

Manufacturer: Deetra
Job # G100248857

Model: WHS 1500
Run 2

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PRETEST DILUTION TUNNEL TRAVERSE RUN

Barometric pressure (P_{bar}) 30.08 (inches Hg.) Static pressure (P_g) .215 (inches w.c.)

Inside diameter: Port A 12 in Port B 12 in Tunnel cross sectional area: .7854 Ft²

Pitot tube type: Standard 10 in 10 in

Traverse Point	Position (inches)	Velocity Head Δ_p (inches H ₂ O)	Tunnel Temperature (°F)	$\sqrt{\Delta_p}$
A-Centroid	<u>KS 6.00-5.00</u>	<u>.196</u>		<u>.4427</u>
B-Centroid	<u>KS 6.00-5.00</u>	<u>.195</u>		<u>.4416</u>
A-1	<u>KS 0.53-.72</u>	<u>.184</u>		<u>.4313</u>
A-2	<u>KS 1.75-2.53</u>	<u>.200</u>		<u>.4472</u>
A-3	<u>KS 3.55-7.47</u>	<u>.214</u>		<u>.4626</u>
A-4	<u>KS 8.45-9.28</u>	<u>.191</u>		<u>.4370</u>
KS A-5	10.25			
KS A-6	11.47			
B-1	<u>KS 0.53-.72</u>	<u>.149</u>		<u>.3860</u>
B-2	<u>KS 1.75-2.53</u>	<u>.180</u>		<u>.4243</u>
B-3	<u>KS 3.55-7.47</u>	<u>.232</u>		<u>.4817</u>
B-4	<u>KS 8.45-9.28</u>	<u>.210</u>		<u>.4583</u>
KS B-5	10.25			
KS B-6	11.47			
AVERAGE				<u>.4413</u>

Adjustment factor application

Pitot correction .9980

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

Δ_p = manometer reading (inches H₂O)

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 (Δ_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 H₂O)

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Pre/Post Checks

Moisture Meter Calibration Check:

Time: <u>11:00 am</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>0</u>
<u>✓</u>	<u>✓</u>

Pitot Leak Check:

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

<u>✓</u>	<u>✓</u>
<u>✓</u>	<u>✓</u>

Temperature System:

Ambient (65°- 90°F).....

<u>66</u> °F

Proportional Checks:

CO Analyzer Drift Check.....
CO₂ Analyzer Check.....
O₂ 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>E</u>	<u>F</u>
<u>25</u>	<u>27</u>
<u>26</u>	<u>28</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>NA</u> lbs., Class F	<u>NA</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, ± 0.1 mg
PLATFORM SCALE 20%-80% of ideal test load weight, ± 0.1 lbs. or 1%
WOOD SCALE 20%-80% of ideal test load weight, ± 0.1 lbs. or 1%

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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.)	<u>10"</u>	<u>10"</u>	<u>10"</u>	<u>10"</u>
Final 1 minute DGM (ft ³)	<u>0</u>	<u>772</u>	<u>0</u>	<u>772</u>
Initial 1 minute DGM (ft ³)	<u>0</u>	<u>772</u>	<u>0</u>	<u>772</u>
Change (C) (ft ³)	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
Allowable leakage .04 x Sample rate or .02cfm	<u>0.0100</u>	<u>0.0100</u>	<u>0.0100</u>	<u>0.0100</u>
Check OK	<u>✓</u>	<u>✓</u>	<u>✓</u>	<u>✓</u>

Leakage Checks Flue Gas Sampler

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

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TEST DATA LOG

RAW DRY GAS METER READINGS

	System 1	System 2
Final (ft ³)	<u>KS 274 772</u>	<u>KS 274 772</u>
Initial (ft ³)	<u>0</u>	<u>0</u>

AMBIENT CONDITIONS

	Start	End
Barometer. (inches Hg)	<u>30.08</u>	<u>29.88</u>
Dry Bulb (°F)	<u>74.1</u>	<u>74</u>
Humidity (%)	<u>22 %</u>	<u>22</u>



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FUEL DATA

FUEL DESCRIPTION:

Kindling weight: 2.14 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:

PRE-TEST LOAD

TEST LOAD

	Lower Limit	Ideal	Upper Limit
Test Load Weight:	<u>127.35</u> Lbs.	<u>141.50</u> lbs.	<u>155.45</u> Lbs.

Fire Box Volume:	<u>14.15</u> Ft. ³	Ideal Length:	_____ Inches
Load Volume:	<u>1.8051</u> Ft. ³	Loading Density:	<u>10.186</u> lbs/ft ³
Spacer weight	_____ Lbs	Load Density:	<u>79.845</u> lbs/ft ³

Piece Size	Weight	Meter Moisture Content (% dry)*		
<u>6 x 6 x 16</u> in	<u>7.52</u> lbs.	<u>22.5</u> %	<u>15.8</u> %	<u>22.2</u> %
<u>6.5 x 4.5 x 16.5</u> in	<u>8.30</u> lbs.	<u>23.7</u> %	<u>19.3</u> %	<u>20.5</u> %
<u>5 x 5 x 15.5</u> in	<u>7.60</u> lbs.	<u>22.9</u> %	<u>16.2</u> %	<u>17.1</u> %
<u>4 x 5 x 16</u> in	<u>6.78</u> lbs.	<u>26.3</u> %	<u>21.9</u> %	<u>23.1</u> %
<u>4.5 x 3.5 x 15.5</u> in	<u>4.52</u> lbs.	<u>20.6</u> %	<u>17.3</u> %	<u>19.0</u> %
<u>6 x 4 x 15.5</u> in	<u>5.88</u> lbs.	<u>25.4</u> %	<u>21.9</u> %	<u>24.1</u> %
<u>4 x 4.5 x 15.5</u> in	<u>5.30</u> lbs.	<u>23.7</u> %	<u>21.0</u> %	<u>22.0</u> %
<u>5 x 4.5 x 14</u> in	<u>6.85</u> lbs.	<u>24.5</u> %	<u>20.8</u> %	<u>19.1</u> %
<u>4 x 3 x 15.5</u> in	<u>4.16</u> lbs.	<u>24.2</u> %	<u>22.1</u> %	<u>23.4</u> %
<u>5 x 4 x 16</u> in	<u>4.96</u> lbs.	<u>25.2</u> %	<u>23.6</u> %	<u>24.4</u> %
<u>6 x 4 x 16</u> in	<u>4.92</u> lbs.	<u>21.4</u> %	<u>18.7</u> %	<u>19.6</u> %
<u>6 x 4 x 16</u> in	<u>6.82</u> lbs.	<u>22.5</u> %	<u>17.9</u> %	<u>23.3</u> %
<u>6 x 3.5 x 16</u> in	<u>5.86</u> lbs.	<u>23.7</u> %	<u>24.1</u> %	<u>26.1</u> %
<u>6 x 3.5 x 17</u> in	<u>8.54</u> lbs.	<u>22.3</u> %	<u>19.8</u> %	<u>20.4</u> %
<u>7 x 5 x 16</u> in	<u>8.28</u> lbs.	<u>24.0</u> %	<u>18.3</u> %	<u>20.1</u> %
<u>5 x 4 x 16</u> in	<u>4.38</u> lbs.	<u>23.6</u> %	<u>19.7</u> %	<u>21.7</u> %

TEST LOAD WEIGHT: 144.13 lbs.

DRY WEIGHT: 53.45 kg.

AVERAGE MOISTURE CONTENT:

(DRY) 22.3 % 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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PRE-TEST LOAD

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: _____

	Lower Limit	Ideal	Upper Limit
Test Load Weight:	Lbs.	lbs.	Lbs.
Fire Box Volume:	Ft. ³	Ideal Length:	Inches
Load Volume:	Ft. ³	Loading Density:	lbs/ft ³
Spacer weight	Lbs	Load Density:	lbs/ft ³

[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:

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COMMENTS

13:51, TEST LOADED AND STARTED

16.22 unit opened and adjusted, Flow-Taps
Decreasing, unit open 13 seconds

16:30 - particulate portion complete

17:30 - Highest Temp in Storage Aug. Complete

TEST LOAD CONFIGURATION

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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	13:51	0			0	9.5	0	9.5	.202		L ON		
1		10			44	9.5	44	9.5	.203		C ON		
2		20			91	10	92	10	.205		C ON		
3		30			138	10	140	10	.204		C ON		
4		40			185	10	188	9	.202		C ON		
5		50			232	10	235	9	.201		C ON		
6		60			278	10.5	282	9	.201		C ON		
7		70			327	10	328	9	.205		C ON		
8		80			375	9.5	374	9	.204		C ON		
9		90			422	10	421	9	.205		C ON		
10		100			470	9	468	9	.204		C ON		
11		110			517	10	516	10	.203		C ON		
12		120			564	10	564	10	.205		C ON		
13		130			611	10	613	9	.203		C ON		
14		140			658	10	660	9	.205		C ON		
15		150			705	9.5	706	9	.206		C ON		
16		160			751	9	752	9	.206		C ON		
17		170			772	9	772	9	.206		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											

16:35
2:44

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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>92.5900</i> grams	<i>4.5902</i> grams	<i>90.9522</i> grams	<i>6.5359</i> grams
Pre Test Weight:	<i>92.5884</i> grams	<i>4.5852</i> grams	<i>90.9502</i> grams	<i>6.5299</i> Grams
Gain:	<i>0.0016</i> grams	<i>0.0050</i> grams	<i>0.0020</i> grams	<i>0.060</i> Grams
	a1	b1	a2	b2

Total Gain: a1 + b1 = *0.0066* grams a2 + b2 = _____ 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	<i>E</i>	<i>25</i>	<i>26</i>	<i>F</i>	<i>27</i>	<i>28</i>	°F	%
<i>3/8</i>	<i>10:00p</i>	<i>92.6335</i>	<i>1.2977</i>	<i>3.2880</i>	<i>91.0112</i>	<i>3.2583</i>	<i>3.2721</i>		
<i>3/21</i>	<i>10:00A</i>	<i>92.5885</i>	<i>1.2976</i>	<i>3.2877</i>	<i>90.9502</i>	<i>3.2582</i>	<i>3.2718</i>	<i>66</i>	<i>34</i>
<i>3/24</i>	<i>2:02p</i>	<i>92.5884</i>	<i>1.2975</i>	<i>3.2877</i>	<i>90.9502</i>	<i>3.2582</i>	<i>3.2717</i>	<i>62</i>	<i>26</i>
Total		<i>4.5852</i>			Total	<i>6.5299</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	<i>E</i>	<i>25 + 26</i>	<i>F</i>	<i>27 + 28</i>	°F	%
<i>4/4</i>		<i>92.5914</i>	<i>4.5905</i>	<i>90.9534</i>	<i>6.5366</i>		
<i>4/5</i>	<i>7:35A</i>	<i>92.5904</i>	<i>4.5902</i>	<i>90.9523</i>	<i>6.5361</i>	<i>66.2</i>	<i>24</i>
<i>4/6</i>		<i>92.5904</i>	<i>4.5902</i>	<i>90.9523</i>	<i>6.5361</i>	<i>65.3</i>	<i>30</i>
<i>4/7</i>	<i>7:36A</i>	<i>92.5900</i>	<i>4.5902</i>	<i>90.9523</i>	<i>6.5361</i>	<i>64.8</i>	<i>32</i>
<i>4-8</i>	<i>8:07A</i>	<i>92.5900</i>	<i>4.5902</i>	<i>90.9522</i>	<i>6.5359</i>	<i>62.6</i>	<i>35</i>
Dry Down Weight							
		P1	F1	P2	F2	Gr/hr	Lb/MMbtu
<i>4-4</i>		<i>3.0</i>	<i>5.3</i>	<i>3.2</i>	<i>6.7</i>		
<i>4-5</i>		<i>2.0</i>	<i>5.0</i>	<i>2.1</i>	<i>6.2</i>	<i>21.7</i>	
<i>4-6</i>		<i>2.0</i>	<i>5.0</i>	<i>2.1</i>	<i>6.2</i>	<i>15.1</i>	
<i>4-7</i>		<i>1.6</i>	<i>5.0</i>	<i>2.1</i>	<i>6.2</i>	<i>14.7</i>	
<i>4-8</i>		<i>1.6</i>	<i>5.0</i>	<i>2.0</i>	<i>6.0</i>	<i>14.4</i>	