

Manufacturer: Deetra  
Job #: 6100248857

Model: WHS1500  
Run: 4

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Tech: KS/SL/ET/JS KS

## PRETEST DILUTION TUNNEL TRAVERSE RUN

Barometric pressure ( $P_{bar}$ ) 29.55 (inches Hg.) Static pressure ( $P_q$ ) .215 (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"

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>.138</u>		<u>.3715</u>
A-1	<u>KS 0.53 .72</u>	<u>.135</u>		<u>.3674</u>
A-2	<u>KS 1.75 2.53</u>	<u>.142</u>		<u>.3768</u>
A-3	<u>KS 3.55 7.47</u>	<u>.142</u> <del>KS</del>		<u>.3768</u>
A-4	<u>KS 8.45 9.28</u>	<u>.153</u>		<u>.3912</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>.097</u>		<u>.3114</u>
B-2	<u>KS 1.75 2.53</u>	<u>.128</u>		<u>.3578</u>
B-3	<u>KS 3.55 7.47</u>	<u>.160</u>		<u>.4000</u>
B-4	<u>KS 8.45 9.28</u>	<u>.150</u>		<u>.3873</u>
<del>KS B-5</del>	<del>10.25</del>			
<del>KS B-6</del>	<del>11.47</del>			
AVERAGE				<u>.2649</u>

Adjustment factor application

Pitot correction 1.0021

Where,

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

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

$$F_p = \frac{(\sqrt{\Delta_p})_{avg}}{(\sqrt{\Delta_p})_{centroid}}$$

$C_p$  = 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  $\frac{\text{inches H}_2\text{O}}{13.6}$

$M_s$  = 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: 8:45 X: ☒ Y: ☒ 12: ☒ 22: ☒

### Pre-Test

### Post-Test

#### Facility Conditions:

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

<u>0</u> fpm	<u>0</u> fpm
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

#### Wood Heater Conditions:

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

<u>3-10-11</u>	
<u>—</u>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<u>0.141</u>	<u>0.143</u>

#### Pitot Leak Check:

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

<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

#### Temperature System:

Ambient (65° - 90°F).....

65 °F

#### Proportional Checks:

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

<u>NA</u>

#### Sampling Train ID Numbers:

#### Train 1

#### Train 2

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

<u>I</u>	<u>J</u>
<u>33</u>	<u>35</u>
<u>34</u>	<u>36</u>
<u>19</u>	<u>22</u>

#### Thermocouple Identification Number

Fluc..... 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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## SAMPLING EQUIPMENT CHECK OUT

### Leakage Checks Tunnel Samplers

	SAMPLE 1		SAMPLE 2	
	Pre-Test	Post-Test	Pre-Test	Post-Test
Unplugged Flow Rate = .25cfm				
Vacuum (inches Hg.)	10"	10"	10"	10"
Final 1 minute DGM (ft <sup>3</sup> )	0	0	0	0
Initial 1 minute DGM (ft <sup>3</sup> )	0	8	0	0
Change (C) (ft <sup>3</sup> )				
Allowable leakage .04 x Sample rate or .02cfm	0.0100	0.0100	0.0100	0.0100
Check OK	✓	✓	✓	

### Leakage Checks Flue Gas Sampler

Plugged Probe	Pre Test	Post Test
Vacuum (inches Hg.)		
Rotometer Reading (mm)		
Flow Rate (CFM)	N/A	N/A
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>776</u>	<u>776</u>
Initial (ft <sup>3</sup> )	<u>0</u>	<u>0</u>

### AMBIENT CONDITIONS

	Start	End
Barometer. (inches Hg)	<u>29.55</u>	<u>29.56</u>
Dry Bulb (°F)	<u>70.5</u>	<u>67.1</u>
Humidity (%)	<u>27</u>	<u>26</u>

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### PRE-TEST LOAD

Kindling weight: 220 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:** \_\_\_\_\_

	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:	10.159 Inches
Load Volume:	2.1499 Ft. <sup>3</sup>	Loading Density:	16.864 lbs/ft <sup>3</sup>
Spacer weight	Lbs	Load Density:	lbs/ft <sup>3</sup>

Piece Size	Weight	Meter Moisture Content (% dry)*					
4.5 x 6 x 19 in.	7.32 lbs.	22.0	%	20.1	%	20.3	%
4 x 8 x 16 in	10.92 lbs.	24.0	%	19.1	%	26.2	%
6 x 4.5 x 16 in	7.51 lbs.	20.9	%	20.8	%	19.6	%
4 x 6 x 15.5 in	7.16 lbs.	22.4	%	18.4	%	19.3	%
6 x 8 x 16 in	13.90 lbs.	25.2	%	23.0	%	24.9	%
6 x 5 x 16 in	7.92 lbs.	24.3	%	19.8	%	22.0	%
4 x 5 x 15.5 in	4.75 lbs.	20.7	%	17.3	%	17.2	%
4 x 7 x 16 in	8.31 lbs.	20.5	%	19.8	%	18.9	%
<del>3 x 4.5 x 15.5 in</del>	<del>5.08 lbs.</del>	<del>21.0</del>	<del>%</del>	<del>18.1</del>	<del>%</del>	<del>18.4</del>	<del>%</del>
4.5 x 5 x 16 in	9.34 lbs.	25.0	%	21.4	%	20.9	%
4 x 6 x 16 in	8.56 lbs.	22.0	%	19.3	%	18.5	%
3.5 x 5 x 20 in	5.88 lbs.	21.4	%	18.7	%	22.2	%
4.5 x 6 x 15 in	6.98 lbs.	19.8	%	18.1	%	21.8	%
4 x 3.5 x 15 in	4.02 lbs.	20.3	%	19.3	%	19.3	%
5 x 3.5 x 16 in	4.50 lbs.	24.4	%	20.2	%	25.6	%
3.5 x 5.5 x 16 in	4.58 lbs.	19.0	%	17.8	%	18.8	%
4 x 4.5 x 15 in	4.42 lbs.	24.4	%	20.9	%	20.1	%
3 x 4.5 x 16 in	3.90 lbs.	22.4	%	18.4	%	20.5	%

TEST LOAD WEIGHT: 143.75 lbs. DRY WEIGHT: 53.71 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

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### FUEL DATA

### PRE-TEST LOAD

**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>

Piece Size	Weight	Meter Moisture Content (% dry)*
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[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

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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	11:35	0			0	10	0	10	.141		L	ON	
1		10			47	10	48	10	.138		C	ON	
2		20			94	10	94	10	.136		C	ON	
3		30			141	10	141	10	.135		C	ON	
4		40			187	9.5	187	9.5	.135		C	ON	
5		50			233	9.5	232	9.5	.136		C	ON	
6		60			279	9.5	276	10	.136		C	ON	
7		70			325	9.5	337	8.5	.136		C	ON	
8		80			370	9.5	380	8	.136		C	ON	
9		90			416	9.5	422	8	.137		C	ON	
10		100			462	9.5	464	8	.137		C	ON	
11		110			508	9.5	507	8	.138		C	ON	
12		120			555	9.5	554	9.5	.138		C	ON	
13		130			602	9.5	601	10	.141		C	ON	
14		140			647	9.5	648	9.5	.142		C	ON	
15		150			694	9.5	695	9.5	.143		C	ON	
16		160			740	9.5	741	9.5	.143		C	ON	
17	2:23	170			776	9.5	776	9.5	.143		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											



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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:	<i>90.1633</i> grams	<i>4.5998</i> grams	<i>92.4520</i> grams	<i>4.6300</i> grams
Pre Test Weight:	<i>90.1609</i> grams	<i>4.5933</i> grams	<i>92.4495</i> grams	<i>4.6234</i> Grams
Gain:	<i>0.0024</i> grams	<i>0.0065</i> grams	<i>0.0025</i> grams	<i>0.0066</i> Grams
	a1	b1	a2	b2

Total Gain: a1 + b1 = *0.0089* grams      a2 + b2 = *0.0091* grams

		SYSTEM 1			SYSTEM 2			Temp	Humidity
Pre-test Weight Record		Probe & Housing Number	Front Filter + gasket Number	Back Filter + gasket Number	Probe & Housing Number	Front Filter + gasket Number	Back Filter + gasket Number		
Date	Time							°F	%
<i>3/16</i>	<i>10:00A</i>	<i>90.1643</i>	<i>3.3112</i>	<i>1.2825</i>	<i>92.4530</i>	<i>3.3332</i>	<i>1.2903</i>	<i>6</i>	
<i>3/21</i>	<i>10:07A</i>	<i>90.1611</i>	<i>3.3111</i>	<i>1.2824</i>	<i>92.4496</i>	<i>3.3332</i>	<i>1.2903</i>	<i>65</i>	<i>34</i>
<i>3/24</i>	<i>2:16p</i>	<i>90.1609</i>	<i>3.3110</i>	<i>1.2823</i>	<i>92.4495</i>	<i>3.3331</i>	<i>1.2903</i>	<i>62</i>	<i>26</i>
		Total	<i>4.5933</i>		Total	<i>4.6234</i>			

		SYSTEM 1		SYSTEM 2		Temp	Humidity
Post-test Weight Record		Probe & Housing Number	Combined Filter + gasket Weight Number	Probe & Housing Number	Combined Filter + gasket Weight Number		
Date	Time					°F	%
<i>4/4</i>		<i>90.1649</i>	<i>4.6021</i>	<i>92.4537</i>	<i>4.6320</i>		
<i>4-5</i>		<i>90.1637</i>	<i>4.6004</i>	<i>92.4524</i>	<i>4.6305</i>	<i>66</i>	<i>25</i>
<i>4-6</i>		<i>90.1637</i>	<i>4.6002</i>	<i>92.4524</i>	<i>4.6302</i>	<i>65</i>	<i>31</i>
<i>4-7</i>	<i>7:47A</i>	<i>90.1633</i>	<i>4.5998</i>	<i>92.4520</i>	<i>4.6302</i>	<i>65.1</i>	<i>32</i>
<i>4-8</i>	<i>8:15A</i>	<i>90.1633</i>	<i>4.5998</i>	<i>92.4520</i>	<i>4.6300</i>		
Dry Down Weight							
		P1	F1	P2	F2	Gr/hr	Lb/MMbtu
<i>4-4</i>		<i>4.0</i>	<i>8.8</i>	<i>4.2</i>	<i>8.6</i>	<i>29.8</i>	
<i>4-5</i>		<i>2.8</i>	<i>7.1</i>	<i>2.9</i>	<i>7.1</i>	<i>23.2</i>	
<i>4-6</i>		<i>2.8</i>	<i>6.9</i>	<i>2.9</i>	<i>6.8</i>	<i>23.2</i>	
<i>4-7</i>		<i>2.4</i>	<i>6.5</i>	<i>2.5</i>	<i>6.8</i>	<i>21.2</i>	
<i>4-8</i>		<i>2.4</i>	<i>6.5</i>	<i>2.5</i>	<i>6.6</i>	<i>21.0</i>	