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Project No. 1289

SOURCE EVALUATION TEST REPORT

HAMPTON LUMBER MILLS
Morton, Washington

Dry Kiln VOC Emission Factors

August 30 through September 4, 1999

Prepared for
Hampton Lumber Mills
P.O. Box 189
Randle, WA 98377

by
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Introduction

Samples of Hemlock lumber from Hampton Lumber Mills (formerly Cowlitz Stud) were dried in Horizon Engineering's laboratory dry kiln between August 30 and September 4, 1999. Volatile organic compounds (measured as total gaseous organic compounds, TGOC) emissions were measured. TGOC was continuously measured in the test kiln using the Dettinger/Horizon method. The laboratory test was done instead of a source test due to the expense and uncertainties involved in source testing an actual dry kiln.

Peppy Elizaga of Hampton Lumber arranged for the work and prepared the lumber samples. Horizon Engineering personnel Kurt Torgerson did the testing and Michael Wallace did the data processing. A copy of the original test method (now modified) has been included in the Appendix.

Summary of Results

Table 1 summarizes the VOC results. Figures 1 and 2 are plots of the calculated emission factors as a function of percentage H_2O in the wood samples (dry basis). It should be noted that the results are based on an actual board-foot basis, not the nominal dimensions of each sample board.

Detailed results and sampling parameters are included in the Appendix.

Table 1
Summary of Results

Test Dates: August 30 to September 4, 1999

Results	**Units**		
Species		**Hemlock Run 1**	**Hemlock Run 2**
Dates		Aug. 30 through Sep. 2	Sep. 2 through 4
Sample Size	bd ft (dry)	47.61	28.56
Initial Weight	lb	209.77	112.72
Weight Loss	lb	107.86	48.68
Test Time	hr	64	47
Emission Factors			
VOC @ 15% Moisture[1]	lbC/Mbdft	0.152	0.064

[1] Wood moisture is on dry basis.

FIGURE 1

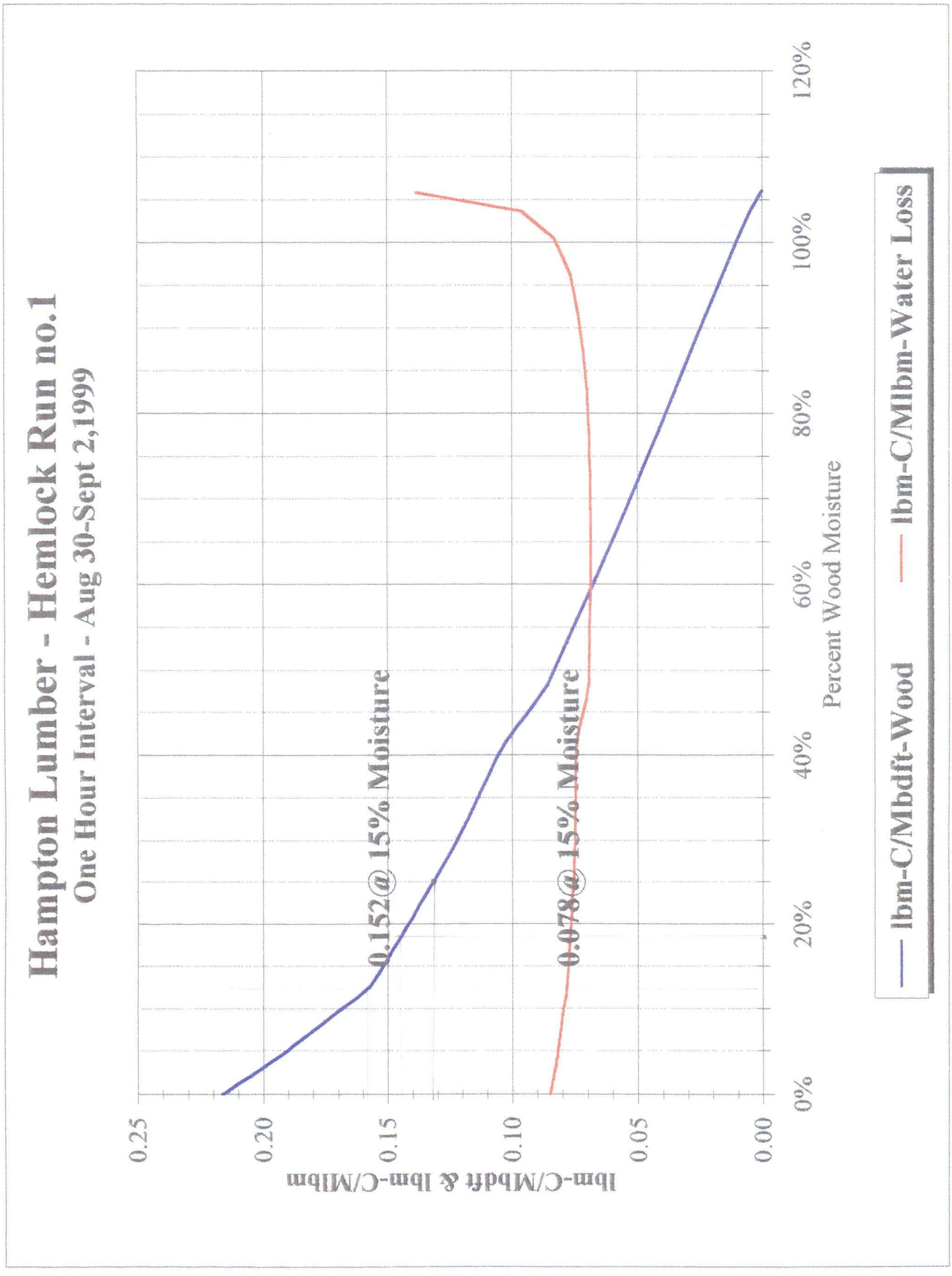
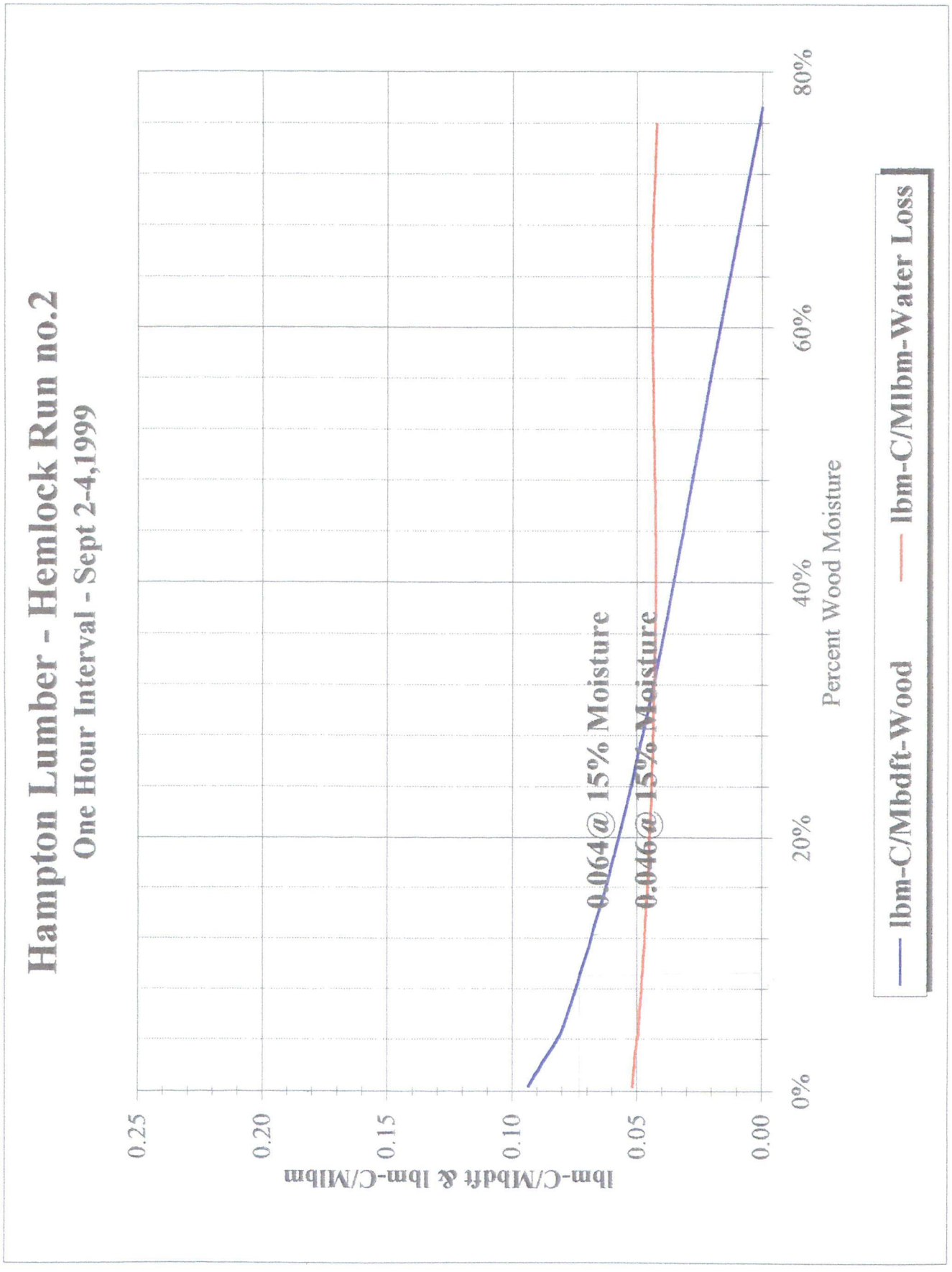

Hampton Lumber - Hemlock Run no.1
One Hour Interval - Aug 30-Sept 2,1999
0.152@ 15% Moisture
0.078@ 15% Moisture
lbm-C/Mbdft & lbm-C/Mlbm
0.25
0.20
0.15
0.10
0.05
0.00
0%
20%
40%
60%
80%
100%
120%
Percent Wood Moisture
lbm-C/Mbdft-Wood
lbm-C/Mlbm-Water Loss
HAM01.WB1
Horizon Engineering
09/10/99 15:37

FIGURE 2



HAM02.WB1 Horizon Engineering 09/10/99 15:49

Purpose for the Laboratory Test Method

Hampton Lumber Mills uses dry kilns to dry cut lumber. Testing the actual kilns would be difficult and costly, with many uncertainties when using the standard EPA Method 25A on a dry kiln. The following conditions make dry kiln testing difficult:

a) Lumber drying can take over 100 hours to process one load.
b) Most dry kilns have multiple vents and often have significant leakage around the loading doors.
c) The venting process is periodic. The vents open to release moisture and VOCs in an irregular pattern.

The multiple-vent configuration of most dry kilns and the periodic venting makes it difficult to quantify the total exhaust rate. Leakage from doors and other gaps is difficult to measure and would seriously affect results. Additionally, tests would need to be repeated for every species of wood the plant dries.

Sampling and Analytical Procedures

Testing Method The Dettinger/Horizon Method, applied to the test kiln, employs EPA Method 25A in a controlled manner to measure TGOC emissions. The method is assumed to be a worst case analysis, drying to the highest temperature for the production kilns at each client's location. The test chamber humidity is not controlled but inlet air humidity is measured and the volume rate of the basic air introduced is measured. Because there is some leakage into the system, total air into the kiln is calculated based on wet and dry bulb temperatures and the weight loss of the wood sample.

General The test kiln schematic is in the Test Method in the Appendix. A Grieve 27-ft^3 industrial convection oven was used to dry the wood. Four Rice Lake Weighing Systems 0-100 lb load cells are used to continuously monitor the weight of the drying lumber. Weight loss (primarily moisture loss) was recorded until a stable weight was recorded, indicating that the load was dry. Temperatures were monitored with k-type thermocouples with shielded cabling.

Measured parameters were read every 30 seconds during the tests by a Keithley Metrabyte DAS-801 data acquisition board installed in a personal computer and customized with Test Point programming software. Data Acquisition System (DAS) printouts are in the Appendix.

VOC A Thermo Environmental Model 51 total hydrocarbon analyzer with heated flame ionization detector and heated sample line was used to measure TGOC concentrations at oven conditions. Gas sample for the analyzer was taken from a fixed sampling probe in the oven. Sample for the TGOC analyzer was diluted with ambient air by a ratio of 1 to 3.1. Two Porter Instrument rotameters were used for the dilution. Periodic checks on the system (dilution and the analyzer) were done and VOC data was corrected for any system drift.

The analyzer output was read every 30 seconds and two-minute averages were recorded by the DAS. Emission factors were calculated at 15% moisture, but the factors for wet-to-0% moisture are on graphs in the Appendix.

Zero, span, calibration error (linearity) and bias checks were made on the TGOC monitor at the beginning, several times during, and at the end of each test.

The VOC analyzer concentrations are corrected for minor instrument drift according to the times when calibrations were done and when the test run was made. System calibration response (bias check) values are used as the basis for these corrections. Values were also corrected for moisture to put results on a dry basis, and for detector attenuation as documented by NCASI for the TECO Model 51 analyzer.

Moisture Kiln moisture was calculated from the wet and dry bulb temperatures as indicated by k-type thermocouples. Wet bulb temperature was maintained with a wick and a reservoir supplied with water from outside the kiln. The thermocouple outputs were read every 30 seconds and two-minute averages were recorded by the DAS.

Flow Rate The air flow rate used in emission rate calculations was obtained from the moisture content of the air in the kiln and the rate that water in the

lumber was evaporated (measured by the load cells). The volume of dry air was determined using EPA's moisture content equation, Eq. 5-3:

$$MoistureContent = \frac{VolumeWater(std)}{VolumeAir(std) + VolumeWater(std)}$$

Due to the nature of the load cell configuration, the lumber weight loss was not a perfectly smooth curve. The jumps in weight loss caused swings in the ongoing calculated dry air rate through the kiln. To remove these swings, a best-fit method was used to derive a smooth (conditioned) curve for the weight loss.

Board Volume Sample boards were measured prior to loading the oven. The board-foot amount was based on a board foot being 144 cubic inches of actual wood.

Discussion

The final moisture content of the normal kiln-dried lumber should be used to enter the plots of the results figures. Annual emissions of TGOC (as carbon) can be calculated based on production of dried lumber. The plots also show VOC emissions as a function of the quantity of water evaporated. In most cases this is a flatter curve than the TGOC as a function of final dried moisture content.

During the first run the oven circulation fan shut down some time between equipment checks by the test technician (between 1253 and 1403 on August 30). We think that a short power outage tripped the magnetic contactor for the fans and they did not restart. The effect of this can be seen in the data graphs in Figure 1 and in the Appendix. All testing functions resumed immediately except the circulation fans in the kiln.

The effect of the fans being off is somewhat uncertain. It seems reasonable that the concentrations of TGOC would increase, but the reduced air volume would result in the same total emissions. For that reason we continued the testing and processed the results.

Near the end of the second run, personnel in another section of the shop were using gasoline-powered equipment, causing increased VOCs in the shop air (and therefore in the dilution air). These were detected by the kiln test equipment. We have cut this approximately 2-hour interval from the logger data.

The two run results are significantly different. We have not arrived at any conclusion on why the emissions would have been affected, so have presented the results. Unless we get compelling reasons to contradict, it is our opinion that the difference is due to wood variation rather than the sampling and that the results of both tests are valid.

APPENDIX

Nomenclature & Drift Correction Documentation

Kiln VOC Data

- Calculated Results & DAS Tables
- Sample Collection Data Sheets
- Field Records
- Temperature-Humidity & Moisture Plots

QA/QC Documentation

- Calibration Information
  - Thermocouples and Indicators
  - Barometer
- Calibration Gas Certificates

Test Methods

NOMENCLATURE
AND
DRIFT CORRECTION
DOCUMENTATION

Nomenclature

Constants	Value	Units	Definition	Ref
Pstd(1)	29.92129	inHg	Standard Pressure	CRC
Pstd(2)	2116.22	lbf / ft²		CRC
Tstd	527.67	°R	Standard Temperature	CRC
R	1545.33	ft lbf / lbmol °R	Ideal Gas Constant	CRC
MWatm	28.965	lbm / lbmole	Atmospheric (20.946 %O2, 0.033% CO2, Balance N2+Ar)	
MWc	12.011	lbm / lbmole	Carbon	CRC
MWco	28.010	lbm / lbmole	Carbon Monoxide	CRC
MWco2	44.010	lbm / lbmole	Carbon Dioxide	CRC
MWh2o	18.015	lbm / lbmole	Water	CRC
MWno2	46.006	lbm / lbmole	Nitrogen Dioxide	CRC
MWo2	31.999	lbm / lbmole	Oxygen	CRC
MWso2	64.063	lbm / lbmole	Sulfur Dioxide	CRC
MWn2+ar	28.154	lbm / lbmole (Balance with 98.82% N2 & 1.18% Ar)	Emission balance	
C1	385.3211	ft³ / lbmol	Ideal Gas Constant @ Standard Conditions	
C2	816.5455	inHg in²/ °R ft²	Isokentics units correction constant	
Kp	5129.4	ft / min [(inHg lbm/mole) / (°R inH2O)] ^½	Pitot tube constant	Ref 2.5.1

Symbol	Units	Definition	Calculating Equation or Source of Data	EPA
As	in²	Area, Stack		
An	in²	Area, Nozzle		
Bws	%	Moisture, % Stack gas	[100 Vw(std) / [Vw(std)+Vm(std)]]	Eq. 5-3
C	ppmv-C	Carbon (General Reporting Basis for Organics)		
C1	ft3/lbmol	Gas Constant @ Standard Conditions	[R Tstd / Pstd(2)]	
C2	inHg in²/ °R ft²		[14,400 Pstd / Tstd]	
Cd	lbm-GAS / MMdscf	Mass of gas per unit volume	[Cgas MWgas / C1]	
cg	gr/dscf	Grain Loading, Actual	[15.432 mn / Vm(std) 1,000]	Eq. 5-6
cg @ X%CO2	gr/dscf	Grain Loading Corrected to X% Carbon Dioxide	[X% / CO2%]	
cg @ X%O2	gr/dscf	Grain Loading Corrected to X% Oxygen	[(20.946-X%) / (20.946-O2%)]	
Cgas	ppmv, %	Gas Concentration, (Corrected)		
Cgas @ X%CO2	ppmv	Gas Concentration Correction to X% Carbon Dioxide	[X% / CO2%]	
Cgas @ X%O2	ppmv	Gas Concentration Correction to X% Oxygen	[(20.946-X%) / (20.946-O2%)]	
CO	ppmv	Carbon Monoxide		
Co	ft	Outer Circumference of Circular Stack		
Ci	ft	Inner Circumference of Circular Stack		
CO2	%	Carbon Dioxide		
Cp		Pitot tube coefficient		
Ct	lb/hr	Particulate Mass Emissions	[60 cg Qsd/ 7,000]	
dH	in H2O	Pressure differential across orifice		
Dn	in	Diameter, Nozzle		
dp^½		Average square root of velocity pressure		
Ds	in	Diameter, Stack		
E	lb / MMBtu	Pollutant Emission Rate	Cgas Fd MWgas (20.946 / (20.946-O2%)) / (1,000,000 C1)	
Fd	dscf / MMBtu	F Factor for Various Fuels		Table 19-1
I	%	Percent Isokinetic	[C2 Ts(abs) Vm(std) / (vs Ps mfg An Ø)]	Eq. 5-8*
Md	lbm / lbmole	Molecular weight, Dry Stack Gas	[(1-%O2-%CO2)(MWn2+ar)+(%O2 MWo2)+(%CO2 MWco2)	Eq. 3-1*
mfg		Mole fraction of dry stack gas	[1-Bws/100]	
Mgas	lbm/hr	Gaseous Mass Emisisons	[60 Cgas(ppmv) MW Pstd(2) Qsd / 1,000,000 R Tstd]	
mn	mg	Particulate lab sample weight		
Ms	lbm / lbmole	Molecular weight, Wet Stack	[Md mfg +MWh2o (1-mfg)]	Eq. 2-5
MW	lbm / lbmole	Molecular Weight		
NO2	ppmv-NO2	Nitrogen Dioxide (General Reporting Basis for NOx)		
NOx	ppmv-NO2	Nitrogen Oxides (Reported as NO2)		
O2	%	Oxygen		
OPC	%	Opacity		
Pbar	in Hg	Pressure, Barometric		
Pg	in H2O	Pressure, Static Stack		
Po	in Hg	Pressure, Absolute across Orifice	[Pbar+dH/13.5955]	
Ps	in Hg	Pressure, Absolute Stack	[Pbar+Pg/13.5955]	Eq. 2-6*
Qa	acf/min	Volumetric Flowrate, Actual	[As vs / 144]	
Qsd	dscf/min	Volumetric Flowrate, Dry Standard	[Qa Tstd mfg Ps] / [Pstd(1) Ts(abs)]	Eq 2-10*
Rf	MMBtu/hr		[1,000,000 Mgas (20.946-O2)]/ [Cd Fd 20.946]	
SO2	ppmv-SO2	Sulfur Dioxide		
t	in	Wall thickness of a stack or duct		
TGOC	ppmv-C	Total Gaseous Organic Concentration (Reported as C)		
Tm	°F	Temperature, Dry gas meter		
Tm(abs)	°R	Temperature, Absolute Dry Meter	[Tm + 459.67]	
Ts	°F	Temperature, Stack gas		
Ts(abs)	°R	Temperature, Absolute Stack gas	[Ts + 459.67]	
Vlc	ml	Volume of condensed water		
Vm	dcf	Volume, Gas sample		
Vm(std)	dscf	Volume, Dry standard gas sample	[Y Vm Tstd Po]/ [Pstd(1) Tm(abs)]	Eq. 5-1
vs	fpm	Velocity, Stack gas	Kp Cp dp^½ [Ts(abs) / (Ps Ms)]^ ½	Eq. 2-9*
Vw(std)	scf	Volume, Water Vapor	0.04707 Vlc	Eq. 5-2
Y		Dry gas meter calibration factor		Fig. 5.6
Ø	min	Time, Total sample		

* Based on equation.

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DRIFT CORRECTION DOCUMENTATION

EPA Drift Equations:

- Method 3A: Oxygen and Carbon Dioxide

$$C_{gas} = \frac{(C_{ma} - C_{oa})(C - C_m) + C_{ma}}{(C_m - C_o)} \qquad \text{(Eq. 3A-1)}$$

- Method 6C: Sulfur Dioxide

$$C_{gas} = \frac{C_{ma}(C - C_o)}{(C_m - C_o)} \qquad \text{where } C_{oa} = 0 \qquad \text{(Eq. 6C-1)}$$

- Method 7E: Nitrogen Oxides, Section 8 of Method 7E states: "Follow Section 8 of Method 6C (Eq. 6C-1)"
- Method 10: Carbon Monoxide, the EPA does not currently address Gas Filter Correlation instruments, therefore there are no current standards.
- Method 25A: Total Gaseous Organic Concentration (TGOC), this method does not mention correcting for drift although there are established limits.

Horizon Engineering Drift Correction Equations:

$$C_{gas} = \frac{(C_{id} - Z_x)(C_{ma} - C_{oa})}{(S_x - Z_x)} \qquad S_x = \frac{C_{mf} - C_{mi})(T_x - T_{ci})}{(T_{cf} - T_{ci})} + C_{mi}$$

$$Z_x = \frac{(C_{of} - C_{oi})(T_x - T_{ci})}{(T_{cf} - T_{ci})} - + C_{oi} \qquad T_x = \frac{(T_{te} - T_{ts})}{2} + T_{ts}$$

EPA	Definition	Horizon
C_{gas}	Effluent gas concentration, dry basis	C_{gas}
C_{ma}	Actual upscale calibration gas concentration	C_{ma}
C_{oa}	Actual zero/low calibration gas concentration	C_{oa}
C_m	Average of initial and final system upscale calibration bias responses	
	Initial system upscale calibration bias response	C_{mi}
	Final system upscale calibration bias response	C_{mf}
C_o	Average of initial and final system zero/low calibration bias responses	
	Initial system zero/low calibration bias response	C_{oi}
	Final system zero/low calibration bias response	C_{of}
C	Average gas concentration indicated by gas analyzer, dry basis	C_{id}
	Starting test time	T_{ts}
	Ending test time	T_{te}
	Initial system bias calibration response time	T_{ci}
	Final system bias calibration response time	T_{cf}
	Mid-point of test time or gas sampling interval to be analyzed	T_x
	Approximate upscale response at mid-point test time	S_x
	Approximate zero/low response at mid-point test time	Z_x

Notes or exceptions:
TGOC is first recorded on a wet basis, then corrected to a dry basis
The TGOC instruments used by Horizon have some historic data on instrument response to different hydrocarbons. For propane the response is 1 to 1 molecule while methane is 1.037 to 1 molecule. We correct for the instrument's "over response" to methane.

KILN V.0.C. DATA

Hampton Lumber - Kiln Testing - Hemlock Run -1

End	09:17:56	63.1953	
Start	18:06:13	Max >	209.766
Test Duration	15:11:43	Min >	101.766
Test Time	3791.72		108.000
1st-Air (Y)	0.983	VMc	
Board Ft	47.61	27.07	bft
Pre-P	*101.33*		kPa
Post-P	*101.33*		kPa
Avg-P	101.33		kPa
	29.92		inHg
	760.00		mmHg
Meter	18:06:13		Start
Readings	09:17:56		End
	3791.72		min
Pre-1st Air	272.830		ft3
Post-1st Air	1691.320		ft3
Total-1st Air	1418.490		ft3
Rate 1st-Air	0.374		acfm
V1(std)	1600.649		dscf
V1	1418.490		acf
Pre-2nd-Air			ft3
Post-2nd Air			ft3
Total-2nd Air			ft3
Rate 2nd-Air			acfm
V2(std)			dscf
V2			acf
Rate Total	0.374		acfm
Vt(std)	1600.649		dscf
Vt	1418.490		acf
Factor	1		
Pre-TFR	1	1.00	lpm
Pre-SFR	1	1.00	lpm
Post-SFR	1	1.00	lpm
Post-TFR	1	1.00	lpm
Dilution	3.1000	TGOC Analyzer	

	Mid-Point Interval Time	Interval Mass				A	B	E	J	I		D	C	H
						Kiln Air	Kiln Water	Wood Water	Inlet Air Moisture	Avg Psycho	Moisture Corrected TGOC	43.84 Inlet	7231.53 Inlet	
	1.00 Hour	Start lbm	End lbm	Displaced lbm	Vc wscf	VMc dscf	VWc scf	VWW scf	BWSi %	BWSc %	ppmv-c IR(i)	VWi scf	VMi dscf	Ve wscf
1	18:35:57	209.77	209.77	0.00	24.37	23.18	1.19	0.000	1.06	4.89	17.78	0.00	0.00	0.00
2	19:35:57	209.77	209.46	0.31	22.98	18.94	4.05	6.597	1.05	17.60	40.82	0.34	32.50	39.11
3	20:35:56	209.46	207.31	2.15	22.21	13.69	8.51	46.004	1.03	38.34	62.14	0.79	75.26	122.05
4	21:35:56	207.31	203.93	3.38	21.79	10.77	11.01	72.205	1.02	50.55	68.34	0.74	71.37	144.31
5	22:35:55	203.93	199.69	4.24	21.61	9.76	11.85	90.595	1.01	54.84	69.17	0.77	75.25	166.61
6	23:35:55	199.69	195.15	4.55	21.56	9.75	11.81	97.302	1.00	54.79	68.50	0.82	80.96	179.08
7	00:35:54	195.15	190.68	4.47	21.54	9.74	11.80	95.570	1.00	54.79	67.23	0.80	79.52	175.89
8	01:35:54	190.68	186.03	4.65	21.50	9.80	11.70	99.441	1.00	54.42	65.47	0.85	83.99	184.28
9	02:35:53	186.03	181.20	4.83	21.48	10.10	11.38	103.348	1.00	53.00	65.48	0.93	92.49	196.77
10	03:35:53	181.20	176.41	4.79	21.45	10.22	11.23	102.414	0.99	52.35	65.73	0.94	94.08	197.44
11	04:35:52	176.41	171.84	4.56	21.43	10.49	10.93	97.618	0.98	51.03	63.87	0.94	94.58	193.14
12	05:35:51	171.84	167.18	4.67	21.41	10.98	10.42	99.830	0.97	48.69	61.80	1.05	106.29	207.17
13	06:35:51	167.18	162.67	4.51	21.27	11.17	10.10	96.376	0.97	47.49	62.30	1.05	107.73	205.16
14	07:35:50	162.67	158.37	4.30	21.18	11.39	9.80	91.997	0.96	46.24	64.49	1.05	108.17	201.22
15	08:35:50	158.37	154.46	3.90	21.17	11.99	9.18	83.512	0.97	43.38	59.77	1.08	110.41	195.00
16	09:35:49	154.46	151.00	3.47	21.23	12.58	8.65	74.162	0.96	40.75	55.26	1.06	109.39	184.62
17	10:35:49	151.00	149.09	1.91	21.46	11.91	9.55	40.831	0.99	44.51	84.00	0.51	51.54	92.88
18	11:35:48	149.09	147.53	1.55	21.46	11.25	10.20	33.256	1.00	47.55	107.80	0.38	37.10	70.73
19	12:35:48	147.53	145.75	1.79	21.42	11.36	10.07	38.180	1.03	46.98	105.41	0.45	43.59	82.22
20	13:35:47	145.75	143.96	1.79	21.21	10.39	10.82	38.211	1.05	51.00	109.68	0.39	37.09	75.69
21	14:35:47	143.96	142.17	1.79	21.19	9.81	11.38	38.261	1.03	53.71	94.56	0.34	33.28	71.88
22	15:35:46	142.17	140.21	1.97	21.21	11.82	9.39	42.036	1.03	44.29	63.74	0.56	53.57	96.17
23	16:35:46	140.21	137.75	2.46	21.20	14.00	7.20	52.588	1.01	33.95	47.49	1.06	104.37	158.01
24	17:35:45	137.75	135.69	2.06	21.18	14.34	6.84	44.064	0.99	32.27	46.52	0.95	94.46	139.48
25	18:35:45	135.69	133.77	1.92	21.17	14.59	6.58	41.113	1.01	31.10	46.17	0.95	93.21	135.27
26	19:35:44	133.77	131.77	1.99	21.17	14.82	6.35	42.589	1.01	29.99	45.82	1.04	101.86	145.49
27	20:35:44	131.77	129.61	2.17	21.17	15.27	5.90	46.381	1.00	27.86	45.21	1.25	123.32	170.95
28	21:35:43	129.61	127.76	1.84	21.17	15.53	5.64	39.383	0.99	26.64	44.52	1.11	111.54	152.04
29	22:35:43	127.76	126.08	1.69	21.17	15.82	5.35	36.114	0.98	25.28	44.16	1.09	109.95	147.15
30	23:35:42	126.08	124.52	1.55	21.17	15.94	5.22	33.202	0.97	24.67	43.14	1.03	104.50	138.73
31	00:35:41	124.52	123.03	1.49	21.16	16.12	5.04	31.895	0.96	23.81	40.22	1.02	105.29	138.20
32	01:35:41	123.03	121.70	1.33	21.16	16.28	4.87	28.459	0.93	23.04	40.00	0.92	98.15	127.53
33	02:35:40	121.70	120.41	1.29	21.16	16.46	4.69	27.552	0.91	22.18	39.74	0.91	99.86	128.32
34	03:35:40	120.41	118.99	1.42	21.16	16.68	4.47	30.447	0.89	21.14	36.87	1.05	117.50	149.00
35	04:35:39	118.99	117.65	1.34	21.16	16.82	4.33	28.735	0.87	20.48	35.93	1.02	115.51	145.26
36	05:35:39	117.65	116.12	1.52	21.16	17.07	4.08	32.595	0.87	19.30	35.71	1.24	141.50	175.34
37	06:35:38	116.12	114.65	1.47	21.16	17.29	3.87	31.421	0.88	18.29	34.14	1.29	146.14	178.85
38	07:35:38	114.65	113.43	2.45	21.16	17.41	3.74	52.367	0.87	17.69	32.01	2.23	253.96	308.55
39	08:35:37	113.43	112.26	2.34	21.16	17.61	3.55	50.100	0.88	16.78	31.88	2.30	259.82	312.23
40	09:35:37	112.26	111.37	1.78	21.16	17.78	3.39	38.056	0.82	16.00	31.85	1.73	208.88	248.67
41	10:35:36	111.37	110.40	1.93	21.16	17.85	3.31	41.363	0.82	15.65	28.67	1.92	233.28	276.56
42	11:35:36	110.40	109.44	1.93	21.16	17.96	3.20	41.259	0.86	15.12	28.09	2.12	243.48	286.85
43	12:35:35	109.44	108.43	2.01	21.16	18.08	3.09	43.007	0.93	14.58	28.54	2.50	266.63	312.14
44	13:35:35	108.43	107.55	1.77	21.17	18.14	3.03	37.856	0.98	14.30	26.82	2.38	241.04	281.28
45	14:35:35	107.55	106.80	1.50	21.16	18.22	2.94	32.051	1.01	13.90	26.55	2.16	211.86	246.07
46	15:35:34	106.80	106.19	1.21	21.16	18.29	2.87	25.805	1.03	13.57	26.33	1.84	175.99	203.63
47	16:35:27	106.19	106.13	0.14	21.69	20.09	1.59	2.980	1.06	7.35	14.95	0.47	43.43	46.87
48	17:35:20	106.13	105.95	0.34	21.13	18.56	2.57	7.362	1.04	12.18	24.61	0.60	57.47	65.44
49	18:35:21	105.95	105.80	0.31	21.12	18.34	2.78	6.629	1.03	13.14	28.82	0.49	47.03	54.15
50	19:35:19	105.80	105.70	0.20	21.12	18.37	2.75	4.282	1.01	13.02	27.29	0.31	30.68	35.28
51	20:35:18	105.70	105.51	0.37	21.12	18.50	2.62	7.994	0.99	12.41	25.25	0.61	60.69	69.29
52	21:35:18	105.51	105.18	0.67	21.12	18.58	2.53	14.285	0.96	11.99	24.93	1.09	112.84	128.22
53	22:35:18	105.18	104.95	0.46	21.11	18.67	2.44	9.770	0.94	11.57	24.29	0.76	80.53	91.07
54	23:35:16	104.95	104.73	0.44	21.11	18.76	2.35	9.320	0.92	11.14	23.65	0.75	80.29	90.35
55	00:35:16	104.73	104.43	0.60	21.12	18.85	2.27	12.826	0.90	10.74	23.01	1.05	115.28	129.16
56	01:35:15	104.43	104.31	0.25	21.12	18.92	2.20	5.381	0.89	10.42	22.39	0.45	50.18	56.01
57	02:35:15	104.31	104.19	0.23	21.11	18.97	2.15	5.022	0.87	10.17	21.77	0.42	48.11	53.55
58	03:35:14	104.19	103.86	0.65	21.11	19.00	2.11	13.954	0.85	10.00	21.17	1.16	136.06	151.17
59	04:35:14	103.86	103.43	0.87	21.11	19.14	1.97	18.539	0.82	9.32	20.53	1.63	196.10	216.26
60	05:35:13	103.43	103.06	0.73	21.11	19.22	1.89	15.692	0.81	8.94	19.92	1.42	174.27	191.37
61	06:35:13	103.06	102.64	0.84	21.11	19.27	1.84	17.953	0.80	8.72	19.32	1.66	205.24	224.85
62	07:35:12	102.64	102.25	0.79	21.11	19.30	1.80	16.895	0.80	8.55	18.74	1.61	197.98	216.48
63	08:35:12	102.25	101.91	0.67	21.11	19.40	1.72	14.316	0.82	8.14	18.14	1.46	178.08	193.86
64	09:11:41	101.91	101.77	0.28	21.12	19.44	1.68	6.019	0.81	7.95	16.99	0.63	77.03	83.68

Hampton Lumber - Kiln Testing - Hemlock Run -1

End	09:17:56	63.195	
Start	18:06:13	Max >	209.766
Test Duration	15:11:43	Min >	101.766
Test Time	3791.72		108.000
1st-Air (Y)	0.983	VMCx	
Board Ft	47.61	27.02	bft
Pre-P	*101.33*		kPa
Post-P	*101.33*		kPa
Avg-P	101.33		kPa
	29.92		inHg
	760.00		mmHg
Meter	18:06:13		Start
Readings	09:17:56		End
	3791.72		min
Pre-1st Air	272.830		ft3
Post-1st Air	1691.320		ft3
Total-1st Air	1418.490		ft3
Rate 1st-Air	0.374		acfm
V1(std)	1600.649		dscf
V1	1418.490		acf
Pre-2nd-Air			ft3
Post-2nd Air			ft3
Total-2nd Air			ft3
Rate 2nd-Air			acfm
V2(std)			dscf
V2			acf
Rate Total	0.374		acfm
Vt(std)	1600.649		dscf
Vt	1418.490		acf
Factor	1		
Pre-TFR	1	1.00	lpm
Pre-SFR	1	1.00	lpm
Post-SFR	1	1.00	lpm
Post-TFR	1	1.00	lpm
Dilution	3.1000	TGOC Analyzer	

	Mid-Point Interval Time	Total Air	TGOC	TGOC	TGOC	TGOC	TGOC		
	1.00 Hour	dscfm Q(std)	lbm-C/m Interval	lbm-C Interval	lbm-C/Mdbft Interval	lbm-C/Mdbft Accum	lbm-C Accum	lbm-H2O	lbm-C/ MlbmH2O
1	18:35:57	0.00	0.000E+00	0.000E+00	0.00000	0.00000	0.000E+00	0.000	
2	19:35:57	0.54	7.115E-07	4.269E-05	0.00090	0.00090	4.269E-05	0.308	0.138
3	20:35:56	1.25	3.238E-06	1.943E-04	0.00408	0.00498	2.370E-04	2.459	0.096
4	21:35:56	1.19	4.131E-06	2.479E-04	0.00521	0.01018	4.849E-04	5.835	0.083
5	22:35:55	1.25	4.789E-06	2.873E-04	0.00604	0.01622	7.722E-04	10.071	0.077
6	23:35:55	1.35	5.086E-06	3.052E-04	0.00641	0.02263	1.077E-03	14.620	0.074
7	00:35:54	1.33	4.897E-06	2.938E-04	0.00617	0.02880	1.371E-03	19.089	0.072
8	01:35:54	1.40	4.987E-06	2.992E-04	0.00629	0.03509	1.670E-03	23.738	0.070
9	02:35:53	1.54	5.321E-06	3.193E-04	0.00671	0.04179	1.990E-03	28.570	0.070
10	03:35:53	1.57	5.352E-06	3.211E-04	0.00675	0.04854	2.311E-03	33.358	0.069
11	04:35:52	1.58	5.082E-06	3.049E-04	0.00640	0.05494	2.616E-03	37.922	0.069
12	05:35:51	1.77	5.269E-06	3.162E-04	0.00664	0.06158	2.932E-03	42.590	0.069
13	06:35:51	1.80	5.228E-06	3.137E-04	0.00659	0.06817	3.246E-03	47.096	0.069
14	07:35:50	1.80	5.285E-06	3.171E-04	0.00666	0.07483	3.563E-03	51.397	0.069
15	08:35:50	1.84	4.745E-06	2.847E-04	0.00598	0.08081	3.847E-03	55.302	0.070
16	09:35:49	1.82	4.164E-06	2.499E-04	0.00525	0.08606	4.097E-03	58.769	0.070
17	10:35:49	0.86	3.219E-06	1.931E-04	0.00406	0.09012	4.290E-03	60.678	0.071
18	11:35:48	0.62	3.146E-06	1.888E-04	0.00396	0.09408	4.479E-03	62.233	0.072
19	12:35:48	0.73	3.570E-06	2.142E-04	0.00450	0.09858	4.693E-03	64.018	0.073
20	13:35:47	0.62	3.385E-06	2.031E-04	0.00427	0.10285	4.896E-03	65.805	0.074
21	14:35:47	0.55	2.769E-06	1.661E-04	0.00349	0.10634	5.063E-03	67.593	0.075
22	15:35:46	0.89	2.500E-06	1.500E-04	0.00315	0.10949	5.213E-03	69.559	0.075
23	16:35:46	1.74	3.059E-06	1.836E-04	0.00386	0.11335	5.396E-03	72.017	0.075
24	17:35:45	1.57	2.642E-06	1.585E-04	0.00333	0.11668	5.555E-03	74.078	0.075
25	18:35:45	1.55	2.543E-06	1.526E-04	0.00320	0.11988	5.707E-03	76.000	0.075
26	19:35:44	1.70	2.713E-06	1.628E-04	0.00342	0.12330	5.870E-03	77.991	0.075
27	20:35:44	2.06	3.146E-06	1.888E-04	0.00396	0.12726	6.059E-03	80.160	0.076
28	21:35:43	1.86	2.755E-06	1.653E-04	0.00347	0.13074	6.224E-03	82.001	0.076
29	22:35:43	1.83	2.645E-06	1.587E-04	0.00333	0.13407	6.383E-03	83.690	0.076
30	23:35:42	1.74	2.436E-06	1.461E-04	0.00307	0.13714	6.529E-03	85.242	0.077
31	00:35:41	1.75	2.262E-06	1.357E-04	0.00285	0.13999	6.665E-03	86.733	0.077
32	01:35:41	1.64	2.076E-06	1.245E-04	0.00262	0.14261	6.789E-03	88.064	0.077
33	02:35:40	1.66	2.074E-06	1.245E-04	0.00261	0.14522	6.914E-03	89.352	0.077
34	03:35:40	1.96	2.235E-06	1.341E-04	0.00282	0.14804	7.048E-03	90.775	0.078
35	04:35:39	1.93	2.123E-06	1.274E-04	0.00268	0.15071	7.175E-03	92.119	0.078
36	05:35:39	2.36	2.547E-06	1.528E-04	0.00321	0.15392	7.328E-03	93.643	0.078
37	06:35:38	2.44	2.484E-06	1.490E-04	0.00313	0.15705	7.477E-03	95.112	0.079
38	07:35:38	4.23	4.018E-06	2.411E-04	0.00506	0.16212	7.718E-03	97.560	0.079
39	08:35:37	4.33	4.049E-06	2.429E-04	0.00510	0.16722	7.961E-03	99.903	0.080
40	09:35:37	3.48	3.223E-06	1.934E-04	0.00406	0.17128	8.154E-03	101.682	0.080
41	10:35:36	3.89	3.227E-06	1.936E-04	0.00407	0.17535	8.348E-03	103.616	0.081
42	11:35:36	4.06	3.278E-06	1.967E-04	0.00413	0.17948	8.545E-03	105.545	0.081
43	12:35:35	4.44	3.624E-06	2.175E-04	0.00457	0.18405	8.762E-03	107.556	0.081
44	13:35:35	4.02	3.070E-06	1.842E-04	0.00387	0.18792	8.946E-03	109.326	0.082
45	14:35:35	3.53	2.658E-06	1.595E-04	0.00335	0.19127	9.106E-03	110.824	0.082
46	15:35:34	3.95	2.941E-06	1.309E-04	0.00275	0.19402	9.237E-03	112.031	0.082
47	16:35:27	1.40	5.656E-07	1.753E-05	0.00037	0.19439	9.254E-03	112.170	0.083
48	17:35:20	0.96	6.543E-07	3.926E-05	0.00082	0.19521	9.293E-03	112.514	0.083
49	18:35:21	0.78	6.338E-07	3.803E-05	0.00080	0.19601	9.331E-03	112.824	0.083
50	19:35:19	0.51	3.909E-07	2.345E-05	0.00049	0.19650	9.355E-03	113.024	0.083
51	20:35:18	1.01	7.104E-07	4.262E-05	0.00090	0.19740	9.398E-03	113.398	0.083
52	21:35:18	1.88	1.298E-06	7.785E-05	0.00164	0.19903	9.475E-03	114.066	0.083
53	22:35:18	1.34	8.980E-07	5.388E-05	0.00113	0.20016	9.529E-03	114.523	0.083
54	23:35:16	1.34	8.674E-07	5.204E-05	0.00109	0.20126	9.581E-03	114.958	0.083
55	00:35:16	1.92	1.207E-06	7.240E-05	0.00152	0.20278	9.654E-03	115.558	0.084
56	01:35:15	0.84	5.091E-07	3.055E-05	0.00064	0.20342	9.684E-03	115.810	0.084
57	02:35:15	0.80	4.733E-07	2.840E-05	0.00060	0.20402	9.713E-03	116.045	0.084
58	03:35:14	2.27	1.299E-06	7.794E-05	0.00164	0.20565	9.791E-03	116.697	0.084
59	04:35:14	3.27	1.802E-06	1.081E-04	0.00227	0.20792	9.899E-03	117.564	0.084
60	05:35:13	2.90	1.547E-06	9.284E-05	0.00195	0.20987	9.992E-03	118.297	0.084
61	06:35:13	3.42	1.764E-06	1.058E-04	0.00222	0.21210	1.010E-02	119.137	0.085
62	07:35:12	3.30	1.646E-06	9.877E-05	0.00207	0.21417	1.020E-02	119.927	0.085
63	08:35:12	2.97	1.427E-06	8.565E-05	0.00180	0.21597	1.028E-02	120.596	0.085
64	09:11:41	5.93	2.665E-06	3.464E-05	0.00073	0.21670	1.032E-02	120.877	0.085

Hampton Lumber - Kiln Testing - Hemlock Run -1

End	09:17:56	63.195	
Start	18:06:13	Max >	209.760
Test Duration	15:11:43	Min >	101.766
Test Time	3791.72		108.000
1st-Air (Y)	0.983	VMC>	
Board Ft	47.61	27.02	bft
Pre-P	*101.33*		kPa
Post-P	*101.33*		kPa
Avg-P	101.33		kPa
	29.92		inHg
	760.00		mmHg
Meter	18:06:13		Start
Readings	09:17:56		End
	3791.72		min
Pre-1st Air	272.830		ft3
Post-1st Air	1691.320		ft3
Total-1st Air	1418.490		ft3
Rate 1st-Air	0.374		acfm
V1(std)	1600.649		dscf
V1	1418.490		acf
Pre-2nd-Air			ft3
Post-2nd Air			ft3
Total-2nd Air			ft3
Rate 2nd-Air			acfm
V2(std)			dscf
V2			acf
Rate Total	0.374		acfm
Vt(std)	1600.649		dscf
Vt	1418.490		acf
Factor	1		
Pre-TFR	1	1.00	lpm
Pre-SFR	1	1.00	lpm
Post-SFR	1	1.00	lpm
Post-TFR	1	1.00	lpm
Dilution	3.1000	TGOC Analyzer	

	Mid-Point Interval Time	Interval Data - Drift Corrected						Moisture				
		Mass	TGOC	37.04 Humidity	149.70 Kiln	209.26 Kiln	71.14 Ambiant	Ambient	Analyzer	Kiln	Wood	Wood Dry Basis
	1.00 Hour	lbm M	ppmv-c IR(i)	% RH	F Twb	F Tdb	F Ta	%MCa	%MCan	%MCk	%MCw	%MCw
1	18:35:57	209.77	17.50	40.03	97.24	125.36	72.07	1.06%	1.58%	4.89%	51.49%	106.13%
2	19:35:57	209.46	38.51	39.70	137.15	160.71	72.01	1.05%	5.68%	17.60%	51.34%	105.82%
3	20:35:56	207.31	54.45	39.22	168.19	182.31	71.86	1.03%	12.37%	38.34%	50.31%	103.71%
4	21:35:56	203.93	57.20	39.43	181.07	194.78	71.46	1.02%	16.31%	50.55%	48.70%	100.39%
5	22:35:55	199.69	56.93	39.46	185.08	200.10	71.11	1.01%	17.69%	54.84%	46.68%	96.23%
6	23:35:55	195.15	56.40	39.37	185.06	201.54	70.87	1.00%	17.67%	54.79%	44.52%	91.76%
7	00:35:54	190.68	55.35	39.35	185.08	202.38	70.74	1.00%	17.67%	54.79%	42.39%	87.37%
8	01:35:54	186.03	53.98	39.54	184.77	203.48	70.60	1.00%	17.56%	54.42%	40.17%	82.80%
9	02:35:53	181.20	54.29	39.93	183.49	204.12	70.41	1.00%	17.10%	53.00%	37.87%	78.05%
10	03:35:53	176.41	54.63	39.96	182.92	205.05	70.13	0.99%	16.89%	52.35%	35.58%	73.35%
11	04:35:52	171.84	53.36	39.82	181.72	205.76	69.94	0.98%	16.46%	51.03%	33.41%	68.86%
12	05:35:51	167.18	52.09	39.79	179.52	206.37	69.74	0.97%	15.71%	48.69%	31.18%	64.27%
13	06:35:51	162.67	52.76	39.74	178.44	210.55	69.54	0.97%	15.32%	47.49%	29.03%	59.85%
14	07:35:50	158.37	54.87	39.77	177.28	213.43	69.43	0.96%	14.92%	46.24%	26.98%	55.62%
15	08:35:50	154.46	51.41	39.88	174.41	213.74	69.44	0.97%	13.99%	43.38%	25.12%	51.78%
16	09:35:49	151.00	48.00	40.80	171.61	211.95	68.68	0.96%	13.14%	40.75%	23.47%	48.38%
17	10:35:49	149.09	71.94	40.08	175.37	204.80	69.95	0.99%	14.36%	44.51%	22.56%	46.50%
18	11:35:48	147.53	91.26	39.88	178.39	204.75	70.56	1.00%	15.34%	47.55%	21.82%	44.97%
19	12:35:48	145.75	89.43	40.01	177.86	205.88	71.14	1.03%	15.16%	46.98%	20.97%	43.22%
20	13:35:47	143.96	91.63	39.83	181.81	212.61	71.90	1.05%	16.45%	51.00%	20.12%	41.46%
21	14:35:47	142.17	78.18	38.82	184.28	213.28	71.98	1.03%	17.33%	53.71%	19.26%	39.71%
22	15:35:46	140.21	54.63	38.90	175.31	212.52	71.97	1.03%	14.29%	44.29%	18.33%	37.77%
23	16:35:46	137.75	42.29	38.80	163.93	212.79	71.40	1.01%	10.95%	33.95%	17.15%	35.36%
24	17:35:45	135.69	41.68	37.74	161.90	213.47	71.91	0.99%	10.41%	32.27%	16.17%	33.33%
25	18:35:45	133.77	41.54	37.44	160.43	213.74	72.69	1.01%	10.03%	31.10%	15.26%	31.44%
26	19:35:44	131.77	41.39	37.03	159.01	213.89	72.88	1.01%	9.67%	29.99%	14.31%	29.49%
27	20:35:44	129.61	41.15	37.38	156.18	213.84	72.39	1.00%	8.99%	27.86%	13.27%	27.36%
28	21:35:43	127.76	40.69	37.63	154.49	213.84	71.83	0.99%	8.59%	26.64%	12.39%	25.55%
29	22:35:43	126.08	40.56	37.82	152.56	213.80	71.34	0.98%	8.15%	25.28%	11.59%	23.89%
30	23:35:42	124.52	39.71	38.25	151.68	213.94	70.90	0.97%	7.96%	24.67%	10.85%	22.36%
31	00:35:41	123.03	37.13	38.15	150.41	214.00	70.42	0.96%	7.68%	23.81%	10.14%	20.90%
32	01:35:41	121.70	37.03	37.87	149.24	214.16	69.82	0.93%	7.43%	23.04%	9.50%	19.59%
33	02:35:40	120.41	36.90	37.64	147.92	214.21	69.23	0.91%	7.16%	22.18%	8.89%	18.32%
34	03:35:40	118.99	34.36	37.45	146.26	214.21	68.78	0.89%	6.82%	21.14%	8.21%	16.93%
35	04:35:39	117.65	33.55	37.43	145.19	214.25	68.32	0.87%	6.61%	20.48%	7.57%	15.61%
36	05:35:39	116.12	33.49	37.50	143.21	214.22	68.15	0.87%	6.23%	19.30%	6.84%	14.11%
37	06:35:38	114.65	32.13	37.86	141.46	214.28	68.08	0.88%	5.90%	18.29%	6.14%	12.66%
38	07:35:38	113.43	30.19	38.12	140.40	214.26	67.68	0.87%	5.71%	17.69%	5.56%	11.46%
39	08:35:37	112.26	30.15	38.59	138.74	214.21	67.64	0.88%	5.41%	16.78%	5.00%	10.31%
40	09:35:37	111.37	30.21	39.21	137.26	214.07	65.24	0.82%	5.16%	16.00%	4.58%	9.44%
41	10:35:36	110.40	27.23	38.70	136.59	214.03	65.48	0.82%	5.05%	15.65%	4.12%	8.49%
42	11:35:36	109.44	26.72	38.06	135.56	214.05	67.48	0.86%	4.88%	15.12%	3.66%	7.54%
43	12:35:35	108.43	27.19	37.20	134.48	214.04	70.27	0.93%	4.70%	14.58%	3.18%	6.55%
44	13:35:35	107.55	25.58	36.43	133.92	213.96	72.39	0.98%	4.61%	14.30%	2.76%	5.68%
45	14:35:35	106.80	25.36	35.36	133.10	214.05	74.28	1.01%	4.48%	13.90%	2.40%	4.94%
46	15:35:34	106.19	25.17	34.64	132.42	214.05	75.56	1.03%	4.38%	13.57%	2.11%	4.35%
47	16:35:27	106.13	14.60	34.00	115.66	197.78	77.04	1.06%	2.37%	7.35%	2.08%	4.28%
48	17:35:20	*105.95*	23.64	33.66	129.47	215.00	76.67	1.04%	3.93%	12.18%	2.00%	4.11%
49	18:35:21	*105.80*	27.60	33.59	131.60	215.44	76.30	1.03%	4.24%	13.14%	1.92%	3.96%
50	19:35:19	*105.70*	26.14	33.32	131.35	215.46	76.03	1.01%	4.20%	13.02%	1.87%	3.86%
51	20:35:18	105.51	24.24	32.99	130.03	215.43	75.73	0.99%	4.00%	12.41%	1.79%	3.68%
52	21:35:18	105.18	23.96	32.83	129.11	215.53	74.98	0.96%	3.87%	11.99%	1.63%	3.35%
53	22:35:18	104.95	23.39	32.90	128.15	215.66	74.28	0.94%	3.73%	11.57%	1.52%	3.13%
54	23:35:16	104.73	22.80	32.89	127.17	215.64	73.68	0.92%	3.59%	11.14%	1.41%	2.91%
55	00:35:16	104.43	22.21	32.69	126.22	215.53	73.17	0.90%	3.46%	10.74%	1.27%	2.62%
56	01:35:15	104.31	21.63	33.18	125.44	215.50	72.52	0.89%	3.36%	10.42%	1.21%	2.49%
57	02:35:15	104.19	21.06	33.14	124.86	215.62	71.91	0.87%	3.28%	10.17%	1.15%	2.38%
58	03:35:14	103.86	20.48	32.93	124.43	215.61	71.12	0.85%	3.23%	10.00%	1.00%	2.06%
59	04:35:14	103.43	19.91	32.55	122.75	215.64	70.64	0.82%	3.01%	9.32%	0.79%	1.63%
60	05:35:13	103.06	19.34	32.47	121.76	215.70	70.15	0.81%	2.88%	8.94%	0.62%	1.27%
61	06:35:13	102.64	18.78	32.71	121.20	215.72	69.81	0.80%	2.81%	8.72%	0.42%	0.86%
62	07:35:12	102.25	18.22	32.91	120.73	215.77	69.68	0.80%	2.76%	8.55%	0.23%	0.47%
63	08:35:12	101.91	17.66	33.15	119.62	215.58	69.89	0.82%	2.63%	8.14%	0.07%	0.14%
64	09:11:41	101.77	16.56	33.09	119.08	215.44	69.81	0.81%	2.56%	7.95%	0.00%	0.01%

Hampton Lumber - Kiln Testing - Hemlock Run -2

End	09:39:08	46.901	
Start	10:45:03	Max >	112.716
Test Duration	22:54:05	Min >	63.588
Test Time	2814.08		49.128
1st-Air (Y)	0.983	VMC1	
Board Ft	28.56	28.61	bft
Pre-P	101.33		kPa
Post-P	101.33		kPa
Avg-P	101.33		kPa
	29.92		inHg
	760.00		mmHg
Meter	10:45:03		Start
Readings	09:39:08		End
	2814.08		min
Pre-1st Air	846.700		ft3
Post-1st Air	1315.140		ft3
Total-1st Air	468.440		ft3
Rate 1st-Air	0.166		acfm
V1(std)	528.596		dscf
V1	468.440		acf
Pre-2nd-Air			ft3
Post-2nd Air			ft3
Total-2nd Air			ft3
Rate 2nd-Air			acfm
V2(std)			dscf
V2			acf
Rate Total	0.166		acfm
Vt(std)	528.596		dscf
Vt	468.440		acf
Dilution	3.1000	TGOC Analyzer	

	Mid-Point Interval Time	Interval Mass				A	B	E	J	I		D	C	H
						Kiln Air	Kiln Water	Wood Water	Inlet Air Moisture	Avg Psycho	Moisture Corrected TGOC	18.40 Inlet	4434.53 Inlet	
	1.00 Hour	Start lbm	End lbm	Displaced lbm	Vc wscf	VMc dscf	VWc scf	VWW scf	BWSi %	BWSc %	ppmv-c IR(i)	VWi scf	VMi dscf	Ve wscf
1	11:14:48	112.72	112.71	0.01	26.22	24.40	1.82	0.165	0.82	6.94	6.45	0.02	2.48	2.67
2	12:14:47	112.71	111.86	0.85	23.91	17.77	6.14	18.120	0.86	25.69	18.90	0.47	53.78	72.37
3	13:14:47	111.86	109.31	2.55	23.21	13.75	9.46	54.558	0.90	40.75	32.05	0.73	80.38	135.67
4	14:14:48	109.31	105.89	3.42	23.11	13.24	9.87	73.123	0.91	42.72	35.55	0.91	99.25	173.29
5	15:14:46	105.89	102.59	3.30	22.96	13.13	9.83	70.574	0.91	42.83	34.92	0.88	95.38	166.83
6	16:14:46	102.59	99.10	3.49	22.79	13.26	9.53	74.740	0.93	41.82	33.24	0.99	105.33	181.06
7	17:14:45	99.10	96.17	2.93	22.60	13.75	8.85	62.580	0.93	39.17	29.98	0.92	98.63	162.13
8	18:14:45	96.17	93.59	2.58	22.58	14.19	8.39	55.136	0.93	37.15	28.32	0.89	94.77	150.79
9	19:14:44	93.59	91.48	2.11	22.57	14.62	7.95	45.194	0.89	35.24	26.67	0.76	84.46	130.41
10	20:14:44	91.48	89.19	2.29	22.56	15.22	7.35	48.880	0.87	32.56	25.72	0.91	103.14	152.93
11	21:14:43	89.19	87.30	1.90	22.56	15.73	6.83	40.636	0.85	30.27	25.42	0.82	95.50	136.96
12	22:14:42	87.30	85.54	1.76	22.55	16.21	6.35	37.585	0.83	28.15	23.42	0.83	98.06	136.47
13	23:14:42	85.54	83.99	1.54	22.55	16.57	5.98	33.022	0.81	26.53	23.19	0.77	93.57	127.36
14	00:14:41	83.99	82.69	1.30	22.54	16.89	5.65	27.846	0.80	25.08	22.97	0.69	85.25	113.78
15	01:14:41	82.69	81.45	1.24	22.55	17.19	5.36	26.500	0.78	23.78	21.50	0.69	87.12	114.31
16	02:14:40	81.45	80.20	1.25	22.55	17.50	5.05	26.810	0.77	22.39	21.42	0.74	95.49	123.04
17	03:14:40	80.20	78.99	1.21	22.54	17.76	4.78	25.789	0.76	21.19	20.64	0.75	98.70	125.25
18	04:14:39	78.99	77.93	1.07	22.53	17.99	4.54	22.851	0.74	20.15	19.58	0.70	93.32	116.87
19	05:14:38	77.93	76.60	1.33	22.53	18.31	4.22	28.380	0.72	18.73	19.54	0.92	127.17	156.47
20	06:14:38	76.60	75.46	1.14	22.53	18.53	4.00	24.347	0.70	17.76	18.75	0.82	116.56	141.73
21	07:14:37	75.46	74.43	1.03	22.53	18.78	3.75	21.933	0.69	16.62	17.79	0.80	114.00	136.73
22	08:14:37	74.43	73.25	1.18	22.54	19.05	3.49	25.314	0.70	15.48	17.80	1.01	143.74	170.06
23	09:14:36	73.25	72.36	0.89	22.54	19.22	3.31	18.974	0.73	14.71	18.49	0.85	114.97	134.80
24	10:14:36	72.36	71.46	0.90	22.54	19.39	3.15	19.233	0.73	13.98	16.31	0.91	123.94	144.09
25	11:14:35	71.46	70.75	0.72	22.54	19.47	3.07	15.333	0.75	13.63	16.01	0.78	102.12	118.23
26	12:14:34	70.75	70.06	0.69	22.54	19.53	3.00	14.802	0.80	13.33	18.03	0.82	101.60	117.22
27	13:14:34	70.06	69.51	0.55	22.53	19.64	2.90	11.753	0.83	12.87	15.88	0.71	84.37	96.83
28	14:14:33	69.51	68.92	0.59	22.53	19.69	2.84	12.595	0.86	12.61	15.57	0.81	92.88	106.28
29	15:14:33	68.92	68.46	0.45	22.53	19.80	2.73	9.688	0.87	12.14	15.55	0.66	74.91	85.26
30	16:14:32	68.46	68.42	0.05	22.54	19.87	2.67	1.032	0.86	11.85	15.36	0.07	8.20	9.31
31	17:14:32	68.42	68.38	0.03	22.52	19.81	2.72	0.728	0.84	12.07	15.26	0.05	5.65	6.43
32	18:14:32	68.38	68.35	0.03	22.53	19.84	2.69	0.644	0.83	11.92	15.22	0.04	5.07	5.76
33	19:14:31	68.35	67.91	0.44	22.53	19.92	2.60	9.451	0.81	11.54	15.23	0.63	77.26	87.34
34	20:14:30	67.91	67.22	0.70	22.53	20.06	2.47	14.867	0.80	10.98	15.21	1.04	129.01	144.92
35	21:14:30	67.22	66.94	0.27	22.53	20.17	2.36	5.840	0.80	10.48	13.81	0.43	53.60	59.87
36	22:14:30	66.94	66.84	0.11	22.52	20.20	2.32	2.281	0.80	10.31	13.74	0.17	21.34	23.80
37	23:14:29	66.84	66.43	0.41	22.52	20.29	2.23	8.689	0.79	9.90	13.77	0.68	85.25	94.62
38	00:14:28	66.43	66.15	0.55	22.52	20.29	2.22	11.756	0.78	9.87	12.28	0.91	115.58	128.24
39	01:14:28	66.15	65.87	0.56	22.53	20.44	2.09	11.966	0.76	9.28	12.06	0.96	126.47	139.40
40	02:14:27	65.87	65.58	0.60	22.52	20.47	2.05	12.756	0.73	9.09	12.17	1.01	137.65	151.42
41	03:14:26	65.58	65.24	0.68	22.52	20.51	2.01	14.598	0.71	8.92	11.82	1.16	160.84	176.59
42	04:14:26	65.24	65.06	0.34	22.51	20.54	1.97	7.365	0.69	8.77	10.33	0.58	82.66	90.60
43	05:14:25	65.06	64.78	0.56	22.51	20.63	1.89	11.935	0.69	8.38	10.37	0.97	141.17	154.08
44	06:14:25	64.78	64.67	0.23	22.51	20.64	1.87	4.867	0.69	8.30	10.44	0.40	58.21	63.48
45	07:14:25	64.67	64.41	0.52	22.51	20.71	1.80	11.139	0.70	8.01	10.48	0.98	139.22	151.34
46	08:14:24	64.41	64.04	0.75	22.52	20.77	1.75	15.977	0.72	7.75	8.90	1.51	208.13	225.62
47	09:11:54	64.04	63.83	0.42	22.52	20.78	1.74	9.015	0.75	7.72	8.80	0.89	118.34	128.24

Hampton Lumber - Kiln Testing - Hemlock Run -2

End	09:39:08	46.901	
Start	10:45:03	Max >	112.716
Test Duration	22:54:05	Min >	63.588
Test Time	2814.08		49.128
1st-Air (Y)	0.983	VMC%	
Board Ft	28.56	28.61	bft
Pre-P	101.33		kPa
Post-P	101.33		kPa
Avg-P	101.33		kPa
	29.92		inHg
	760.00		mmHg
Meter	10:45:03		Start
Readings	09:39:08		End
	2814.08		min
Pre-1st Air	846.700		ft3
Post-1st Air	1315.140		ft3
Total-1st Air	468.440		ft3
Rate 1st-Air	0.166		acfm
V1(std)	528.596		dscf
V1	468.440		acf
Pre-2nd-Air			ft3
Post-2nd Air			ft3
Total-2nd Air			ft3
Rate 2nd-Air			acfm
V2(std)			dscf
V2			acf
Rate Total	0.166		acfm
Vt(std)	528.596		dscf
Vt	468.440		acf
Dilution	3.1000	TGOC Analyzer	

	Mid-Point Interval Time	Interval Data - Drift Corrected						Moisture				
		Mass	TGOC	26.92 Humidity	138.67 Kiln	206.15 Kiln	75.36 Ambiant	Ambient	Analyzer	Kiln	Wood	Wood Dry Basis
	1.00 Hour	lbm M	ppmv-c IR(i)	% RH	F Twb	F Tdb	F Ta	%MCa	%MCan	%MCk	%MCw	%MCw
1	11:14:48	112.71	6.31	32.79	104.67	116.09	70.51	0.82%	2.24%	6.94%	43.58%	77.25%
2	12:14:47	111.86	17.33	32.63	151.41	171.67	72.01	0.86%	8.29%	25.69%	42.83%	75.92%
3	13:14:47	109.31	27.84	32.05	171.09	190.55	73.95	0.90%	13.15%	40.75%	40.56%	71.90%
4	14:14:48	105.89	30.65	30.53	173.27	193.59	75.47	0.91%	13.78%	42.72%	37.53%	66.53%
5	15:14:46	102.59	30.10	29.32	173.48	197.76	76.81	0.91%	13.82%	42.83%	34.60%	61.34%
6	16:14:46	99.10	28.75	28.69	172.53	202.66	78.09	0.93%	13.49%	41.82%	31.50%	55.84%
7	17:14:45	96.17	26.19	27.93	169.80	208.33	78.82	0.93%	12.63%	39.17%	28.91%	51.24%
8	18:14:45	93.59	24.92	27.90	167.56	208.76	78.81	0.93%	11.98%	37.15%	26.62%	47.19%
9	19:14:44	91.48	23.64	27.46	165.35	209.05	78.18	0.89%	11.37%	35.24%	24.75%	43.87%
10	20:14:44	89.19	23.02	27.34	162.12	209.29	77.67	0.87%	10.50%	32.56%	22.72%	40.27%
11	21:14:43	87.30	22.94	27.04	159.23	209.56	77.27	0.85%	9.76%	30.27%	21.03%	37.28%
12	22:14:42	85.54	21.29	26.93	156.41	209.63	76.74	0.83%	9.08%	28.15%	19.47%	34.52%
13	23:14:42	83.99	21.21	26.77	154.18	209.73	76.14	0.81%	8.56%	26.53%	18.10%	32.09%
14	00:14:41	82.69	21.12	26.96	152.11	209.90	75.43	0.80%	8.09%	25.08%	16.95%	30.04%
15	01:14:41	81.45	19.85	27.13	150.18	209.76	74.66	0.78%	7.67%	23.78%	15.85%	28.10%
16	02:14:40	80.20	19.87	27.18	148.04	209.78	73.98	0.77%	7.22%	22.39%	14.74%	26.12%
17	03:14:40	78.99	19.23	27.34	146.15	210.09	73.34	0.76%	6.84%	21.19%	13.67%	24.23%
18	04:14:39	77.93	18.30	27.44	144.45	210.26	72.75	0.74%	6.50%	20.15%	12.72%	22.55%
19	05:14:38	76.60	18.36	27.17	142.02	210.34	72.13	0.72%	6.04%	18.73%	11.54%	20.46%
20	06:14:38	75.46	17.68	27.06	140.31	210.33	71.43	0.70%	5.73%	17.76%	10.53%	18.67%
21	07:14:37	74.43	16.84	27.10	138.22	210.37	71.03	0.69%	5.36%	16.62%	9.62%	17.06%
22	08:14:37	73.25	16.91	27.03	136.02	210.10	71.20	0.70%	4.99%	15.48%	8.57%	15.20%
23	09:14:36	72.36	17.61	27.60	134.48	210.10	72.12	0.73%	4.74%	14.71%	7.79%	13.80%
24	10:14:36	71.46	15.57	28.18	133.00	210.00	71.44	0.73%	4.51%	13.98%	6.99%	12.39%
25	11:14:35	70.75	15.30	28.33	132.26	210.03	72.17	0.75%	4.40%	13.63%	6.35%	11.26%
26	12:14:34	70.06	17.26	28.32	131.63	210.09	73.98	0.80%	4.30%	13.33%	5.74%	10.17%
27	13:14:34	69.51	15.22	27.96	130.65	210.19	75.40	0.83%	4.15%	12.87%	5.25%	9.31%
28	14:14:33	68.92	14.94	27.54	130.10	210.24	77.11	0.86%	4.07%	12.61%	4.73%	8.38%
29	15:14:33	68.46	14.94	26.49	129.04	210.20	78.58	0.87%	3.91%	12.14%	4.33%	7.67%
30	16:14:32	68.42	14.77	25.05	128.39	210.08	79.86	0.86%	3.82%	11.85%	4.28%	7.59%
31	17:14:32	68.38	14.66	24.20	128.91	210.49	80.32	0.84%	3.89%	12.07%	4.25%	7.54%
32	18:14:32	68.35	14.63	24.08	128.58	210.42	80.09	0.83%	3.85%	11.92%	4.23%	7.49%
33	19:14:31	67.91	14.66	23.78	127.71	210.46	79.67	0.81%	3.72%	11.54%	3.83%	6.80%
34	20:14:30	67.22	14.67	23.78	126.38	210.30	79.31	0.80%	3.54%	10.98%	3.22%	5.70%
35	21:14:30	66.94	13.34	24.02	125.19	210.42	78.92	0.80%	3.38%	10.48%	2.98%	5.28%
36	22:14:30	66.84	13.28	24.60	124.79	210.54	78.29	0.80%	3.33%	10.31%	2.88%	5.11%
37	23:14:29	66.43	13.33	24.91	123.79	210.67	77.53	0.79%	3.19%	9.90%	2.52%	4.47%
38	00:14:28	66.15	11.88	25.20	123.72	210.68	76.65	0.78%	3.19%	9.87%	2.28%	4.04%
39	01:14:28	65.87	11.70	25.06	122.18	210.40	75.98	0.76%	2.99%	9.28%	2.03%	3.60%
40	02:14:27	65.58	11.81	24.92	121.72	210.54	75.13	0.73%	2.93%	9.09%	1.76%	3.13%
41	03:14:26	65.24	11.48	24.83	121.28	210.70	74.45	0.71%	2.88%	8.92%	1.46%	2.59%
42	04:14:26	65.06	10.04	24.63	120.88	210.85	73.86	0.69%	2.83%	8.77%	1.31%	2.32%
43	05:14:25	64.78	10.09	24.75	119.84	210.86	73.36	0.69%	2.70%	8.38%	1.06%	1.88%
44	06:14:25	64.67	10.16	25.17	119.63	210.82	72.95	0.69%	2.68%	8.30%	0.96%	1.70%
45	07:14:25	64.41	10.21	25.82	118.82	210.79	72.70	0.70%	2.58%	8.01%	0.73%	1.29%
46	08:14:24	64.04	8.67	26.66	118.08	210.60	72.73	0.72%	2.50%	7.75%	0.40%	0.71%
47	09:11:54	63.83	8.58	27.35	118.02	210.74	72.97	0.75%	2.49%	7.72%	0.21%	0.37%

Hampton Lumber - Kiln Testing - Hemlock Run -2

End	09:39:08	46.901	
Start	10:45:03	Max >	112.716
Test Duration	22:54:05	Min >	63.588
Test Time	2814.08		49.128
1st-Air (Y)	0.983	VMCx	
Board Ft	28.56	28.61	bft
Pre-P	101.33		kPa
Post-P	101.33		kPa
Avg-P	101.33		kPa
	29.92		inHg
	760.00		mmHg
Meter	10:45:03		Start
Readings	09:39:08		End
	2814.08		min
Pre-1st Air	846.700		ft3
Post-1st Air	1315.140		ft3
Total-1st Air	468.440		ft3
Rate 1st-Air	0.166		acfm
V1(std)	528.596		dscf
V1	468.440		acf
Pre-2nd-Air			ft3
Post-2nd Air			ft3
Total-2nd Air			ft3
Rate 2nd-Air			acfm
V2(std)			dscf
V2			acf
Rate Total	0.166		acfm
Vt(std)	528.596		dscf
Vt	468.440		acf
Dilution	3.1000	TGOC Analyzer	

	Mid-Point Interval Time	Total Air	TGOC	TGOC	TGOC	TGOC	TGOC		
	1.00 Hour	dscfm Q(std)	lbm-C/m Interval	lbm-C Interval	lbm-C/Mdbft Interval	lbm-C/Mdbft Accum	lbm-C Accum	lbm-H2O	lbm-C/ MlbmH2O
1	11:14:48	0.04	8.194E-09	4.916E-07	0.00002	0.00002	4.916E-07	0.008	
2	12:14:47	0.90	5.939E-07	3.563E-05	0.00125	0.00126	3.613E-05	0.855	0.042
3	13:14:47	1.34	1.833E-06	1.100E-04	0.00385	0.00512	1.461E-04	3.406	0.043
4	14:14:48	1.65	2.585E-06	1.551E-04	0.00543	0.01055	3.012E-04	6.825	0.044
5	15:14:46	1.59	2.429E-06	1.458E-04	0.00510	0.01565	4.470E-04	10.124	0.044
6	16:14:46	1.76	2.491E-06	1.494E-04	0.00523	0.02088	5.964E-04	13.619	0.044
7	17:14:45	1.64	1.995E-06	1.197E-04	0.00419	0.02507	7.161E-04	16.544	0.043
8	18:14:45	1.58	1.751E-06	1.051E-04	0.00368	0.02875	8.212E-04	19.122	0.043
9	19:14:44	1.41	1.426E-06	8.554E-05	0.00299	0.03174	9.067E-04	21.235	0.043
10	20:14:44	1.72	1.612E-06	9.671E-05	0.00339	0.03513	1.003E-03	23.521	0.043
11	21:14:43	1.59	1.426E-06	8.556E-05	0.00300	0.03812	1.089E-03	25.421	0.043
12	22:14:42	1.63	1.309E-06	7.855E-05	0.00275	0.04087	1.168E-03	27.178	0.043
13	23:14:42	1.56	1.210E-06	7.259E-05	0.00254	0.04342	1.240E-03	28.722	0.043
14	00:14:41	1.42	1.070E-06	6.422E-05	0.00225	0.04566	1.304E-03	30.024	0.043
15	01:14:41	1.45	1.007E-06	6.040E-05	0.00211	0.04778	1.365E-03	31.263	0.044
16	02:14:40	1.59	1.079E-06	6.475E-05	0.00227	0.05005	1.430E-03	32.516	0.044
17	03:14:40	1.65	1.058E-06	6.349E-05	0.00222	0.05227	1.493E-03	33.722	0.044
18	04:14:39	1.56	9.362E-07	5.617E-05	0.00197	0.05423	1.549E-03	34.790	0.045
19	05:14:38	2.12	1.251E-06	7.506E-05	0.00263	0.05686	1.624E-03	36.117	0.045
20	06:14:38	1.94	1.087E-06	6.524E-05	0.00228	0.05915	1.689E-03	37.256	0.045
21	07:14:37	1.90	9.953E-07	5.972E-05	0.00209	0.06124	1.749E-03	38.281	0.046
22	08:14:37	2.40	1.239E-06	7.432E-05	0.00260	0.06384	1.824E-03	39.465	0.046
23	09:14:36	1.92	1.020E-06	6.120E-05	0.00214	0.06598	1.885E-03	40.352	0.047
24	10:14:36	2.07	9.621E-07	5.772E-05	0.00202	0.06800	1.942E-03	41.251	0.047
25	11:14:35	1.70	7.747E-07	4.648E-05	0.00163	0.06963	1.989E-03	41.968	0.047
26	12:14:34	1.69	8.652E-07	5.191E-05	0.00182	0.07145	2.041E-03	42.660	0.048
27	13:14:34	1.41	6.293E-07	3.776E-05	0.00132	0.07277	2.079E-03	43.210	0.048
28	14:14:33	1.55	6.772E-07	4.063E-05	0.00142	0.07419	2.119E-03	43.798	0.048
29	15:14:33	1.25	5.424E-07	3.255E-05	0.00114	0.07533	2.152E-03	44.251	0.049
30	16:14:32	0.14	5.852E-08	3.511E-06	0.00012	0.07545	2.155E-03	44.300	0.049
31	17:14:32	0.09	4.014E-08	2.408E-06	0.00008	0.07554	2.158E-03	44.334	0.049
32	18:14:32	0.08	3.583E-08	2.150E-06	0.00008	0.07561	2.160E-03	44.364	0.049
33	19:14:31	1.29	5.442E-07	3.265E-05	0.00114	0.07676	2.192E-03	44.806	0.049
34	20:14:30	2.15	9.021E-07	5.413E-05	0.00189	0.07865	2.247E-03	45.501	0.049
35	21:14:30	0.89	3.383E-07	2.030E-05	0.00071	0.07936	2.267E-03	45.774	0.050
36	22:14:30	0.36	1.337E-07	8.023E-06	0.00028	0.07964	2.275E-03	45.880	0.050
37	23:14:29	1.42	5.328E-07	3.197E-05	0.00112	0.08076	2.307E-03	46.287	0.050
38	00:14:28	1.93	6.438E-07	3.863E-05	0.00135	0.08211	2.346E-03	46.836	0.050
39	01:14:28	2.11	6.877E-07	4.126E-05	0.00144	0.08356	2.387E-03	47.396	0.050
40	02:14:27	2.29	7.539E-07	4.523E-05	0.00158	0.08514	2.432E-03	47.992	0.051
41	03:14:26	2.68	8.537E-07	5.122E-05	0.00179	0.08693	2.483E-03	48.675	0.051
42	04:14:26	1.38	3.828E-07	2.297E-05	0.00080	0.08774	2.506E-03	49.019	0.051
43	05:14:25	2.35	6.534E-07	3.920E-05	0.00137	0.08911	2.545E-03	49.577	0.051
44	06:14:25	0.97	2.709E-07	1.625E-05	0.00057	0.08968	2.562E-03	49.805	0.051
45	07:14:25	2.32	6.485E-07	3.891E-05	0.00136	0.09104	2.601E-03	50.325	0.052
46	08:14:24	3.47	8.210E-07	4.926E-05	0.00172	0.09277	2.650E-03	51.072	0.052
47	09:11:54	2.15	5.032E-07	2.768E-05	0.00097	0.09374	2.678E-03	51.494	0.052

LUMBER DRYING VOC ANALYSIS
SAMPLE COLLECTION DATA SHEET

a.) Company Name: Hampton Lumber Mills - Cowlitz Morton Div.
Address: Morton WA
Telephone Number: (360) 496-5115 Ext. 140
Contact Person: Joe Hellem

b.) Date of sample preparation: 8-9-99
Responsible person collecting the sample: Joe Hellem
Signature of the responsible person: Joseph Hellem

c.) Species of the lumber: Hem Fir

d.) Total number of pieces shipped: 48 Total board feet: 1006/F

e.) Dry kiln identification in which this lumber is normally dried: 16 - 18 %
(Identify more than one kiln, if appropriate.)

f.) Normal drying schedule for this lumber.
Ramp up-temperature and time: 180° - 48 hrs, humidity: 150°,
Total drying time: 50 hrs, Maximum drying temperature: 180° °F.

g.) Final moisture content for this lumber: 16° - 18° %

h.) How is the final moisture determined? We check it with a Wagner 612.

i) Estimated initial moisture content (wet basis): 50 %

Joe H 8-9-99 D. Horn

Client: HAMPTON LUMBER
Species: ~~DOUGLAS FIR~~ HEMLOCK
Run: 1
Start Time: 1802
Start Date: 30 AUGUST 1999
Y of meter: 0.98300

Pbar						
Date	8-30-99	8-31	9-1			

# of boards: 30
dim of boards: AVG $3\frac{1}{2} \times 3\frac{3}{4} \times 1\frac{5}{8}$
dim of total load:
Bdft (note if dry or wet):

DILUTED

JUM #	actual	start bias	end bias		
span	871	874/291	290.6	313.3	325
mid	492	475/162	157.3	167	177
mid	311	293/101	98.8	102	108
zero	50.4	44.2/15.9	16.8	15.6	17
time & date	0.0	0.1/0.0	0.1	1.03	1.21
		1750, 8-30	0900-8-31	0845-9-1	1550-9-1

LOAD CELL	actual	start check	end check	
high	50.0	-0.23	5.50	5.08
zero	0.0	50.1	55.5	54.97
time & date		1715, 8-30-99	1602, 9-1-99	0926-9-2

Meter Reading	Time	Date	Load Weight	VOC
272.43	1809	8-30	208.0	2.6
411.09	0855	9-1	155.51	15.54

Client: HAMPTON LUMBER
Species: HEMLOCK
Run: 1 – CONT'D
Start Time: 16
Start Date: 9-1-99
Y of meter:

Pbar						
Date	9-1	9-2				

# of boards: 30
dim of boards:
dim of total load:
Bdft (note if dry or wet):

JUM #	actual	start bias	end bias
span	871	874 / 286	/ 313
mid	492	491 / 157	/ 164.
mid	311	290 / 99	/ 104
zero	~~50.4~~	~~48.37~~ / 14.5	/ 15.0
time & date	0.0	0.0 / 00	/ 0.12

1613-9-1-99.

LOAD CELL	actual	start check	end check
high	55.50		~~54.98~~ 54.97
zero	5.50		~~5.05~~ 5.08
time & date	1602-9-1-99		0926-9-2

Meter Reading	Time	Date	Load Weight

Hampton Lumber

CIRC FAN = 30 Hz.

TIME	MTR	MTR °F	AMBIENT °F	% HUMIDITY	HOT LINE	FILTER OVN ~~COOLING~~
1810	272.83	70°	71.8°	40.2%	251°	261°
1825	274.83	70°	72.1°	40%	251°	260°
0855	411.09	68°	69.4	40.2%	252°	259°
1253	447.53	69°	71.4	39.7	253°	260°
1403 – CHANGED AIR SUPPLY – CIRC FAN STOPPED						
1412	459.86	70°	71.5°	39	254	261
1531 – CHANGED SPEED OF CIRC FAN = 60 Hz						
1608	477.54	70°	71.8°	39%	252°	261°
0836	626.97	67°	68°	38%	250°	260°
1207	658.51	67°	69.2°	37%	249°	260°
1415	677.43	72°	74°	36%	250	261°
1549	691.32	72°	76°	34%	251	261

TIME	LOAD	VOC	OVN DRY	OVN WT	OVN MECH	DIL Q
1812	208.3	2.8	102°F	80.6°F	102°F	2.8
1825	209.5	3.7	120.4	90.6	125°F	2.8
0855	155.51	15.54	213.5°	175.1°	217°	2.8
1253	140.02	28.94	204.7	178.1	212°	2.8
1412	147	29.4	213°	185°	218°	2.8
1608	142.1	13.73	212.3°	167.8°	218°	2.8
0836	117.09	10.8	214.5°	138.6°	219°	2.8
1207	114.4	11.	214.2	135°	220	2.8
1415	112.3	9.8	214.3	131°	220	2.8
1549	111.4	9.8	214	130	219	2.8

Hampton Lumber

TIME	MTR	MTR °F	AMB °F	% RH	HOT LINE	FILTR OVN
1639	695.92	76°	77.3°	34%	253°	262°
9-0916	843.49	68°F	69.9	33%	250	259

TIME	LOAD	VOC	OVN DRY	OVN WT	OVN MECH	DIL Q
1640	111.75	3.7	205°	117.3°	211°	2.8
0916	106.56	5.0	215.2	120	221	2.8

Hampton Lumber

#1 = $3\frac{3}{4} \times 1\frac{5}{8} \times 37\frac{5}{8}$"

$3\frac{5}{8} \times 1\frac{5}{8} \times 37\frac{5}{8}$

$3\frac{3}{4} \times 1\frac{5}{8} \times 37\frac{3}{8}$

$3\frac{3}{4} \times 1\frac{11}{16} \times 37\frac{7}{16}$

@ 1750			DILUTED @ 2.8
	0.0 =	0.1 ppm	0.0
C_3H_8	871 =	874	291
	492 =	475	162
	311 =	293	101
	50.4 =	44.2	15.9

GAS MIX @ 1802 = 271.33 FT^3 @ 70°F

COMBF

Hampton Lumber

AIR = 34
H_2/He = 65

1648 ZERO ADJUST, ZERO = -0.06
SPAN, SPAN 871 = ~~[illegible]~~ 874
CHECK 492 = 480
311 = 297
50.4 = 43
DILUTED - 871 CAL GAS = 293 ppm C_3H_8

1715 LOAD CELL = 0.0 LBS - -0.23
50.0 LBS = ~~51.0 LBS~~. 49.3/50.6

164
3/492
3
19
18
12

2 = 454 ppm / 871
3 = 269
4 = 63.5.

2.8 POTAMUS = 293

	B4	AFTER
#1 DERMHORST =	25% + 26%	<10 + <10
2	31 + 32%	32+32
3	28 + 25%	22+25
		@1600

Client: HAMPTON LUMBER
Species: HEMLOCK
Run: 2
Start Time: 1042
Start Date: 9-2-99
Y of meter: 0.98300

Pbar	✓	✓	✓			
Date	9-2	9-3	9-4			

# of boards: 18
dim of boards: $37\frac{1}{2} \times 1\frac{5}{8} \times 3\frac{3}{4}$
dim of total load:
Bdft (note if dry or wet):

DILUTED W/AIR

JUM #	actual	start bias		end bias	
span	492	491	162		179
mid	311	299	100		109
mid	50.4	49.4	15.3		15.7
zero	0.0	0.0	0.1		-0.08
time & date					

1038 9-2 9-4 0930

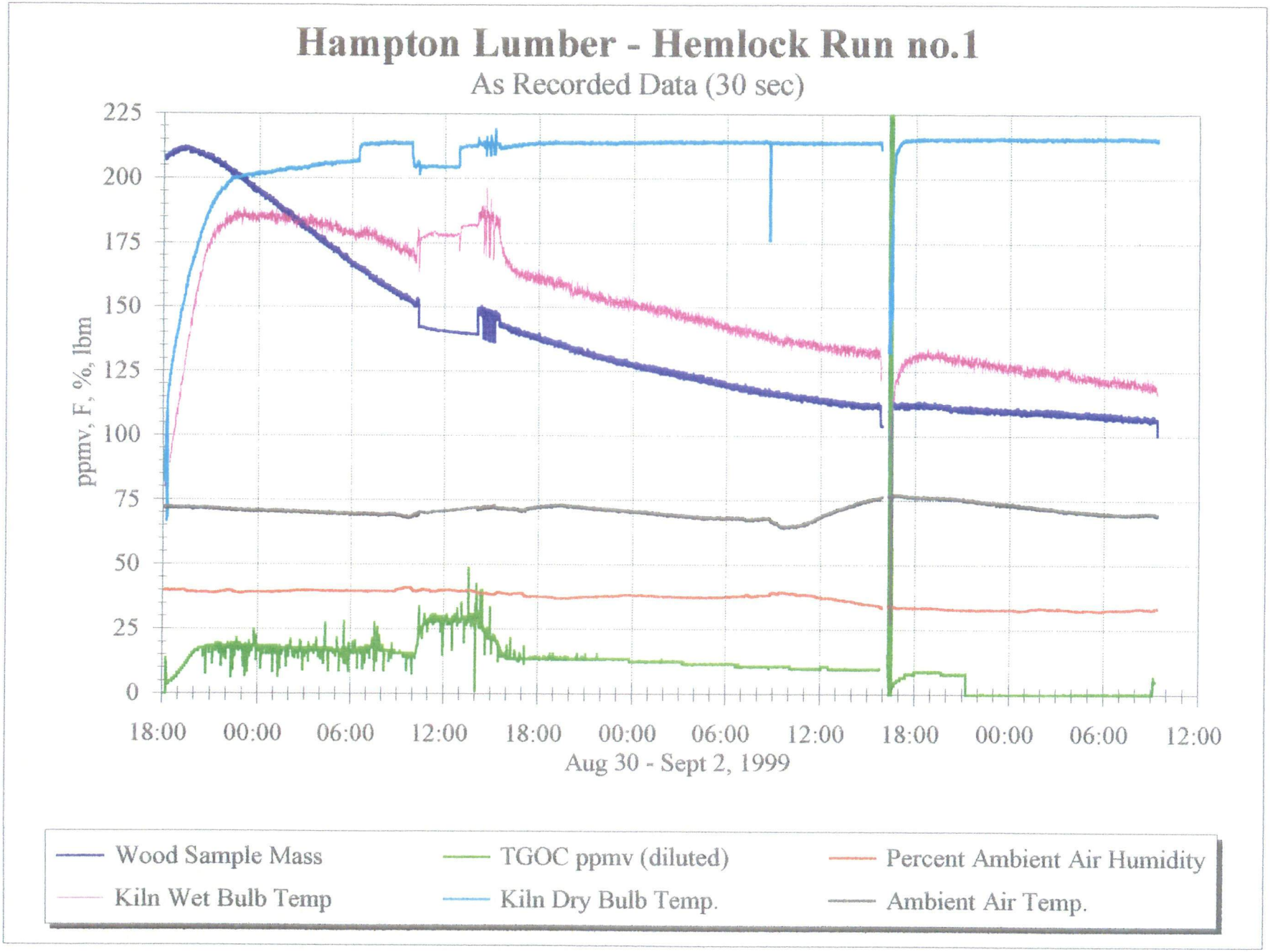
LOAD CELL	actual	start check		end check
high	50.0	50.91		52.40
zero	0.0	0.5		2.35
time & date		9-2 ~~0945~~		9-4, 0950

Meter Reading	Time	Date	Load Weight	VOC
845.10	1040	9-2	105.12.	1.3
1315.14	0940	9-4	65.06	2.6

HAMPTON LUMBER
RUN #2
HEMLOCK.

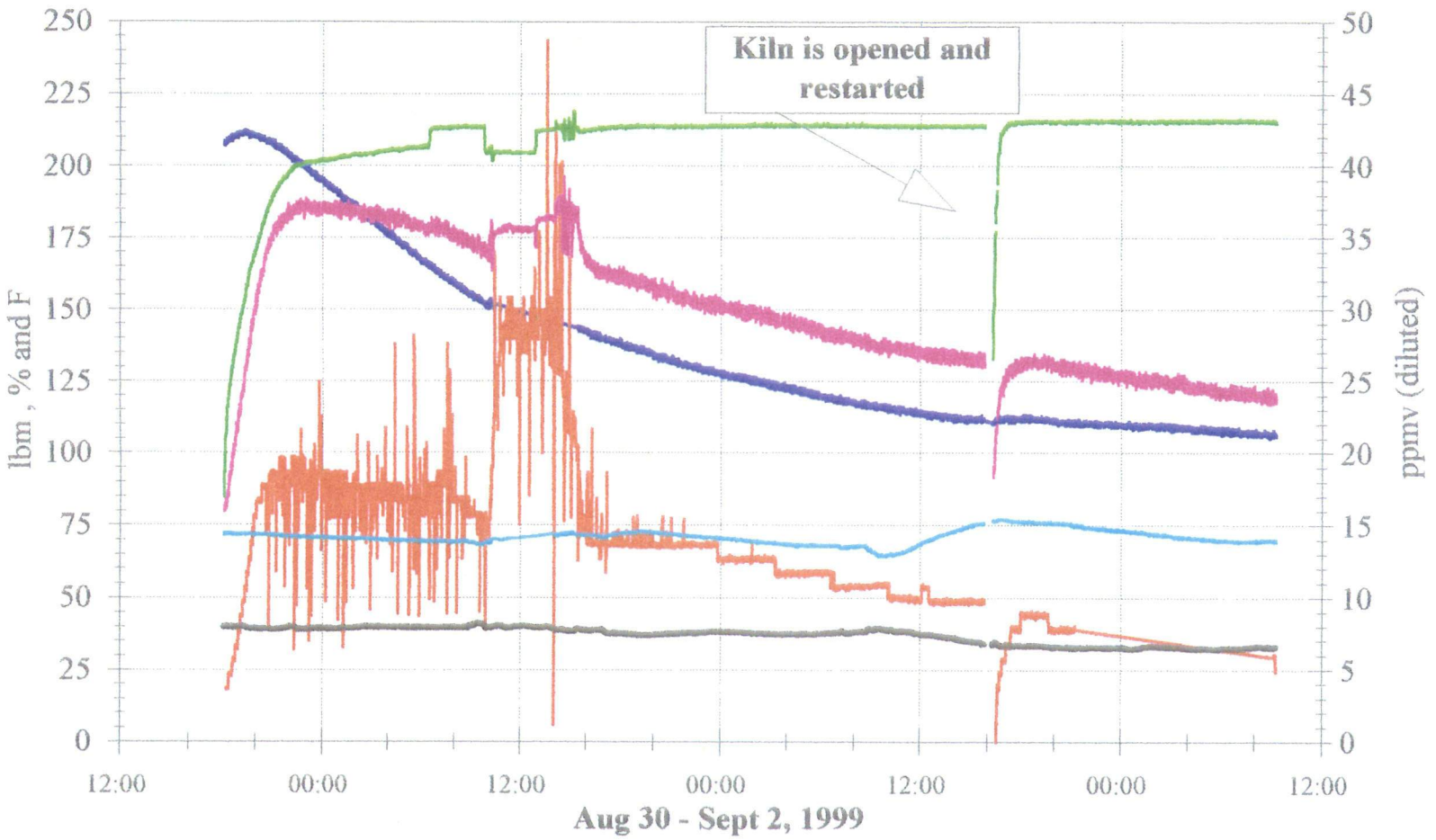
TIME	MTR	MECH MTR °F	AMB °F	% RH	HOT LINE °F	FILTER °F
1051	846.7	68°	70°	32.15	248°	260°
1125	852.6	69°	70.5°	33	251°	260°
1220	862.19	70°	72.3°	32.5%	251	261°
1345	876.95	73°	74.8°	31.7	251°	261°
1543	897.4	76°	77.5°	29%	253°	260°
1654	910	76°	78.5	28	252°	260°
0835	68.95	70°	71.7°	27%	250°	259°
1144	100.20	71°	72.8°	28.4	250°	261°
1300	112.73	74°	75.2°	28	249	260°
0940	315.14	72°	73.2	27	252	261

TIME	LOAD	VOC	OVN DRY°	OVN WET°	OVN MECH	DIL Q
052	113.31	1.3	96°	89.4°	104°	2.8
1125	114	2.2	132°	111	145°	2.8
220	112.7 LBS	5.8	172.4°	154.7°	185°	2.8
1345	109.6	9.6	192.4	171.7	205°	2.8
1543	102	9.0	199.3	171.5	212°	2.8
1654	99	8.1	207.9	171.2	214°	2.8
0836	74.5	5.3	210	134	215°	2.8
1145	73.1	5.1	210	135°	215°	2.8
1300	72.54	4.7	210	132°	215°	2.8
0940	65.06	2.6	210	117.9°	215°	2.8


Hampton Lumber - Hemlock Run no.1
As Recorded Data (30 sec)
ppmv, F, %, lbm
225
200
175
150
125
100
75
50
25
0
18:00
00:00
06:00
12:00
18:00
00:00
06:00
12:00
18:00
00:00
06:00
12:00
Aug 30 - Sept 2, 1999
Wood Sample Mass
TGOC ppmv (diluted)
Percent Ambient Air Humidity
Kiln Wet Bulb Temp
Kiln Dry Bulb Temp.
Ambient Air Temp.

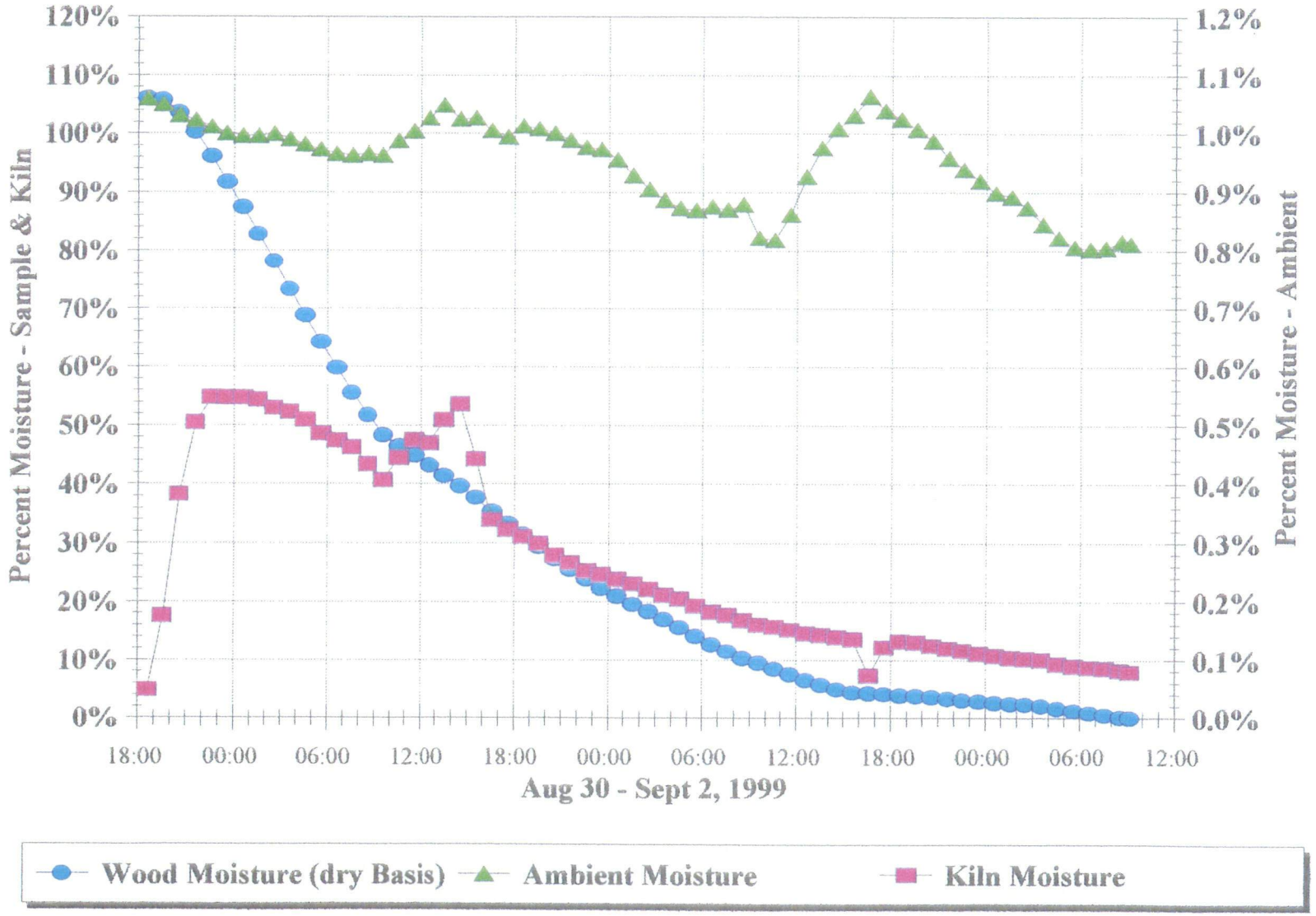
Hampton Lumber- Hemlock Run no.1

Raw Data 30 sec interval



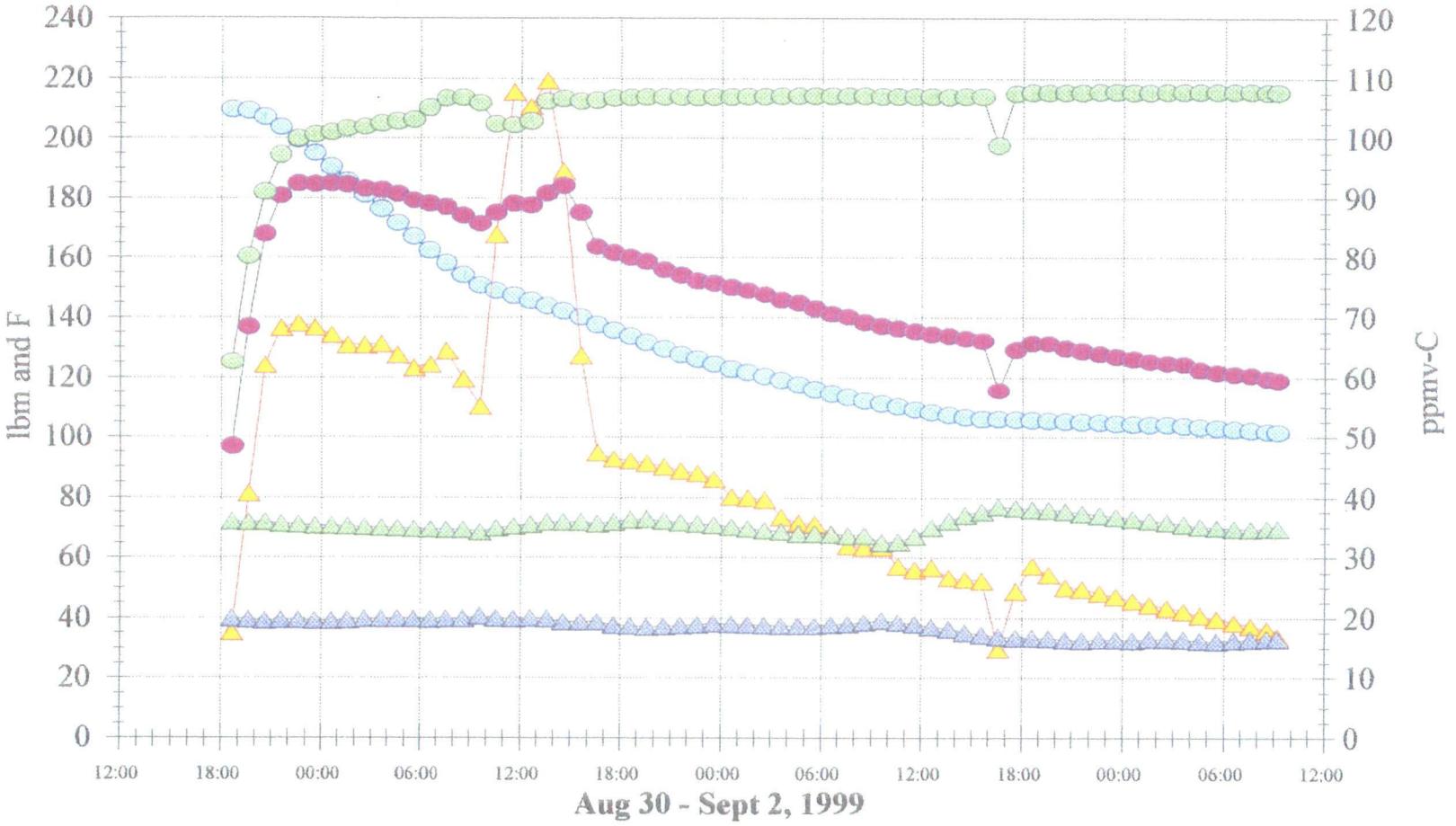
Hampton Lumber - Hemlock Run no.1

One Hour Interval - Moisture



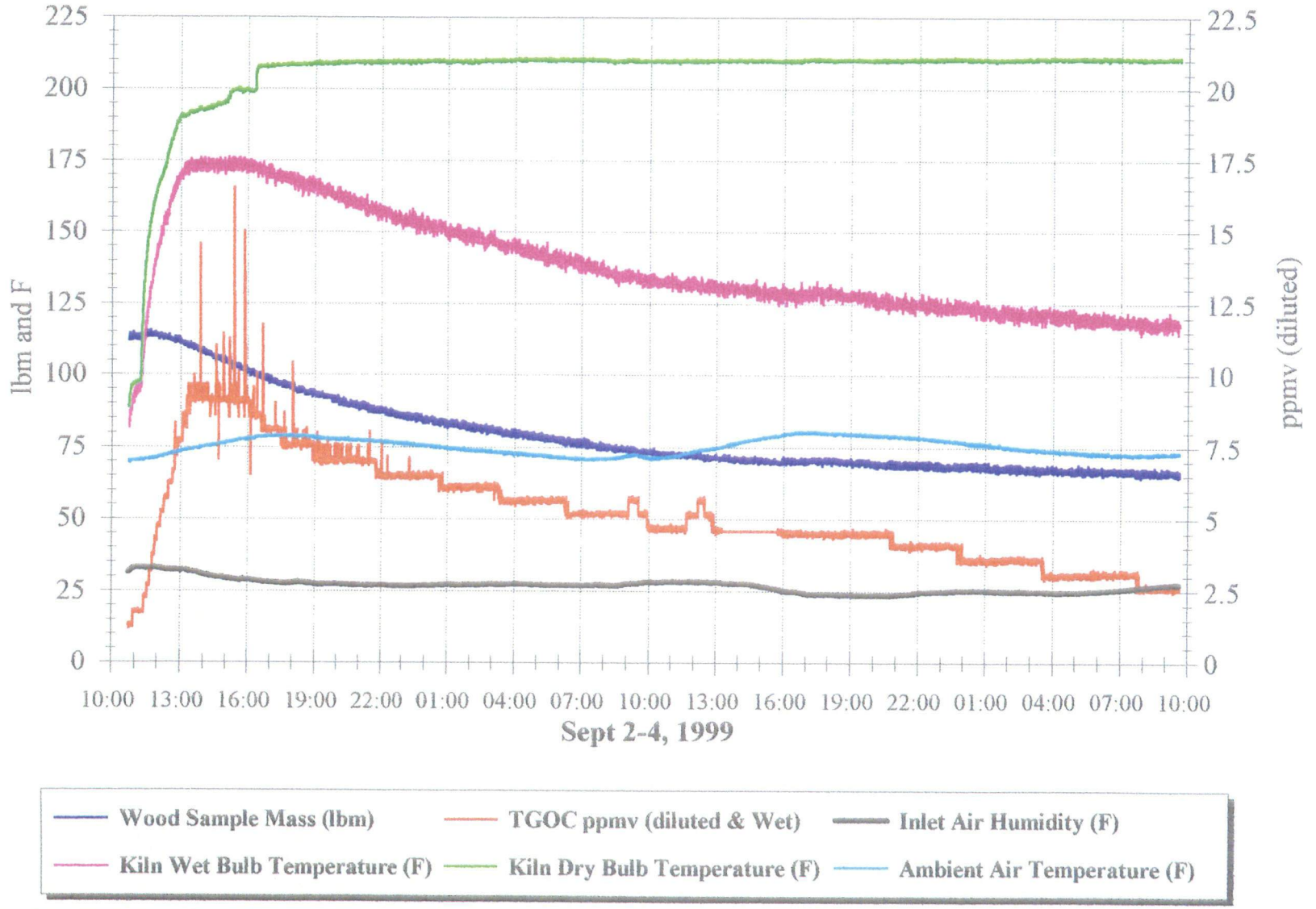
Hampton Lumber- Hemlock Run no.1

One Hour Interval Averages



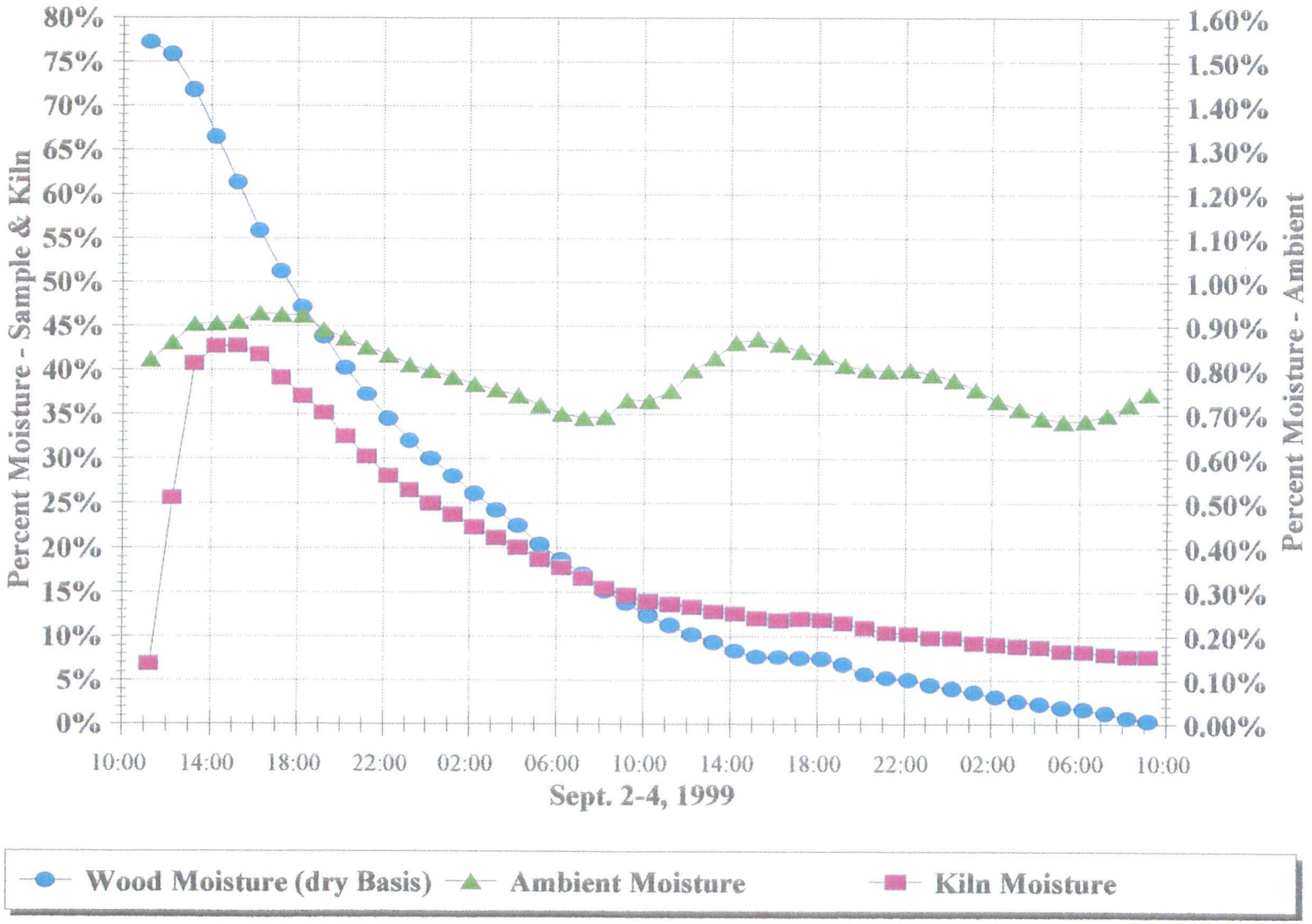
Hampton Lumber- Hemlock Run no.2

Raw Data 30 sec interval



Hampton Lumber - Hemlock Run no.2

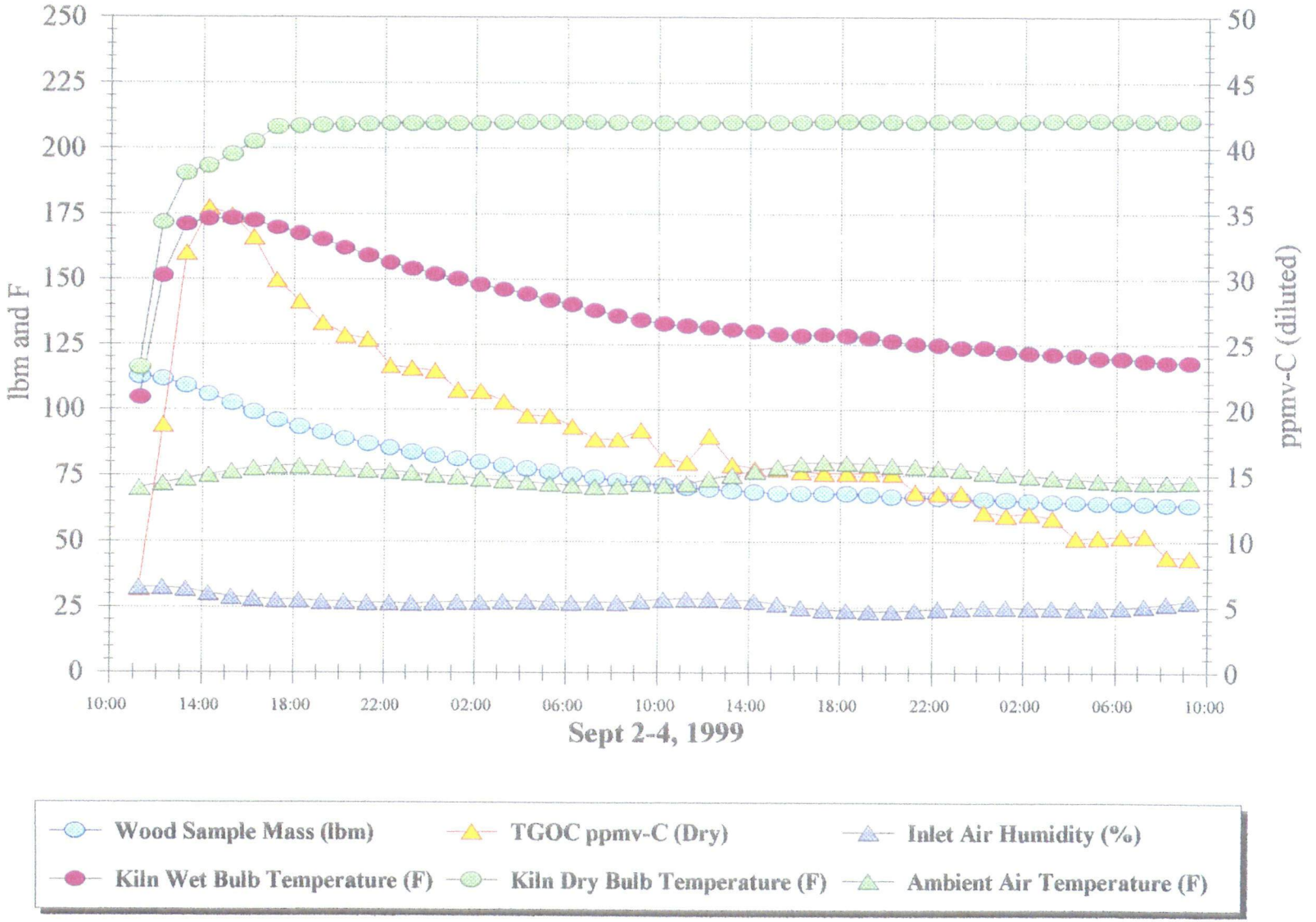
One Hour Interval - Moisture



HAM02.WB1 Horizon Engineering 09/10/99 15:42

Hampton Lumber- Hemlock Run no.2

One Hour Interval Averages



QUALITY ASSURANCE
AND
QUALITY CONTROL
DOCUMENTATION

Thermocouple Calibration

Date:	23-Mar-99	Deviation	@60 F	7.8	Allowable Diff.	Pb=	29.60	in Hg	cdb
Next Calibration:	28-Jun-00	Limit	@212 F	10.1	Allowable Diff.	Ta=	60.0	oF	980324tc
			@325 F	11.8	Allowable Diff.				

		Ambient			Boiling, Water			Boiling, Oil			Average
	Probe/ID	Standard, F	Measured, F	Difference F	Standard, F	Measured, F	Difference F	Standard, F	Measured, F	Difference F	Difference F
Probe	3-1	59.6	59.0	0.6	212.4	210.8	1.6	334.6	335.0	-0.4	0.60
Probe	3-2	59.0	58.8	0.2	212.8	210.8	2.0	325.2	322.4	2.8	1.67
Probe	3-3	58.4	58.2	0.2	212	210.6	1.4	322.2	323.4	-1.2	0.13
Probe	wc3-4	59.0	59.2	-0.2	213.2	210.8	2.4	322.2	323.4	-1.2	0.33
Probe	3-5	59.4	59.0	0.4	212.8	211	1.8	322.8	321.4	1.4	1.20
Probe	3-6	59.4	59.0	0.4	214	211	3.0	330.2	330.4	-0.2	1.07
Probe	3-7	59.2	59.0	0.2	212.8	211.2	1.6	336.2	336.4	-0.2	0.53
Probe	3-8	59.2	58.8	0.4	212.2	211.4	0.8	333.0	333.0	0.0	0.40
Probe	4-1	58.8	57.8	1.0	212.4	210.6	1.8	340.6	341.2	-0.6	0.73
Probe	4-2	59.0	58.0	1.0	211.8	210.8	1.0	333.2	335.6	-2.4	-0.13
Probe	4-3	58.8	57.6	1.2	212.4	210.6	1.8	320.8	323.6	-2.8	0.07
Probe	4-4	58.8	57.6	1.2	212.4	210.6	1.8	326.4	324.6	1.8	1.60
Probe	4-5	60.0	59.2	0.8	212.8	210.6	2.2	322.6	322.6	0.0	1.00
Probe	4-6	58.4	58.2	0.2	212.8	211	1.8	322.4	326.2	-3.8	-0.60
Probe	4-7	59.0	58.4	0.6	212	210.8	1.2	323.6	324.0	-0.4	0.47
Probe	5-2	59.2	59.0	0.2	213.4	211	2.4	320.0	320.0	0.0	0.87
Probe	5-3	53.8	54.2	-0.4	211.4	208.8	2.6	437.0	438.0	-1.0	0.40
Probe	5-4	60.8	59.8	1.0	211.6	210.2	1.4	320.6	324.0	-3.4	-0.33
Probe	5-5	59.8	58.8	1.0	212.4	212	0.4	311.6	314.2	-2.6	-0.40
Probe	5-6	59.8	58.8	1.0	212.2	210.8	1.4	322.8	324.4	-1.6	0.27
Probe	5-7	59.2	59.0	0.2	212.4	211	1.4	316.2	317.0	-0.8	0.27
Probe	5-8	59.2	59.0	0.2	213.4	211	2.4	322.6	324.2	-1.6	0.33
Probe	5-9	59.6	59.0	0.6	211.6	211	0.6	312.0	315.6	-3.6	-0.80
Probe	7-1	56.0	54.0	2.0	211.6	211.6	0.0	322.8	324.8	-2.0	0.00
Probe	7-2	61.2	61.0	0.2	212	211.8	0.2	325.0	327.0	-2.0	-0.53
Probe	7-3	61.4	60.8	0.6	213.6	211.8	1.8	329.2	330.4	-1.2	0.40
Probe	7-4	62.2	60.8	1.4	213.2	211.8	1.4	332.8	332.6	0.2	1.00
Probe	7-5	61.4	61.0	0.4	212.4	211.6	0.8	337.0	337.2	-0.2	0.33
Probe	7-6	61.0	60.6	0.4	212.4	211.4	1.0	314.0	316.8	-2.8	-0.47
Probe	10-1	61.0	59.8	1.2	211.8	211.8	0.0	324.4	320.8	3.6	1.60
Probe	10-2	61.2	60.2	1.0	211.8	211.4	0.4	324.0	325.0	-1.0	0.13
Probe	10-3	61.2	59.4	1.8	211.8	211.4	0.4	326.4	328.2	-1.8	0.13
FS Pitot	10-S	59.6	61.0	-1.4	213.2	214.6	-1.4	326.6	326.8	-0.2	-1.00
FS Pitot	11-S	54.2	54.0	0.2	206.6	- 206	0.6	431.0	433.0	-2.0	-0.40
	14-S	62.8	62.4	0.4	214	211.4	2.6	338.0	338.6	-0.6	0.80
	F3	61.4	59.4	2.0	212.6	211.8	0.8	330.2	329.4	0.8	1.20
	F23	53.2	53.4	-0.2	213	212.2	0.8	323.4	323.4	0.0	0.20
	F51	60.4	59.0	1.4	211.4	211.4	0.0	326.4	326.0	0.4	0.60
	F84	61.2	59.4	1.8	213	211.2	1.8	326.4	326.6	-0.2	1.13
	F85	61.6	61.0	0.6	212.6	211.6	1.0	331.2	331.6	0.6	0.73
	A1	61.8	59.2	2.6	212.2	211.4	0.8	332.2	332.2	1.0	1.47
	A2	64.8	60.4	4.4	212.4	211.4	1.0	333.2	334.4	-0.2	1.73
	A3	61.4	59.2	2.2	212.8	211.2	1.6	334.2	332.2	-1.2	0.87
	A5	53.6	53.4	0.2	212.2	211.6	0.6	331.0	331.6	-12.6	-3.93
	A6	62.2	59.2	3.0	208.6	211.8	-3.2	319.0	326.2	-7.0	-2.40
	B10	64.6	61.4	3.2	216	211.4	4.6	319.2	320.2	8.0	5.27
	B4	61.4	61.0	0.4	209.6	211.4	-1.8	328.2	331.6	-5.4	-2.27
	F9	63.4	61.6	1.8	214	211.4	2.6	326.2	324.6	6.6	3.67
	F4	53.4	53.6	-0.2	212.2	211.6	0.6	331.2	332.6	-0.6	-0.07
	B15	53.6	53.8	-0.2	212	211.8	0.2	332.0	332.4	-0.4	-0.13
	6S-2	54.4	54.6	-0.2	209	208.6	0.4	462.0	463.0	-1.0	-0.27
				0.0			0.0			0.0	0.00
				0.0			0.0			0.0	0.00
AVERAGE		**59.5**	**58.6**	**0.8**	**212.3**	**211.1**	**1.1**	**333.3**	**334.1**	**-0.8**	**0.4**
				0.16%			0.16%			-0.10%	
Hivol Dial Gauges											
9118		58	59.4	-1.4							
D-3		58	60		212	212.6	-0.6			0.0	
1000		56	59.4				0.0			0.0	
9169		59	59.8	-0.8	206	212	-6.0				
							0.0			0.0	
				0.0			0.0				
				0.0							

Standard Used Fluke 5895570

Thermocouple Indicator Calibration

Date: 01-28-99 | Deviation Limit | @32 F 7.4 | @212 F 10.1 | @400 F 12.9 | Pb= 30.05 in Hg | Ta= 55.0 oF | cdb TCINDm99.WB1

Next Calibration: 7-99

Thermocouple Indicator	Channel	Measured, F	Standard, F	Deviation % absolute	Measured, F	Standard, F	Deviation % absolute	Measured, F	Standard, F	Deviation % absolute	Average Deviation, %
Dial multi-indicator	1	82	84.2	-0.4	487	486.2	0.1	1074	1074.8	-0.1	-0.12
	2	93	94.4	-0.3	520	523.2	-0.3	1074	1076.6	-0.2	-0.25
	3	99	102.0	-0.5	512	516.0	-0.4	1076	1075.4	0.0	-0.30
	4	103	105.2	-0.4	522	526.6	-0.5	1076	1073.2	0.2	-0.22
	5	103	101.4	0.3	504	502.8	0.1	1075	1072.2	0.2	0.20
	6	95	98.2	-0.6	538	543.0	-0.5	1077	1075.6	0.1	-0.33
	7	113	117.2	-0.7	515	514.8	0.0	1147	1146.8	0.0	-0.23
	8	114	112.0	0.3	511	509.4	0.2	1074	1078.2	-0.3	0.08
	9	114	116.0	-0.3	515	514.6	0.0	1076	1079.8	-0.2	-0.18
	10	110	113.4	-0.6	503	506.8	-0.4	1076	1077.0	-0.1	-0.35
Omega trendicator	1	111	110.2	0.1	533	533.2	-0.0	1123	1123.2	-0.0	0.04
	2	117	115.8	0.2	509	507.6	0.1	1123	1123.0	0.0	0.12
	3	117	115.6	0.2	463	462.0	0.1	1018	1016.8	0.1	0.14
	4	119	117.6	0.2	451	449.4	0.2	1018	1017.0	0.1	0.16
	5	119	117.8	0.2	581	579.8	0.1	1078	1077.2	0.1	0.13
Fluke 6393007		108.8	107.4	0.2	520.4	518.6	0.2	1201	1198.8	0.1	0.19
Fluke 7029062		123.8	122.6	0.2	491.6	490.8	0.1	1200.6	1200.8	-0.0	0.09
Meter Box 4	1	75	78.8	-0.7	569	569.4	-0.0	923	924.6	-0.1	-0.29
	2	118	120.8	-0.5	580	580.2	-0.0	931	930.4	0.0	-0.15
	3	118	118.4	-0.1	489	491.6	-0.3	980	981.8	-0.1	-0.16
	4	122	122.8	-0.1	549	551.2	-0.2	971	972.8	-0.1	-0.16
	5	121	122.2	-0.2	502	502.8	-0.1	999	999.6	-0.0	-0.11
Meter Box 5	1	107	110.2	-0.6	482	485.2	-0.3	1137	1138.4	-0.1	-0.33
	2	107	111.8	-0.8	612	614.2	-0.2	1344	1351.6	-0.4	-0.49
	3	167	168.2	-0.2	490	490.0	0.0	1372	1374.4	-0.1	-0.11
	4	93	93.0	0.0	410	410.6	-0.1	1190	1191.0	-0.1	-0.04
	5	98	99.6	-0.3	441	441.8	-0.1	1164	1165.8	-0.1	-0.16
Meter Box 6	1	99	102.4	-0.6	509	511.0	-0.2	1203	1203.2	-0.0	-0.27
	2	115	116.0	-0.2	509	510.4	-0.1	1203	1203.6	-0.0	-0.12
	3	115	115.6	-0.1	484	485.6	-0.2	1203	1204.2	-0.1	-0.12
	4	101	101.6	-0.1	420	422.0	-0.2	1203	1204.8	-0.1	-0.15
	5	101	100.8	0.0	535	533.2	0.2	1204	1203.2	0.0	0.09
Meter Box 7	1	104	104.8	-0.1	497	496.8	0.0	1257	1256.0	0.1	-0.02
	2	118	118.2	-0.0	523	523.2	-0.0	1217	1216.6	0.0	-0.01
	3	126	126.2	-0.0	488	488.4	-0.0	1237	1237.4	-0.0	-0.03
	4	85	86.2	-0.2	517	516.2	0.1	1191	1195.6	-0.3	-0.14
	5	85	85.4	-0.1	517	518.4	-0.1	1225	1207.2	1.1	0.28
Meter Box 8	1	101	101.2	-0.0	407	407.2	-0.0	1202	1203.6	-0.1	-0.05
	2	105	107.8	-0.5	507	507.8	-0.1	1202	1201.0	0.1	-0.17
	3	106	106.4	-0.1	507	507.6	-0.1	1201	1203.4	-0.1	-0.09
	4	103	103.0	0.0	494	494.2	-0.0	1202	1202.4	-0.0	-0.02
	5	103	104.0	-0.2	497	498.2	-0.1	1201	1201.8	-0.0	-0.12
Meter Box 9	1	98	99.8	-0.3	484	486.4	-0.3	1146	1145.2	0.0	-0.18
	2	102	103.6	-0.3	471	469.6	0.2	1177	1172.0	0.3	0.06
	3	94	92.8	0.2	461	462.0	-0.1	1197	1197.8	-0.0	0.02
	4	109	111.6	-0.5	496	498.2	-0.2	1180	1179.8	0.0	-0.22
	5	104	102.2	0.3	409	410.2	-0.1	1174	1175.2	-0.1	0.04
temp. control box 1	1	138	138.8	-0.1	491	488.4	0.3	1146	1146.8	-0.0	0.03
	2	137	136.6	0.1	545	547.6	-0.3	1152	1152.0	0.0	-0.06
	3	138	138.2	-0.0	426	426.6	-0.1	959	957.2	0.1	0.01
	4	99	99.2	-0.0	456	457.8	-0.2	951	948.4	0.2	-0.02
	5	99	99.2	-0.0	505	503.6	0.1	932	933.2	-0.1	0.01
	6	98	97.8	0.0	535	536.4	-0.1	932	932.4	-0.0	-0.04
temp. control box 2	1	97	97.8	-0.1	490	491.0	-0.1	910	910.4	-0.0	-0.09
	2	98	100.0	-0.4	532	533.0	-0.1	910	911.4	-0.1	-0.19
	3	97	96.6	0.1	476	476.2	-0.0	957	956.4	0.0	0.03
	4	146	145.0	0.2	498	498.2	-0.0	958	960.2	-0.2	-0.00
	5	147	145.4	0.3	540	539.0	0.1	992	990.8	0.1	0.15
	6	126	125.6	0.1	489	490.0	-0.1	993	993.2	-0.0	-0.02
Van II Heater Controls	1	157	156.0	0.2	524	525.8	-0.2	1089	1090.8	-0.1	-0.05
	2	213	213.4	-0.1	528	529.8	-0.2	966	967.8	-0.1	-0.12
	3	105	105.7	-0.1	445	445.2	-0.0	724	720.8	0.3	0.04
	4	125	125.3	-0.1	471	472.6	-0.2	727	725.9	0.1	-0.04
											0.00
											0.00
											0.00
											0.00
AVERAGE		112.09	112.81	-0.13	499.73	500.47	-0.08	1093.98	1094.10	-0.01	-0.07

Standard used, fluke 5895570 calibrated 4-1-98 by Grant Edgie Co.

HORIZON ENGINEERING LLC

13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
horizone@teleport.com

January 15, 1999
Horizon Lab
Barometer Calibrations
CDB

On January 15, 1999 at 15:06 the barometric pressure at the Portland airport was 29.94" Hg. The barometer in TV1 read 30.13", TVII's read 29.73", and the FSL digital barometer read 30.30". All readings were corrected to absolute barometric pressure.

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

#23
P025-97
5-17-99

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENGØ1
TO:
DAVID ROSSMAN
HORIZON ENG'G'INFRARED NW
13585 NE WHITAKER WAY
PORTLAND, OR 97230-

07-26-99

DATE : Ø7/21/99

CUSTOMER ORDER NUMBER: ØØ2597

COMPONENT	CONCENTRATION(v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.:	CC66249					
			Varian Model 1860		Ø7/20/99	
Carbon dioxide	12.52 ±.Ø3 %	GMIS	S/N None	Ø7/20/Ø1	12.53 %	
		Cylinder #	Thermal Conductivity		12.52 %	
		CC122859	Gas Chromatography		12.50 %	
		@ 17.91 %	Last Cal Date: Ø7/19/99	Mean:	12.52 %	
			Bovar West Res Model 922		Ø7/Ø2/99	Ø7/12/99
Nitric oxide	90.2 ±.1 ppm	GMIS	S/N VD92284841	Ø7/12/Ø1	90.2 ppm	90.1 ppm
NOx	90.2 ppm	Cylinder #	Continuous		90.1 ppm	90.3 ppm
		CAØ1327	UV Photometry		90.5 ppm	90.Ø ppm
		@ 98.7 ppm	Last Cal Date: Ø6/17/99	Mean:	90.3 ppm	90.1 ppm
			Carle Insts Model 8000		Ø7/Ø7/99	Ø7/14/99
Carbon monoxide	513 ±1 ppm	GMIS	S/N 8249	Ø7/14/Ø1	512 ppm	512 ppm
		Cylinder #	Methanation/FID		514 ppm	514 ppm
		CC7496	Gas Chromatography		514 ppm	514 ppm
		@ 529 ppm	Last Cal Date: Ø7/Ø9/99	Mean:	513 ppm	513 ppm
			Varian Model 1860		Ø7/Ø6/99	
Propane	50.4 ±.1 ppm	GMIS	S/N None	Ø7/Ø6/Ø1	50.4 ppm	
		Cylinder #	Flame Ionization		50.3 ppm	
Nitrogen,O2-Free Balance		CC121986	Gas Chromatography		50.5 ppm	
Cylinder Pressure: 2000 psig		@ 50.6 ppm	Last Cal Date: Ø6/11/99	Mean:	50.4 ppm	

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.
This cylinder should not be used if the pressure is less than 150 psig.

Analyst: _____ Approved: _____

M.S. Calhoun J.T. Marrin

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

#09
PO2622
4/6-9-99

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENGØ1
TO:
DAVID ROSSMAN
HORIZON ENG'G/INFRARED NW
13585 NE WHITAKER WAY
PORTLAND, OR 97230-

07-26-99

DATE : Ø7/21/99

CUSTOMER ORDER NUMBER: ØØ2622

COMPONENT	CONCENTRATION(v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.:	CAØ3468				
			Varian Model 1860		Ø7/16/99
Propane	871 ±1 ppm	GMIS	S/N None	Ø7/16/Ø2	871 ppm
		Cylinder #	Flame Ionization		871 ppm
Zero Air	Balance	CC105469	Gas Chromatography		871 ppm
Cylinder Pressure: 2000 psig		@ 1017 ppm	Last Cal Date: Ø7/Ø1/99	Mean:	871 ppm

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.
This cylinder should not be used if the pressure is less than 150 psig.

Analyst: _____ Approved: _____

M.S. Calhoun J.T. Marrin

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

#P6
002437
9/12-21-98

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

HENG01

TO:
DAVID ROSSMAN
HORIZON ENG'G/INFRARED NW
13585 NE WHITAKER WAY
PORTLAND, OR 97230-

DATE : 02/10/99

CUSTOMER ORDER NUMBER: 002437

PAGE 1

COMPONENT	CONCENTRATION(v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.:	CC16289				
			Varian Model 1860		01/14/99
Propane	492 ±0 ppm	GMIS	S/N None	01/14/02	493 ppm
		Cylinder #	Flame Ionization		491 ppm
Zero Air	Balance	CC2818	Gas Chromatography		493 ppm
Cylinder Pressure: 2000 psig		@ 515 ppm	Last Cal Date: 12/15/98		Mean: 492 ppm

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.
This cylinder should not be used if the pressure is less than 150 psig.

Analyst: M.S. Calhoun

Approved: J.T. Marrin

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (909) 653-6780 • FAX (909) 653-2430

08-16-99

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

#P5
P02631
of 6-22-99

HENGØ1

TO:
DAVID ROSSMAN
HORIZON ENG'G/INFRARED NW
13585 NE WHITAKER WAY
PORTLAND, OR 97230-

DATE : Ø8/12/99

CUSTOMER ORDER NUMBER: 2631

COMPONENT	CONCENTRATION(v/v) +/-EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.: CC16308					
			Varian Model 1860		Ø7/27/99
Propane	✓311 ±1 ppm	GMIS	S/N None	Ø7/27/02	311 ppm
		Cylinder #	Flame Ionization		311 ppm
Zero Air	Balance	CC2810	Gas Chromatography		311 ppm
Cylinder Pressure: 2000 psig		@ 515 ppm	Last Cal Date: Ø7/Ø1/99		Mean: 311 ppm

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R93/224, dated September 1993.
This cylinder should not be used if the pressure is less than 150 psig.

Analyst: _____ Approved: _____

M.S. Calhoun J.T. Marrin

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

TEST METHODS

Test Method for Determination of Dry Kiln VOC Emissions

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1.0 INTRODUCTION

Lumber dry kilns have been identified by the EPA and other environmental agencies as a source of Volatile Organic Compounds (VOCs). The green lumber contains VOCs, which are emitted during the drying process. In order to measure the emissions from dry kilns, it is recommended to apply a test method incorporating EPA Method 25A. However, it is not practical to use the standard EPA Method 25A for dry kilns, because of the following conditions:

a.) Lumber drying can take over 100 hours to process one load.

b.) Most dry kilns have multiple vents and often have significant leakage around the loading doors.

c.) The venting process is periodic. The vents open to release moisture and VOCs in an irregular pattern.

The multiple vent configuration of most dry kilns and the periodic venting makes it difficult to measure the exhaust flow rate. The leakage from doors and other gaps is not measurable and therefore will produce inaccurate results. In addition, tests would need to be repeated for every species of wood the plant dries.

This method applies EPA Method 25A in a controlled environment, where a sample of the lumber is dried in a laboratory dryer and the VOC emissions are measured. The measured quantity of emissions can then be applied to determine accurate emission factors for the actual process by mathematical methods.

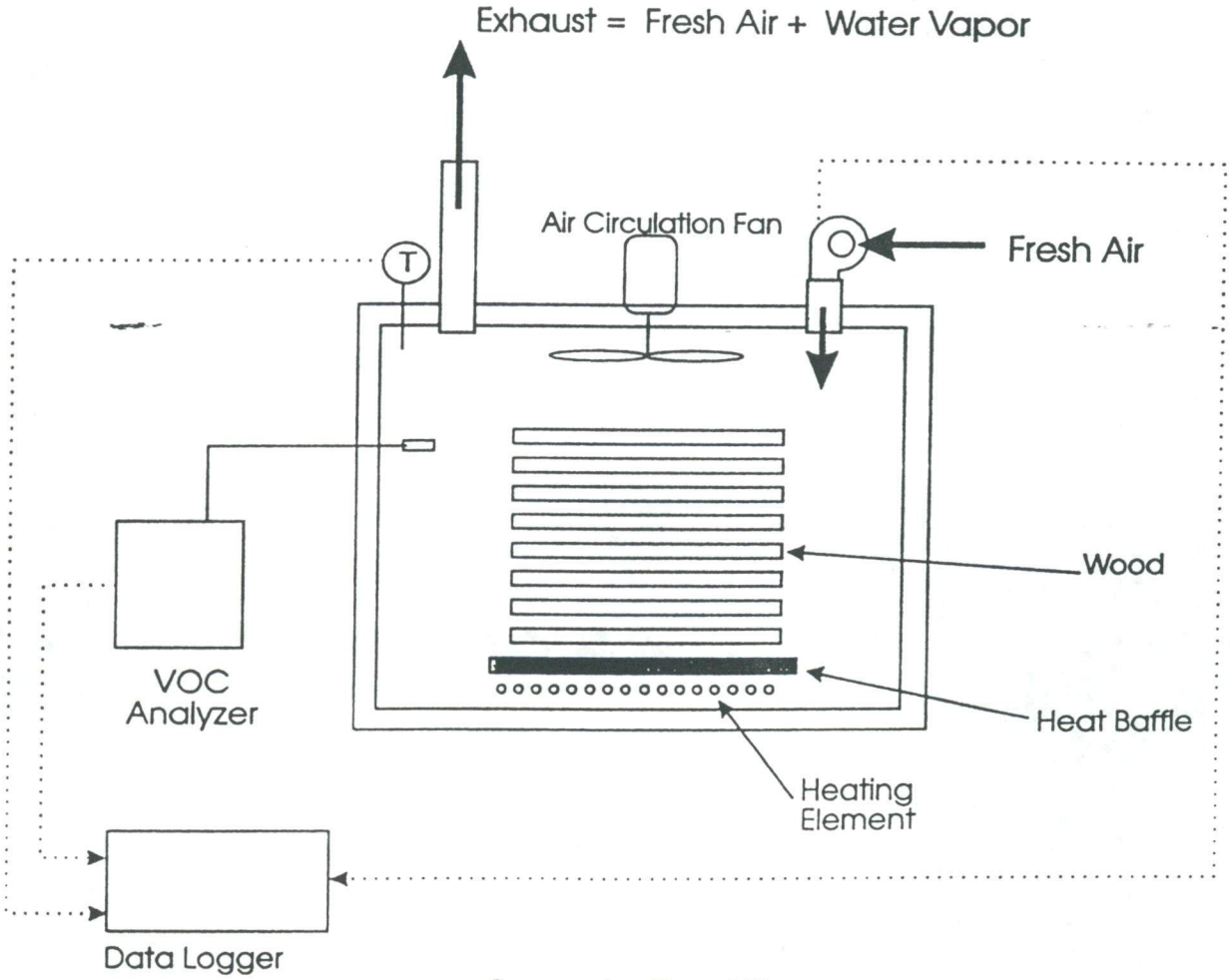
1.1 PRINCIPAL

The method for VOC measurements is based on simulated drying conditions in a laboratory size lumber dry kiln that operates in a controlled environment and can dry approximately 10 to 15 board foot of lumber.

The method is considered to be a worst case analysis, where the highest temperature for a typical drying cycle is applied to the sample at all times. The humidity is not controlled. The maximum temperature is to be that used at the actual kiln site. This is normally about 200°F. This method allows any sample drying time, but normal times of approximately 36 to 48 hours will result in a stable (dry) test load weight. Testing times can be extended if the test load weight is not stable. VOC concentrations from the test kiln are not expected to reach zero near the end of the drying cycle.

The VOC analyzer indicates concentration on a wet basis. To correct the concentration to a dry basis it is not necessary to continuously measure the moisture content of the sample stream even though the moisture varies over the drying cycle. An average moisture content for VOC analyzer correction is calculated at any time based on the dry air volume delivered to the kiln and the amount of moisture evaporated from the sample load. As long as the air flow rate to the kiln is greater than that extracted by the analyzer, moisture and air escaping from the oven through cracks are not a problem.

1.2 SYSTEM SCHEMATIC



Sample Dry Kiln

1.3 APPLICABILITY AND SENSITIVITY OF RESULTS

From the laboratory test results emission factors can be calculated for a typical drying schedule. Separate emission factors can be calculated for each wood species to any percentage dryness.

1.4 TEST KILN APPARATUS

Test Kiln: Industrial drying oven, convection type, with sealed doors and openings, of a size sufficient to hold the test load with adequate air circulation space around the test load. The kiln shall be equipped with the following instrumentation:

Load Cell and Platform: The entire test load shall be sensed by the load cell on a continuous basis. The load cell suspension system shall be designed to minimize binding. The platform should allow the use of non-organic sticker boards to separate the test load boards in a manner similar to actual drying conditions.

Temperature Sensor: A continuous record of the kiln temperature shall be maintained.

VOC Sample Probe: A stainless steel or glass probe to gather sample for the analyzer. The probe outlet should be kept to a minimum length and insulated to prevent condensation before the heated sample line connection.

Air Inlet: To be placed in a location where the air becomes mixed quickly with oven internal air.

Air Outlet: A pressure relief line to allow excess exhaust air to vent. This line should be heated or kept sloped down to prevent accumulation of condensed water vapor that could block the exhaust stream.

Other Test System Equipment Necessary:

Total Hydrocarbon Analyzer System: Heated total hydrocarbon analyzer and sample line, constructed, operated, and calibrated according to EPA Method 25A.

Inlet Air System: A system of providing a constant, measured, hydrocarbon free air to the system. The air should either be dried or have its temperature and humidity measure so that moisture in the stream can be quantified.

Data Logging System: A system to provide a continuous record of the recorded parameters throughout the testing period. Data is to be recorded at intervals no longer than two minutes apart.

2.0 SAMPLE COLLECTION PROCEDURE

Depending on the species and on the location of the board within the log, the VOC content will vary. It is recommended that the collected samples represent a cross section of the log from which the board were cut.

Resin rich soft woods often have localized pitch concentration. These so-called pitch pockets can release significantly more VOC than the average board. Sample boards with pitch pockets should not be selected for the test batch of lumber.

Each species of lumber must be tested separately in order to determine species specific VOC release. Therefore all sample boards for a specific test must be of the same species.

The selected boards must be cut into sample boards between 18" and 24" long (all samples boards should be of approximately the same length).

The board thickness and the width of the boards must represent the average dry kiln load.

The samples must be collected immediately after the log is sawed into boards (within 8 hours).

At least 6 separate boards must be used to compile the sample load.

The composite sample load must be at least 10 board foot based on U.S. Lumber Scale.

Each board must be marked with the date of collection, a batch number and a board number (example - Mar 20/96 - 1/3). This means that the piece came from the first of the six selected boards and is the third piece of the same board. It is best to use pencil for marking. Marking pens may add VOCs to the board.

After the sample board are collected, prepare a data sheet with the following information:

a.) Company Name
Address
Telephone Number

Contact Person

b.) Date of sample preparation.
Responsible person collecting the sample.
Signature of the responsible person.

c.) Species of the lumber.

d.) Total number of pieces shipped and the total board feet in the sample batch.

e.) Dry kiln identification in which this lumber is normally dried.
Identify more than one kiln, if appropriate.

f.) Identify each sample piece as shown in the following example:

Sample #	Nominal Size	Length
1/3	8/4" by 6"	18" (plus or minus 1/8")

g.) Provide the normal drying schedule for this lumber and the maximum drying temperature.

h.) Provide the final moisture content for this lumber.

Immediately after collecting the samples the entire package of sample boards must be shrink-wrapped or enclosed in a plastic bag and sealed with tape to avoid moisture and VOC loss.

2.1 SAMPLE SHIPPING PROCEDURE

The samples should be packaged in a box to avoid damage of the vapor seal during shipping. To ensure arrival at the laboratory within 48 hours of the date the samples were cut and wrapped, select a carrier that can deliver within the specified time.

2.2 PREPARATION AND SET-UP BEFORE TESTING

The testing laboratory must be prepared to perform the test within 96 hours after the samples were collected. Samples should be refrigerated in the shipping materials until the testing is started.

The VOC analyzer must be calibrated following EPA Method 25A. The load cell must be calibrated with known weights. The oven should be preheated for several hours at a temperature slightly above the anticipated test maximum to avoid condensation.

After the preparation, place the lumber in the sample dry kiln and start the VOC sampling device. After the drying cycle has been started, the sample kiln door must be latched and may not be opened during the entire drying process.

The lumber in the sample dry kiln must be dried to the maximum temperature at which the lumber is normally dried at the plant site. Test kiln temperature may be increased at intervals, however, to avoid very high humidity in the chamber.

The heating system and internal air circulation system for the dry kiln must be operating continuously during the drying process.

2.3 DATA COLLECTION

During the drying cycle the following information shall be collected and recorded.

a.) VOC concentration, in ppmvC, inside the sample dry kiln once every two minutes.

b.) The temperature in the sample dry kiln.

c.) The in-flow of fresh air into the sample dry kiln in scfh. The flow rate shall not be less than 10 scfh and not more than 100 scfh for every 10 board foot of lumber in the sample kiln. The meter temperature and the relative humidity of the in-flow air should be recorded.

d.) The weight of the lumber once every two minutes.

e.) The total drying time in hours and minutes shall be recorded.

2.4 TERMINATING THE DRYING CYCLE

The lumber will be dried until the weight of the wood has become stable to less than +/- 0.25 lb over a 12 hour period. Some variation in weight can be expected due to inlet air humidity changes.

Final calibrations checks should be conducted on the VOC analyzer as outlined in EPA Method 25A. A post check on the weighing system must also be performed.

3.0 DATA EVALUATION THEORY

The air in-flow rate and the total air flow data for the entire cycle will be the summarized meter reading in cubic feet. The air in-flow corrected to a dry standard (dscf) will be the same as the out-flow dscf. This will be the volume used in the pounds of VOC calculation.

The water vapor volume will be calculated from the total water loss of the sample plus the water introduced in the in-flow air. From the total water vapor volume and the total dry air volume a percentage moisture can be calculated for any time during the test cycle.

With the results of VOC concentration in ppmvC (wet basis), the percentage moisture, and the volumetric flow in dscf, the total VOC release in lbC can be calculated for any lumber moisture content.

From the result in lb of VOC for the test sample, an emission factor in lb of VOC per 1000 board feet of lumber can be calculated.

3.1 EQUATIONS TO DETERMINE EXHAUST FLOW

The actual exhaust flow from the sample dry kiln is the sum of the air flow plus the water vapor flow from the evaporated water in the wood. However, this is not used in the emission factor calculation.

a.) Air in-flow in dscf

Vsd = Y Vm T(std) Pb mfg(2) / P(std-1) Tm(abs)

Vm = meter reading volume in actual cft
Y = gas meter correction factor
T(std) = standard temperature, 527.67°R
Tm(abs) = meter temperature in degree Rankin.
Pb = pressure in inch Hg at test site.
P(std-1) = standard pressure, 29.92129 inHg
mfg(2) = mole fraction of dry meter air

b.) Mole fraction of dry meter air

mfg(2) = 1 - Bws(2)/100

$Bws(2) = RH\ Vp / Pb(2)$

Bws(2) = precent moisture of in-flow air
RH = relative humidity of in-flow air
Vp = vapor presure of moisture content of in-flow air
Pb(2) = barametric pressure in kPa

c.) Vapor pressure of moisture content of in-flow air

$Vp = \exp(A + B\ Tm + C/Tm + D/Tm^2)$

A = 18.6866
B = -0.00243724
C = -4509.47
D = -149541.0
*in this equation Tm is in °C + 273.15

3.2 EQUATION TO DETERMINE EXHAUST MOISTURE

a.) Mole fraction of dry gas

$mfg(1) = 1 - Bws(1)/100$

Bws = precent moisture of exhaust

b.) Precent moisture

$Bws(1) = 100\ Vw(std) / Vw(std) + Vm(std)$

Vw(std) = volume of water vapor, scf
Vm(std) = volume of dry gas, scf

c.) Volume of water vapor

$Vw(std) = 0.04707\ W / 0.99823 + Vw(std)_{in} + Vw(std)_{inital}$

W = weight loss of wood, grams
$Vw(std)_{in}$ = volume of water vapor in the in-flow gas, scf
$Vw(std)_{initial}$ = volume of water vapor in over at start of test

3.3 VOC CONCENTRATION

a.) VOC concentration corrected

VOC(cor) = VOC(dry) corrected for drift per EPA Method 25A

b.) VOC dry calculation

VOC(dry) = VOC(wet) / mfg(1)

VOC(wet) = average from analyzer in ppm
mfg(1) = mole fraction of dry air in oven

3.4 TOTAL SAMPLE VOC IN POUNDS

Mgas = VOC(cor) MW Pstd(2) Vsd / 1000000 R T(std)

VOC(cor) = ppm dry, corrected for drift
MW = molecular weight of carbon, 12.01 lbm / lbmol
Pstd(2) = 2116.22 lbf / ft^2
Vsd = volume of sample (section 3.1)
R = 1545.33 ft lbf / lbmol °R
T(std) = absolute standard temp., 527.67 °R

3.5 VOC EMISSION FACTOR

It is recommended to express the VOC emission factor is in Lbs. of VOC per 1000 board foot of lumber based on U.S. lumber scale. For other lumber scales the numbers must be corrected.

a.) Emission factor in Lbs./1000 BF (U.S.)

EF = Mgas / (BF_{sample}) * 1000 (in Lb / 1000 BF U.S.)

BF = Total board foot of lumber dried in the sample kiln in U.S. lumber scale.