sub>O (enter as negative value e.g. -0.12)Barometer: **28.41** in HgTunnel Diameter: **6** inPITOT  
TUNNEL  
VELOCITY PTUNNEL  
TEMPSQUARE  
ROOT VP

|          |       |        |
|----------|-------|--------|
| A CENTER |       | 0.0000 |
| B CENTER |       | 0.0000 |
| A1       | 0.032 | 88     |
| A2       | 0.036 | 88     |
| A3       | 0.034 | 88     |
| A4       | 0.020 | 88     |
| B1       | 0.034 | 88     |
| B2       | 0.036 | 88     |
| B3       | 0.034 | 88     |
| B4       | 0.024 | 88     |
| AVERAGE  | 0.031 | 88     |
|          |       | 0.1760 |

PITOT CONSTANT= #DIV/0! For Pitot P<sub>c</sub>1.00 For Pitot P<sub>c</sub>

| Tunnel V | Tunnel Q |
|----------|----------|
| ft/sec   | scfm     |
| 12.25    | 126.58   |

Manufacturer: Hearth &amp; Home Technologies

Model: Voyageur

Date: 7/27/2010

Run: 1

Control #: G100167575

Test Engineer Bob - 8/3/10

T 31

burn

## STOVE TEMPERATURE TEST DATA - METHOD 5H

Page 1 of 1Client/Model: Heath Home Voyager Control #: 6100167575Date: 7/27/10 Test Crew: B DavisEquipment ID #: 

| Preburn<br>Test | Fuel<br>Weight | Delta<br>Weight | Stack<br>Draft | Coal Bed:<br>Data: |     |        |      | Actual:<br>Range: 26 - 32<br>Coal Bed: 30 |       |      |          |
|-----------------|----------------|-----------------|----------------|--------------------|-----|--------|------|---|-------|------|----------|
|                 |                |                 |                | Ambient            | Top | Bottom | Back | Left                                      | Right | Flue | Catalyst |
| 0               | 5.7            | -0.22           | 77             | 394                | 362 | 548    | 467  | 394                                       | 394   | 293  |          |
| 10              | 4.9            | 0.8             | 78             | 435                | 353 | 525    | 447  | 368                                       | 368   | 282  |          |
| 20              | 4.3            | 0.6             | 78             | 405                | 335 | 496    | 416  | 336                                       | 336   | 268  |          |
| 30              | 3.8            | 0.5             | 79             | 398                | 318 | 476    | 388  | 304                                       | 304   | 235  |          |
| 40              | 3.4            | 0.4             | 79             | 332                | 307 | 450    | 367  | 273                                       | 273   | 216  |          |
| 50              | 3.2            | 0.2             | 80             | 276                | 296 | 921    | 351  | 211                                       | 211   | 181  |          |
| 60              | 3.0            | 0.1             | 79             | 236                | 280 | 391    | 323  | 217                                       | 217   | 171  |          |
| 70              |                |                 |                |                    |     |        |      |   |       |      |          |
| 80              |                |                 |                |                    |     |        |      |   |       |      |          |
| 90              |                |                 |                |                    |     |        |      |   |       |      |          |
| 00              |                |                 |                |                    |     |        |      |   |       |      |          |
| 10              |                |                 |                |                    |     |        |      |   |       |      |          |
| 20              |                |                 |                |                    |     |        |      |   |       |      |          |
| 30              |                |                 |                |                    |     |        |      |   |       |      |          |
| 40              |                |                 |                |                    |     |        |      |   |       |      |          |
| 50              |                |                 |                |                    |     |        |      |   |       |      |          |
| 60              |                |                 |                |                    |     |        |      |   |       |      |          |
| 70              |                |                 |                |                    |     |        |      |   |       |      |          |
| 80              |                |                 |                |                    |     |        |      |   |       |      |          |
| 90              |                |                 |                |                    |     |        |      |   |       |      |          |
| AVG             |                |                 |                |                    |     |        |      |   |       |      |          |

Engineer signature: BobDate: 8/14/10

Date: 7/27/10Page 1 of 1Manufacturer: Hearth N Home Model: VoyageurProject #: G100167575Run: 1

### FUEL DATA PRE-TEST LOAD

**FUEL DESCRIPTION:**

Kindling weight: \_\_\_\_\_ lbs. Consisting of: \_\_\_\_\_ Fire lit Time: \_\_\_\_\_

Pre-test load weight: 2.5 lbs. Consisting of: 3 2X4X 8 inches Time loaded: \_\_\_\_\_Pre-test moisture content: Corrected Dry: 19.6 % Wet: \_\_\_\_\_ %  .70"Test Air Control Settings: from bottom airrod to top heat air opening, no cast. Time: \_\_\_\_\_Test Unit Fan Settings: off or high for preburn off for first 30 min. of test. Time: \_\_\_\_\_**TEST LOAD**

| Test Load Weight: | Lower Limit       | Ideal             | Upper Limit       |
|-------------------|-------------------|-------------------|-------------------|
|                   | <u>11.78</u> lbs. | <u>13.09</u> lbs. | <u>14.39</u> lbs. |

|                   |                              |                  |                     |
|-------------------|------------------------------|------------------|---------------------|
| Fire Box Volume:  | <u>1.87</u> ft. <sup>3</sup> | Ideal Length:    | inches              |
| Load Volume:      | ft. <sup>3</sup>             | Loading Density: | lbs/ft <sup>3</sup> |
| Number of Spacers | :x12x5                       | Load Density:    | lbs/ft <sup>3</sup> |

| Piece Size     | Meter Moisture Content (% dry)* |               |               |                     |
|----------------|---------------------------------|---------------|---------------|---------------------|
| 4 x 4 x 14 in. | <u>18.1</u> %                   | <u>21.3</u> % | <u>21.0</u> % | <u>&gt; 7.0 lbs</u> |
| 4 x 4 x 14 in. | <u>21.1</u> %                   | <u>24.2</u> % | <u>19.1</u> % |                     |
| 2 x 4 x 14 in. | <u>19.0</u> %                   | <u>23.1</u> % | <u>21.3</u> % |                     |
| 2 x 4 x 14 in. | <u>21.1</u> %                   | <u>20.3</u> % | <u>20.6</u> % |                     |
| 2 x 4 x 14 in. | <u>20.0</u> %                   | <u>21.1</u> % | <u>20.5</u> % |                     |
| x x in.        | %                               | %             | %             |                     |
| x x in.        | %                               | %             | %             |                     |

\*uncorrected range = 17.9% to 23.1%

TEST LOAD WEIGHT: 13.0 lbs DRY WEIGHT: \_\_\_\_\_ kg.**AVERAGE MOISTURE CONTENT:**CORRECTED TO TWO PIN: (DRY) 20.8 % (WET) \_\_\_\_\_ %**COAL BED RANGE:**2.6 lbs. to 3.2 lbs. (20% to 25% of test load)**TEST CHARGE:**Time loaded: \_\_\_\_\_ Coal bed weight: 3.0 lbs. Coal bed weight = \_\_\_\_\_ % of test load weightCHARCOALIZATION: good-----B.R.-----8/30/10-----poor

Date: 7/27/10

Page 1 of 1

Manufacturer: Hearth N Home

Model: Voyageur

Project #: G100167575

Run: 1

Tech: BDavis

Reviewer:

## COMMENTS

Preburn Raked coals @ 55 minutes

Pb Sh.L 28.40

End 28.41

Probs Analyzer CA1 Low CO<sub>2</sub>

Post test

O = 0

O = 0.00

1.00 = 1.00

1.00 = 1.02

Start Gas

O = 0

CO O = 0.00

CO<sub>2</sub> 4.00 = 4.08

CO<sub>2</sub> O = 0.00

CO 1.97 = 1.97

CO<sub>2</sub> 4.10 = 4.10

CO 1.97 = 1.99

Test Load

CO .97 = 1.00

fuel loaded by 50 seconds

CO<sub>2</sub> 9.93 = 9.96

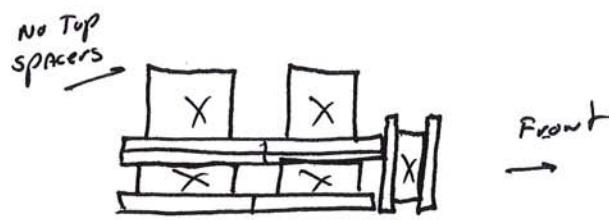
door closed by 60 seconds

Primary Air @ test setting full 5 minutes

Timed Air pushed @ 0 minutes of test

## TEST LOAD CONFIGURATION

Side view



BR - 8/30/10

192-K-0602





**Manufacturer:** Hearth & Home Technologies

**Model:** Voyageur

**Date:** 7/28/2010

**Run:** 2

**Control #:** G100167575

**Tech:** B. Davis

-0.032935

| DGM Temps. (F) | DGM Vol.<br>ft <sup>3</sup> | Orifice Meter<br>ΔH (in H <sub>2</sub> O) | Tunnel SP<br>(in H <sub>2</sub> O) | Impinger<br>Exit | Front<br>Filter | VAC | Draft |
|----------------|-----------------------------|---|------------------------------------|------------------|-----------------|-----|-------|
| 79             | 79                          | 957.555                                   | 0.2                                | -0.46            | 83              | 231 | 0     |
| 79             | 79                          | 960.02                                    | 0.2900                             | -0.46            | 67              | 230 | 0     |
| 80             | 80                          | 962.85                                    | 0.3000                             | -0.46            | 58              | 232 | 0     |
| 80             | 80                          | 965.79                                    | 0.3600                             | -0.46            | 56              | 236 | 0     |
| 80             | 80                          | 968.97                                    | 0.2800                             | -0.46            | 56              | 237 | 0     |
| 80             | 80                          | 971.8                                     | 0.3000                             | -0.46            | 58              | 230 | 0     |
| 81             | 81                          | 974.75                                    | 0.2800                             | -0.46            | 58              | 227 | 0     |
| 81             | 81                          | 977.6                                     | 0.2200                             | -0.46            | 59              | 225 | 0     |
| 81             | 81                          | 980.06                                    | 0.2100                             | -0.46            | 61              | 224 | 0     |
| 81             | 81                          | 982.5                                     | 0.2200                             | -0.46            | 62              | 225 | 0     |
| 82             | 82                          | 985.12                                    | 0.2200                             | -0.46            | 52              | 226 | 0     |
| 82             | 82                          | 987.38                                    | 0.2500                             | -0.46            | 51              | 228 | 0     |
| 82             | 82                          | 990.18                                    | 0.2200                             | -0.46            | 53              | 229 | 0     |
| 82             | 82                          | 992.66                                    | 0.2100                             | -0.46            | 55              | 228 | 0     |
| 83             | 83                          | 995.05                                    | 0.1800                             | -0.46            | 56              | 227 | 0     |
| 83             | 83                          | 997.28                                    | 0.1900                             | -0.46            | 60              | 226 | 0     |
| 83             | 83                          | 999.5                                     | 0.1900                             | -0.46            | 61              | 226 | 0     |
| 84             | 84                          | 1001.801                                  | 0.1800                             | -0.46            | 63              | 225 | 0     |
| 84             | 84                          | 1003.95                                   | 0.1500                             | -0.46            | 64              | 225 | 0     |
| 85             | 85                          | 1006.03                                   | 0.1400                             | -0.46            | 61              | 225 | 0     |
| 85             | 85                          | 1008.07                                   | 0.1300                             | -0.46            | 63              | 225 | 0     |
| 85             | 85                          | 1010                                      | 0.1300                             | -0.46            | 63              | 224 | 0     |
| 85             | 85                          | 1011.97                                   | 0.1300                             | -0.46            | 64              | 224 | 0     |
| 85             | 85                          | 1013.87                                   | 0.1100                             | -0.46            | 64              | 224 | 0     |
| 86             | 86                          | 1015.81                                   | 0.1                                | -0.46            | 66              | 224 | 0     |
| 86             | 86                          | 1017.5                                    | 0.1                                | -0.46            | 66              | 224 | 0     |
| 86             | 86                          | 1019.25                                   | 0.09                               | -0.46            | 66              | 225 | 0     |
| 86             | 86                          | 1020.8                                    | 0.09                               | -0.46            | 66              | 225 | 0     |
| 86             | 86                          | 1022.27                                   | 0.07                               | -0.46            | 67              | 224 | 0     |
| 87             | 87                          | 1023.7                                    | 0.07                               | -0.46            | 67              | 225 | 0     |
| 87             | 87                          | 1025.08                                   | 0.07                               | -0.46            | 68              | 225 | 0     |

B D - 8/3/10  
JW

**Manufacturer:** Hearth & Home Technologies

| C <sub>f</sub>       |                             | 1.0000 Pitot Center Correction (Tunnel Traverse) |   |                                    | P <sub>g</sub>        | -0.46 (Tunnel Traverse) |      |
|----------------------|-----------------------------|--|---|------------------------------------|-----------------------|-------------------------|------|
| k <sub>p</sub>       | 85.49                       | C <sub>p</sub>                                   | 0.99  | N <sub>c</sub>                     | 0.0425                |                         |      |
| M <sub>s</sub>       | 28.56                       | K <sub>2</sub>                                   | 384.8   | HC                                 | 0.0132                | B <sub>ws</sub>         | 0.04 |
| CO <sub>2amb</sub>   | 0.034                       | Tunnel Area                                      | 0.19635 ft <sup>2</sup> (Tunnel Traverse) <th></th> <th></th> <th></th> <th></th> |                                    |                       |                         |      |
| 12.918               | 131.754                     | 5.792  | 0.993   | 0.185                              |                       |                         |      |
| <b>Tunnel Tunnel</b> |                             |  |   |                                    |                       |                         |      |
| V                    | Q <sub>tunnel</sub><br>scfm | Q <sub>stack</sub><br>scfm                       | Q <sub>stack</sub> /<br>Q <sub>sinit</sub>  | Target<br>ΔH (in H <sub>2</sub> O) | Burn Rate<br>lb/h dry | S <sub>i</sub>          |      |
| 12.918               | 133.507                     | 1.000  | 0.1995  |                                    |                       |                         |      |
| 12.918               | 132.780                     | 0.997  | 0.2946  | 2.479544                           | 0.1065                |                         |      |
| 12.918               | 132.061                     | 0.995  | 0.3023  | 3.471361                           | 0.0865                |                         |      |
| 12.918               | 130.413                     | 0.988  | 0.3636  | 4.959088                           | 0.0768                |                         |      |
| 12.918               | 129.720                     | 0.986  | 0.2849  | 5.454996                           | 0.0775                |                         |      |
| 12.918               | 129.720                     | 0.986  | 0.2959  | 4.463179                           | 0.1063                |                         |      |
| 12.918               | 130.181                     | 0.987  | 0.2771  | 4.463179                           | 0.0824                |                         |      |
| 12.918               | 130.880                     | 0.990  | 0.2199  | 3.471361                           | 0.0946                |                         |      |
| 12.918               | 131.586                     | 0.993  | 0.2108  | 2.479544                           | 0.1318                |                         |      |
| 12.918               | 131.823                     | 0.994  | 0.2183  | 2.975453                           | 0.1218                |                         |      |
| 12.918               | 131.350                     | 0.992  | 0.2234  | 3.471361                           | 0.1224                |                         |      |
| 12.918               | 130.646                     | 0.989  | 0.2479  | 3.967727                           | 0.1176                |                         |      |
| 12.918               | 130.646                     | 0.989  | 0.2242  | 3.471361                           | 0.1181                |                         |      |
| 12.918               | 131.115                     | 0.991  | 0.2100  | 2.479544                           | 0.1462                |                         |      |
| 12.918               | 131.350                     | 0.992  | 0.1764  | 1.983635                           | 0.1722                |                         |      |
| 12.918               | 131.350                     | 0.992  | 0.1913  | 1.4877726                          | 0.2372                |                         |      |
| 12.918               | 131.350                     | 0.992  | 0.1866  | 1.983635                           | 0.1755                |                         |      |
| 12.918               | 131.586                     | 0.993  | 0.1836  | 1.4877726                          | 0.2289                |                         |      |
| 12.918               | 131.823                     | 0.994  | 0.1519  | 0.991818                           | 0.3333                |                         |      |
| 12.918               | 132.061                     | 0.995  | 0.1437  | 0.495909                           | 0.6510                |                         |      |
| 12.918               | 132.061                     | 0.995  | 0.1349  | 0.991818                           | 0.3325                |                         |      |
| 12.918               | 132.061                     | 0.995  | 0.1351  | 0.991818                           | 0.3270                |                         |      |
| 12.918               | 132.300                     | 0.995  | 0.1296  | 0.495909                           | 0.6052                |                         |      |
| 12.918               | 132.540                     | 0.996  | 0.1134  | 0.495909                           | 0.5852                |                         |      |
| 12.918               | 132.780                     | 0.997  | 0.0952  | 0.991818                           | 0.2882                |                         |      |
| 12.918               | 133.022                     | 0.998  | 0.1043  | 0.495909                           | 0.5541                |                         |      |
| 12.918               | 132.780                     | 0.997  | 0.0879  | 0.495909                           | 0.5408                |                         |      |
| 12.918               | 132.540                     | 0.996  | 0.0894  | 0.247954                           | 0.1698                |                         |      |
| 12.918               | 132.780                     | 0.997  | 0.0745  | 0.247954                           | 0.1372                |                         |      |
| 12.918               | 132.780                     | 0.997  | 0.0760  | 0.495909                           | 0.5134                |                         |      |
| 12.918               | 132.780                     | 0.997  | 0.0760  | 0.495909                           | 0.5083                |                         |      |

| Model: Voyageur                      |                          |                                  |           |                     |                       |
|--------------------------------------|--------------------------|----------------------------------|-----------|---------------------|-----------------------|
| Date:                                | 7/28/2010                | Run:                             | 2         | Control #:          | G100167575            |
|                                      |                          |                                  |           | Tech:               | B. Davis              |
| <b>Sum Si x Vm</b>                   |                          |                                  |           |                     |                       |
|                                      | <b>7.964</b>             |                                  |           |                     |                       |
| <b>Proportional Rate Calculation</b> |                          |                                  |           |                     |                       |
| <b>Sum</b>                           | <b>θ x Si x Vm (std)</b> | <b>t x Sum Si<br/>x Vm (std)</b> | <b>PR</b> | <b>Qf by tracer</b> | <b>1/Qf by tracer</b> |
| <b>Si x Vm (std)</b>                 |                          |                                  |           |                     |                       |
| 0.2772                               | 0.2772                   | 73.0017                          | 79.635    | 100.0%              | 8.240                 |
| 0.2629                               | 0.5401                   | 68.0135                          | 79.635    | 99.1%               | 9.973                 |
| 0.2699                               | 0.8100                   | 62.6460                          | 79.635    | 101.7%              | 10.075                |
| 0.2679                               | 1.0779                   | 68.3653                          | 79.635    | 100.9%              | 10.981                |
| 0.2698                               | 1.3477                   | 83.4624                          | 79.635    | 101.6%              | 9.889                 |
| 0.2759                               | 1.6236                   | 67.4884                          | 79.635    | 103.9%              | 9.587                 |
| 0.2745                               | 1.8980                   | 74.6646                          | 79.635    | 103.4%              | 8.562                 |
| 0.2652                               | 2.1633                   | 89.8231                          | 79.635    | 99.9%               | 8.406                 |
| 0.2680                               | 2.4313                   | 82.3267                          | 79.635    | 101.0%              | 8.507                 |
| 0.2843                               | 2.7156                   | 88.8090                          | 79.635    | 107.1%              | 8.654                 |
| 0.2406                               | 2.9562                   | 73.4934                          | 79.635    | 90.7%               | 9.100                 |
| 0.2835                               | 3.2398                   | 91.3811                          | 79.635    | 106.8%              | 8.646                 |
| 0.2643                               | 3.5041                   | 100.2263                         | 79.635    | 99.6%               | 8.390                 |
| 0.2625                               | 3.7666                   | 113.7707                         | 79.635    | 98.9%               | 7.698                 |
| 0.2664                               | 4.0330                   | 145.9826                         | 79.635    | 100.4%              | 8.022                 |
| 0.2545                               | 4.2875                   | 107.5231                         | 79.635    | 95.9%               | 7.932                 |
| 0.2668                               | 4.5544                   | 145.3068                         | 79.635    | 100.5%              | 7.904                 |
| 0.2496                               | 4.8040                   | 197.2762                         | 79.635    | 94.0%               | 7.169                 |
| 0.2664                               | 5.0704                   | 372.9833                         | 79.635    | 100.3%              | 6.973                 |
| 0.2681                               | 5.3385                   | 186.5115                         | 79.635    | 101.0%              | 6.767                 |
| 0.2614                               | 5.5989                   | 173.5104                         | 79.635    | 98.5%               | 6.767                 |
| 0.2668                               | 5.8667                   | 327.7671                         | 79.635    | 100.5%              | 6.634                 |
| 0.2625                               | 6.1291                   | 305.6862                         | 79.635    | 98.9%               | 6.215                 |
| 0.2860                               | 6.4152                   | 153.6933                         | 79.635    | 107.8%              | 5.700                 |
| 0.2712                               | 6.6884                   | 256.9912                         | 79.635    | 102.2%              | 5.972                 |
| 0.2681                               | 6.9545                   | 259.7198                         | 79.635    | 101.0%              | 5.478                 |
| 0.2588                               | 7.2133                   | 457.0401                         | 79.635    | 97.5%               | 5.520                 |
| 0.2436                               | 7.4569                   | 418.4225                         | 79.635    | 91.8%               | 5.045                 |
| 0.2593                               | 7.7162                   | 201.4861                         | 79.635    | 97.7%               | 5.094                 |
| 0.2473                               | 7.9635                   | 192.1281                         | 79.635    | 93.2%               | 5.094                 |
|                                      |                          |                                  |           | 99.9%               | 7.70                  |

**Intertek**

## EPA Method 5H Spreadsheets

| (ENTER X)     |                               | Cat              |                 | Non Cat         |           | Pellet    |            | Constants     |                   | Center         |                          | R. Curkeet     | 2/18/2010 |
|---------------|-------------------------------|------------------|-----------------|-----------------|-----------|-----------|------------|---------------|-------------------|----------------|--------------------------|----------------|-----------|
|               | X                             |                  | X               |                 |           |           |            |               |                   |                |                          | Pitot Location |           |
| Initial Delta | 0.25                          | K <sub>i</sub>   |                 |                 |           |           |            | 17.64 R/in Hg | V <sub>m</sub>    | 67.525         | ft <sup>3</sup>          |                |           |
| Delta H @     | 1.937                         | T <sub>std</sub> | 528 R           |                 |           |           |            |               | V <sub>mstd</sub> | 62.202         | dscf                     |                |           |
| Baro:         | 28.41 in Hg (Tunnel Traverse) | P <sub>std</sub> | 29.92 in Hg     |                 |           |           |            |               |                   |                |                          |                |           |
| DGM Cal       | 0.9974 Y                      |                  |                 |                 |           |           |            |               |                   |                |                          |                |           |
| Averages      | 1.318065                      | 6.44             | 13.14645        | 0.427419        | 670.1613  | 540.32258 | 555.32     | 0.034         | 543.09677         | 543.09677      | 995.134                  | 0.183          | -0.034    |
| Time          | Weight                        | CO               | Stack Gas Comp. | Tunnel          | Flue      | Room      | Tunnel     | Tunnel Pitot  | DGM Temps. (R)    | DGM Temps. (R) | Orifice Meter            | Tunnel SP      |           |
|               |                               | CO <sub>2</sub>  | O <sub>2</sub>  | CO <sub>2</sub> | Temp. (R) | Temp. (R) | (in. w.c.) | In            | ft                | ft             | ΔH (in H <sub>2</sub> O) | (in Hg)        |           |
| 0             | 12.60                         | 0.92             | 5.64            | 14.34           | 0.38      | 631       | 537        | 548           | 0.0340            | 539            | 957.555                  | 0.200          | -0.03382  |
| 10            | 12.10                         | 0.84             | 5.04            | 15.02           | 0.41      | 668       | 537        | 551           | 0.0340            | 539            | 960.020                  | 0.290          | -0.03382  |
| 20            | 11.40                         | 0.98             | 5.88            | 14.04           | 0.48      | 705       | 537        | 554           | 0.0340            | 540            | 962.850                  | 0.300          | -0.03382  |
| 30            | 10.40                         | 0.76             | 8.3             | 11.84           | 0.73      | 777       | 537        | 561           | 0.0340            | 540            | 965.790                  | 0.360          | -0.03382  |
| 40            | 9.30                          | 0.46             | 9.74            | 10.7            | 0.76      | 783       | 538        | 564           | 0.0340            | 540            | 968.970                  | 0.280          | -0.03382  |
| 50            | 8.40                          | 0.61             | 11              | 9.29            | 0.87      | 797       | 538        | 564           | 0.0340            | 540            | 971.800                  | 0.300          | -0.03382  |
| 60            | 7.50                          | 0.99             | 7.72            | 12.19           | 0.6       | 742       | 538        | 562           | 0.0340            | 541            | 974.750                  | 0.280          | -0.03382  |
| 70            | 6.80                          | 1.39             | 6.24            | 13.27           | 0.44      | 702       | 538        | 559           | 0.0340            | 541            | 977.600                  | 0.220          | -0.03382  |
| 80            | 6.30                          | 1.67             | 5.92            | 13.31           | 0.41      | 674       | 538        | 556           | 0.0340            | 541            | 980.060                  | 0.210          | -0.03382  |
| 90            | 5.70                          | 1.46             | 7.1             | 12.34           | 0.49      | 679       | 531        | 555           | 0.0340            | 541            | 982.500                  | 0.220          | -0.03382  |
| 100           | 5.00                          | 1.18             | 9.08            | 10.64           | 0.63      | 711       | 539        | 557           | 0.0340            | 542            | 985.120                  | 0.220          | -0.03382  |
| 110           | 4.20                          | 0.8              | 10.6            | 9.5             | 0.77      | 753       | 540        | 560           | 0.0340            | 542            | 987.380                  | 0.250          | -0.03382  |
| 120           | 3.50                          | 0.81             | 9.04            | 11.05           | 0.63      | 725       | 539        | 560           | 0.0340            | 542            | 990.180                  | 0.220          | -0.03382  |
| 130           | 3.00                          | 1.4              | 7.16            | 12.34           | 0.49      | 699       | 540        | 558           | 0.0340            | 542            | 992.660                  | 0.210          | -0.03382  |
| 140           | 2.60                          | 1.37             | 6.62            | 12.91           | 0.42      | 677       | 540        | 557           | 0.0340            | 543            | 995.050                  | 0.180          | -0.03382  |
| 150           | 2.30                          | 0.8              | 7.5             | 12.6            | 0.49      | 678       | 541        | 557           | 0.0340            | 543            | 997.280                  | 0.190          | -0.03382  |
| 160           | 1.90                          | 0.75             | 7.42            | 12.73           | 0.48      | 677       | 542        | 557           | 0.0340            | 543            | 999.500                  | 0.190          | -0.03382  |
| 170           | 1.60                          | 1                | 6.96            | 12.94           | 0.45      | 666       | 546        | 556           | 0.0340            | 544            | 1001.801                 | 0.180          | -0.03382  |
| 180           | 1.40                          | 1.11             | 6.58            | 13.21           | 0.39      | 654       | 542        | 555           | 0.0340            | 544            | 1003.950                 | 0.150          | -0.03382  |
| 190           | 1.30                          | 1.84             | 5.64            | 13.42           | 0.33      | 643       | 541        | 554           | 0.0340            | 545            | 1006.030                 | 0.140          | -0.03382  |
| 200           | 1.10                          | 2.25             | 5.42            | 13.23           | 0.31      | 635       | 543        | 554           | 0.0340            | 545            | 1008.070                 | 0.130          | -0.03382  |
| 210           | 0.90                          | 2.1              | 5.42            | 13.38           | 0.31      | 632       | 542        | 554           | 0.0340            | 545            | 1010.000                 | 0.130          | -0.03382  |
| 220           | 0.80                          | 1.92             | 4.94            | 14.04           | 0.28      | 627       | 542        | 553           | 0.0340            | 545            | 1011.970                 | 0.130          | -0.03382  |
| 230           | 0.70                          | 1.95             | 4.64            | 14.31           | 0.25      | 619       | 543        | 552           | 0.0340            | 545            | 1013.870                 | 0.110          | -0.03382  |
| 240           | 0.5                           | 1.87             | 4.6             | 14.43           | 0.23      | 614       | 543        | 551           | 0.034             | 546            | 1015.810                 | 0.100          | -0.03382  |
| 250           | 0.4                           | 1.77             | 4.4             | 14.73           | 0.23      | 609       | 543        | 550           | 0.034             | 546            | 1017.500                 | 0.100          | -0.03382  |
| 260           | 0.3                           | 1.69             | 4.3             | 14.91           | 0.21      | 605       | 543        | 551           | 0.034             | 546            | 1019.250                 | 0.090          | -0.03382  |
| 270           | 0.25                          | 1.65             | 4.26            | 14.99           | 0.21      | 603       | 543        | 552           | 0.034             | 546            | 1020.800                 | 0.090          | -0.03382  |
| 280           | 0.2                           | 1.55             | 4.14            | 15.21           | 0.19      | 599       | 543        | 551           | 0.034             | 546            | 1022.270                 | 0.070          | -0.03382  |
| 290           | 0.1                           | 1.52             | 4.1             | 15.28           | 0.19      | 596       | 543        | 551           | 0.034             | 547            | 1023.700                 | 0.070          | -0.03382  |
| 300           | 0                             | 1.45             | 4.1             | 15.35           | 0.19      | 595       | 543        | 551           | 0.034             | 547            | 1025.080                 | 0.070          | -0.03382  |

2/18/2010  
R. Curkeet  
Center Point of Ave.  
X

8/31/10  
JMM

## EPA Method 5H Spreadsheet

## INPUT DATA

|                             |       |          |
|-----------------------------|-------|----------|
| Load Weight (lbs wet)       | 12.60 | $W_{wd}$ |
| Load Weight (kg wet)        | 5.717 |          |
| Total Test Duration (min)   | 300   | $\Theta$ |
| Total Test Duration (hours) | 5.000 |          |
| Wood Moisture (Dry Basis)   | 20.99 | %        |
| Wood Moisture (Wet Basis)   | 17.35 | %        |

Manufacturer: Hearth & Home Technologies  
 Model: Voyageur  
 Date: 7/28/2010  
 Run: 2  
 Control #: G100167575  
 Tech: B. Davis

|               |       |           |
|---------------|-------|-----------|
| Dry Burn Rate | 0.945 | Dry kg/hr |
|               | 2.083 | Dry Lb/hr |

| PARTICULATE CATCH        | Tare or<br>Final Wt. | Initial Wt. | Net Catch<br>(mg) |    |
|--------------------------|----------------------|-------------|-------------------|----|
| Front Filter             | 1.1726               | 0.6358      | 536.8             | F1 |
| Rear Filter              | 0.3378               | 0.1646      | 173.2             | F2 |
| Probe/Front Half Rinse   | 108.2941             | 107.9812    | 312.9             | R1 |
| Impinger H2O +Back Rinse | 144.6674             | 144.3383    | 329.1             | R2 |
| Meth Chlor. Extraction   | 110.5772             | 110.2192    | 358               | R3 |
| Back Half Acetone Rinse  | 108.5772             | 108.3348    | 242.4             | R4 |

|                             |        |    |
|-----------------------------|--------|----|
| Total Particulate Collected | 1948.2 | mg |
|-----------------------------|--------|----|

|      |        |         |
|------|--------|---------|
| Cs   | 0.0313 | g/dscf  |
| Qstd | 7904.8 | dscf/hr |
| E    | 8.24   | g/hr    |

|                         |        |          |
|-------------------------|--------|----------|
| Average Stack Flow (Qf) | 4.39   | dscf/min |
| Average Stack Flow (Qf) | 263.14 | dscf/hr  |

| Solvent Volumes<br>(ml)            |           |
|------------------------------------|-----------|
| Acetone Front Half Rinse           | 125       |
| Acetone Back Half Rinse            | 145       |
| Water- Impingers + Back Half Rinse | 300       |
| Methylene Chloride Extraction      | 150       |
|                                    | $V_{a1}$  |
|                                    | $V_{a2}$  |
|                                    | $V_w$     |
|                                    | $V_{DCM}$ |

| Blinks<br>(mg/ml)  |           |
|--------------------|-----------|
| Acetone            | 0         |
| Water              | 0.01      |
| Methylene Chloride | 0.008     |
|                    | $B_a$     |
|                    | $B_w$     |
|                    | $B_{DCM}$ |

Total Particulate Collected 1948.2 mg

## Weighing Record

| PER-TEST INITIAL/TARE WEIGHTS |      |  |  |                   |
|-------------------------------|------|--|--|-------------------|
| DATE                          | TIME |  |  | Stable<br>Weights |
| Front Filter                  |      |  |  | 0.6358            |
| Rear Filter                   |      |  |  | 0.1646            |
| Probe/Front Half Rinse        |      |  |  | 107.9812          |
| Impinger H2O +Back Rinse      |      |  |  | 144.3383          |
| Meth Chlor. Extraction        |      |  |  | 110.2192          |
| Back Half Acetone Rinse       |      |  |  | 108.3348          |

| POST-TEST FINAL WEIGHTS  |      |  |  |                   |
|--------------------------|------|--|--|-------------------|
| DATE                     | TIME |  |  | Stable<br>Weights |
| Front Filter             |      |  |  | 1.1726            |
| Rear Filter              |      |  |  | 0.3378            |
| Probe/Front Half Rinse   |      |  |  | 108.2941          |
| Impinger H2O +Back Rinse |      |  |  | 144.6674          |
| Meth Chlor. Extraction   |      |  |  | 110.5772          |
| Back Half Acetone Rinse  |      |  |  | 108.5772          |

Test Engineer 

**Intertek**

V1.2      R. Curkeet      2/18/2010

**Emissions Tunnel Traverse Worksheet**

Static Pressure: **-0.46** in H<sub>2</sub>O (enter as negative value e.g. -0.12)  
Barometer: **28.41** in Hg  
Tunnel Diameter **6** in  
Tunnel Area **0.19635** ft<sup>2</sup>

| PITOT      | TUNNEL | TUNNEL  | SQUARE  |
|------------|--------|---------|---------|
| VELOCITY P | TEMP   | ROOT VP | ROOT VP |
| A CENTER   |        |         | 0.0000  |
| B CENTER   |        |         | 0.0000  |
| A1         | 0.034  | 94      | 0.1844  |
| A2         | 0.040  | 94      | 0.2000  |
| A3         | 0.040  | 94      | 0.2000  |
| A4         | 0.028  | 94      | 0.1673  |
| B1         | 0.028  | 94      | 0.1673  |
| B2         | 0.042  | 94      | 0.2049  |
| B3         | 0.034  | 94      | 0.1844  |
| B4         | 0.026  | 94      | 0.1612  |
| AVERAGE    | 0.034  | 94      | 0.1837  |

PITOT CONSTANT = #DIV/0! For Pitot Palced at Center.  
1.00 For Pitot Palced at point of average VP

| Tunnel V | Tunnel Q |
|----------|----------|
| ft/sec   | scfm     |
| 12.85    | 131.41   |

**Manufacturer:** Hearth & Home Technologies**Model:** Voyageur**Date:** 7/28/2010**Run:** 2**Control #:** G100167575

Test Engineer *Bob S* 2/28/10

# STOVE TEMPERATURE TEST DATA - METHOD 5H

P 1

burn

Client/Model: Heath & Home

Control #: 6100167575

Date: 7/28/10 Test Crew: B Davis

Equipment ID #: \_\_\_\_\_

Page 1 of 4

Run #: 2

| Preburn<br>Test | Fuel<br>Weight<br>[ ] | Delta<br>Weight | Stack | Coal Bed:<br>Data: 0 = Ø |     |        |      |       | Range: 2.6 - 3.1 | Actual:<br>Coal Bed: 3.0 |
|-----------------|-----------------------|-----------------|-------|--------------------------|-----|--------|------|-------|------------------|--------------------------|
|                 |                       |                 |       | Ambient                  | Top | Bottom | Back | Right |                  |                          |
| 0               | 5.4                   | -0.47           | 24    | 372                      | 343 | 494    | 467  | 272   | 268              | WA                       |
| 10              | 4.8                   | -0.42           | 25    | 412                      | 340 | 466    | 440  | 241   | 284              |                          |
| 20              | 4.2                   | 0.6             | 43    | 401                      | 328 | 446    | 420  | 225   | 280              |                          |
| 30              | 3.6                   | 0.8             | 42    | 372                      | 309 | 439    | 418  | 226   | 263              |                          |
| 40              | 3.3                   | 0.3             | 30    | 325                      | 292 | 428    | 399  | 214   | 209              |                          |
| 50              | 3.2                   | 0.1             | 27    | 275                      | 281 | 406    | 371  | 199   | 182              |                          |
| 60              | 3.1                   | 0.1             | 22    | 248                      | 272 | 388    | 355  | 182   | 171              |                          |
| 70              |                       |                 |       |                          |     |        |      |       |                  |                          |
| 80              |                       |                 |       |                          |     |        |      |       |                  |                          |
| 90              |                       |                 |       |                          |     |        |      |       |                  |                          |
| AVG             |                       |                 |       |                          |     |        |      |       |                  |                          |

Engineer signature: Bob

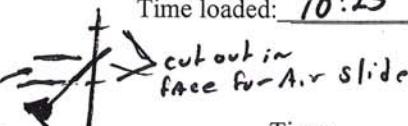
Date: 8/29/10

Date: 7/28/10Page 1 of 1Manufacturer: Hearth N Home Model: VoyageurProject #: G100167575Run: 2

### FUEL DATA PRE-TEST LOAD

**FUEL DESCRIPTION:**

Kindling weight: \_\_\_\_\_ lbs. Consisting of: \_\_\_\_\_ Fire lit Time: \_\_\_\_\_

Pre-test load weight: 2.4 lbs. Consisting of: 3 2X4X8 inches Time loaded: 10:25Pre-test moisture content: Corrected Dry: \_\_\_\_\_ % Wet: \_\_\_\_\_ % Test Air Control Settings: from the bottom of air control to bottom of cutout in face Time: \_\_\_\_\_

Test Unit Fan Settings: \_\_\_\_\_ Time: \_\_\_\_\_

**TEST LOAD**

|                   | Lower Limit | Ideal | Upper Limit |
|-------------------|-------------|-------|-------------|
| Test Load Weight: | lbs.        | lbs.  | lbs.        |

|                   |                              |                  |                       |
|-------------------|------------------------------|------------------|-----------------------|
| Fire Box Volume:  | <u>1.87</u> ft. <sup>3</sup> | Ideal Length:    | inches                |
| Load Volume:      | ft. <sup>3</sup>             | Loading Density: | lbs./ft. <sup>3</sup> |
| Number of Spacers | :x12x5                       | Load Density:    | lbs./ft. <sup>3</sup> |

| Piece Size                          | Meter Moisture Content (% dry)* |               |               |  |
|-------------------------------------|---------------------------------|---------------|---------------|--|
| <u>4</u> x <u>4</u> x <u>14</u> in. | <u>20.0</u> %                   | <u>21.7</u> % | <u>18.8</u> % |  |
| <u>4</u> x <u>4</u> x <u>14</u> in. | <u>18.0</u> %                   | <u>19.9</u> % | <u>19.7</u> % |  |
| <u>2</u> x <u>4</u> x <u>14</u> in. | <u>22.4</u> %                   | <u>23.1</u> % | <u>21.5</u> % |  |
| x x in.                             | <u>23.7</u> %                   | <u>20.3</u> % | <u>23.1</u> % |  |
| <u>2</u> x <u>4</u> x <u>14</u> in. | <u>19.7</u> %                   | <u>21.5</u> % | <u>21.5</u> % |  |
| x x in.                             | %                               | %             | %             |  |
| x x in.                             | %                               | %             | %             |  |

\*uncorrected range = 17.9% to 23.1%

**TEST LOAD WEIGHT:** 12.6 lbs **DRY WEIGHT:** \_\_\_\_\_ kg.**AVERAGE MOISTURE CONTENT:**CORRECTED TO TWO PIN: (DRY) 20.99 % (WET) \_\_\_\_\_ %**COAL BED RANGE:**3.6 lbs. to 2.4 3.1 lbs. (20% to 25% of test load)**TEST CHARGE:**Time loaded: 11:35 Coal bed weight: 3.0 lbs. Coal bed weight = \_\_\_\_\_ % of test load weight**CHARCOALIZATION:** good\*\*\*\*\*poor  8/28/10

Date: 7/28/10Page 1 of 1Manufacturer: Hearth N HomeModel: VoyageurProject #: G100167575Run: 2Tech: B Davis Reviewer: \_\_\_\_\_**COMMENTS**

|   |                         |  |
|---|-------------------------|--|
| <p><b>Preheat Analyzer CA1</b></p> <p>Low CO<sub>2</sub></p> <p>O = 0.00<br/>1.00 - 1.03</p>  |                         |  |
| Stack Gas   |                         |  |
| CO O = 0.00 1.97 - 1.97<br>CO <sub>2</sub> O = 0.00 4.10 = 4.10   |                         |  |
| <p><b>Preburn</b></p> <p>Racked coals @ 55 min</p>  |                         |  |
| Pb start 28.37<br>End 28.45   |                         |  |
| <p><b>Test Load</b></p> <p>Fuel loaded by 45 seconds<br/>door closed by 60 seconds<br/>Primary Air At least setting full 5 minute start<br/>Timed Air (boost) was pushed @ 0 minutes of test.</p> |                         |  |
| <p><b>Post Test Analyzer CA1</b></p> <p>Low CO<sub>2</sub></p>  |                         |  |
| O = 0.0<br>1.00 = 1.01  | TEST LOAD CONFIGURATION |  |
| Stack Gas   | <p>No top spacers</p>   |  |
| CO O = 0.00 1.97 - 1.96<br>CO <sub>2</sub> O = 0.00 4.10 = 4.10   |                         |  |
| 54 min Post Load bath 0.08 @ 10"  |                         |  |

BBD - 8/28/10

**Intertek****EPA Method 5H Spreadsheet**

Manufacturer: Hearth &amp; Home Technologies

Model: Voyageur

Date: 7/29/2010

Run: 3

Control #: G100167575

V1.2 R. Curkeet 2/18/2010

Tech: B. Davis

Start: 306.4  
End: 250.8  
Delta T: 55.6

| Elapsed Time (min) | Fuel Weight (lbs) | Stack Gas Comp. (%) |                 |                | Tunnel CO <sub>2</sub> | Room Flue Temp. (F) | Tunnel Temp. (F) (in. w.c.) | Tunnel Pitot | Appliance Firebox Temperatures (F) |       |      |        |
|--------------------|-------------------|---------------------|-----------------|----------------|------------------------|---------------------|-----------------------------|--------------|------------------------------------|-------|------|--------|
|                    |                   | CO                  | CO <sub>2</sub> | O <sub>2</sub> |                        |                     |                             |              | top back                           | right | left | bottom |
| 0                  | 12.6              | 1.01                | 4.46            | 15.43          | 0.33                   | 214                 | 77                          | 93           | 0.032                              | 265   | 277  | 400    |
| 10                 | 11.9              | 0.58                | 5.18            | 15.14          | 0.43                   | 255                 | 76                          | 94           | 0.032                              | 400   | 389  | 360    |
| 20                 | 11.1              | 0.5                 | 9.26            | 11.14          | 0.85                   | 384                 | 77                          | 105          | 0.032                              | 548   | 419  | 334    |
| 30                 | 10.4              | 1.1                 | 13.8            | 6              | 1.24                   | 472                 | 78                          | 117          | 0.032                              | 782   | 442  | 341    |
| 40                 | 8                 | 1.47                | 12.66           | 6.77           | 1.03                   | 408                 | 79                          | 114          | 0.032                              | 654   | 312  | 373    |
| 50                 | 6.7               | 1.62                | 11.96           | 7.32           | 0.92                   | 388                 | 79                          | 111          | 0.032                              | 613   | 291  | 406    |
| 60                 | 5.7               | 1.16                | 11.92           | 7.82           | 0.95                   | 377                 | 80                          | 110          | 0.032                              | 597   | 280  | 421    |
| 70                 | 4.5               | 1.77                | 12.26           | 6.87           | 0.99                   | 377                 | 79                          | 110          | 0.032                              | 596   | 271  | 440    |
| 80                 | 3.6               | 0.89                | 9.74            | 10.27          | 0.72                   | 334                 | 80                          | 107          | 0.032                              | 573   | 265  | 458    |
| 90                 | 3                 | 1.17                | 8.14            | 11.59          | 0.56                   | 276                 | 80                          | 103          | 0.032                              | 428   | 260  | 472    |
| 100                | 2.6               | 1.08                | 7.42            | 12.4           | 0.5                    | 256                 | 80                          | 100          | 0.032                              | 370   | 256  | 469    |
| 110                | 2.2               | 1.04                | 7.12            | 12.74          | 0.46                   | 234                 | 81                          | 97           | 0.032                              | 329   | 248  | 458    |
| 120                | 1.8               | 1.19                | 7.56            | 12.15          | 0.48                   | 226                 | 81                          | 96           | 0.032                              | 306   | 241  | 444    |
| 130                | 1.6               | 1.12                | 6.58            | 13.2           | 0.41                   | 214                 | 81                          | 94           | 0.032                              | 304   | 235  | 432    |
| 140                | 1.4               | 1.03                | 6.48            | 13.39          | 0.39                   | 204                 | 80                          | 93           | 0.032                              | 283   | 228  | 416    |
| 150                | 1.2               | 1.17                | 6.4             | 13.33          | 0.37                   | 197                 | 79                          | 93           | 0.032                              | 270   | 220  | 402    |
| 160                | 1                 | 1.3                 | 6.34            | 13.26          | 0.36                   | 191                 | 80                          | 91           | 0.032                              | 261   | 214  | 391    |
| 170                | 0.9               | 1.4                 | 6.08            | 13.42          | 0.34                   | 188                 | 80                          | 91           | 0.032                              | 254   | 210  | 383    |
| 180                | 0.7               | 1.52                | 5.96            | 13.42          | 0.33                   | 184                 | 81                          | 91           | 0.032                              | 248   | 207  | 375    |
| 190                | 0.5               | 1.67                | 5.82            | 13.41          | 0.33                   | 181                 | 81                          | 91           | 0.032                              | 242   | 209  | 366    |
| 200                | 0.4               | 1.75                | 5.88            | 13.27          | 0.33                   | 180                 | 81                          | 90           | 0.032                              | 237   | 200  | 358    |
| 210                | 0.2               | 1.79                | 5.66            | 13.45          | 0.32                   | 179                 | 81                          | 90           | 0.032                              | 233   | 198  | 352    |
| 220                | 0.1               | 1.65                | 5.02            | 14.23          | 0.27                   | 170                 | 81                          | 90           | 0.032                              | 225   | 198  | 346    |
| 230                | 0                 | 1.36                | 4.54            | 15             | 0.24                   | 162                 | 82                          | 90           | 0.032                              | 215   | 200  | 336    |

3/31/10  
JRW

**Manufacturer:** Hearth & Home Technologies

**Model:** Voyageur

**Date:** 7/29/2010

**Run:** 3

**Control #:** G100167575

**Tech:** B. Davis

-0.041375

| DGM Temps. (F) | DGM Vol.<br>ft <sup>3</sup> | Orifice Meter<br>ΔH (in H <sub>2</sub> O) | Tunnel SP<br>(in H <sub>2</sub> O) | Impinger<br>Exit | Front<br>Filter | VAC | Draft |
|----------------|-----------------------------|---|------------------------------------|------------------|-----------------|-----|-------|
| In             | Out                         |   |                                    |                  |                 |     |       |
| 77             | 77                          | 25.435                                    | 0.25                               | -0.46            | 81              | 225 | 0     |
| 77             | 77                          | 28.05                                     | 0.3300                             | -0.46            | 59              | 228 | 0     |
| 78             | 78                          | 31.06                                     | 0.4300                             | -0.46            | 58              | 230 | 0     |
| 78             | 78                          | 34.59                                     | 0.4100                             | -0.46            | 57              | 238 | 0     |
| 79             | 79                          | 37.88                                     | 0.3300                             | -0.46            | 60              | 238 | 0     |
| 79             | 79                          | 40.95                                     | 0.3000                             | -0.46            | 64              | 233 | 0     |
| 80             | 80                          | 43.83                                     | 0.3200                             | -0.46            | 56              | 229 | 0     |
| 80             | 80                          | 46.84                                     | 0.3300                             | -0.46            | 53              | 227 | 0     |
| 81             | 81                          | 49.9                                      | 0.2700                             | -0.46            | 54              | 228 | 0     |
| 81             | 81                          | 52.58                                     | 0.2300                             | -0.46            | 56              | 224 | 0     |
| 82             | 82                          | 55.1                                      | 0.2200                             | -0.46            | 57              | 225 | 0     |
| 82             | 82                          | 57.57                                     | 0.2000                             | -0.46            | 58              | 226 | 0     |
| 83             | 83                          | 60  | 0.1900                             | -0.46            | 59              | 225 | 0     |
| 83             | 83                          | 62.23                                     | 0.1800                             | -0.46            | 60              | 228 | 0     |
| 83             | 83                          | 64.48                                     | 0.1700                             | -0.46            | 61              | 229 | 0     |
| 84             | 84                          | 66.67                                     | 0.1600                             | -0.46            | 62              | 229 | 0     |
| 84             | 84                          | 68.82                                     | 0.1500                             | -0.46            | 63              | 229 | 0     |
| 84             | 84                          | 70.95                                     | 0.1400                             | -0.46            | 63              | 229 | 0     |
| 84             | 84                          | 72.96                                     | 0.1400                             | -0.46            | 65              | 228 | 0     |
| 84             | 84                          | 74.97                                     | 0.1400                             | -0.46            | 66              | 228 | 0     |
| 84             | 84                          | 77  | 0.1400                             | -0.46            | 67              | 228 | 0     |
| 85             | 85                          | 79.03                                     | 0.1400                             | -0.46            | 66              | 229 | 0     |
| 85             | 85                          | 80.77                                     | 0.1400                             | -0.46            | 66              | 229 | 0     |
| 85             | 85                          | 83.056                                    | 0.1200                             | -0.46            | 67              | 229 | 0     |

BDR  
JHM  
8/31/10

## Manufacturer: Hearth &amp; Home Technologies

Model: Voyageur

Date: 7/29/2010

Run: 3

Control #: G100167575

Tech: B. Davis

| Dilution Tunnel |                             | Proportional Rate Calculation |                              |                                    |   |                |                      | Sum Si x Vm                           |        |   |  |        |              |                |
|-----------------|-----------------------------|-------------------------------|------------------------------|------------------------------------|---|----------------|----------------------|---------------------------------------|--------|---|--|--------|--------------|----------------|
| V<br>ft/min     | Q <sub>tunnel</sub><br>scfm | Q <sub>stack</sub><br>scfm    | Q <sub>snew/<br/>sinit</sub> | Target<br>ΔH (in H <sub>2</sub> O) | Burn Rate<br>lb/h dry                     | S <sub>i</sub> | V <sub>mi(sat)</sub> | S <sub>i</sub> x V <sub>mi(std)</sub> | Sum    | θ x S <sub>i</sub> x V <sub>mi(std)</sub> | t x Sum S <sub>i</sub><br>x V <sub>mi(std)</sub> | PR     | Qf by tracer | 1/Qf by tracer |
| 12.541          | 127.763                     | 6.2221                        | 0.995                        | 0.2226                             |   |                |                      |                                       |        |   |  |        |              |                |
| K <sub>2</sub>  | 384.8                       |                               |                              | Tunnel Area                        | 0.19635 ft <sup>2</sup> (Tunnel Traverse) |                |                      |                                       |        |   |  |        |              |                |
|                 |                             |                               |                              | 6.589                              |   |                |                      |                                       |        |   |  |        |              |                |
| 12.541          | 128.974                     | 13.2763                       | 0.999                        | 0.3310                             | 3.448559                                  | 0.0753         | 2.4425               | 0.2832                                | 0.2832 | 42.3133                                   | 65.894   | 100.0% | 8.625        | 0.116          |
| 12.541          | 128.741                     | 9.59533                       | 0.989                        | 0.4280                             | 3.94121                                   | 0.1031         | 2.8114               | 0.2838                                | 0.5669 | 66.6938                                   | 65.894   | 99.1%  | 9.907        | 0.101          |
| 12.541          | 126.235                     | 9.59533                       | 0.979                        | 0.4104                             | 3.448559                                  | 0.1726         | 3.2909               | 0.2948                                | 0.8617 | 130.6138                                  | 65.894   | 102.9% | 11.165       | 0.090          |
| 12.541          | 123.609                     | 5.795082                      | 0.982                        | 0.3339                             | 11.82363                                  | 0.0479         | 3.0672               | 0.2832                                | 1.1449 | 33.8201                                   | 65.894   | 98.9%  | 10.829       | 0.092          |
| 12.541          | 124.255                     | 20.85908                      | 0.982                        | 0.2977                             | 6.404467                                  | 0.0854         | 2.8568               | 0.2915                                | 1.4364 | 56.0837                                   | 65.894   | 101.7% | 9.802        | 0.102          |
| 12.541          | 124.908                     | 11.71573                      | 0.984                        | 0.3203                             | 4.926513                                  | 0.1072         | 2.6800               | 0.2888                                | 1.7252 | 66.1013                                   | 65.894   | 99.2%  | 9.280        | 0.108          |
| 12.541          | 125.127                     | 9.325022                      | 0.985                        | 0.3303                             | 5.911815                                  | 0.0953         | 2.7958               | 0.2899                                | 2.0151 | 61.2553                                   | 65.894   | 100.8% | 9.643        | 0.104          |
| 12.541          | 125.127                     | 10.49748                      | 0.985                        | 0.2708                             | 4.433862                                  | 0.0989         | 2.8422               | 0.2905                                | 2.3056 | 64.6393                                   | 65.894   | 101.4% | 9.784        | 0.102          |
| 12.541          | 125.789                     | 10.11316                      | 0.988                        | 0.2299                             | 2.955908                                  | 0.1319         | 2.4847               | 0.2795                                | 2.5851 | 75.3986                                   | 65.894   | 97.5%  | 8.891        | 0.112          |
| 12.541          | 126.683                     | 7.579322                      | 0.991                        | 0.2185                             | 1.970605                                  | 0.1828         | 2.3363               | 0.2842                                | 2.8693 | 92.2423                                   | 65.894   | 98.2%  | 8.220        | 0.122          |
| 12.541          | 127.362                     | 5.469667                      | 0.994                        | 0.1996                             | 1.97165                                   | 0.1765         | 2.2857               | 0.2845                                | 3.1537 | 92.7876                                   | 65.894   | 99.2%  | 8.036        | 0.124          |
| 12.541          | 128.048                     | 5.668836                      | 0.996                        | 0.1938                             | 1.970605                                  | 0.1875         | 2.2487               | 0.2921                                | 3.4459 | 96.9662                                   | 65.894   | 102.0% | 7.602        | 0.132          |
| 12.541          | 128.278                     | 5.333876                      | 0.997                        | 0.1827                             | 0.985303                                  | 0.3359         | 2.0598               | 0.2710                                | 3.7168 | 159.1202                                  | 65.894   | 94.6%  | 7.395        | 0.135          |
| 12.541          | 128.741                     | 2.977391                      | 0.999                        | 0.1695                             | 0.985303                                  | 0.3288         | 2.0783               | 0.2810                                | 3.9979 | 157.1655                                  | 65.894   | 98.1%  | 7.123        | 0.140          |
| 12.541          | 128.974                     | 3.041457                      | 1.000                        | 0.1551                             | 0.985303                                  | 0.3310         | 2.0229               | 0.2840                                | 4.2819 | 154.0139                                  | 65.894   | 99.1%  | 6.807        | 0.147          |
| 12.541          | 128.974                     | 3.02093                       | 1.000                        | 0.1491                             | 0.985303                                  | 0.3336         | 1.9823               | 0.2912                                | 4.5731 | 152.1113                                  | 65.894   | 101.6% | 6.692        | 0.149          |
| 12.541          | 129.442                     | 2.997329                      | 1.002                        | 0.1429                             | 0.492651                                  | 0.6553         | 1.9639               | 0.2935                                | 4.8665 | 296.0105                                  | 65.894   | 102.4% | 6.551        | 0.153          |
| 12.541          | 129.442                     | 1.525913                      | 1.002                        | 0.1389                             | 0.985303                                  | 0.3277         | 1.8532               | 0.2829                                | 5.1494 | 139.6669                                  | 65.894   | 98.7%  | 6.466        | 0.155          |
| 12.541          | 129.442                     | 3.051825                      | 1.002                        | 0.1457                             | 0.985303                                  | 0.3280         | 1.8532               | 0.2866                                | 5.4360 | 139.8256                                  | 65.894   | 100.0% | 6.622        | 0.151          |
| 12.541          | 129.442                     | 3.048361                      | 1.002                        | 0.1430                             | 0.492651                                  | 0.6665         | 1.8717               | 0.2826                                | 5.7187 | 286.9221                                  | 65.894   | 98.7%  | 6.566        | 0.152          |
| 12.541          | 129.678                     | 1.500339                      | 1.003                        | 0.1442                             | 0.985303                                  | 0.3266         | 1.8717               | 0.2851                                | 6.0037 | 140.5758                                  | 65.894   | 99.5%  | 6.592        | 0.152          |
| 12.541          | 129.678                     | 3.062265                      | 1.003                        | 0.1250                             | 0.492651                                  | 0.5950         | 1.6013               | 0.2429                                | 6.2467 | 219.1509                                  | 65.894   | 84.8%  | 6.138        | 0.163          |
| 12.541          | 129.678                     | 1.680605                      | 1.003                        | 0.1164                             | 0.492651                                  | 0.5377         | 2.1038               | 0.3428                                | 6.5894 | 260.1721                                  | 65.894   | 119.6% | 5.928        | 0.169          |


  
 8/3/10



Intertek

EPA Method 5H Spreadsheet

V1.2 R. Curkeet 2/18/2010

דעת הארץ

Center Point of Ave. X

Constants

|               | Cat    | Non Cat                  | Pellet |
|---------------|--------|--------------------------|--------|
| (ENTER X)     | X      |                          |        |
| Initial Delta | 0.28   |                          |        |
| Delta H @     | 1.937  |                          |        |
| Bao:          | 28.53  | in Hg (Tunnel Traverser) |        |
| DGM cal       | 0.9974 |                          | Y      |

|          | Stack Gas Comp. | Tunnel          | Flue            | Room            | Tunnel          | Tunnel Pitot    | DGM Vol. Orifice Meter          | Tunnel S        |
|----------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|---------------------------------|-----------------|
|          | CO <sub>2</sub> | CO <sub>2</sub> | Temp. (R)       | Temp. (R)       | Temp. (R)       | (in. w.c.)      | ft.<br>ΔH (in H <sub>2</sub> O) | (in Hg)         |
| Averages | 1.264167        | 7.76            | 11.87583        | 0.547917        | 720.4583        | 539.75          | 558.38                          | 0.032           |
| Weight   | CO              | CO <sub>2</sub>                 | CO <sub>2</sub> |
| 0        | 12.60           | 1.01            | 4.46            | 15.43           | 0.33            | 674             | 537                             | 553             |
| 0        | 11.90           | 0.58            | 5.18            | 15.14           | 0.43            | 715             | 536                             | 554             |
| 0        | 11.10           | 0.5             | 9.26            | 11.14           | 0.85            | 844             | 537                             | 565             |
| 0        | 10.40           | 1.1             | 13.8            | 6               | 1.24            | 932             | 538                             | 577             |
| 0        | 8.00            | 1.47            | 12.66           | 6.77            | 1.03            | 868             | 539                             | 574             |
| 0        | 6.70            | 1.62            | 11.96           | 7.32            | 0.92            | 848             | 539                             | 571             |
| 0        | 5.70            | 1.16            | 11.92           | 7.82            | 0.95            | 837             | 540                             | 570             |
| 0        | 4.50            | 1.77            | 12.26           | 6.87            | 0.99            | 837             | 539                             | 570             |
| 0        | 3.60            | 0.89            | 9.74            | 10.27           | 0.72            | 794             | 540                             | 567             |
| 0        | 3.00            | 1.17            | 8.14            | 11.59           | 0.56            | 736             | 540                             | 563             |
| 0        | 2.60            | 1.08            | 7.42            | 12.4            | 0.5             | 716             | 540                             | 560             |
| 0        | 2.20            | 1.04            | 7.12            | 12.74           | 0.46            | 694             | 541                             | 557             |
| 0        | 1.80            | 1.19            | 7.56            | 12.15           | 0.48            | 686             | 541                             | 556             |
| 0        | 1.60            | 1.12            | 6.58            | 13.2            | 0.41            | 674             | 541                             | 554             |
| 0        | 1.40            | 1.03            | 6.48            | 13.39           | 0.39            | 664             | 540                             | 553             |
| 0        | 1.20            | 1.17            | 6.4             | 13.33           | 0.37            | 657             | 539                             | 553             |
| 0        | 1.00            | 1.3             | 6.34            | 13.26           | 0.36            | 651             | 540                             | 551             |
| 0        | 0.90            | 1.4             | 6.08            | 13.42           | 0.34            | 648             | 540                             | 551             |
| 0        | 0.70            | 1.52            | 5.96            | 13.42           | 0.33            | 644             | 541                             | 551             |
| 0        | 0.50            | 1.67            | 5.82            | 13.41           | 0.33            | 641             | 541                             | 551             |
| 0        | 0.40            | 1.75            | 5.88            | 13.27           | 0.33            | 640             | 541                             | 550             |
| 0        | 0.20            | 1.79            | 5.66            | 13.45           | 0.32            | 639             | 541                             | 550             |
| 0        | 0.10            | 1.65            | 5.02            | 14.23           | 0.27            | 630             | 541                             | 550             |
| 0        | 0.00            | 1.36            | 4.54            | 15              | 0.24            | 622             | 542                             | 550             |

## EPA Method 5H Spreadsheet

## INPUT DATA

|                             |       |          |
|-----------------------------|-------|----------|
| Load Weight (lbs wet)       | 12.60 | $W_{wd}$ |
| Load Weight (kg wet)        | 5.717 |          |
| Total Test Duration (min)   | 230   | $\Theta$ |
| Total Test Duration (hours) | 3.833 |          |
| Wood Moisture (Dry Basis)   | 21.79 | %        |
| Wood Moisture (Wet Basis)   | 17.89 | %        |

Manufacturer: Hearth & Home Technologies  
 Model: Voyageur  
 Date: 7/29/2010  
 Run: 3  
 Control #: G100167575  
 Tech: B. Davis

|               |       |           |
|---------------|-------|-----------|
| Dry Burn Rate | 1.225 | Dry kg/hr |
|               | 2.699 | Dry Lb/hr |

| PARTICULATE CATCH        | Tare or<br>Final Wt. | Net Catch<br>(mg) |    |
|--------------------------|----------------------|-------------------|----|
|                          | Initial Wt.          |                   |    |
| Front Filter             | 0.7534               | 0.6363            | F1 |
| Rear Filter              | 0.2601               | 0.1659            | F2 |
| Probe/Front Half Rinse   | 107.3383             | 107.2226          | R1 |
| Impinger H2O +Back Rinse | 150.9738             | 150.8637          | R2 |
| Meth Chlor. Extraction   | 108.1708             | 108.0593          | R3 |
| Back Half Acetone Rinse  | 103.1409             | 102.9946          | R4 |

|                             |       |    |
|-----------------------------|-------|----|
| Total Particulate Collected | 690.7 | mg |
|-----------------------------|-------|----|

|      |        |         |
|------|--------|---------|
| Cs   | 0.0129 | g/dscf  |
| Qstd | 7664.0 | dscf/hr |
| E    | 3.79   | g/hr    |

|                         |        |          |
|-------------------------|--------|----------|
| Average Stack Flow (Qf) | 4.88   | dscf/min |
|                         | 293.03 | dscf/hr  |

| Solvent Volumes (ml)               |           |
|------------------------------------|-----------|
| Acetone Front Half Rinse           | 120       |
| Acetone Back Half Rinse            | 130       |
| Water- Impingers + Back Half Rinse | 300       |
| Methylene Chloride Extraction      | 150       |
|                                    | $V_a1$    |
|                                    | $V_a2$    |
|                                    | $V_w$     |
|                                    | $V_{DCM}$ |

| Blanks (mg/ml)     |           |
|--------------------|-----------|
| Acetone            | 0         |
| Water              | 0.01      |
| Methylene Chloride | 0.008     |
|                    | $B_a$     |
|                    | $B_w$     |
|                    | $B_{DCM}$ |

|                             |       |    |
|-----------------------------|-------|----|
| Total Particulate Collected | 690.7 | mg |
|-----------------------------|-------|----|

## Weighing Record

| PER-TEST INITIAL/TARE WEIGHTS |      |  |  |                |
|-------------------------------|------|--|--|----------------|
| DATE                          | TIME |  |  | Stable Weights |
| Front Filter                  |      |  |  | 0.6363         |
| Rear Filter                   |      |  |  | 0.1659         |
| Probe/Front Half Rinse        |      |  |  | 107.2226       |
| Impinger H2O +Back Rinse      |      |  |  | 150.8637       |
| Meth Chlor. Extraction        |      |  |  | 108.0593       |
| Back Half Acetone Rinse       |      |  |  | 102.9946       |

| POST-TEST FINAL WEIGHTS  |      |  |  |                |
|--------------------------|------|--|--|----------------|
| DATE                     | TIME |  |  | Stable Weights |
| Front Filter             |      |  |  | 0.7534         |
| Rear Filter              |      |  |  | 0.2601         |
| Probe/Front Half Rinse   |      |  |  | 107.3383       |
| Impinger H2O +Back Rinse |      |  |  | 150.9738       |
| Meth Chlor. Extraction   |      |  |  | 108.1708       |
| Back Half Acetone Rinse  |      |  |  | 103.1409       |

Test Engineer. 

**Intertek**

V1.2      R. Curkeet      2/18/2010

**Emissions Tunnel Traverse Worksheet**Static Pressure: **-0.46** in H<sub>2</sub>O (enter as negative value e.g. -0.12)Barometer: **28.53** in HgTunnel Diameter: **6** inTunnel Area: **0.19635** ft<sup>2</sup>

| PITOT<br>TUNNEL<br>VELOCITY P | TUNNEL<br>TEMP | SQUARE<br>ROOT VP |        |
|-------------------------------|----------------|-------------------|--------|
| A CENTER                      |                | 0.0000            |        |
| B CENTER                      |                | 0.0000            |        |
| A1                            | 0.032          | 97                | 0.1789 |
| A2                            | 0.042          | 97                | 0.2049 |
| A3                            | 0.032          | 97                | 0.1789 |
| A4                            | 0.026          | 97                | 0.1612 |
| B1                            | 0.032          | 97                | 0.1789 |
| B2                            | 0.042          | 97                | 0.2049 |
| B3                            | 0.040          | 97                | 0.2000 |
| B4                            | 0.030          | 97                | 0.1732 |
| AVERAGE                       | 0.035          | 97                | 0.1851 |

PITOT CONSTANT= #DIV/0! For Pitot Palced at Center.  
**1.00** For Pitot Palced at point of average VP

| Tunnel V | Tunnel Q |
|----------|----------|
| ft/sec   | scfm     |
| 12.96    | 132.35   |

Manufacturer: Hearth &amp; Home Technologies

Model: Voyageur

Date: 7/29/2010

Run: 3

Control #: G100167575

Test Engineer Bob John

## STOVE TEMPERATURE TEST DATA - METHOD 5H

Client/Model: Headless & Home

Date: 7/29/10 Test Crew: B Paus

Equipment ID #:

Control #: G100167575

Run #: 3

Page / of /

3

Engineer signature: 

Date: 8/28/10

Date: 7/29/14Page 1 of 1Manufacturer: Hearth N Home Model: VoyageurProject #: G100167575Run: 3

### FUEL DATA PRE-TEST LOAD

**FUEL DESCRIPTION:**

Kindling weight: \_\_\_\_\_ lbs. Consisting of: \_\_\_\_\_ Fire lit Time: \_\_\_\_\_

Pre-test load weight: 2.5 lbs. Consisting of: 3 2X4X8 inches Time loaded: \_\_\_\_\_Pre-test moisture content: Corrected Dry: \_\_\_\_\_ % Wet: 25 % ~~22.6, 18.0, 23.1~~ 1.125"Test Air Control Settings: measured between lever and face opening Time: \_\_\_\_\_

Test Unit Fan Settings: \_\_\_\_\_ Time: \_\_\_\_\_

**TEST LOAD**

|                   | Lower Limit      | Ideal            | Upper Limit          |
|-------------------|------------------|------------------|----------------------|
| Test Load Weight: | lbs.             | lbs.             | lbs.                 |
| Fire Box Volume:  | ft. <sup>3</sup> | Ideal Length:    | inches               |
| Load Volume:      | ft. <sup>3</sup> | Loading Density: | lbs./ft <sup>3</sup> |
| Number of Spacers | :x12x5           | Load Density:    | lbs./ft <sup>3</sup> |

| Piece Size      | Meter Moisture Content (% dry)* |                        |        |
|-----------------|---------------------------------|------------------------|--------|
| 4 x 4 x 1/4 in. | 19.2 %                          | 19.3 %                 | 19.5 % |
| 4 x 4 x 1/4 in. | 21.4 <del>19.3</del> %          | 21.3 <del>20.0</del> % | 21.0 % |
| 2 x 4 x 1/4 in. | 22.5 %                          | 22.1 %                 | 22.3 % |
| 2 x 4 x 1/4 in. | 24.1 %                          | 21.9 %                 | 23.8 % |
| 2 x 4 x 1/4 in. | 24.1 %                          | 20.6 %                 | 23.7 % |
| x x in.         | %                               | %                      | %      |
| x x in.         | %                               | %                      | %      |

\*uncorrected range = 17.9% to 23.1%

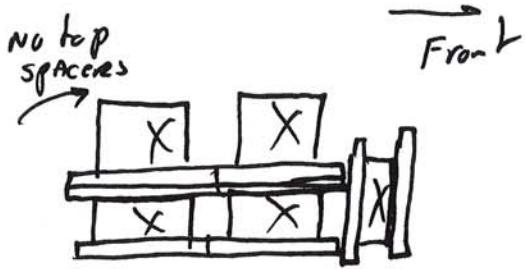
**TEST LOAD WEIGHT:** 12.6 lbs **DRY WEIGHT:** \_\_\_\_\_ kg.**AVERAGE MOISTURE CONTENT:**CORRECTED TO TWO PIN: (DRY) 21.79 % (WET) \_\_\_\_\_ %**COAL BED RANGE:**2.6 lbs. to 3.1 lbs. (20% to 25% of test load)**TEST CHARGE:**Time loaded: 11:22 Coal bed weight: 2.8 lbs. Coal bed weight = \_\_\_\_\_ % of test load weight**CHARCOALIZATION:** good\*\*\*\*\*poor B0 8/24/14

Date: 7/29/10Page 1 of 1Manufacturer: Hearth N Home Model: VoyageurProject #: G100167575 Run: 3 Tech: A Davis Reviewer: \_\_\_\_\_

## COMMENTS

Pre test Gas Analyzer (A)Stack gnsLow CO<sub>2</sub>CO O = 0.00O = 0.00CO<sub>2</sub> O = 0.001.00 = 1.01Pb start 28.55CO 1.97 = 1.98End 28.51CO<sub>2</sub> 9.93 4.10 = 4.06PreburnRaked coals @ 55 minutesTestfuel loaded by 65 secondsdoor closed by 80 secondsPrimary Air @ test setting full 5:00Timed Air pushed @ 0 minutesPost test Gas AnalyzerStack GasLow CO<sub>2</sub>CO O<sub>2</sub> 0.00O = 0.00CO<sub>2</sub> O = 0.001.00 = .99CO 1.97 = 2.00CO<sub>2</sub> 4.10 = 4.08SH Tm. & leak chh .006 @ 6

## TEST LOAD CONFIGURATION



BD = 8/24/10



**Manufacturer:** Hearth & Home Technologies

Model: Voyageur

WILSON: 1700/1701

Date: 7/30/2010

Run: 4

-0 058581

|                  | DGM Vol.<br>ft³ | Orifice Meter<br>ΔH (in H₂O) | Tunnel SP<br>(in H₂O) | Impinger<br>Exit | Front<br>Filter | VAC | Draft  |
|------------------|-----------------|------------------------------|-----------------------|------------------|-----------------|-----|--------|
| m̄ps. (F)<br>Out |                 |                              |                       |                  |                 |     |        |
| 74               | 83.5            | 0.28                         | -0.548                | 80               | 229             | 0   | -0.042 |
| 74               | 85.02           | 0.2200                       | -0.548                | 65               | 234             | 0   | -0.06  |
| 74               | 86.15           | 0.2400                       | -0.548                | 66               | 238             | 0   | -0.07  |
| 74               | 87.54           | 0.2600                       | -0.548                | 58               | 238             | 0   | -0.078 |
| 75               | 88.85           | 0.2800                       | -0.548                | 50               | 238             | 0   | -0.077 |
| 75               | 90.225          | 0.2500                       | -0.548                | 47               | 238             | 0   | -0.08  |
| 75               | 91.57           | 0.2400                       | -0.548                | 47               | 238             | 0   | -0.078 |
| 75               | 92.93           | 0.2400                       | -0.548                | 48               | 237             | 0   | -0.072 |
| 76               | 94.08           | 0.2300                       | -0.548                | 49               | 237             | 0   | -0.075 |
| 76               | 95.35           | 0.2200                       | -0.548                | 50               | 237             | 0   | -0.077 |
| 76               | 96.53           | 0.2200                       | -0.548                | 51               | 238             | 0   | -0.07  |
| 76               | 97.77           | 0.2200                       | -0.548                | 51               | 235             | 0   | -0.07  |
| 77               | 99.01           | 0.1800                       | -0.548                | 52               | 233             | 0   | -0.07  |
| 77               | 100.22          | 0.1800                       | -0.548                | 54               | 232             | 0   | -0.062 |
| 77               | 101.25          | 0.1700                       | -0.548                | 55               | 232             | 0   | -0.06  |
| 77               | 102.3           | 0.1900                       | -0.548                | 56               | 231             | 0   | -0.06  |
| 78               | 103.38          | 0.1900                       | -0.548                | 56               | 231             | 0   | -0.06  |
| 78               | 104.48          | 0.1800                       | -0.548                | 56               | 231             | 0   | -0.06  |
| 78               | 105.6           | 0.1600                       | -0.548                | 57               | 231             | 0   | -0.058 |
| 78               | 106.64          | 0.1700                       | -0.548                | 58               | 230             | 0   | -0.052 |
| 79               | 107.7           | 0.1700                       | -0.548                | 58               | 230             | 0   | -0.05  |
| 79               | 108.77          | 0.1600                       | -0.548                | 59               | 229             | 0   | -0.05  |
| 79               | 109.85          | 0.1600                       | -0.548                | 59               | 228             | 0   | -0.05  |
| 80               | 110.95          | 0.1600                       | -0.548                | 60               | 228             | 0   | -0.048 |
| 80               | 111.93          | 0.16                         | -0.548                | 60               | 227             | 0   | -0.042 |
| 80               | 112.9           | 0.16                         | -0.548                | 61               | 227             | 0   | -0.042 |
| 80               | 113.95          | 0.16                         | -0.548                | 61               | 227             | 0   | -0.042 |
| 80               | 114.99          | 0.16                         | -0.548                | 62               | 228             | 0   | -0.04  |
| 81               | 116.06          | 0.16                         | -0.548                | 62               | 226             | 0   | -0.041 |
| 81               | 117.08          | 0.16                         | -0.548                | 63               | 227             | 0   | -0.04  |
| 81               | 118.165         | 0.16                         | -0.548                | 64               | 228             | 0   | -0.04  |

Tech: B. Davis

1

-0 058581

| Draft | VAC     | Front Filter | Impinger Exit | Tunnel SP (in H <sub>2</sub> O) | Orifice Meter ΔH (in H <sub>2</sub> O) | DGM Vol. ft <sup>3</sup> | mps. (F) Out |
|-------|---------|--------------|---------------|---------------------------------|--|--------------------------|--------------|
| 74    | 83.5    | 0.28         | -0.548        | 80                              | 229                                    | 0                        | -0.042       |
| 74    | 85.02   | 0.2200       | -0.548        | 65                              | 234                                    | 0                        | -0.06        |
| 74    | 86.15   | 0.2400       | -0.548        | 66                              | 238                                    | 0                        | -0.07        |
| 74    | 87.54   | 0.2600       | -0.548        | 58                              | 238                                    | 0                        | -0.078       |
| 75    | 88.85   | 0.2800       | -0.548        | 50                              | 238                                    | 0                        | -0.077       |
| 75    | 90.225  | 0.2500       | -0.548        | 47                              | 238                                    | 0                        | -0.08        |
| 75    | 91.57   | 0.2400       | -0.548        | 47                              | 238                                    | 0                        | -0.078       |
| 75    | 92.93   | 0.2400       | -0.548        | 48                              | 237                                    | 0                        | -0.072       |
| 76    | 94.08   | 0.2300       | -0.548        | 49                              | 237                                    | 0                        | -0.075       |
| 76    | 95.35   | 0.2200       | -0.548        | 50                              | 237                                    | 0                        | -0.077       |
| 76    | 96.53   | 0.2200       | -0.548        | 51                              | 238                                    | 0                        | -0.07        |
| 76    | 97.77   | 0.2200       | -0.548        | 51                              | 235                                    | 0                        | -0.07        |
| 77    | 99.01   | 0.1800       | -0.548        | 52                              | 233                                    | 0                        | -0.07        |
| 77    | 100.22  | 0.1800       | -0.548        | 54                              | 232                                    | 0                        | -0.062       |
| 77    | 101.25  | 0.1700       | -0.548        | 55                              | 232                                    | 0                        | -0.06        |
| 77    | 102.3   | 0.1900       | -0.548        | 56                              | 231                                    | 0                        | -0.06        |
| 78    | 103.38  | 0.1900       | -0.548        | 56                              | 231                                    | 0                        | -0.06        |
| 78    | 104.48  | 0.1800       | -0.548        | 56                              | 231                                    | 0                        | -0.06        |
| 78    | 105.6   | 0.1600       | -0.548        | 57                              | 231                                    | 0                        | -0.058       |
| 78    | 106.64  | 0.1700       | -0.548        | 58                              | 230                                    | 0                        | -0.052       |
| 79    | 107.7   | 0.1700       | -0.548        | 58                              | 230                                    | 0                        | -0.05        |
| 79    | 108.77  | 0.1600       | -0.548        | 59                              | 229                                    | 0                        | -0.05        |
| 79    | 109.85  | 0.1600       | -0.548        | 59                              | 228                                    | 0                        | -0.05        |
| 80    | 110.95  | 0.1600       | -0.548        | 60                              | 228                                    | 0                        | -0.048       |
| 80    | 111.93  | 0.16         | -0.548        | 60                              | 227                                    | 0                        | -0.042       |
| 80    | 112.9   | 0.16         | -0.548        | 61                              | 227                                    | 0                        | -0.042       |
| 80    | 113.95  | 0.16         | -0.548        | 61                              | 227                                    | 0                        | -0.042       |
| 80    | 114.99  | 0.16         | -0.548        | 62                              | 228                                    | 0                        | -0.04        |
| 81    | 116.06  | 0.16         | -0.548        | 62                              | 226                                    | 0                        | -0.041       |
| 81    | 117.08  | 0.16         | -0.548        | 63                              | 227                                    | 0                        | -0.04        |
| 81    | 118.165 | 0.16         | -0.548        | 64                              | 228                                    | 0                        | -0.04        |

300-8/21/10

**Manufacturer:** Hearth & Home Technologies

**Model:** Voyageur

**Date:** 7/30/2010

**Run:** 4

**Control #:** G100167575

**Tech:** B. Davis

-0.058581

| DGM Temps. (F) | DGM Vol.<br>ft <sup>3</sup> | Orifice Meter<br>ΔH (in H <sub>2</sub> O) | Tunnel SP<br>(in H <sub>2</sub> O) | Impinger<br>Exit | Front<br>Filter | VAC | Draft |
|----------------|-----------------------------|---|------------------------------------|------------------|-----------------|-----|-------|
| 74             | 74                          | 83.5                                      | 0.28                               | -0.548           | 80              | 229 | 0     |
| 74             | 74                          | 85.02                                     | 0.2200                             | -0.548           | 65              | 234 | 0     |
| 74             | 74                          | 86.15                                     | 0.2400                             | -0.548           | 66              | 238 | 0     |
| 74             | 74                          | 87.54                                     | 0.2600                             | -0.548           | 58              | 238 | 0     |
| 75             | 75                          | 88.85                                     | 0.2800                             | -0.548           | 50              | 238 | 0     |
| 75             | 75                          | 90.225                                    | 0.2500                             | -0.548           | 47              | 238 | 0     |
| 75             | 75                          | 91.57                                     | 0.2400                             | -0.548           | 47              | 238 | 0     |
| 75             | 75                          | 92.93                                     | 0.2400                             | -0.548           | 48              | 237 | 0     |
| 76             | 76                          | 94.08                                     | 0.2300                             | -0.548           | 49              | 237 | 0     |
| 76             | 76                          | 95.35                                     | 0.2200                             | -0.548           | 50              | 237 | 0     |
| 76             | 76                          | 96.53                                     | 0.2200                             | -0.548           | 51              | 238 | 0     |
| 76             | 76                          | 97.77                                     | 0.2200                             | -0.548           | 51              | 235 | 0     |
| 77             | 77                          | 99.01                                     | 0.1800                             | -0.548           | 52              | 233 | 0     |
| 77             | 77                          | 100.22                                    | 0.1800                             | -0.548           | 54              | 232 | 0     |
| 77             | 77                          | 101.25                                    | 0.1700                             | -0.548           | 55              | 232 | 0     |
| 77             | 77                          | 102.3                                     | 0.1900                             | -0.548           | 56              | 231 | 0     |
| 78             | 78                          | 103.38                                    | 0.1900                             | -0.548           | 56              | 231 | 0     |
| 78             | 78                          | 104.48                                    | 0.1800                             | -0.548           | 56              | 231 | 0     |
| 78             | 78                          | 105.6                                     | 0.1600                             | -0.548           | 57              | 231 | 0     |
| 78             | 78                          | 106.64                                    | 0.1700                             | -0.548           | 58              | 230 | 0     |
| 79             | 79                          | 107.7                                     | 0.1700                             | -0.548           | 58              | 230 | 0     |
| 79             | 79                          | 108.77                                    | 0.1600                             | -0.548           | 59              | 229 | 0     |
| 79             | 79                          | 109.85                                    | 0.1600                             | -0.548           | 59              | 228 | 0     |
| 80             | 80                          | 110.95                                    | 0.1600                             | -0.548           | 60              | 228 | 0     |
| 80             | 80                          | 111.93                                    | 0.16                               | -0.548           | 60              | 227 | 0     |
| 80             | 80                          | 112.9                                     | 0.16                               | -0.548           | 61              | 227 | 0     |
| 80             | 80                          | 113.95                                    | 0.16                               | -0.548           | 61              | 227 | 0     |
| 80             | 80                          | 114.99                                    | 0.16                               | -0.548           | 62              | 228 | 0     |
| 81             | 81                          | 116.06                                    | 0.16                               | -0.548           | 62              | 226 | 0     |
| 81             | 81                          | 117.08                                    | 0.16                               | -0.548           | 63              | 227 | 0     |
| 81             | 81                          | 118.165                                   | 0.16                               | -0.548           | 64              | 228 | 0     |

B.D. - 8/31/10  
JW

## Manufacturer: Hearth &amp; Home Technologies

Model: Voyageur

Date: 7/30/2010

Run: 4

Control #: G100167575

Tech: B. Davis

| V<br>ft/min | Q <sub>tunnel</sub><br>scfm | Q <sub>stack</sub><br>scfm | Q <sub>snew/<br/>Q<sub>smit</sub></sub> | Target<br>ΔH (in H <sub>2</sub> O) | Burn Rate<br>lb/h dry | S <sub>i</sub>                            | V <sub>mi(sit)</sub> | S <sub>i</sub> x V <sub>mi(sit)</sub> | Sum     | Proportional Rate Calculation             |  |                                   |        |
|-------------|-----------------------------|----------------------------|---|------------------------------------|-----------------------|---|----------------------|---------------------------------------|---------|---|--|-----------------------------------|--------|
|             |                             |                            |   |                                    |                       |   |                      |                                       |         | θ x S <sub>i</sub> x V <sub>mi(sit)</sub> | t x Sum S <sub>i</sub><br>x V <sub>mi(sit)</sub> | PR<br>Qf by tracer / Qf by tracer |        |
| 13.547      | 132.967                     | 9.166                      | 0.986                                   | 0.196                              |                       |   |                      |                                       |         |   |  |                                   |        |
|             |                             |                            |   |                                    | Tunnel Area           | 0.19635 ft <sup>2</sup> (Tunnel Traverse) |                      |                                       |         |   |  |                                   |        |
|             |                             |                            |   |                                    |                       |   | Sum Si x V/m         | 2.730                                 |         |   |  |                                   |        |
|             |                             |                            |   |                                    |                       |   |                      |                                       |         | 99.7%                                     | 11.73  |                                   |        |
|             |                             |                            |   |                                    |                       |   |                      |                                       |         |   |  | 10/10/10                          |        |
| 13.553      | 136.789                     | 1.000                      | 0.2895                                  |                                    |                       |   |                      |                                       |         |   |  |                                   |        |
| 13.553      | 135.819                     | 0.996                      | 0.2179                                  | 4.927727                           | 0.0608                | 1.4188                                    | 0.0996               | 0.0996                                | 12.9457 | 13.650                                    | 100.0%   | 0.070                             |        |
| 13.553      | 134.625                     | 0.992                      | 0.2408                                  | 5.913272                           | 0.0637                | 1.0548                                    | 0.0842               | 0.1838                                | 10.0718 | 13.650                                    | 92.5%  | 0.080                             |        |
| 13.553      | 130.497                     | 0.977                      | 0.2600                                  | 10.841                             | 0.0501                | 1.2975                                    | 0.0990               | 0.2828                                | 9.7546  | 13.650                                    | 108.8%   | 0.076                             |        |
| 13.553      | 128.743                     | 0.970                      | 0.2766                                  | 9.855453                           | 0.0658                | 1.2228                                    | 0.0912               | 0.3740                                | 12.0722 | 13.650                                    | 100.2%   | 0.075                             |        |
| 13.553      | 128.743                     | 0.970                      | 0.2534                                  | 9.855453                           | 0.0652                | 1.2811                                    | 0.0931               | 0.4670                                | 12.5330 | 13.650                                    | 102.3%   | 0.073                             |        |
| 13.553      | 128.743                     | 0.970                      | 0.2431                                  | 11.82654                           | 0.0548                | 1.2531                                    | 0.0951               | 0.5621                                | 10.2921 | 13.650                                    | 104.5%   | 0.076                             |        |
| 13.363      | 126.942                     | 15.53654                   | 0.957                                   | 0.2348                             | 9.855453              | 0.0644                                    | 1.2671               | 0.0982                                | 0.6603  | 12.2335                                   | 13.650   | 107.9%                            | 0.077  |
| 13.553      | 128.959                     | 13.04805                   | 0.971                                   | 0.2342                             | 7.884363              | 0.0766                                    | 1.0715               | 0.0846                                | 0.7449  | 12.3174                                   | 13.650   | 92.9%                             | 0.079  |
| 13.553      | 129.177                     | 12.29815                   | 0.972                                   | 0.2214                             | 6.898817              | 0.0813                                    | 1.1811               | 0.0931                                | 0.8380  | 14.4052                                   | 13.650   | 102.3%                            | 0.081  |
| 13.553      | 129.834                     | 13.50853                   | 0.974                                   | 0.2149                             | 6.898817              | 0.0740                                    | 1.0974               | 0.0889                                | 0.9269  | 12.1851                                   | 13.650   | 97.7%                             | 0.082  |
| 13.553      | 130.054                     | 13.927081                  | 0.975                                   | 0.2173                             | 4.927727              | 0.1007                                    | 1.1532               | 0.0945                                | 1.0214  | 17.4244                                   | 13.650   | 103.9%                            | 0.081  |
| 13.553      | 130.720                     | 10.60927                   | 0.978                                   | 0.1839                             | 4.927727              | 0.0943                                    | 1.1532               | 0.0940                                | 1.1154  | 16.3040                                   | 13.650   | 103.3%                            | 0.088  |
| 13.553      | 131.618                     | 11.46019                   | 0.981                                   | 0.1819                             | 4.927727              | 0.0873                                    | 1.1232               | 0.0991                                | 1.2145  | 14.7008                                   | 13.650   | 108.9%                            | 0.089  |
| 13.553      | 132.300                     | 6.953239                   | 0.983                                   | 0.1695                             | 2.956636              | 0.1438                                    | 0.9561               | 0.0846                                | 1.2991  | 20.6252                                   | 13.650   | 93.0%                             | 0.091  |
| 13.553      | 132.759                     | 9.433777                   | 0.985                                   | 0.1934                             | 3.942181              | 0.1060                                    | 0.9746               | 0.0891                                | 1.3882  | 15.4971                                   | 13.650   | 97.9%                             | 0.085  |
| 13.553      | 132.989                     | 7.119085                   | 0.986                                   | 0.1892                             | 2.956636              | 0.1405                                    | 1.0025               | 0.0856                                | 1.4738  | 21.1226                                   | 13.650   | 94.1%                             | 0.086  |
| 13.553      | 133.221                     | 7.234115                   | 0.987                                   | 0.1823                             | 2.956636              | 0.1382                                    | 1.0192               | 0.0879                                | 1.5618  | 21.1323                                   | 13.650   | 96.6%                             | 0.088  |
| 13.553      | 133.686                     | 7.602645                   | 0.989                                   | 0.1598                             | 2.956636              | 0.1315                                    | 1.0377               | 0.0911                                | 1.6529  | 20.4735                                   | 13.650   | 100.1%                            | 0.082  |
| 13.553      | 134.154                     | 5.504648                   | 0.990                                   | 0.1744                             | 1.971091              | 0.1817                                    | 0.9636               | 0.0902                                | 1.7431  | 26.2569                                   | 13.650   | 99.1%                             | 0.1188 |
| 13.553      | 134.625                     | 3.070021                   | 0.992                                   | 0.1652                             | 0.985545              | 0.3257                                    | 0.9821               | 0.0878                                | 1.8309  | 47.9848                                   | 13.650   | 96.5%                             | 0.092  |
| 13.553      | 135.100                     | 5.910381                   | 0.994                                   | 0.1578                             | 1.971091              | 0.1692                                    | 0.9895               | 0.0907                                | 1.9216  | 25.1132                                   | 13.650   | 99.7%                             | 0.094  |
| 13.553      | 135.339                     | 2.929409                   | 0.995                                   | 0.1627                             | 0.985545              | 0.3414                                    | 0.9988               | 0.0935                                | 2.0151  | 51.1419                                   | 13.650   | 102.8%                            | 0.092  |
| 13.553      | 135.339                     | 6.395876                   | 0.995                                   | 0.1611                             | 1.971091              | 0.1564                                    | 1.0173               | 0.0937                                | 2.1088  | 23.8575                                   | 13.650   | 103.0%                            | 0.093  |
| 13.553      | 135.579                     | 3.20175                    | 0.996                                   | 0.1582                             | 0.985545              | 0.3123                                    | 0.9046               | 0.0838                                | 2.1926  | 42.3806                                   | 13.650   | 92.0%                             | 0.093  |
| 13.553      | 135.819                     | 3.160315                   | 0.996                                   | 0.1556                             | 0.985545              | 0.3164                                    | 0.8954               | 0.0833                                | 2.2759  | 42.4981                                   | 13.650   | 91.6%                             | 0.094  |
| 13.553      | 135.819                     | 6.291026                   | 0.996                                   | 0.1565                             | 1.971091              | 0.1590                                    | 0.9692               | 0.0909                                | 2.3668  | 23.1098                                   | 13.650   | 99.9%                             | 0.094  |
| 13.553      | 135.819                     | 3.11994                    | 0.996                                   | 0.1595                             | 0.985545              | 0.3205                                    | 0.9600               | 0.0898                                | 2.4566  | 46.1546                                   | 13.650   | 98.6%                             | 0.093  |
| 13.553      | 136.060                     | 3.171509                   | 0.997                                   | 0.1592                             | 0.985545              | 0.3153                                    | 0.9877               | 0.0914                                | 2.5480  | 46.7139                                   | 13.650   | 100.4%                            | 0.093  |
| 13.553      | 136.060                     | 3.156602                   | 0.997                                   | 0.1506                             | 0.985545              | 0.3168                                    | 0.9398               | 0.0870                                | 2.6350  | 44.6586                                   | 13.650   | 95.6%                             | 0.095  |
| 13.553      | 136.060                     | 3.439524                   | 0.997                                   | 0.1560                             | 0.985545              | 0.2907                                    | 0.9997               | 0.0950                                | 2.7300  | 43.5969                                   | 13.650   | 104.4%                            | 0.093  |

B. Davis  
10/10/10

**Intertek**

## EPA Method 5H Spreadsheet

V1.2

2/18/2010

Center

Point of Ave.

Pitot Location

X

### Cat Non Cat Pellet

(ENTER X)  X

Initial Delta  0.3

Delta H @  1.937

Baro:  28.36 in Hg (Tunnel Traverse)

DGM Cal  0.9974 Y

Averages  0.690323 9.58 10.62516 0.900968 848.4194 538.25806 576.10 0.036 537.41935 537.41935 101.766 0.196 -0.040

### Constants

K<sub>1</sub>  17.64 R/in Hg  
T<sub>std</sub>  528 R  
P<sub>std</sub>  29.92 in Hg

| Time | Weight | Stack Gas Comp. | Tunnel          | Flue           | Room      | Tunnel    | Tunnel Pitot | DGM Temps. (R) | DGM Vol. ft <sup>3</sup> | Orifice Meter            | Tunnel SP |
|------|--------|-----------------|-----------------|----------------|-----------|-----------|--------------|----------------|--------------------------|--------------------------|-----------|
|      |        | CO              | CO <sub>2</sub> | O <sub>2</sub> | Temp. (R) | Temp. (R) | (in. w.c.)   | In             | Out                      | ΔH (in H <sub>2</sub> O) | (in Hg)   |
| 0    | 13.30  | 0.65            | 10.46           | 9.79           | 1.12      | 731       | 534          | 560            | 0.0360                   | 534                      | 83.500    |
| 5    | 12.80  | 0.57            | 6.28            | 14.05          | 0.61      | 783       | 534          | 564            | 0.0360                   | 534                      | 85.020    |
| 10   | 12.20  | 0.32            | 8.62            | 11.96          | 0.87      | 852       | 534          | 569            | 0.0360                   | 534                      | 86.150    |
| 15   | 11.10  | 0.65            | 12.84           | 7.41           | 1.35      | 981       | 534          | 587            | 0.0360                   | 534                      | 87.540    |
| 20   | 10.10  | 1.96            | 14.4            | 4.54           | 1.57      | 1002      | 536          | 595            | 0.0360                   | 535                      | 88.850    |
| 25   | 9.10   | 1.84            | 14.36           | 4.7            | 1.5       | 990       | 536          | 595            | 0.0360                   | 535                      | 90.225    |
| 30   | 7.90   | 1.87            | 14.46           | 4.57           | 1.48      | 982       | 536          | 595            | 0.0360                   | 535                      | 91.570    |
| 35   | 6.90   | 1.65            | 14.32           | 4.93           | 1.46      | 982       | 535          | 595            | 0.0350                   | 535                      | 92.930    |
| 40   | 6.10   | 1.13            | 14.02           | 5.75           | 1.41      | 988       | 537          | 594            | 0.0360                   | 536                      | 94.080    |
| 45   | 5.40   | 0.69            | 13.28           | 6.93           | 1.3       | 981       | 537          | 593            | 0.0360                   | 536                      | 95.350    |
| 50   | 4.70   | 0.26            | 12.34           | 8.3            | 1.19      | 957       | 537          | 590            | 0.0360                   | 536                      | 96.530    |
| 55   | 4.20   | 0.35            | 11.86           | 8.69           | 1.15      | 950       | 537          | 589            | 0.0360                   | 536                      | 97.770    |
| 60   | 3.70   | 0.16            | 11.18           | 9.56           | 1         | 910       | 538          | 586            | 0.0360                   | 537                      | 99.010    |
| 65   | 3.20   | 0.16            | 10.24           | 10.5           | 0.91      | 880       | 537          | 582            | 0.0360                   | 537                      | 100.220   |
| 70   | 2.90   | 0.37            | 9.9             | 10.63          | 0.85      | 866       | 538          | 579            | 0.0360                   | 537                      | 101.250   |
| 75   | 2.50   | 0.33            | 9.74            | 10.83          | 0.89      | 853       | 538          | 577            | 0.0360                   | 537                      | 102.300   |
| 80   | 2.20   | 0.26            | 9.74            | 10.9           | 0.88      | 847       | 538          | 576            | 0.0360                   | 538                      | 103.380   |
| 85   | 1.90   | 0.24            | 9.58            | 11.08          | 0.85      | 840       | 538          | 575            | 0.0360                   | 538                      | 104.480   |
| 90   | 1.60   | 0.16            | 9.12            | 11.62          | 0.76      | 830       | 538          | 573            | 0.0360                   | 538                      | 105.600   |
| 95   | 1.40   | 0.3             | 8.14            | 12.46          | 0.71      | 808       | 539          | 571            | 0.0360                   | 538                      | 106.640   |
| 100  | 1.30   | 0.41            | 7.02            | 13.47          | 0.6       | 788       | 539          | 569            | 0.0360                   | 539                      | 107.700   |
| 105  | 1.10   | 0.45            | 7.32            | 13.13          | 0.61      | 777       | 539          | 567            | 0.0360                   | 539                      | 108.770   |
| 110  | 1.00   | 0.51            | 7.34            | 13.05          | 0.62      | 770       | 539          | 566            | 0.0360                   | 539                      | 109.850   |
| 115  | 0.80   | 0.58            | 6.5             | 13.82          | 0.55      | 760       | 539          | 566            | 0.0360                   | 540                      | 110.950   |
| 120  | 0.7    | 0.65            | 6.42            | 13.83          | 0.54      | 752       | 542          | 565            | 0.036                    | 540                      | 111.930   |
| 125  | 0.6    | 0.7             | 6.48            | 13.72          | 0.54      | 749       | 542          | 564            | 0.036                    | 540                      | 112.900   |
| 130  | 0.4    | 0.76            | 6.46            | 13.68          | 0.54      | 745       | 542          | 564            | 0.036                    | 540                      | 113.950   |
| 135  | 0.3    | 0.77            | 6.52            | 13.61          | 0.55      | 741       | 543          | 564            | 0.036                    | 540                      | 114.990   |
| 140  | 0.2    | 0.87            | 6.28            | 13.75          | 0.53      | 738       | 543          | 563            | 0.036                    | 541                      | 116.060   |
| 145  | 0.1    | 0.87            | 6.32            | 13.71          | 0.52      | 737       | 544          | 563            | 0.036                    | 541                      | 117.080   |
| 150  | 0      | 0.91            | 5.58            | 14.41          | 0.47      | 731       | 543          | 563            | 0.036                    | 541                      | 118.165   |

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## EPA Method 5H Spreadsheet

## INPUT DATA

|                             |       |          |
|-----------------------------|-------|----------|
| Load Weight (lbs wet)       | 13.30 | $W_{wd}$ |
| Load Weight (kg wet)        | 6.034 |          |
| Total Test Duration (min)   | 150   | $\Theta$ |
| Total Test Duration (hours) | 2.500 |          |
| Wood Moisture (Dry Bais)    | 21.76 | %        |
| Wood Moisture (Wet Bais)    | 17.87 | %        |

Manufacturer: Hearth & Home Technologies  
 Model: Voyageur  
 Date: 7/30/2010  
 Run: 4  
 Control #: G100167575  
 Tech: B. Davis

|               |       |           |
|---------------|-------|-----------|
| Dry Burn Rate | 1.982 | Dry kg/hr |
|               | 4.369 | Dry Lb/hr |

| PARTICULATE CATCH        |          | Tare or<br>Initial Wt. | Net Catch<br>(mg) |    |
|--------------------------|----------|------------------------|-------------------|----|
| Front Filter             | 0.6888   | 0.6346                 | 54.2              | F1 |
| Rear Filter              | 0.2014   | 0.1665                 | 34.9              | F2 |
| Probe/Front Half Rinse   | 104.5124 | 104.4647               | 47.7              | R1 |
| Impinger H2O +Back Rinse | 142.4346 | 142.4047               | 29.9              | R2 |
| Meth Chlor. Extraction   | 106.1183 | 106.0915               | 26.8              | R3 |
| Back Half Acetone Rinse  | 109.1668 | 109.1210               | 45.8              | R4 |

|                             |       |    |
|-----------------------------|-------|----|
| Total Particulate Collected | 235.2 | mg |
|-----------------------------|-------|----|

|      |        |         |
|------|--------|---------|
| Cs   | 0.0073 | g/dscf  |
| Qstd | 7974.4 | dscf/hr |
| E    | 3.04   | g/hr    |

|                         |        |          |
|-------------------------|--------|----------|
| Average Stack Flow (Qf) | 6.95   | dscf/min |
| Average Stack Flow (Qf) | 416.73 | dscf/hr  |

| Solvent Volumes                    | (ml) |
|------------------------------------|------|
| Acetone Front Half Rinse           | 105  |
| Acetone Back Half Rinse            | 125  |
| Water- Impingers + Back Half Rinse | 290  |
| Methylene Chloride Extraction      | 150  |
| $V_{a1}$                           |      |
| $V_{a2}$                           |      |
| $V_w$                              |      |
| $V_{DCM}$                          |      |

| Blanks             | (mg/ml) |
|--------------------|---------|
| Acetone            | 0       |
| Water              | 0.01    |
| Methylene Chloride | 0.008   |
| $B_a$              |         |
| $B_w$              |         |
| $B_{DCM}$          |         |

|                             |       |    |
|-----------------------------|-------|----|
| Total Particulate Collected | 235.2 | mg |
|-----------------------------|-------|----|

## Weighing Record

| PER-TEST INITIAL/TARE WEIGHTS |  |  |  |                |
|-------------------------------|--|--|--|----------------|
| DATE                          |  |  |  | Stable Weights |
| TIME                          |  |  |  | 0.6346         |
| Front Filter                  |  |  |  | 0.1665         |
| Rear Filter                   |  |  |  | 104.4647       |
| Probe/Front Half Rinse        |  |  |  | 142.4047       |
| Impinger H2O +Back Rinse      |  |  |  | 106.0915       |
| Meth Chlor. Extraction        |  |  |  | 109.1210       |
| Back Half Acetone Rinse       |  |  |  |                |

| POST-TEST FINAL WEIGHTS  |  |  |  |                |
|--------------------------|--|--|--|----------------|
| DATE                     |  |  |  | Stable Weights |
| TIME                     |  |  |  | 0.6888         |
| Front Filter             |  |  |  | 0.2014         |
| Rear Filter              |  |  |  | 104.5124       |
| Probe/Front Half Rinse   |  |  |  | 142.4346       |
| Impinger H2O +Back Rinse |  |  |  | 106.1183       |
| Meth Chlor. Extraction   |  |  |  | 109.1668       |
| Back Half Acetone Rinse  |  |  |  |                |

Test Engineer 

**Intertek**

V1.2

R. Curkeet

2/18/2010

**Emissions Tunnel Traverse Worksheet**Static Pressure: **-0.548** in H<sub>2</sub>O (enter as negative value e.g. -0.12)Barometer: **28.36** in HgTunnel Diameter **6** inTunnel Area **0.19635** ft<sup>2</sup>

| PITOT<br>TUNNEL<br>VELOCITY P | TUNNEL<br>TEMP |
|-------------------------------|----------------|
|-------------------------------|----------------|

| A CENTER | SQUARE<br>ROOT VP |
|----------|-------------------|
| B CENTER | 0.0000            |
| A1       | 0.034             |
| A2       | 0.042             |
| A3       | 0.046             |
| A4       | 0.030             |
| B1       | 0.030             |
| B2       | 0.044             |
| B3       | 0.034             |
| B4       | 0.030             |
| AVERAGE  | 0.036             |

PITOT CONSTANT= #DIV/0! For Pitot Palced at Center.  
**1.00** For Pitot Palced at point of average VP

| Tunnel V | Tunnel Q |
|----------|----------|
| ft/sec   | scfm     |

13.48

133.65

Manufacturer: Hearth &amp; Home Technologies

Model: Voyageur

Date: 7/30/2010

Run: 4

Control #: G100167575

Test Engineer *Bob* - 8/3/10

## STOVE TEMPERATURE TEST DATA - METHOD 5H

Page 1 of 1Client/Model: Hearth & Home Control #: 6100167575Date: 7/30/10 Test Crew: B DavisEquipment ID #: 

| Preburn<br>Test | Coal Bed:<br>Data: |                 |                |         |     |        | Actual:<br>Range: <u>22-33</u> |      |       | Coal Bed: <u>3.1</u> |          |
|-----------------|--------------------|-----------------|----------------|---------|-----|--------|--------------------------------|------|-------|----------------------|----------|
|                 | Fuel<br>Weight     | Delta<br>Weight | Stack<br>Draft | Ambient | Top | Bottom | Back                           | Left | Right | Flue                 | Catalyst |
| Time            | TEMPERATURES (oF)  |                 |                |         |     |        |                                |      |       |                      |          |
| 0               | 14.1               | -0.50           | 20             | 488     | 329 | 490    | 414                            | 391  | 283   | NA                   |          |
| 10              | 14.8               | 1.3             | 70             | 472     | 288 | 457    | 373                            | 346  | 438   |                      |          |
| 20              | 11.2               | 1.6             | -0.21          | 71      | 580 | 279    | 418                            | 347  | 283   | 492                  |          |
| 30              | 9.1                | 2.1             | -0.72          | 73      | 430 | 281    | 421                            | 365  | 262   | 508                  |          |
| 40              | 7.0                | 2.1             | -0.20          | 74      | 645 | 284    | 452                            | 396  | 262   | 503                  |          |
| 50              | 5.0                | 2.0             | -0.20          | 74      | 691 | 292    | 505                            | 432  | 273   | 413                  |          |
| 60              | 4.0                | 1.0             | -0.62          | 74      | 616 | 295    | 534                            | 456  | 294   | 413                  |          |
| 70              | 3.5                | 0.5             | -0.52          | 75      | 459 | 303    | 532                            | 461  | 335   | 331                  |          |
| 80              | 3.2                | 0.3             | -0.42          | 74      | 378 | 306    | 526                            | 449  | 248   | 293                  |          |
| 86.90           | 3.1                | 0.1             | -0.41          | 74      | 350 | 304    | 509                            | 440  | 268   | 273                  |          |
| 00              |                    |                 |                |         |     |        |                                |      |       |                      |          |
| 10              |                    |                 |                |         |     |        |                                |      |       |                      |          |
| 20              |                    |                 |                |         |     |        |                                |      |       |                      |          |
| 30              |                    |                 |                |         |     |        |                                |      |       |                      |          |
| 40              |                    |                 |                |         |     |        |                                |      |       |                      |          |
| 50              |                    |                 |                |         |     |        |                                |      |       |                      |          |
| 60              |                    |                 |                |         |     |        |                                |      |       |                      |          |
| 70              |                    |                 |                |         |     |        |                                |      |       |                      |          |
| 80              |                    |                 |                |         |     |        |                                |      |       |                      |          |
| 90              |                    |                 |                |         |     |        |                                |      |       |                      |          |
| AVG             |                    |                 |                |         |     |        |                                |      |       |                      |          |

Rate  
comb  
23Engineer signature: B. DavisDate: 8/24/10

Date: 7/30/10Page 1 of 1Manufacturer: Hearth N Home Model: VoyageurProject #: G100167575Run: 4

### FUEL DATA PRE-TEST LOAD

**FUEL DESCRIPTION:**

Kindling weight: \_\_\_\_\_ lbs. Consisting of: \_\_\_\_\_ Fire lit Time: \_\_\_\_\_

Pre-test load weight: \_\_\_\_\_ lbs. Consisting of: 2X4X \_\_\_\_\_ inches Time loaded: \_\_\_\_\_

Pre-test moisture content: Corrected Dry: 21.6 21.3 22.1 % Wet: \_\_\_\_\_ %

Test Air Control Settings: \_\_\_\_\_ Time: \_\_\_\_\_

Test Unit Fan Settings: \_\_\_\_\_ Time: \_\_\_\_\_

**TEST LOAD**

|                   | Lower Limit      | Ideal            | Upper Limit           |
|-------------------|------------------|------------------|-----------------------|
| Test Load Weight: | lbs.             | lbs.             | lbs.                  |
| Fire Box Volume:  | ft. <sup>3</sup> | Ideal Length:    | inches                |
| Load Volume:      | ft. <sup>3</sup> | Loading Density: | lbs./ft. <sup>3</sup> |
| Number of Spacers | :x12x5           | Load Density:    | lbs./ft. <sup>3</sup> |

| Piece Size     | Meter Moisture Content (% dry)* |               |               |
|----------------|---------------------------------|---------------|---------------|
| 4 x 4 x 14 in. | <u>19.4</u> %                   | <u>22.0</u> % | <u>19.2</u> % |
| 4 x 4 x 14 in. | <u>23.7</u> %                   | <u>23.9</u> % | <u>24.6</u> % |
| 4 x 4 x 14 in. | <u>19.5</u> %                   | <u>22.1</u> % | <u>21.2</u> % |
| 2 x 4 x 14 in. | <u>21.6</u> %                   | <u>20.4</u> % | <u>21.3</u> % |
| 2 x 4 x 14 in. | <u>20.3</u> %                   | <u>22.2</u> % | <u>25.0</u> % |
| x x in.        | %                               | %             | %             |
| x x in.        | %                               | %             | %             |

\*uncorrected range = 17.9% to 23.1% wet basis

TEST LOAD WEIGHT: 13.3 lbs DRY WEIGHT: \_\_\_\_\_ kg.**AVERAGE MOISTURE CONTENT:**CORRECTED TO TWO PIN: (DRY) 21.76 % (WET) 12.12 %**COAL BED RANGE:**2.7 lbs. to 3.3 lbs. (20% to 25% of test load)**TEST CHARGE:**

Time loaded: \_\_\_\_\_ Coal bed weight: \_\_\_\_\_ lbs. Coal bed weight = \_\_\_\_\_ % of test load weight

B.D. 8/26/10

CHARCOALIZATION: good\*\*\*\*\*poor

Date: 7/30/10

Page \_\_\_\_ of \_\_\_\_

Manufacturer: Hearth N Home

Model: Voyageur

Project #: G100167575

Run: 4

Tech: A Davis

Reviewer:

## COMMENTS

Low CO<sub>2</sub>

$O = 0.0$

$CO_2 \ 1.0 = 1.01$

Stack Gas

$CO \ O = 0.00$

$CO_2 \ O = 0.00$

$CO \ .1.97 = 1.99$

$CO_2 \ 4.10 = 4.08$

Preburn

Raked coals @ 73 minutes

Pb start 28.37

End 28.35

Test

Fuel loaded by 45 seconds

Door closed by 60 seconds

Primary Air fully open full 5.00

Timed Air Leached open

Fan on high entire test

Post Test Gas Analyzer

Low CO<sub>2</sub>

Stack Gas

$O = 0.0$

$CO \ O = 0.00$

$CO_2 \ 1.0 = 1.00$

$CO_2 \ O = 0.01$

$CO \ 1.97 = 1.99$

$CO_2 \ 4.10 = 4.09$

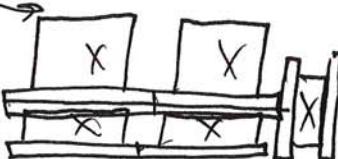
54 Tim. Leach Lb .010 @ 15"

## TEST LOAD CONFIGURATION

Side view

No top spacers

Front L



B D - 8/20/10





**Manufacturer:** Hearth & Home Technologies

**Model:** Voyageur

**Date:** 7/30/2010

**Run:** 5

**Control #:** G100167575

**Tech:** B. Davis

-0.048955

| DGM Temps. (F) | DGM Vol.<br>ft <sup>3</sup> | Orifice Meter<br>ΔH (in H <sub>2</sub> O) | Tunnel SP<br>(in H <sub>2</sub> O) | Impinger<br>Exit | Front<br>Filter | VAC | Draft |
|----------------|-----------------------------|---|------------------------------------|------------------|-----------------|-----|-------|
| 85             | 85                          | 118.502                                   | 0.28                               | -0.49            | 92              | 225 | 0     |
| 85             | 85                          | 121.52                                    | 0.5200                             | -0.49            | 66              | 229 | 0     |
| 86             | 86                          | 125.16                                    | 0.5200                             | -0.49            | 57              | 238 | 0     |
| 86             | 86                          | 129.08                                    | 0.3500                             | -0.49            | 57              | 238 | 0     |
| 86             | 86                          | 132.33                                    | 0.3500                             | -0.49            | 63              | 238 | 0     |
| 86             | 86                          | 135.17                                    | 0.4000                             | -0.49            | 67              | 238 | 0     |
| 87             | 87                          | 138.51                                    | 0.2800                             | -0.49            | 64              | 238 | 0     |
| 87             | 87                          | 141.45                                    | 0.3000                             | -0.49            | 67              | 234 | 3     |
| 87             | 87                          | 144.26                                    | 0.3200                             | -0.49            | 68              | 234 | 5     |
| 87             | 87                          | 147.19                                    | 0.3100                             | -0.49            | 68              | 234 | 5     |
| 87             | 87                          | 149.85                                    | 0.3300                             | -0.49            | 63              | 237 | 7     |
| 87             | 87                          | 152.63                                    | 0.2900                             | -0.49            | 61              | 237 | 8     |
| 87             | 87                          | 155.54                                    | 0.2400                             | -0.49            | 60              | 237 | 8     |
| 87             | 87                          | 158.37                                    | 0.2500                             | -0.49            | 61              | 236 | 8     |
| 88             | 88                          | 161.15                                    | 0.2400                             | -0.49            | 62              | 237 | 7     |
| 87             | 87                          | 163.94                                    | 0.2200                             | -0.49            | 62              | 237 | 7     |
| 87             | 87                          | 166.75                                    | 0.2200                             | -0.49            | 63              | 236 | 7     |
| 87             | 87                          | 169.6                                     | 0.2200                             | -0.49            | 63              | 237 | 7     |
| 87             | 87                          | 172.27                                    | 0.2100                             | -0.49            | 65              | 237 | 7     |
| 87             | 87                          | 174.76                                    | 0.2200                             | -0.49            | 65              | 236 | 6     |
| 87             | 87                          | 177.25                                    | 0.2000                             | -0.49            | 66              | 237 | 6     |
| 86             | 86                          | 179.782                                   | 0.1900                             | -0.49            | 66              | 236 | 6     |

*RH = 8/31/10*

## STOVE TEMPERATURE TEST DATA - METHOD 5H

Page 4 of 4Client/Model: Heat & HomeControl #: 6100147575Date: 7/30/10 Test Crew: B DavisEquipment ID #: Run #: 5

| Preburn<br>Test<br>[ ] | Coal Bed:<br>Data: |        |       |       |         |     | Actual:<br>Range: 277 - 333 |      |      | Coal Bed: 3.1 |      |          |
|------------------------|--------------------|--------|-------|-------|---------|-----|-----------------------------|------|------|---------------|------|----------|
|                        | Fuel               | Weight | Delta | Stack | Ambient | Top | Bottom                      | Back | Left | Right         | Flue | Catalyst |
| Time                   |                    |        |       |       |         |     |                             |      |      |               |      |          |
| 1540 0                 | 6.5                | .05    | -.061 | 85    | 629     | 322 | 520                         | 482  | 327  | 450           | 417  |          |
| 10                     | 5.3                | 1.2    | -.060 | 83    | 601     | 323 | 517                         | 465  | 365  |               |      |          |
| 20                     | 4.5                | 0.8    | -.060 | 84    | 547     | 320 | 503                         | 449  | 315  | 398           |      |          |
| 30                     | 3.8                | 0.7    | -.065 | 83    | 520     | 316 | 499                         | 442  | 309  | 362           |      |          |
| 40                     | 3.6                | 0.2    | -.042 | 83    | 420     | 314 | 429                         | 434  | 302  | 292           |      |          |
| 50                     | 3.3                | 0.3    | -.040 | 84    | 340     | 315 | 454                         | 417  | 232  | 262           |      |          |
| 60                     | 3.1                | 0.2    | -.035 | 83    | 299     | 310 | 435                         | 400  | 210  | 254           |      |          |
| 70                     |                    |        |       |       |         |     |                             |      |      |               |      |          |
| 80                     |                    |        |       |       |         |     |                             |      |      |               |      |          |
| 90                     |                    |        |       |       |         |     |                             |      |      |               |      |          |
| 00                     |                    |        |       |       |         |     |                             |      |      |               |      |          |
| 10                     |                    |        |       |       |         |     |                             |      |      |               |      |          |
| 20                     |                    |        |       |       |         |     |                             |      |      |               |      |          |
| 30                     |                    |        |       |       |         |     |                             |      |      |               |      |          |
| 40                     |                    |        |       |       |         |     |                             |      |      |               |      |          |
| 50                     |                    |        |       |       |         |     |                             |      |      |               |      |          |
| 60                     |                    |        |       |       |         |     |                             |      |      |               |      |          |
| 70                     |                    |        |       |       |         |     |                             |      |      |               |      |          |
| 80                     |                    |        |       |       |         |     |                             |      |      |               |      |          |
| 90                     |                    |        |       |       |         |     |                             |      |      |               |      |          |
| AVG                    |                    |        |       |       |         |     |                             |      |      |               |      |          |

Engineer signature: B. C.Date: 8/24/10

Date: 7/30/10

Page \_\_\_\_ of \_\_\_\_

Manufacturer: Hearth N Home Model: VoyageurProject #: G100167575Run: 5

### FUEL DATA PRE-TEST LOAD

**FUEL DESCRIPTION:**

Kindling weight: \_\_\_\_\_ lbs. Consisting of: \_\_\_\_\_ Fire lit Time: \_\_\_\_\_

Pre-test load weight: 2.7 lbs. Consisting of: 3 2X4X 8 inches Time loaded: \_\_\_\_\_

Pre-test moisture content: Corrected Dry: \_\_\_\_\_ % Wet: \_\_\_\_\_ %

23.1, 17.3, 26.8Test Air Control Settings: Air control fully open, timed air pushed @ 0 minutes Time: \_\_\_\_\_Test Unit Fan Settings: On high entire heat Time: \_\_\_\_\_**TEST LOAD**

|                   | Lower Limit      | Ideal            | Upper Limit          |
|-------------------|------------------|------------------|----------------------|
| Test Load Weight: | lbs.             | lbs.             | lbs.                 |
| Fire Box Volume:  | ft. <sup>3</sup> | Ideal Length:    | inches               |
| Load Volume:      | ft. <sup>3</sup> | Loading Density: | lbs./ft <sup>3</sup> |
| Number of Spacers | :x12x5           | Load Density:    | lbs./ft <sup>3</sup> |

| Piece Size                          | Meter Moisture Content (% dry)* |               |               |
|-------------------------------------|---------------------------------|---------------|---------------|
| <u>4</u> x <u>4</u> x <u>14</u> in. | <u>23.3</u> %                   | <u>23.2</u> % | <u>23.1</u> % |
| <u>4</u> x <u>4</u> x <u>14</u> in. | <u>23.5</u> %                   | <u>18.9</u> % | <u>21.1</u> % |
| <u>2</u> x <u>4</u> x <u>14</u> in. | <u>23.8</u> %                   | <u>22.3</u> % | <u>23.1</u> % |
| <u>2</u> x <u>4</u> x <u>14</u> in. | <u>19.2</u> %                   | <u>19.1</u> % | <u>19.4</u> % |
| <u>2</u> x <u>4</u> x <u>14</u> in. | <u>22.0</u> %                   | <u>19.5</u> % | <u>20.0</u> % |
| x x in.                             | %                               | %             | %             |
| x x in.                             | %                               | %             | %             |

> 7.3

\*uncorrected range = 17.9% to 23.1%

TEST LOAD WEIGHT: 13.5 lbs DRY WEIGHT: \_\_\_\_\_ kg.**AVERAGE MOISTURE CONTENT:**CORRECTED TO TWO PIN: (DRY) 21.43 % (WET) \_\_\_\_\_ %**COAL BED RANGE:**2.7 lbs. to 3.3 lbs. (20% to 25% of test load)**TEST CHARGE:**

Time loaded: \_\_\_\_\_ Coal bed weight: \_\_\_\_\_ lbs. Coal bed weight = \_\_\_\_\_ % of test load weight

CHARCOALIZATION: good poor

Date: 7/30/10

Page \_\_\_\_ of \_\_\_\_

Manufacturer: Hearth N Home

Model: Voyageur

Project #: G100167575

Run: 5

Tech: B Davis

Reviewer:

## COMMENTS

## Pretest Gas Analyzer

Stack Gas

Low CO<sub>2</sub>

CO O = 0.00

O = 0.00

CO<sub>2</sub> O = 0.02

1.00 = 1.00

CO 1.97 = 2.04

Pb Start 28.35

CO<sub>2</sub> 4.10 = 4.08

End 28.34

Preburn Rated comb @ 55 minutes

Test load fuel loaded by 49 seconds

door closed by 60 seconds

Primary Air fully open entire test

Timed Air pushed @ zero minutes

Fan on high entire test.

## Post Test Gas Analyzer Cal

Stack Gas

Low CO<sub>2</sub> O = 0.0

CO O = 0.00

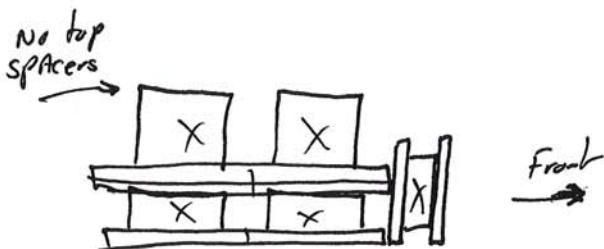
1.00 = .98

CO<sub>2</sub> O = 0.00

## TEST LOAD CONFIGURATION

Side view

CO 1.97 = 2.04



5H Post Test Load thickness .008 @ 10"

B.D. = 8/20/10