

Manufacturer: DECTRA  
Job # C100248857

Model: WHS1500  
Run 3

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Date 3-31-11  
Tech KS/SL/ET/JS KS

## PRETEST DILUTION TUNNEL TRAVERSE RUN

Barometric pressure ( $P_{bar}$ ) 29.73 (inches Hg.) Static pressure ( $P_g$ ) .216 (inches w.c.)  
Inside diameter: Port A 12 in Port B 12 in Tunnel cross sectional area: .7854 Ft<sup>2</sup>  
Pitot tube type: Standard 10" 10"

Traverse Point	Position (inches)	Velocity Head $\Delta_p$ (inches H <sub>2</sub> O)	Tunnel Temperature (°F)	$\sqrt{\Delta_p}$
A-Centroid	<u>KS 6.00 5.00</u>	<u>.136</u>		<u>.3688</u>
B-Centroid	<u>KS 6.00 5.00</u>	<u>.135</u>		<u>.3674</u>
A-1	<u>KS 0.53 .72</u>	<u>.127</u>		<u>.3564</u>
A-2	<u>KS 1.75 2.53</u>	<u>.144</u>		<u>.3821</u>
A-3	<u>KS 3.55 7.47</u>	<u>.156</u>		<u>.3950</u>
A-4	<u>KS 8.45 9.28</u>	<u>.127</u>		<u>.3564</u>
<del>KS A-5</del>	<del>10.25</del>			
<del>KS A-6</del>	<del>11.47</del>			
B-1	<u>KS 0.53 .72</u>	<u>.085</u>		<u>.2915</u>
B-2	<u>KS 1.75 2.53</u>	<u>.126</u>		<u>.3550</u>
B-3	<u>KS 3.55 7.47</u>	<u>.156</u>		<u>.3950</u>
B-4	<u>KS 8.45 9.28</u>	<u>.145</u>		<u>.3808</u>
<del>KS B-5</del>	<del>10.25</del>			
<del>KS B-6</del>	<del>11.47</del>			
AVERAGE				<u>.2606</u>

Adjustment factor application

Pitot correction .9911

Where,

$$V_s = K_p C_p F_p (\sqrt{\Delta_p})_{AVG} \sqrt{\frac{T_s}{P_s M_s}} \quad V_s = K_p C_p (\sqrt{\Delta_p})_{avg} \sqrt{\frac{T_s}{P_s M_s}} \quad F_p = \frac{(\sqrt{\Delta_p})_{avg}}{(\sqrt{\Delta_p})_{centroid}}$$

$C_p$  = Pitot tube coefficient = 0.99 for standard pitot

$\Delta_p$  = manometer reading (inches H<sub>2</sub>O)

$T_s$  = average absolute dilution tunnel temperature (°F + 460)

$P_s$  = absolute dilution tunnel gas pressure or  $P_{bar} + P_g$

$P_g$  = static pressure inches H<sub>2</sub>O  
13.6

$M_s$  = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)

$K_p$  = 85.49 Pitot tube constant, (conversion factor for English units)

Adjustment factor for alternative Pitot tube placement:

$(\sqrt{\Delta_p})_{avg}$  = Average of the square roots of the velocity heads ( $\Delta_p$ ) measured at each traverse point.

$(\sqrt{\Delta_p})_{centroid}$  = Average of the square roots of the velocity heads measured at the tunnel centroid (inches of H<sub>2</sub>O)

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## Pre/Post Checks

Moisture Meter Calibration Check:

Time: <u>8:30a</u>	X: <input checked="" type="checkbox"/>	Y: <input checked="" type="checkbox"/>	12: <input checked="" type="checkbox"/>	22: <input checked="" type="checkbox"/>
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### Pre-Test

### Post-Test

#### Facility Conditions:

Air Velocity.....  
Smoke Capture Check.....

<u>/</u> fpm	<u>0</u> fpm
<u>/</u>	<u>/</u>

#### Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....  
Date Dilution Tunnel Cleaned.....  
Induced Draft Check.....  
Tunnel Velocity.....

<u>3-10-11</u>	
<u>/</u>	
<u>/</u>	
<u>14.135</u>	<u>.143</u>

#### Pitot Leak Check:

Side A.....  
Side B.....

<u>/</u>	<u>/</u>
<u>/</u>	<u>/</u>

#### Temperature System:

Ambient (65°- 90°F).....

<u>67</u> °F
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#### Proportional Checks:

CO Analyzer Drift Check.....  
CO<sub>2</sub> Analyzer Check.....  
O<sub>2</sub> Analyzer Check.....  
Thermocouple check.....

<u>NA</u>
<u>NA</u>
<u>NA</u>
<u>NA</u>

#### Sampling Train ID Numbers:

#### Train 1

#### Train 2

Probe.....  
Filter Front.....  
Filter Back.....  
Filter Thermocouple.....  
Filter 5G-3 (<90°F).....

<u>G</u>	<u>H</u>
<u>29</u>	<u>31</u>
<u>30</u>	<u>32</u>
<u>19</u>	<u>22</u>

#### Thermocouple Identification Number

Flue..... 1  
Dilution Tunnel Wet Bulb..... 4  
Unit Right Side..... 7  
Catalyst/Combustion Chamber..... 10

Room..... 2  
Unit Top..... 5  
Unit Left Side..... 8

Dilution Tunnel Dry Bulb..... 3  
Unit Back..... 6  
Unit Bottom..... 9

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## Pre-Test Scale Audit

Scale Type	Audit Weight	Measured Weight
Platform	<u>N/A</u> lbs., Class F	<u>N/A</u> lbs.
Wood	<u>25</u> lbs., Class F	<u>25</u> lbs.
Analytical	<u>100</u> mg, Class S	<u>100.00</u> mg.

### LIMITS OF WEIGHT RANGES

**ANALYTICAL SCALE** ..... 50%-150% of dry filter weight,  $\pm 0.1$  mg  
**PLATFORM SCALE** ..... 20%-80% of ideal test load weight,  $\pm 0.1$  lbs. or 1%  
**WOOD SCALE** ..... 20%-80% of ideal test load weight,  $\pm 0.1$  lbs. or 1%

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Job # *C00248857*

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## SAMPLING EQUIPMENT CHECK OUT

### Leakage Checks Tunnel Samplers

	SAMPLE 1		SAMPLE 2	
Unplugged Flow Rate = .25cfm	Pre-Test	Post-Test	Pre-Test	Post-Test
Vacuum (inches Hg.)	<i>10"</i>	<i>10"</i>	<i>10"</i>	<i>10"</i>
Final 1 minute DGM (ft <sup>3</sup> )	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>
Initial 1 minute DGM (ft <sup>3</sup> )	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>
Change (C) (ft <sup>3</sup> )				
Allowable leakage .04 x Sample rate or .02cfm	0.0100	0.0100	0.0100	0.0100
Check OK	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>

### Leakage Checks Flue Gas Sampler

Plugged Probe	Pre Test	Post Test
Vacuum (inches Hg.)		
Rotometer Reading (mm)		
Flow Rate (CFM)	<i>NA</i>	<i>NA</i>
Allowable (.04 x Sample Rate)		
Check OK		

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## TEST DATA LOG

### RAW DRY GAS METER READINGS

	System 1	System 2
Final (ft <sup>3</sup> )	<u>794</u>	<u>794</u>
Initial (ft <sup>3</sup> )	<u>0</u>	<u>0</u>

### AMBIENT CONDITIONS

	Start	End
Barometer. (inches Hg)	<u>29.73</u>	<u>29.65</u>
Dry Bulb (°F)	<u>20<sup>KS</sup>: 74</u>	<u>70.2</u>
Humidity (%)	<u>21</u>	<u>22</u>

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### PRE-TEST LOAD

Kindling weight: 2.24 lbs. Consisting of: Scrap and paper Fire lit Time: \_\_\_\_\_  
Pre-test load weight: \_\_\_\_\_ lbs. Consisting of: 2X4X \_\_\_\_\_ inches Time loaded: \_\_\_\_\_  
Pre-test moisture content: Uncorrected: \_\_\_\_\_ % Corrected Dry: \_\_\_\_\_ % Wet: \_\_\_\_\_ %

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

	Lower Limit	Ideal	Upper Limit
Test Load Weight:	127.35 Lbs.	141.50 lbs.	155.65 Lbs.

Fire Box Volume:	14.15	Ft. <sup>3</sup>	Ideal Length:		Inches
Load Volume:	1.7467	Ft. <sup>3</sup>	Loading Density:	10.230	lbs/ft <sup>3</sup>
Spacer weight		Lbs	Load Density:	82.874	lbs/ft <sup>3</sup>

W x H x L

Piece Size	Weight	Meter Moisture Content (% dry)*
5 x 6.5 x 15.5 in.	10.36 lbs.	26.6 %
4 x 6 x 15.5 in.	5.44 lbs.	21.8 %
4 x 5.5 x 15.5 in.	4.85 lbs.	17.1 %
3.5 x 4.5 x 14.5 in.	2.87 lbs.	25.6 %
4.5 x 4.5 x 15.5 in.	5.68 lbs.	19.3 %
4.5 x 4.5 x 15.5 in.	4.28 lbs.	24.4 %
5 x 5.5 x 15.5 in.	7.70 lbs.	17.5 %
5 x 3.5 x 15 in.	3.75 lbs.	27.0 %
4 x 4 x 15.5 in.	4.96 lbs.	20.9 %
5 x 4.5 x 15.5 in.	6.43 lbs.	24.0 %
4 x 5.5 x 15.5 in.	10.12 lbs.	22.0 %
5 x 4.5 x 15.5 in.	6.12 lbs.	28.6 %
4 x 5 x 15.5 in.	5.24 lbs.	24.2 %
3 x 5 x 15.0 in.	3.94 lbs.	20.6 %
4 x 4.5 x 15 in.	4.00 lbs.	20.7 %
4 x 6 x 15.5 in.	7.14 lbs.	15.7 %
3 x 4 x 15.5 in.	3.74 lbs.	23.3 %
4 x 4.5 x 15.5 in.	2.80 lbs.	15.5 %

DRY WEIGHT: 53.17 kg.

(DRY) \_\_\_\_\_%      CORRECTED TO TWO PIN: (DRY) \_\_\_\_\_%      (WET) \_\_\_\_\_%

\_\_\_\_\_ lbs. to \_\_\_\_\_ lbs. (10% to 15% of test load)  
 \_\_\_\_\_ lbs. to \_\_\_\_\_ lbs. (20% to 25% of test load)

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

[illegible]

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### FUEL DATA

**FUEL DESCRIPTION:**

Kindling weight: \_\_\_\_\_ lbs. Consisting of: Scrap and paper Fire lit Time: \_\_\_\_\_  
Pre-test load weight: \_\_\_\_\_ lbs. Consisting of: 2X4X \_\_\_\_\_ inches Time loaded: \_\_\_\_\_  
Pre-test moisture content: Uncorrected: \_\_\_\_\_ % Corrected Dry: \_\_\_\_\_ % 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>
Spacer weight	Lbs	Load Density:	lbs/ft <sup>3</sup>

[illegible]

TEST LOAD WEIGHT: \_\_\_\_\_ lbs.                      DRY WEIGHT: \_\_\_\_\_ kg.  
AVERAGE MOISTURE CONTENT:  
(DRY) \_\_\_\_\_%              CORRECTED TO TWO PIN: (DRY) \_\_\_\_\_%              (WET) \_\_\_\_\_%  
COAL BED RANGE: \_\_\_\_\_

\_\_\_\_\_ lbs. to \_\_\_\_\_ lbs. (10% to 15% of test load)  
\_\_\_\_\_ lbs. to \_\_\_\_\_ 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



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Job # C100248857

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## COMMENTS

11:30 - UNIT START 144 lbs added

2:00 pm - Five Temps Declining, unit opened and stirred, opened for 7 seconds

## TEST LOAD CONFIGURATION

Manufacturer: DeTrea  
Job # 6100248857

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READING #	REAL TIME	ELAPSED TIME	WEIGHT REMAINING	WATER METER	DGM 1	ROTOMETER 1	DGM 2	ROTOMETER 2	TUNNEL VELOCITY	DRAFT	SMOKE	UNIT ON OR OFF	MAX DGM PRESSURE
0	11:30	0			0	10	0	10	.140		M	ON	
1		10			46	10	51	8.5	.135		C	ON	
2		20			95	10	102	9	.134		C	ON	
3		30			143	10	147	8.5	.135		C	ON	
4		40			191	10	191	9.5	.136		C	ON	
5		50			238	10	237	10	.133		C	ON	
6	11:30	60			286	10	284	10	.135		C	ON	
7		70			332	9	330	10	.135		C	ON	
8		80			378	9.5	377	10	.135		C	ON	
9		90			424	9.5	423	10	.135		C	ON	
10		100			470	9.5	470	10	.136		C	ON	
11		110			516	9.5	516	10	.138		C	ON	
12	1:30	120			563	9.5	563	10	.140		C	ON	
13		130			609	9.5	609	10	.140		C	ON	
14		140			656	9.5	656	10	.141		C	ON	
15	2:00	150			702	9.5	702	10	.141		C	ON	
16	2:10	160			748	9.5	749	10	.141		C	ON	
17	2:20	170			794	9.5	794	10	1.43		C	ON	
18		180											
19		190											
20		200											
21		210											
22		220											
23		230											
24		240											
25		250											
26		260											
27		270											
28		280											
29		290											
30		300											
31		310											
32		320											
33		330											
34		340											
35		350											



Manufacturer: Dectra  
Job # 6100248007

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### DILUTION TUNNEL PARTICULATE SAMPLER DATA

FILTER TYPE: Gelman 47mm A/E

	SYSTEM 1		SYSTEM 2	
	Probe and Front Half Housing #	Filters + gaskets Numbers	Probe and Front Half Housing #	Filters + gaskets Numbers
Post Test Weight:	92.3050 grams	6.5647 grams	92.6685 grams	6.6035 grams
Pre Test Weight:	92.3028 grams	6.5568 grams	92.6662 grams	6.5953 Grams
Gain:	0.0022 grams	0.0079 grams	0.0023 grams	0.0082 Grams
	a1	b1	a2	b2

Total Gain: a1 + b1 = 0.0101 grams      a2 + b2 = 0.0105 grams

Pre-test Weight Record		SYSTEM 1			SYSTEM 2			Temp	Humidity
		Probe & Housing Number	Front Filter + gasket Number	Back Filter + gasket Number	Probe & Housing Number	Front Filter + gasket Number	Back Filter + gasket Number		
Date	Time	G	29	30	H	31	32	°F	%
3/8	1:15 p	92.3049	3.3342	3.2236	92.6676	3.2790	3.3174		
3/21	10:05 A	92.3029	3.3337	3.2232	92.6662	3.2785	3.3170	65	34
3/24	2:15 p	92.3028	3.3337	3.2231	92.6662	3.2784	3.3169	62	26
Total		6.5568			Total	6.5953			

Post-test Weight Record		SYSTEM 1		SYSTEM 2		Temp	Humidity
		Probe & Housing Number	Combined Filter + gasket Weight Number	Probe & Housing Number	Combined Filter + gasket Weight Number		
Date	Time	G	29 + 30	H	31 + 32	°F	%
4-4		92.3043	6.5660	92.6699	6.6043		
4-5	7:40 A	92.3054	6.5652	92.6690	6.6037	66.2	24
4-6	7:55 A	92.3054	6.5652	92.6690	6.6037	65.5	20
4-7	7:42 A	92.3050	6.5650	92.6685	6.6035		
4-8	8:12 A	92.3050	6.5647	92.6685	6.6035	62.6	35
Dry Down Weight							
		P1	F1	P2	F2	Gr/hr	Lb/MMbtu
4-4		3.5	9.2	3.7	9.0	29.2	
4-5		2.6	8.4	2.8	8.4	24.9	
4-6		2.6	8.4	2.8	8.4	24.9	
4-7		2.2	8.2	2.3	8.2	23.4	
4-8		2.2	7.9	2.3	7.2	23.1	