Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP42 Section 1.6

Reference: 34

Title: Source Emission Testing of the Wood-fired boiler at Catalyst Hudson, Inc., Anderson California,

Performed for the Timber Association of California,

Galston Technical Services, February 1991.

FEBRUARY, 1991

GALSON PROJECT S9-072.CH

Pb 9.91

File #15 CPS Copy

SOURCE EMISSION TESTING OF THE WOOD-FIRED BOILER

1.6 #34

AT

CATALYST HUDSON, INC.
ANDERSON, CALIFORNIA

Performed for:
The Timber Association of California
1311 I Street, Suite 100
Sacramento, CA 95814

Galson
Technical Services

Galson
Technical Services

Galson Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389
FAX: (415) 848-0838

February 8, 1991

Mr. Steve Petrin
The Timber Association of California (TAC)
1311 I Street, Suite 100
Sacramento, CA 95814

Re: Source Emission Test Report
Catalyst Hudson, Anderson, CA - TAC Site #5
Wood-Fired Boiler
Galson Project S9-072.CH

Dear Steve:

Enclosed are the results of the source emission testing performed on the Wood-Fired Boiler at Catalyst Hudson in Anderson, California. Testing was conducted by Galson Technical Services, Inc. from September 6 to 8, 1990 to determine emissions of the following pollutants:

- Formaldehyde/Acetaldehyde
- Benzene
- Particulate Matter
- Metals (12 - including hexavalent chromium)
- Polycyclic Aromatic Hydrocarbons (PAHs: 16 Compounds)
- Phenolic Compounds (11)

In addition, carbon monoxide (CO), total hydrocarbon (THC), carbon dioxide (CO_2), and oxygen (O_2) levels were continuously monitored throughout the testing.

The primary purpose of the test program was to develop emission data in support of Catalyst Hudson's AB2588[1] reporting requirements. Catalyst Hudson was selected by the Timber Association of California (TAC) and the California Air Resources Board (CARB) as one of the sites to be tested in a pooled testing program. Emission data collected at this site will be utilized to satisfy the AB2588 reporting requirements of other similar facilities represented in the program.

---

1. Air Toxics "Hot Spots" Information and Assessment Act of 1987.

Mr. Chuck Sassenrath, P.E., representing the TAC, and Ed Deedon of Catalyst Hudson were present to coordinate testing activities with the boiler operations and to observe test procedures. Kenneth Berryman of the Shasta County Department of Public Health was also present to observe the testing.

Source Description and Operating Conditions:

The facility is equipped with a Zurn Hogged Fuel Boiler installed in 1982. The rated capacity of this unit is 90,000 lbs/hr steam at 625 psi. The boiler is typically fired with Pine and Cedar hog fuel. Exhaust gases from the boiler pass through a multi-clone and wet scrubber and are discharged to the atmosphere through a 65-inch diameter stack, approximately 80 feet above grade.

During the test program, the boiler steam production was maintained at 90,000 lbs/hr. The boiler was fired with Pine and Cedar hog fuel. Boiler operating data, including fuel feed rate, steam flow rate, pressure and temperature, furnace draft, air flow, feedwater flow, scrubber pressure differential and drum level were recorded by plant personnel during the testing. These data are presented in Attachment I.

Test Methods:

Testing was performed in accordance with California Air Resources Board (CARB) and Environmental Protection Agency (EPA) methods. The methods used are summarized below:

Pollutant	Method
Formaldehyde, Acetaldehyde	CARB Method 430
Benzene	CARB Method 410A
Metals (11)[2]/ Particulate	EPA Draft Method[3]/CARB Method 5
Hexavalent chromium	CARB Method 425 Draft[4]
PAH (16 Priority Compounds) Phenolic Compounds (11)	CARB Method 429
CO, CO_2, O_2, and THC	CARB Method 100

Three formaldehyde/acetaldehyde tests were conducted during the first PAH/phenol and hexavalent chromium test (Test 1). Three benzene samples were collected during the second test (Test 2) of the PAH/phenol and hexavalent chromium. Front-half particulate matter was collected as part of each multiple metals test (Tests 4, 5, and 6). Condensable

2. Arsenic, beryllium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, and zinc.

3. Dated August 28, 1989.

4. Dated July 10, 1990.

particulate matter was collected in a separate sampling train concurrent with the multiple metals Test 6.

Testing for each parameter was performed in triplicate, with the exception of the O_2, CO_2, CO, and THC levels which were monitored continuously during all tests.

Sampling ports were located in the 65-inch diameter stack at a point approximately 36 feet (6.6 diameters) downstream of a disturbance in the duct and 9 feet (1.7 diameters) upstream of the stack discharge. A preliminary velocity/cyclonic flow traverse of the exhaust stack was conducted in accordance with CARB Methods 1 and 2, prior to the start of testing. These measurements confirmed the acceptability of the test sites (i.e., cyclonic flow was not present). These preliminary flow measurements, the sample traverse points, and a stack diagram are presented in Attachment II

All test equipment were calibrated either prior to, or during, use in the field. The CO, CO_2, O_2, and THC monitors were calibrated with cylinder gases of known concentrations immediately before and after each test period. The dry gas meter/orifice modules were calibrated immediately prior to, and following, the test program. Pitot tubes were also calibrated prior to use in the field and were visually inspected for damage during the test program. All thermometers, thermocouples, and temperature read-outs are routinely calibrated at six-month intervals, or immediately following any damage/repair. A post-test QA check of the thermocouples was also performed. Calibration data are presented in Attachment IV.

Further details of the sampling and analytical techniques are presented in Attachment III.

Results and Discussion:

Test results are summarized in Tables 1 through 6 and are discussed below. Supporting field data and calculations are presented in Attachment V. Emission data, expressed as concentration and emission rates, can be found in the Attachment V calculation tables. Laboratory data are presented in Attachment VI.

Formaldehyde, Acetaldehyde and Benzene Emissions:

As presented in Table 1, formaldehyde and acetaldehyde emissions were relatively consistent from test to test, averaging 0.49 ppm and 0.09 ppm (at 12% CO_2), respectively. No detectable quantities of formaldehyde and acetaldehyde were determined to be present in the field-blank.

The benzene emissions, presented in Table 2, were generally consistent from test to test, averaging 0.087 ppm (at 12% CO_2). No detectable quantities of benzene were determined to be present in the field-blank.

Particulate and Metals Emissions:

As presented in Table 3, total particulate emissions from the exhaust stack were relatively consistent from test to test, averaging 0.0146 gr/dscf (at 12% CO_2). The front-half particulate concentration averaged 0.0139 gr/dscf (at 12% CO_2). Condensable particulate emissions (BH PM) contributed less than 6 percent to the total particulate loadings.

Referring to Table 3, metals emissions were generally consistent from test to test. Mercury, cadmium and nickel emissions were low relative to detection limits during all tests. The highest average emissions were: zinc (8,910 ug/gm), manganese (3,530

ug/gm), lead (1,270 ug/gm), chromium (629 ug/gm) and copper (514 ug/gm). Beryllium and selenium were not detected in any of the tests.

Manganese was detected at very high levels in Test 4; sample contamination is suspected. Potassium permanganate is used in the back-half of the sampling train to collect mercury[5], and is a likely source of sample contamination. The manganese result from Test 4 was not included in the average emission calculations.

The field-blank was reanalyzed on 12/12/90, after it was reported that the it contained quantities of metals comparable to the samples. Repeat analysis determined all metals were below detection limits except for lead and zinc which were present at the method detection limit. The source of the blank-contained metals is not known, although it is believed to be attributable to background sources (e.g., the filter, reagents, solvents) and/or contamination. The data presented in Table 3 are corrected for blank-contained quantities, using the results from the repeat analysis of the field-blank.

Hexavalent and Total Chromium Emissions:

Referring to Table 4, hexavalent chromium emissions were below detection limits during Tests 1 and 2, and were 320 µg/gm of front-half particulate during Test 3. Total chromium was detected in all three of the tests and averaged 518 ug/gm. This average level of total chromium compares to levels found in the multi-metals tests. The particulate emissions upon which the emissions are based were calculated from the average grain loading observed during the multiple metals testing and the exhaust gas volume drawn through the hexavalent chromium sampling train. Hexavalent and total chromium were not detected in the field-blank.

PAH Emissions:

As presented in Table 5, the total PAH emissions comprising the six compounds listed as carcinogens by CARB[6], averaged 0.060 µg/dscm, at 12% CO_2. Other PAH compounds were detected in all three samples. The highest average concentrations (excluding naphthalene) were acenaphthylene (0.316 ug/dscm) and phenanthrene (0.229 ug/dscm). All the data were blank-corrected.

The naphthalene results should be interpreted with caution, because relatively high levels were present in the field-blank[7], and in all three samples. Background quantities have been observed in similar blank samples previously submitted for analysis and although the

---

5. As per method specifications, 100 milliliters of potassium permanganate ($KMnO_4$) in a sulfuric acid solution is placed in the fourth impinger of the sampling train (refer to Attachment III).

6. Total PAH consists of the six compounds denoted by footnote (a) in Table 5, per Appendix A-1 of the AB2588 Guidelines.

7. The field blank sample contained 2900 µg of naphthalene, while the quantities determined to be present in the Tests 1 through 3 samples ranged from 2500 to 4200 µg per sample (refer to the laboratory data presented in Attachment VI).

source of the naphthalene is not known, it is suspected to be an impurity and/or a by-product of the break-down of the XAD-2 resin[8].

Phenolic Compounds Emissions:

As presented in Table 6, phenol emissions averaged 40.4 ug/dscm at 12% CO_2. The only other phenolic compound present was 2,4-dinitrophenol which was detected in Test 1 at a concentration of, 0.979 µg/dscm at 12% CO_2.

General:

Other than noted, no sampling problems were encountered during the test program. Isokinetic sampling conditions were maintained during the particulate/metals, hexavalent chromium, and PAH tests, with isokinetic percentages within the allowable 100 ± 10% during all tests (refer to Attachment V). Calibrations of the monitors performed before and after each test period were in agreement (within 3 percent).

It has been a pleasure working with you and with the plant personnel on this project. If you have any further questions about details of the testing procedures, laboratory procedures, or the calculations, please do not hesitate to call.

Sincerely,
GALSON TECHNICAL SERVICES, INC.

Approved by:

Guy Worthington
ENVIRONMENTAL SCIENTIST
ASSISTANT DEPARTMENT MANAGER

David Galson, P.E.
DEPARTMENT MANAGER

Rev: dg

8. XAD is 1,4-divinyl benzene; 1,2-divinyl benzene (an impurity) can react to form naphthalene.

Attachments:

Tables:

Table 1: Summary of Test Results - Formaldehyde, Acetaldehyde Test Data
Table 2: Summary of Test Results - Benzene Test Data
Table 3: Summary of Test Results - Particulate/Metals Test Data
Table 4: Summary of Test Results - Hexavalent and Total Chromium Test Data
Table 5: Summary of Test Results - PAH Test Data
Table 6: Summary of Test Results - Phenolic Compounds Test Data

Attachments:

Attachment I: Process Operating Data
Attachment II: Stack Configuration And Traverse Point Locations
Attachment III: Sampling And Analytical Methods
Attachment IV: Calibration Data
Attachment V: Field Data And Calculations
Attachment VI: Laboratory Data
Attachment VII: Project Personnel

File: 72.CH Report
Disk: S9-072.CH

Table 1: Summary of Test Results - Catalyst Hudson
Formaldehyde and Acetaldehyde Test Data

Test ID	1A	1B	1C	Average
Date	9/6/90	9/6/90	9/6/90	
Test Times	1056-1141	1215-1300	1345-1430	
Steam Flow (lbs/hr)	90,000	90,000	90,000	90,000
Flow (ACFM) (a)	40,296	39,193	39,159	39,549
Stack Gas Temperature (°F) (a)	137	138	138	138
Stack Gas Moisture (%) (a)	17.5	17.5	17.5	17.5
Flow (DSCFM) (a)	29,324	28,505	28,480	28,770
Oxygen (%, dry basis)	6.0	5.6	5.1 (b)	5.6
CO2 (%, dry basis)	15.1	15.3	15.8 (b)	15.4
Nitrogen (%, dry basis)	78.9	79.1	79.1	79.0
Flow (DSCFM, @12% CO2)	36,899	36,344	37,499	36,914
Volume Sampled (DSCF)	1.43	1.38	1.39	1.40
CO (ppm, dry basis)	235	214	210 (b)	220
THC (ppm, as methane, dry)	9	12	13 (b)	11
Formaldehyde Emissions:				
(ppm)	0.91	0.43	0.55	0.63
(ppm@12%CO2)	0.73	0.34	0.42	0.49
(mg/dscm@ 12%CO2)	0.90	0.42	0.52	0.62
Acetaldehyde Emissions:				
(ppm)	0.12	0.14	0.07	0.11
(ppm@12%CO2)	0.10	0.11	0.05	0.09
(mg/dscm@12%CO2)	0.18	0.20	0.09	0.16

Notes: Standard conditions are defined as 68° F and 1 atmosphere.
(a) Based on data collected during the concurrent PAH and hexavalent chromium sampling (i.e., Test 1).
(b) Based on levels monitored from 1345-1359.

Table 2: Summary of Test Results - Catalyst Hudson
Benzene Test Data

Test ID	2A	2B	2C	Average
Date	9/6/90	9/6/90	9/6/90	
Test Times	1558-1618	1628-1648	1740-1815	
Steam Flow (lbs/hr)	90,000	90,000	90,000	90,000
Flow (ACFM) (a)	40,948	40,941	39,541	40,477
Stack Gas Temperature (°F) (a)	138	138	137	138
Stack Gas Moisture (%) (a)	18.2	18.2	18.2	18.2
Flow (DSCFM) (a)	29,502	29,497	28,551	29,183
Oxygen (%, dry basis)	4.7	4.6	4.6	4.6
CO2 (%, dry basis)	15.5	15.6	15.7	15.6
Nitrogen (%, dry basis)	79.8	79.8	79.7	79.8
Flow (DSCFM, @12% CO2)	38,107	38,346	37,354	37,936
CO (ppm, dry basis)	224	213	254	230
THC (ppm, as methane, dry)	8	7	8	8
Benzene Emissions				
Benzene (ppm)	0.110	0.089	0.140	0.113
Benzene (ppm@12%CO2)	0.085	0.068	0.107	0.087
Benzene (µg/dscm@12%CO2)	276	222	347	282

Notes: Standard conditions are defined as 68 F and 1 atmosphere.
(a) Based on data collected during the concurrent PAH and hexavalent chromium sampling (i.e., Test 2).

Table 3: Summary of Test Results - Catalyst Hudson
Particulate/Multiple Metals Test Data

Test ID	Run # 4	Run #5	Run #6	Average
Date	9/7/90	9/8/90	9/8/90	
Test Times	1417-1634	0933-1153	1250-1511	
Steam Flow (lbs/hr)	90,000	90,000	90,000	90,000
Flow (ACFM)	39,810	43,359	41,302	41,490
Stack Gas Temperature (°F)	137	138	138	138
Stack Gas Moisture Content (%)	16.7	17.5	17.3	17.2
Flow (DSCFM)	29,336	31,627	30,201	30,388
Oxygen (%, dry basis)	5.2	6.5	6.1	5.9
CO2 (%, dry basis)	15.2	14.2	14.3	14.6
Nitrogen (%, dry basis)	79.6	79.3	79.6	79.5
Flow (DSCFM, @12% CO2)	37,159	37,425	35,990	36,858
Volume Sampled (DSCF)	80.91	89.66	84.81	
CO (ppmv, dry basis)	231	202	225	219
THC (ppmv, as methane, dry)	5	6	7	6
Front-half (FH) PM (mg)	94.1	85.9	98.9	93.0
FH PM (gr/dscf, @12%CO2)	0.0142	0.0125	0.0151	0.0139
BH PM (gr/dscf, @12%CO2) (a)	0.0007	0.0007	0.0007	0.0007
Total PM (gr/dscf, @12%CO2)	0.0149	0.0132	0.0158	0.0146
Metals Emissions (µg/gm of FH PM)				
Arsenic	287	210	192	230
Beryllium	[11]	[12]	[10]	0
Cadmium	43	70	30	48 *
Chromium	616	664	607	629
Copper	521	547	475	514
Lead	1,570	1,140	1,090	1,270
Manganese	(b)	2,910	4,150	3,530 (b)
Mercury	31	[15]	13	17
Nickel	128	140	121	130
Selenium	[106]	[116]	[101]	0
Zinc	14,520	6,590	5,620	8,910

Notes: Standard Conditions are defined as 68° F and 1 atmosphere.
Emission values presented in this table have been blank-corrected.
[ ] Indicates that the samples were below detection limit.
Average values are indicated as zero if all threee samples are below the detection limit; non-detectable quantities are counted as 1/2 of the detection limit if any of the samples contain detectable quantities.
(a) BH PM data is from the back-half of a separate sampling train (Test #6CD), performed simultaneously with Test #6.
(b) Test 4 manganese emission data were voided due to suspected sample contamination; average emissions are based on the Tests 5 and 6 data.

* Cadmium by ARB Method 424 = 36 µg/g

Table 4: Summary of Test Results - Catalyst Hudson
Hexavalent and Total Chromium Test Data

Test ID	1	2	3	Average
Date	9/6/90	9/6/90	9/7/90	
Test Times	1017-1356	1539-1900	0919-1236	
Steam Flow (lbs/hr)	90,000	90,000	90,000	90,000
Flow (ACFM)	39,832	39,635	40,997	40,155
Stack Gas Temperature (°F)	137	136	136	136
Stack Gas Moisture Content (%)	17.67	17.55	17.52	17.58
Flow (DSCFM)	28,934	28,847	29,932	29,238
Oxygen (%, dry basis)	5.8	5	5.8	5.5
CO2 (%, dry basis)	15.2	15.3	15.3	15.3
Nitrogen (%, dry basis)	79	79.7	78.9	79.2
Flow (DSCFM, @12% CO2)	36,650	36,780	38,163	37,198
Volume Sampled (DSCF)	123.39	120.11	125.09	
CO (ppm, dry basis)	223	226	193	214
THC (ppm, as methane, dry)	11	7	9	9
Front-half (FH) PM (mg) (a)	142	141	145	143
Chromium Emissions (µg/gm of FH PM)				
Hexavalent Chromium	[140]	[140]	~~320~~	* ~~150~~ 0
Total Chromium	380	603	572	518

Notes: Standard conditions are defined as 68° F and 1 atmosphere.
Data are blank-corrected.
[ ] Indicates sample quantities were below the detection limit.
Average values are indicated as zero if all three samples are below the detection limit; non-detectable quantities are counted as 1/2 of the detection limit if any of the samples contain detectable quantities.
(a) FH particulate quantities were pro-rated, based on the average grain loading observed during Tests 4-6 (multiple metals runs) and the hexavalent chromium sample volume (ft3).

* Hex Chrome test #3 invalidated by subsequent testing.

Table 5: Summary of Test Results - Catalyst Hudson
Polycyclic Aromatic Hydrocarbon (PAH) Test Data

Test ID	Run #1	Run #2	Run #3	Average
Date	9/6/90	9/6/90	9/7/90	
Test Times	1014-1352	1535-1905	0915-1240	
Steam Flow (lbs/hr)	90,000	90,000	90,000	90,000
Flow (ACFM)	39,650	40,842	41,966	40,819
Stack Gas Temperature (°F)	138	138	138	138
Stack Gas Moisture Content (%)	17.24	18.21	18.25	17.9
Flow (DSCFM)	28,918	29,397	30,271	29,529
Oxygen (%, dry basis)	5.8	5.0	5.8	5.5
CO2 (%, dry basis)	15.2	15.3	15.3	15.3
Nitrogen (%, dry basis)	79	79.7	78.9	79.2
Flow (DSCFM, @12% CO2)	36,629	37,481	38,596	37,569
Volume Sampled (DSCF)	119.6	123.5	128.9	
CO (ppmv, dry basis)	223	226	193	214
THC (ppmv, as methane, dry)	11	7	9	9
Micrograms per DSCM at 12 % Carbon Dioxide, 68°F				
Naphthalene	303	[642]	[625]	312
Acenaphthylene	0.373	0.359	0.215	0.316
Acenaphthene	0.203	0.076	0.030	0.103
Fluorene	0.072	0.033	0.060	0.055
Phenanthrene	0.277	0.219	0.192	0.229
Anthracene	0.028	0.018	0.017	0.021
Fluoranthene	0.110	0.099	0.039	0.083
Pyrene	0.107	0.113	0.069	0.096
Benzo(a)Anthracene (a)	0.008	[0.004]	[0.004]	0.004
Chrysene	0.012	[0.004]	[0.004]	0.005
Benzo(b)Fluoranthene (a)	0.044	0.070	[0.004]	0.039
Benzo(k)Fluoranthene (a)	[0.005]	0.054	[0.004]	0.020
Benzo(a)Pyrene (a)	[0.005]	[0.004]	[0.004]	0
Benzo(ghi)Perylene	[0.005]	[0.004]	[0.004]	0
Dibenzo(ah)Anthracene (a)	[0.005]	[0.004]	[0.004]	0
Indeno(123cd)Pyrene (a)	[0.005]	[0.004]	[0.004]	0
Total PAH's (a)	0.052	0.124	[0.004]	0.060

Notes: Standard conditions are defined as 68° F and 1 atmosphere.
Data are blank-corrected.
[ ] Indicates sample quantities were below the detection limit.
Average values are indicated as zero if all three samples are below the detection limit; non-detectable quantities are counted as 1/2 of the detection limit if any of the samples contain detectable quantities.
(a) Total PAH consists of the six compounds which are identified as carcinogens in Appendix A-1 of AB2588 Emission Inventory and Criteria Guidelines.

Table 6: Summary of Test Results - Catalyst Hudson
Phenolic Compounds Test Data

Test ID	Run #1	Run #2	Run #3	Average
Date	9/6/90	9/6/90	9/7/90	
Test Times	1014-1352	1535-1905	0915-1240	
Steam Flow (lbs/hr)	90,000	90,000	90,000	90,000
Flow (ACFM)	39,650	40,842	41,966	40,819
Stack Gas Temperature (°F)	138	138	138	138
Stack Gas Moisture Content (%)	17.24	18.21	18.25	17.9
Flow (DSCFM)	28,918	29,397	30,271	29,529
Oxygen (%, dry basis)	5.8	5.0	5.8	5.5
CO2 (%, dry basis)	15.2	15.3	15.3	15.3
Nitrogen (%, dry basis)	79	79.7	78.9	79.2
Flow (DSCFM, @12% CO2)	36,629	37,481	38,596	37,569
Volume Sampled (DSCF)	119.6	123.5	128.9	
CO (ppmv, dry basis)	223	226	193	214
THC (ppmv, as methane, dry)	11	7	9	9
Micrograms per DSCM at 12 % Carbon Dioxide, 68°F				
2,4,6-Trichlorophenol	[0.023]	[0.022]	[0.021]	0.0
2,4-Dichlorophenol	[0.023]	[0.038]	[0.021]	0.0
2,4-Dimethylphenol	[0.233]	[0.224]	[0.215]	0.0
2,4-Dinitrophenol	0.979	[0.224]	[0.215]	0.399
2-Chlorophenol	[0.023]	[0.022]	[0.043]	0.0
2-Nitrophenol	[0.058]	[0.047]	[0.021]	0.0
4,6-Dinitro-o-cresol	[0.047]	[0.045]	[0.043]	0.0
4-Chloro-3-methylphenol	[0.023]	[0.022]	[0.021]	0.0
4-Nitrophenol	[0.117]	[0.112]	[0.107]	0.0
Pentachlorophenols	[0.047]	[0.045]	[0.043]	0.0
Phenol	32.2	73.5	15.5	40.4

Note: Standard conditions defined as 68° F and 1 atmosphere.
Data are blank-corrected.
[ ] Indicates sample quantities were below the detection limit.
Average values are indicated as zero if all three samples are below the detection limit; non-detectable quantities are counted as 1/2 of the detection limit if any of the samples contain detectable quantities.

ATTACHMENT I: Process Operating Data

Table I: Summary of Process Operating Data

Test # - Date (Times)	Steam Load (lbs/hr)	Steam Pressure (psi)	Scrubber ΔP (in. H2O)
PAH/Hex. Chromium Tests:			
1 - 9/6/90 (1014-1356)	90,000	625	16.8
2 - 9/6/90 (1535-1905)	90,000	625	14.8
3 - 9/7/90 (0915-1240)	90,000	625	16.0
Aldehyde Tests:			
1A - 9/6/90 (1056-1141)	90,000	625	17.5
1B - 9/6/90 (1215-1300)	90,000	625	16.2
1C - 9/6/90 (1345-1430)	90,000	625	16.0
Benzene Tests:			
2A - 9/6/90 (1558-1618)	90,000	625	15.3
2B - 9/6/90 (1628-1648)	90,000	625	15.3
2C - 9/6/90 (1740-1815)	90,000	625	14.0
Metals/Particulate Tests:			
4 - 9/7/90 (1417-1634)	90,000	625	14.9
5 - 9/8/90 (0933-1153)	90,000	625	17.3
6 - 9/8/90 (1250-1511)	90,000	625	16.6

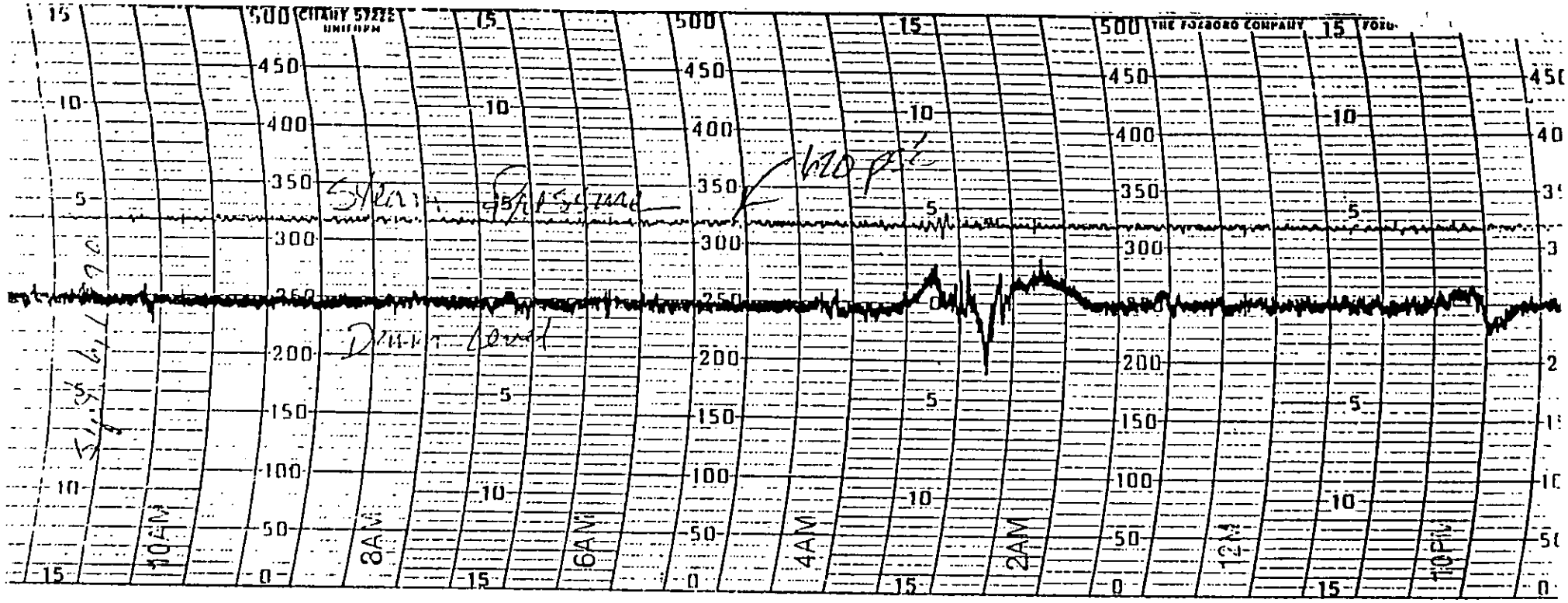
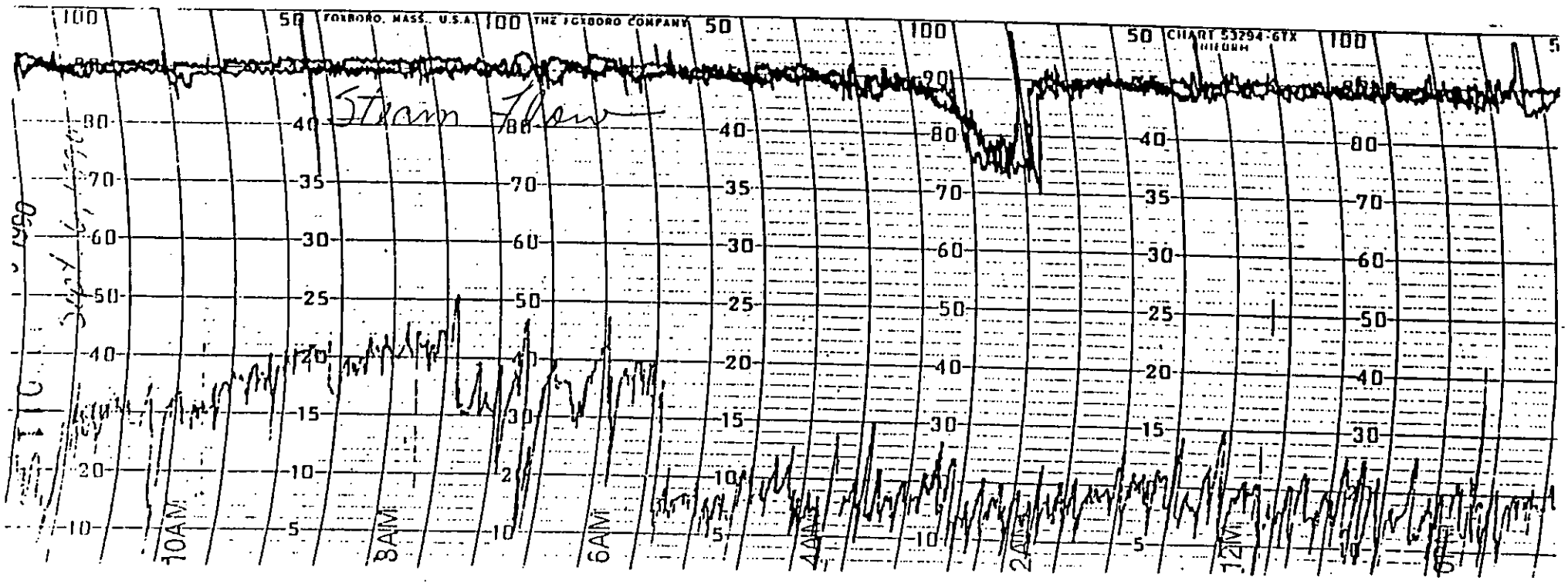
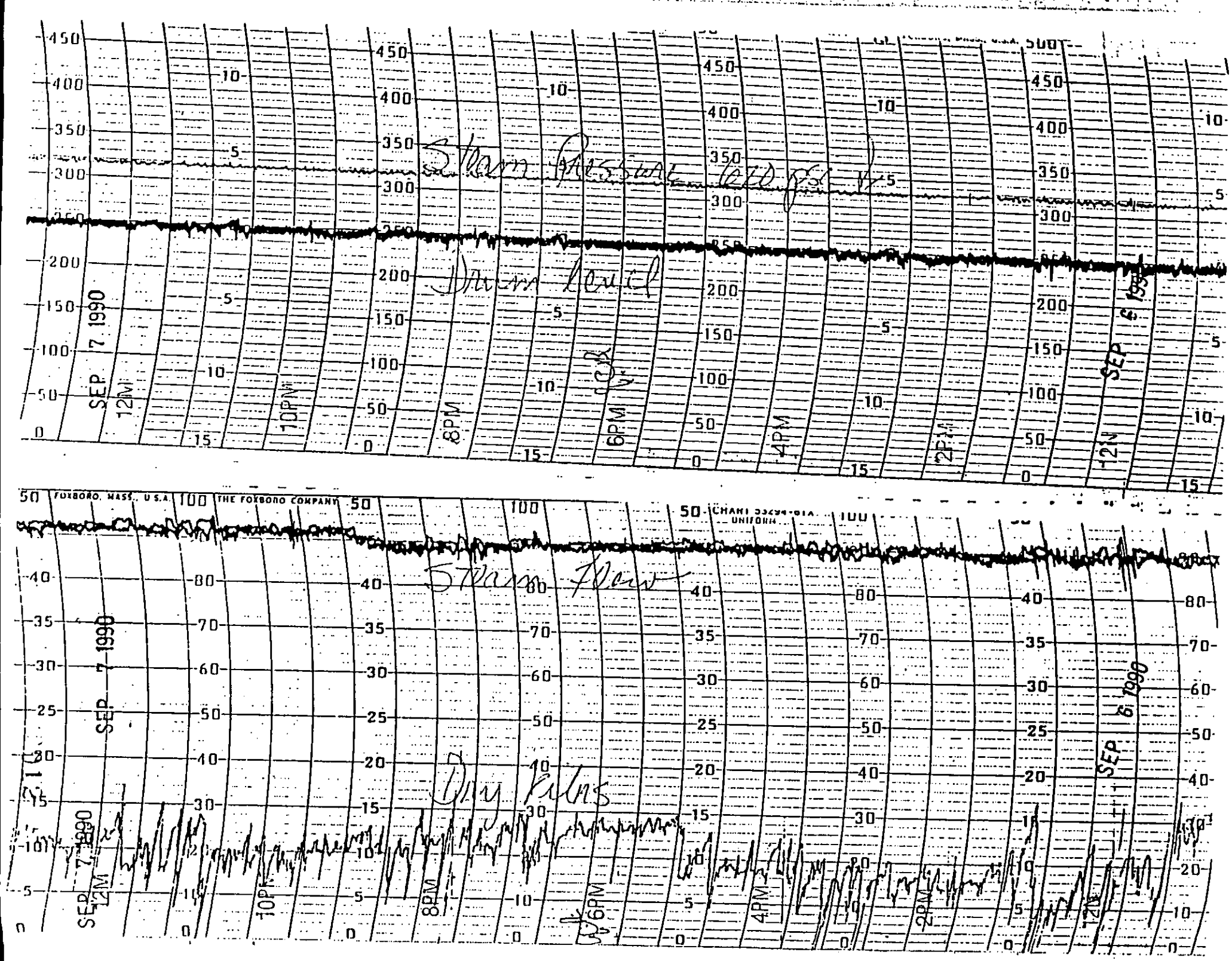
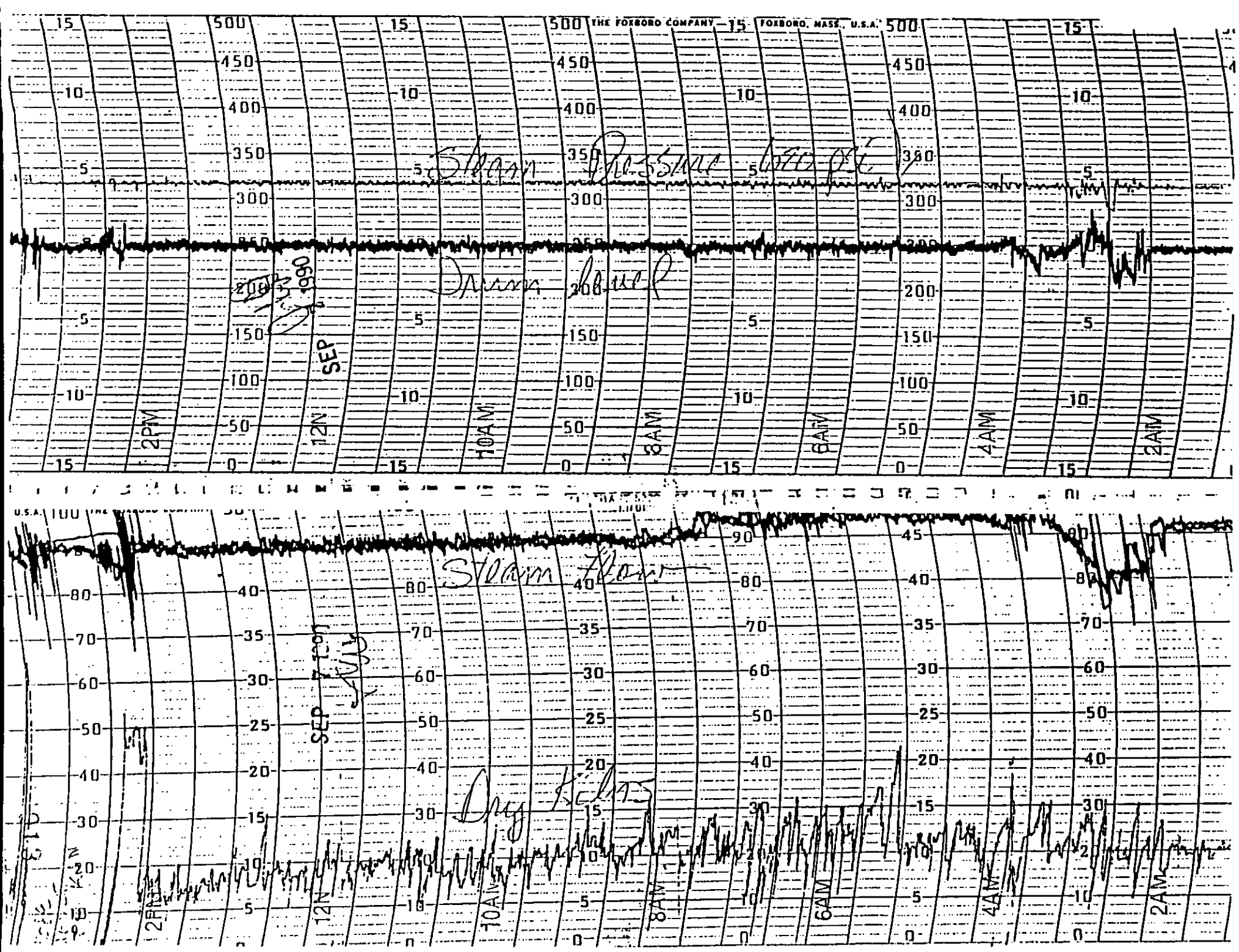
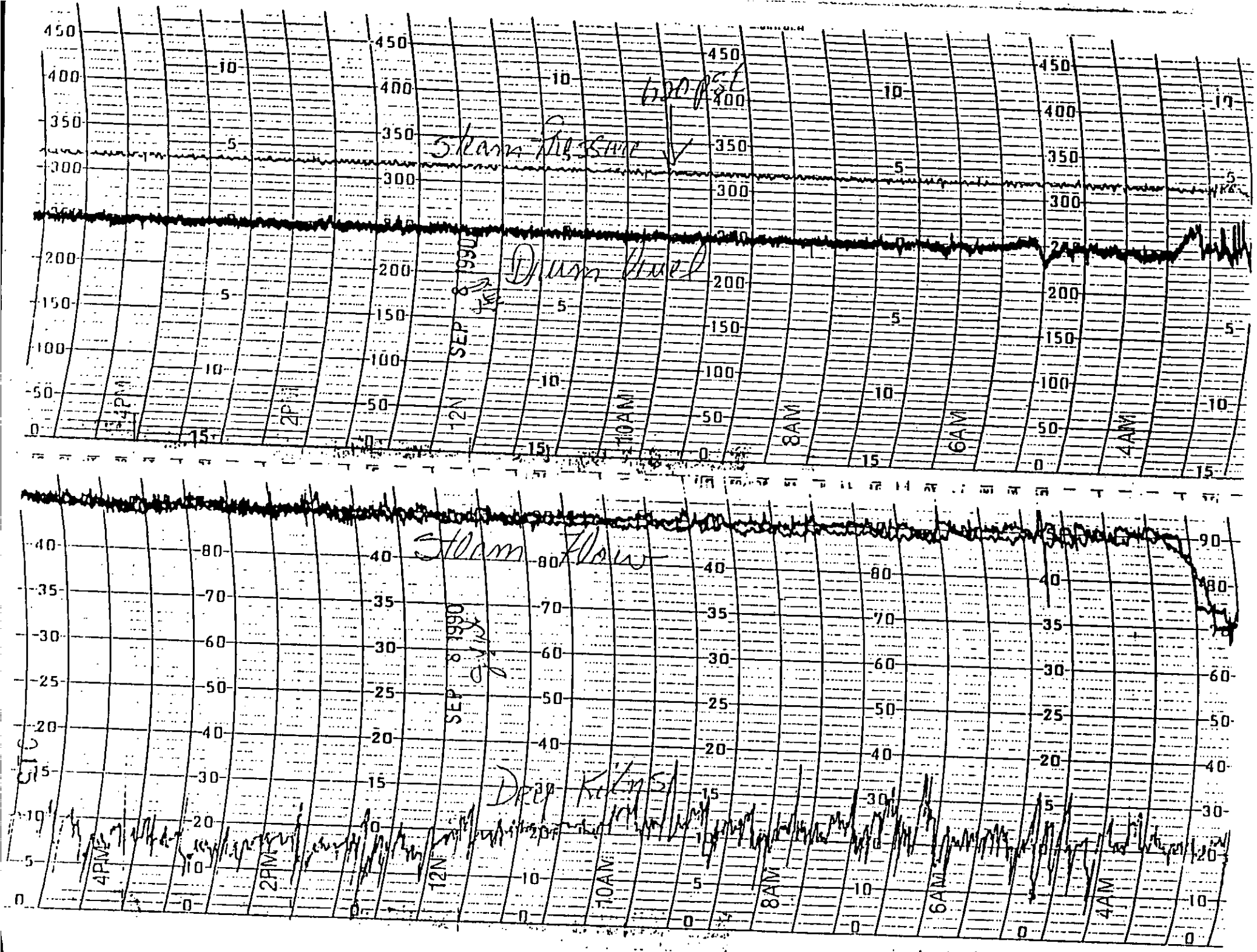


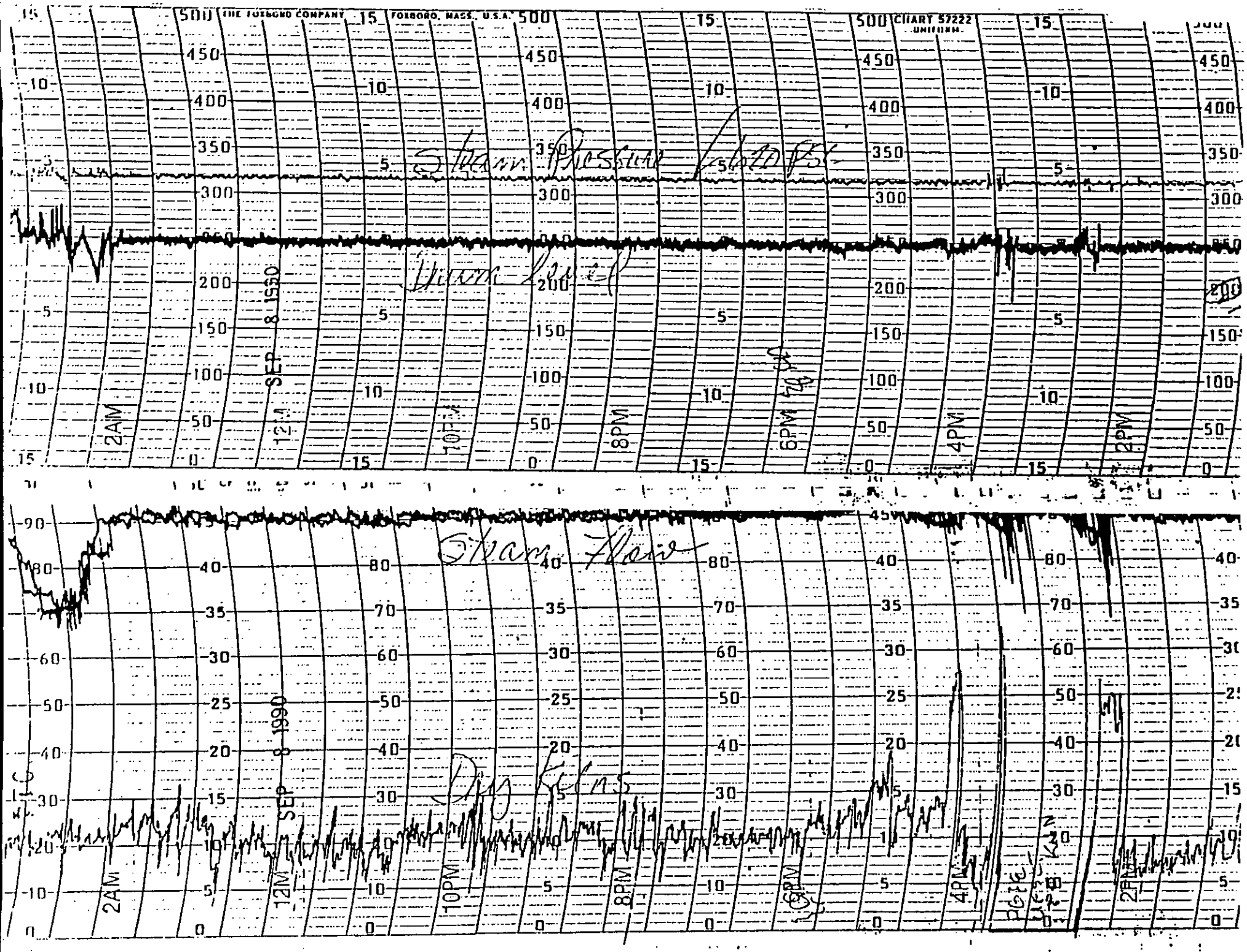
CHART 57222
UNIFORM
THE FOXBORO COMPANY
Steam Pressure
Drum Level
10AM
8AM
6AM
4AM
2AM
12M
10PM


FOXBORO, MASS., U.S.A.
THE FOXBORO COMPANY
CHART 53294-6TX
UNIFORM
Steam Flow
10AM
8AM
6AM
4AM
2AM
12M


Steam Pressure
Drum Level
Steam Flow
Dry Pulps
SEP 7 1990
SEP 6 1990
12M
10PM
8PM
6PM
4PM
2PM
12N
FOXBORO, MASS., U.S.A.
THE FOXBORO COMPANY


THE FOXBORO COMPANY — FOXBORO, MASS., U.S.A.
Steam Pressure
Drum Level
Steam Flow
Dry Kilns
SEP 7 1990
2PM
12N
10AM
8AM
6AM
4AM
2AM


Steam Pressure
Drum Level
Steam Flow
Deep Kelvin
SEP 8 1990
4PM
2PM
12N
10AM
8AM
6AM
4AM


THE FOXBORO COMPANY
FOXBORO, MASS., U.S.A.
CHART 57222
UNIFORM
Steam Pressure
Steam Level
Steam Flow
Dry Kilns
SEP 8 1990
2AM
12M
10PM
8PM
6PM
4PM
2PM
Pizzle

9/6

Boiler Operating Data

Fuel type: ✓

every (15 min) Time	Fuel Feed Rate	Steam Flow	Steam Press	Steam Temp	Furnace Draft	Air Flow Gauge	Feed water Flow	Scrubber ΔP Differential	Drum Level
10:15	37	90,000	625 (psi)	767 (F)	-.35"	59 (%)	90,000 (gpm)	18"	Ø (Even)
10:30	36	90,000	625	773	-.35	57	90,000	18"	Ø
10:45	36	90,000	629	773	-.35	57	90,000	18"	Ø
11:00	37	90,000	625	769	-.35	60	90,000	18	Ø
11:15	34	90,000	625	767	-.35	52	90,000	17"	Ø
11:30	37	90,000	625	769	-.35	59	90,000	18"	Ø
11:45	35	90,000	625	764	-.35	57	90,000	17"	Ø
12:00	34	90,000	625	769	-.35	54	90,000	17"	Ø
12:15	34	90,000	627	764	-.35	52	90,000	15"	Ø
12:30	34	90,000	625	764	-.35	54	90,000	17"	Ø
12:45	35	90,000	625	773	-.35	56	90,000	17"	Ø
13:00	32	90,000	625	767	-.35	51	90,000	16"	Ø
13:15	32	90,000	625	767	-.35	56	90,000	15"	Ø
13:30	33	90,000	625	767	-.35	51	90,000	16"	Ø
13:45	34	90,000	625	768	-.35	51	90,000	16"	Ø
14:00	33	90,000	625	766	-.35	49	90,000	16"	Ø
14:15	34.5625		625.375	767.938		54.6875		16.8125	
14:30									
14:45									
15:00									
15:15									

±1

9/6/90

BOILER OPERATING DATA

FUEL TYPE White Fir Fuel

15 MIN INTERVAL TIME	FUEL FEED RATE	STEAM LB/HR FLOW	STEAM PRESS	STEAM TEMP	FURNACE DRAFT	AIR FLOW	FEEDWATER FLOW	SCRUBBER ΔP DIFFERENTIAL	DRUM LEVEL	
15:30	33	90,000	625	769	-.35"	53	90,000	15"	Ø	#2
15:45	31	90,000	625	769	-.35	53	90,000	16"	Ø	
16:00	33	90,000	626	768	-.35	50	90,000	14"	Ø	
16:15	32	90,000	625	769	-.35	54	90,000	16"	Ø	
16:30	31	90,000	625	764	+.35	49	90,000	15"	Ø	
16:45	32	90,000	625	765	+.35	51	90,000	15"	Ø	
17:00	35	91,000	624	768	+.35	57	91,000	16"	Ø	
17:15	32	90,000	625	768	+.35	50	90,000	15"	Ø	
17:30	33	90,000	625	767	+.35	51	90,000	15"	Ø	
17:45	33	90,000	625	767	+.35	72*	90,000	14"	Ø	
18:00	34	90,000	625	767	+.35	75	90,000	14"	Ø	
18:15	35	90,000	625	768	+.3	76	90,000	14"	Ø	
18:30	33	90,000	625	763	+.3	76	90,000	14"	Ø	
18:45	32.5	90,000	625	766	-.3	78	90,000	14.5"	Ø	
19:00	32.5	90,000	625	769	-.3	77	90,000	14.5"	Ø	
19:15										
19:30										
19:45										
20:00										

* Values around 50 are damper opening percentages
Values around 70 are % of Air flow capacity ≈ 30,000 FPM

SEP 7 1990 BOILER OPERATING DATA SEP 7 1990 FUEL TYPE FID PINE

15 MIN INTERVAL TIME	FUEL FEED RATE	STEAM LB/HR FLOW	STEAM PRESS	STEAM TEMP	FURNACE DRAFT	FD AIR FLOW	FEEDWATER FLOW	SCRUBBER ΔP DIFFERENTIAL	DRUM LEVEL	Hog Fuel
0915	36	90000	625	773	.35	87	90,000	17"	Ø	#3
0930	35	90000	625	768	.25	86	89,000	16"	Ø	"
0945	34	90000	626	771	.27	84	89,000	16"	Ø	"
1000	33.5	90000	626	771	.25	81	90,000	16"	Ø	"
1015	34.5	91,000	625	771	.28	84	90,000	16.5"	Ø	"
1030	32	90,000	626	769	.25	82	90,000	16"	Ø	"
1045	37	91,000	625	772	.27	88	90,000	16"	Ø	"
1100	35	90000	625	772	Ø	84	90,000	16"	Ø	"
1115	34	90,000	627	773	.25	80	89,000	16.5"	Ø	"
1130	34	89,000	625	769	.25	84	89,000	16"	Ø	"
1145	34	90,000	625	770	.24	82	90,000	16"	Ø	"
1200	35	90,000	625	769	.5	84	89000	16"	Ø	"
1215	33	90,000	625	774	.2	84	89,000	16"	Ø	"
1230	35	90,000	627	772	.25	82	90,000	15.5"	Ø	"
1245	33.5	90,000	626	773	.28	82	90,000	15.5"	Ø	"
1300	35	90,000	625	771	.25	86	90,000	15.5"	Ø	"
1315	34	90,000	625	770	.25	85	90,000	15"	Ø	"
1330	35	90,000	625	771	.27	85	90,000	17"	Ø	"
1345										
1400							SEP 7 1990			
1415 *	34.5	90,000	625	776	Ø	88	90,000	15.5"	Ø	#4
1430 *	32	91,000	625	768	.25	74	90,000	15"	Ø	"
1445	32	90,000	625	763	.2	78	89,000	14.5"	Ø	"
1500	32	9000	625	765	.27	82	90,000	15"	Ø	"
1515	* Power Back on to Kilns Small Boiler Upset									
1530	34	8002	625	772	.25	85	89,000	14.5	Ø	"
1545	33	90,000	627	766	.5	80	88,000	15"	Ø	"

NOTE: [illegible] THIS [illegible] RUN [illegible] THIS PAGE

SEP 7 1990 BOILER OPERATING DATA SEP 7 1990 FUEL TYPE FIR/PIN/COAL

15 MIN INTERVAL TIME	FUEL FEED RATE	STEAM LB/HR FLOW	STEAM PRESS	STEAM TEMP	FURNACE DRAFT	AIR FLOW	FEEDWATER FLOW	SCRUBBER ΔP DIFFERENTIAL	DRUM LEVEL	
1600	33.5	91,000	625	775	.25	93	91,000	15.	0	J Y Adams
1615	32	90,000	625	771	.25	92	89,000	15.5	0	"
1630	32	90,000	626	769	.26	83	89,000	15	0	"
1645	39	91,000	625	767	.26	95	90,000	14.5	0	J Y Adams
1700										
1715										
1730										
1745										
1800										

INCINERATOR TIME	FUEL FEED RATE %	STEAM LB/HR FLOW	STEAM PRESS	STEAM TEMP	FURNACE DRAFT	AIR FLOW	FEEDWATER FLOW	SCRUBBER ΔP DIFFERENTIAL	DRUM LEVEL	SEP 8 1990
0015	38%	90,000	625	739	.27"	94%	89,000	18"	0	TEST
				TEST STARTED						SEP 8 1990
0930	36	89,000	626	779	0	91	88,000	17.5"	0	J. L. Adams
0945	39	91,000	625	777	-.25	98	89,000	17.5"	0	"
1000	33	90,000	625	773	-.25	94	89,000	18"	0	"
1015	37	90,000	625	775	-.24	92	89,000	17.5"	0	"
1030	36	90,000	627	777	-.27	90	89,000	18"	0	"
1045	37	90,000	625	775	-.24	92	89,000	17"	0	"
1100	36.5	90,000	625	773	-.25	93	88,000	17"	0	"
1115	37	90,000	625	775	-.25	93	90,000	17"	0	"
1130	38	89,000	624	779	0	95	88,000	17"	0	"
1145	38	90,000	625	773	-.15	94	90,000	17"	0	"
1200	37.5	90,000	625	777	-.25	92	89,000	18"	0	"
1215	36	90,000	625	773	-.25	88	89,000	16"	0	"
1230	37	88,000	625	773	-.25	90	88,000	16"	0	"
1245	34.5	90,000	625	772	-.30	89	90,000	17"	0	"
* 1300	35.5	90,000	627	777	-.25	89	90,000	17"	0	J. L. Adams
1315	37	90,000	625	774	-.13	90	89,000	17.5"	0	"
1330	36	89,000	625	770	-.25	90	88,000	16"	0	"
1345	35	90,000	627	772	-.12	89	89,000	17"	0	"
1400	37	90,000	625	769	-.28	90	90,000	16.5"	0	"
1415	36	88,000	626	767	-.25	88	88,000	16.5"	0	"
1430	35	90,000	628	773	-.12	87	89,000	16"	0	"
1445	36	90,000	625	771	-.26	92	89,000	16.5"	0	"
1500	35	91,000	626	772	-.25	85	90,000	16.5"	0	"
1515	36	90,000	625	766	-.25	88	90,000	17"	0	"
1530	36	90,000	622	770	-.29	88	90,000	17"	0	J. L. Adams

* START OF SECOND TEST.

15 MIN INTERVAL

SEP 8 1990

TIME	FUEL FEED RATE	STEAM LB/HR FLOW	STEAM PRESS	STEAM TEMP	FURNACE DRAFT	AIR FLOW	FEED WATER FLOW	SCRUBBER ΔP DIFFERENTIAL	DRUM LEVEL	SEP 8 1990
1545	35	90000	600	269	.25	85	89,000	19"	0	J.L. Adams
1600										
1615										
1630										J.L. Adams

ATTACHMENT II: Stack Configuration And Traverse Point Locations

SELECTION OF SAMPLING SITES AND

NUMBER OF TRAVERSE POINTS

PARTICULATE TRAVERSES

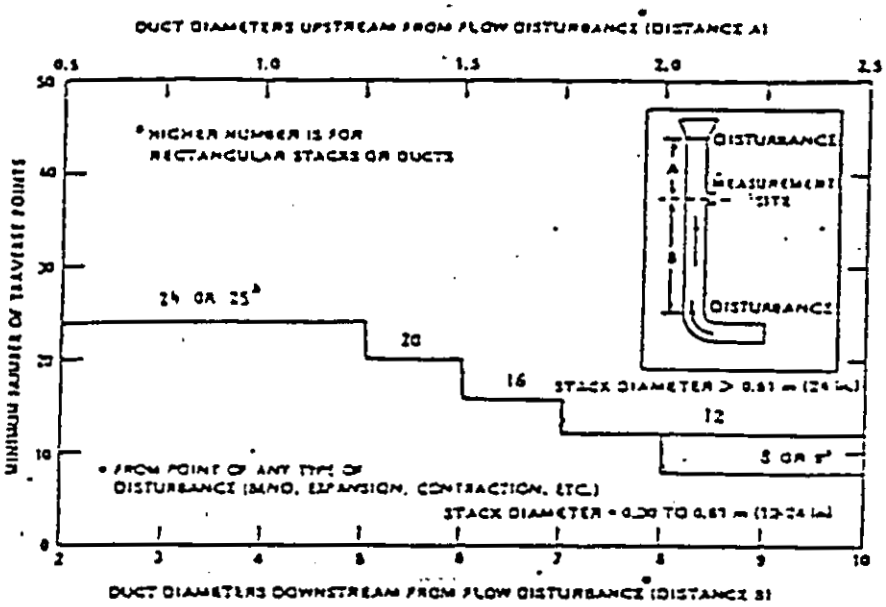


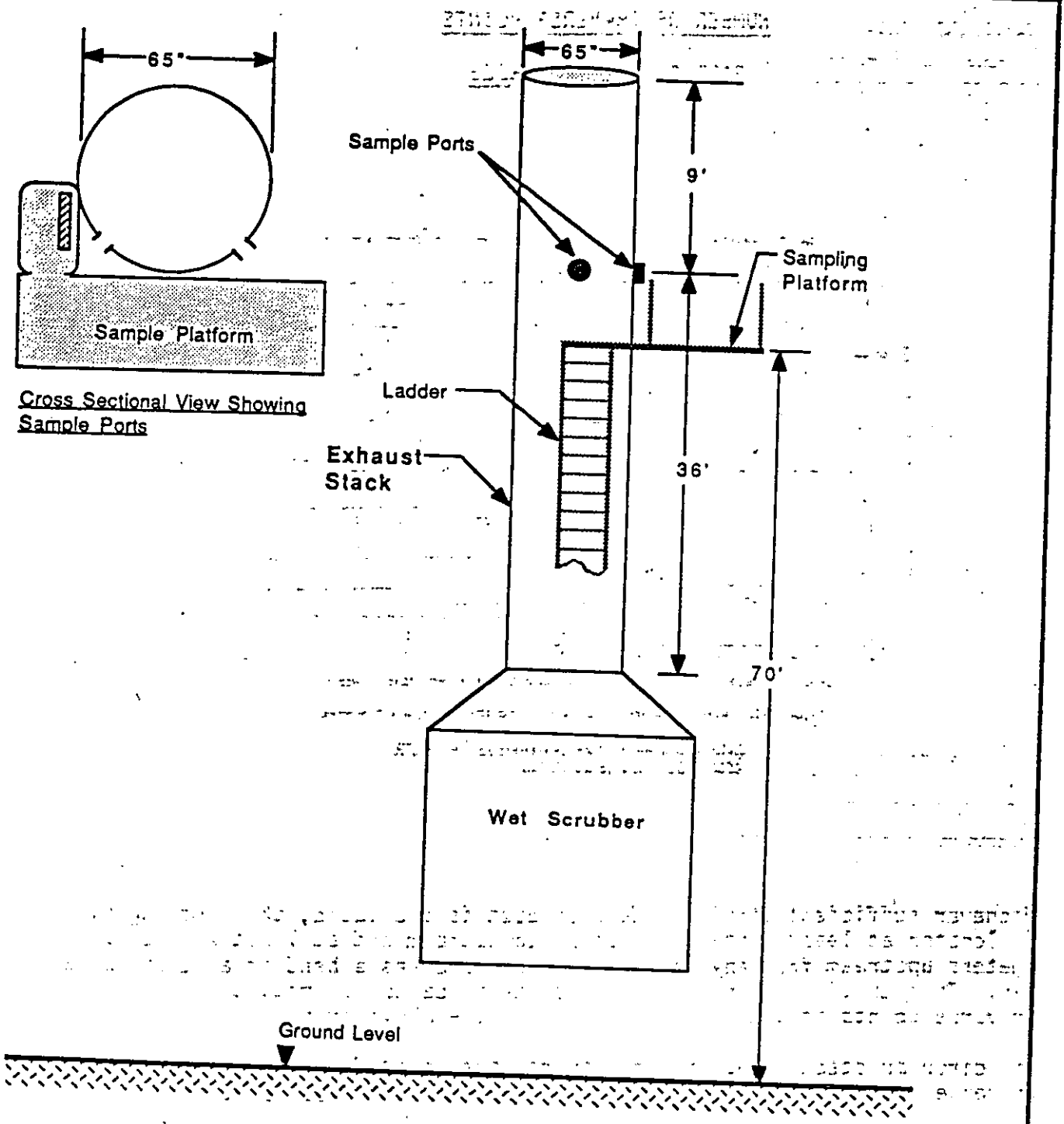
Figure 1-1. Minimum number of traverse points for particulate traverses.

[Method 1 — Figure 1-1 revised by 48 FR 45035, September 30, 1983]

Whenever sufficient straight stack or duct is available, the sampling site is located at least 8 stack diameters downstream and at least 2 stack diameters upstream from any flow disturbance such as a bend or an elbow or a fan. In situations where the above criteria cannot be met, the number of traverse points is increased according to the above graph.

For circular stacks, the traverse points are located on two diameters, the traverse axes dividing the stack cross-section into equal parts.

For rectangular stacks, the cross-section is divided into equal areas, such that the ratio of the length to width of the rectangles formed, is between 1 and 2. The traverse points are located at the center of each area.



Galson Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704	SCALE: NTS	JOB NUMBER: S9-072.CH	Timber Association of California Catalyst Hudson	SKETCH
	DATE: 9/5/90	DRAWN BY: EC	Boiler Exhaust Stack	

Traverse Locations (Circular Stack):

Stack Identification:	Boiler #1 Exhaust
Stack Diameter:	65 inches
Sampling Locations:	≈1.7 diameters uptream of stack discharge ≈6.6 diameters downstream of nearest disturbance
Minimum Number of Traverse Points as Specified by CARB Method 1:	20
Number of Traverse Points Sampled:	20

Traverse Point Number	Distance From Inside Wall (In.)
1	1.7
2	5.3
3	9.5
4	14.7
5	22.2
6	42.8
7	50.3
8	55.5
9	59.7
10	63.3

CYCLONIC FLOW DETERMINATION

Plant: Catalyst Hudson Stack: 65"

Traverse Point No.	Velocity Head ΔP, inches H_2O	TEMP.	Degrees Deviation From Reference α
1	.21	138	22°
2	.25	134	24°
3	.25	136	10°
4	.24	135	-4°
5	.26	134	-3°
[illegible]	.29	136	-1°
7	.31	137	0°
8	.28	135	-2°
[illegible]	.29	135	3°
10	.24	134	-2°

Traverse Point No.	Velocity Head ΔP, inches H_2O	TEMP	Degrees Deviation From Reference α
B 1	.10	135	0°
2	.20	135	1°
3	.25	135	2°
4	.24	133	2°
5	.26	136	0°
6	.28	135	-6°
7	.28	136	0°
8	.32	135	0°
9	.27	136	-5°
10	.24	137	2

Average | α | = [illegible]

ATTACHMENT III: Sampling And Analytical Methods

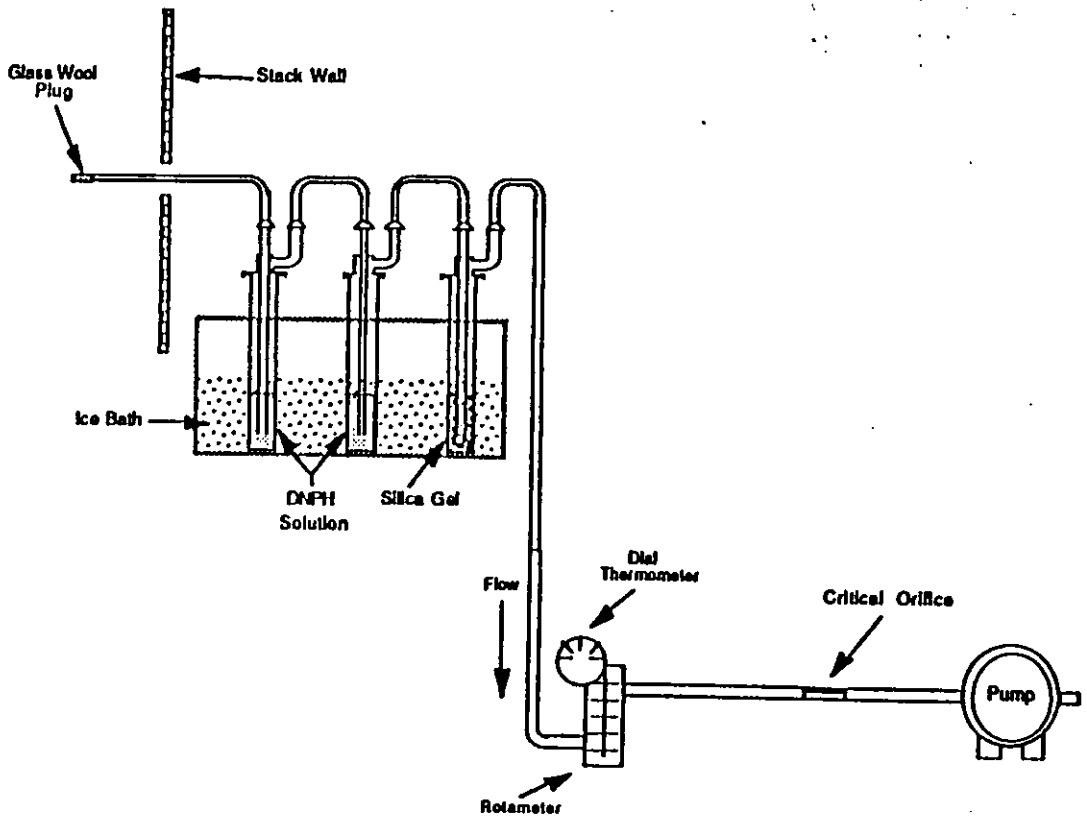
SAMPLING AND ANALYTICAL METHODS:
FORMALDEHYDE AND ACETALDEHYDE EMISSIONS - CARB METHOD 430

Formaldehyde and acetaldehyde emission testing was conducted in accordance with California Air Resources Board Method 430. The sampling train shown on the following page was utilized to collect the samples. Exhaust gases are drawn through an integral probe/particulate filter (glass wool plug) assembly followed by two impingers containing 15 milliliters (each) of absorbing solution (2,4-dinitrophenylhydrazone, DNPH). Sample flow rate is regulated by a critical orifice/high vacuum pump assembly.

The DNPH solution is formulated within 48 hours of sampling. Sampling is performed at a single point in the exhaust stack/duct at a constant flow rate (i.e., approximately 0.5 liters per minute). The sampling rate is determined prior to each test period with a soap bubble flow meter; sample gas temperatures (at the critical orifice), rotameter readings, and pump vacuum are recorded at approximately 5 to 10 minute intervals during the testing.

At the end of the test interval, the sampling rate is again determined with the bubble meter. The solution is then transferred to a sample bottle, along with a small volume of rinse (approximately 5 milliliters of the DNPH). The samples are packaged (on ice) for shipment to the laboratory.

In the laboratory, the solution is extracted and the derivative is analyzed using high performance liquid chromatography (HPLC), coupled with ultraviolet (UV) absorption detector (at 360 nanometers). Quantification is provided by comparing the sample response with laboratory-prepared standards of formaldehyde. A field blank is prepared and analyzed in conjunction with the samples to determine if sample contamination occurred. The samples are analyzed within seven days of collection.



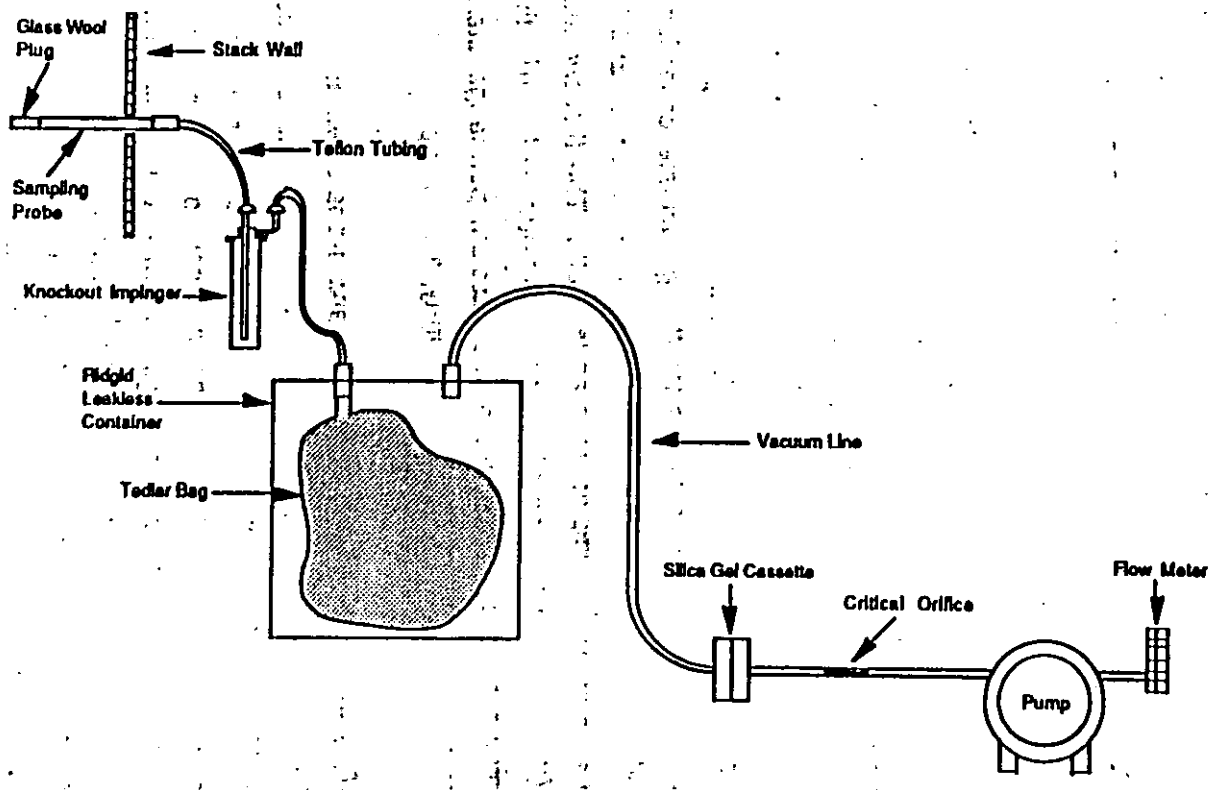
GALSON Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0389 Fax: (415) 848-0838	SCALE: NA	JOB NUMBER: S9-072	TIMBER ASSOCIATION OF CALIFORNIA	File: Form. Drwg
	DATE: 6/14/90	DRAWN BY: ML	FORMALDEHYDE SAMPLING TRAIN	Disk: S9-072

SAMPLING AND ANALYTICAL METHODS:
BENZENE EMISSIONS - CARB METHOD 410A

Benzene emission testing was conducted in accordance with California Air Resources Board Method 410A. The sampling train shown on the following page was utilized to collect the samples.

An integrated sample of the exhaust gas is collected in a tedlar bag. Sample gas is drawn through a stainless steel probe/integrated particulate filter (glass wool plug) assembly. The gas then passes through teflon tubing and into a 10-liter tedlar bag. The bag is retained in a rigid, leak-free container (i.e., lung sampler) which is evacuated at a constant rate of approximately 0.2 lpm. The sampling system is leak tested prior to use.

Following sampling, the bag is labelled, sealed, and transferred to a storage container. Exposure to sunlight is minimized. The sample is then transferred to a laboratory where it is analyzed for benzene using gas chromatography/mass spectrometry (GC/MS). Quantification is provided by comparing the sample response with laboratory-prepared standards. A field blank (nitrogen) is prepared and analyzed in conjunction with the samples to determine if sample contamination occurred. Sample analyses are performed within 48 hours of collection.



GALSON Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0389 Fax: (415) 848-0838	SCALE: NA	JOB NUMBER: S9-072	TIMBER ASSOCIATION OF CALIFORNIA	File: Benz. Drwg
	DATE: 10/10/90	DRAWN BY: ML	BENZENE SAMPLING TRAIN (CARB 410A)	Disk: MASTER METHODS

SAMPLING AND ANALYTICAL METHODS: DETERMINATION OF PARTICULATE AND METALS (11) EMISSIONS - CARB METHOD 5 AND EPA MULTIPLE METALS METHOD (DRAFT: 8/28/89)

Particulate and metals emission testing was performed in accordance with the California Air Resources Board (CARB) Method 5 and the EPA Draft Multiple Metals Method (dated August 28, 1989), respectively. Sampling equipment manufactured by Research Appliance Corporation (RAC) and Nutech Corporation was utilized to collect the samples. A schematic of the sampling train is shown on the following page. Velocity pressure of the stack gas is measured with a Stausscheibe-type pitot tube connected to an inclined gauge manometer. Isokinetic sampling rates are calculated using a nomograph and sample flow rate is regulated accordingly by adjusting the pressure drop across a calibrated orifice. Total sample volume is measured with a dry gas meter. Direct thermocouple read-out is provided for stack gas, impinger effluent, probe, sampling box, and gas meter influent and effluent temperatures. Emissions of the following metals were determined:

Arsenic	Beryllium
Cadmium	Chromium (Total)
Copper	Lead
Manganese	Mercury
Nickel	Selenium
Zinc	

Stack gases are drawn through a glass nozzle and a heated, glass-lined sampling probe, prior to passing through a pre-weighed 85 millimeter glass fiber filter (for particulate collection). The filter, which meets CARB specifications for removal efficiency, is maintained at 250°F. The gases are then bubbled through a series of five impingers in an ice bath. The first two impingers each contain 100 milliliters (mls) of a nitric acid/hydrogen peroxide solution[1]; the third impinger is empty; the fourth impinger contains 100 mls of a potassium permanganate/sulfuric acid solution[2]; the fifth impinger contains 200 grams of indicating-type silica gel.

Following the completion of sampling, the filter is recovered and transferred to a storage container (Container C); the probe, nozzle, and filter holder are rinsed (and brushed) with acetone (Container A), and then rinsed (only) with the nitric acid/hydrogen peroxide solution (Container B). The volume of solution in the first, second, and third impingers is measured and transferred to Container D; these impingers (and connecting glassware) are then rinsed with the nitric acid/hydrogen peroxide solution and the rinses are added to Container D. The volume of solution in the fourth impinger is measured and transferred to Container E; this impinger is then rinsed with the potassium permanganate/sulfuric acid solution and transferred to Container E. Lastly, the silica gel in the fifth impinger is transferred to Container F.

---

1 5%HNO_3/10%H_2O_2.

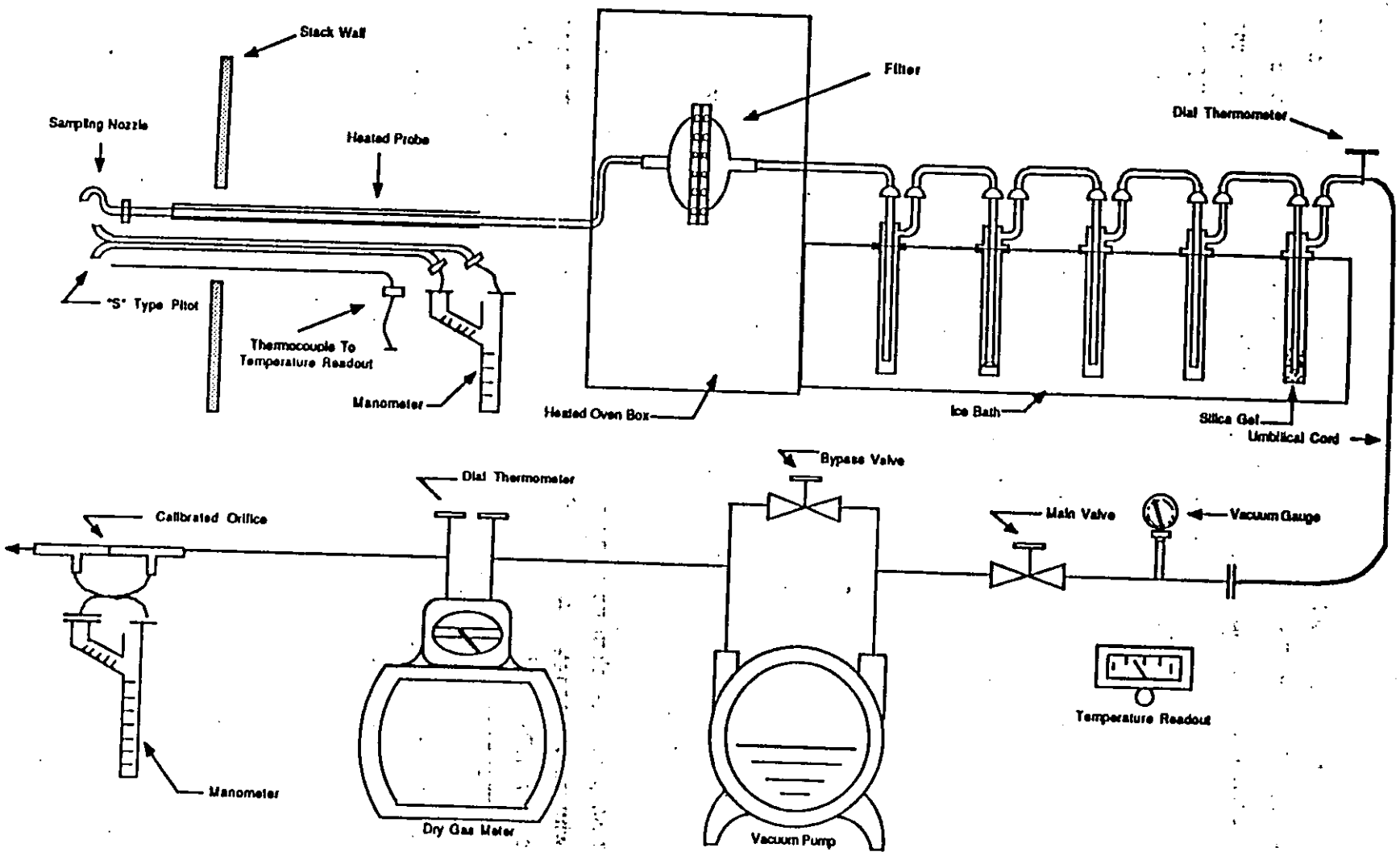
2 4%$KMnO_4$/10%H_2SO_4

In the laboratory, the acetone rinse sample (Container A) is poured into a pre-weighed beaker and evaporated to dryness. The filter (Container C) and beaker are then placed in a dessicator for is then added to the beakers and the samples are digested; following digestion, the Container B and D samples are added and the solution is concentrated to approximately 250 mls. The sample is then analyzed for each metal using the following instrumentation:

Metal	Instrument
Arsenic	Atomic Absorption (Graphite Furnace)
Beryllium	Inductively Coupled Plasma
Cadmium	Inductively Coupled Plasma
Chromium	Inductively Coupled Plasma
Copper	Inductively Coupled Plasma
Lead	Atomic Absorption (Graphite Furnace)
Manganese	Inductively Coupled Plasma
Mercury	Atomic Absorption (Cold Vapor)
Nickel	Inductively Coupled Plasma
Selenium	Atomic Absorption (Graphite Furnace)
Zinc	Inductively Coupled Plasma

The Container E sample (i.e., potassium permanganate/sulfuric acid solution) is first filtered and the filter is washed with permanganate. An aliquot of the filtrate is then analyzed for mercury (only) in accordance with EPA Method 101A (cold vapor atomic absorption), following the addition of potassium permanganate, nitric acid, and sodium chloride hydroxylamine.

The pre-weighed silica gel sample (Container F) is re-weighed and summed with the increase in impinger contents to determine the total volume of water condensed.



GALSON Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0389 Fax: (415) 848-0838	SCALE: NA	JOB NUMBER: S9-072	TIMBER ASSOCIATION OF CALIFORNIA	File: Metals. Drwg
	DATE: 9/27/90	DRAWN BY: ML	MULTIPLE METALS SAMPLING TRAIN	Disk: S9-072

SAMPLING AND ANALYTICAL METHODS:
CONDENSABLE PARTICULATE EMISSIONS (CARB METHOD 5)

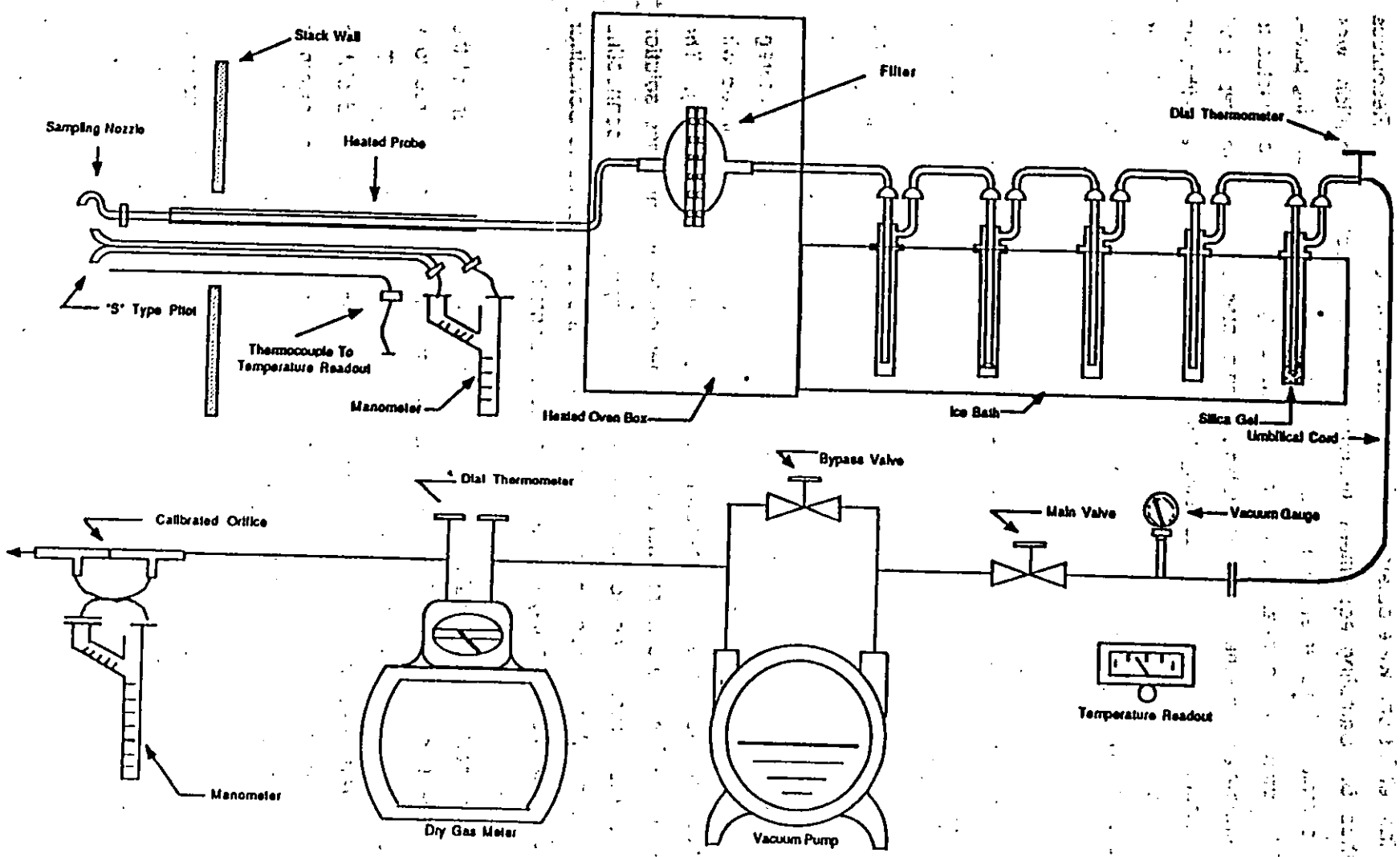
Condensable particulate emissions were determined in accordance with California Air Resources Board (CARB) Method 5. Sampling equipment, manufactured by Nutech Corporation, was utilized to collect the samples. A schematic of the sampling train is shown on the following page. Velocity pressure of the stack gas is measured with a stausscheibe-type pitot tube connected to an inclined gauge manometer. Isokinetic sampling rates are calculated using a nomograph and sample flow rate is regulated accordingly by adjusting the pressure drop across a calibrated orifice. Total sample volume is measured with a dry gas meter. Direct thermocouple read-out is provided for stack gas, impinger effluent, probe, sampling box, gas meter influent and effluent temperatures.

Stack gases are drawn through a glass nozzle and a glass-lined sampling probe, followed by a filter on which particulate matter is collected The gases are then bubbled through a series of four impingers in an ice bath to condense moisture. The first two impingers each contain 100 ml of deionized water, the third impinger is empty and the fourth impinger contains 300 grams of indicating silica gel.

Following the completion of sampling, the filter is removed and transferred to a storage container (Container #A). The probe liner, sampling nozzle, and filter holder are rinsed with acetone, and the rinses are transferred to a separate storage container (Container #B). The volume of the water in the impingers is measured; the impinger contents and rinse solution (deionized water) are then transferred to Container #C. The impingers and connecting glassware are then rinsed with methylene chloride and the rinses are transferred to Container #C. Lastly, the silica gel in the fourth impinger is transferred to Container #D.

In the laboratory, the back-half, or condensable, particulate matter is reported as the sum of the organic and water-soluble fractions of the Container C sample; the sample is transferred to a separatory funnel and extracted with methylene chloride (liquid-liquid extraction). The methylene chloride and water fractions are then evaporated to dryness in pre-weighed dishes and the organic and water-soluble back-half particulate quantities are determined gravimetrically in accordance with section 4.3.1 of Method 5.

The pre-weighed silica gel sample (Container #D) is re-weighed and summed with the increase in impinger contents to determine the total volume of water condensed.



GALSON Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0389 Fax: (415) 848-0838	SCALE: NA	JOB NUMBER: S9-072	TIMBER ASSOCIATION OF CALIFORNIA	File: Part. Drwg
	DATE: 9/27/90	DRAWN BY: ML	CONDENSABLE PARTICULATE SAMPLING TRAIN	Disk: S9-072

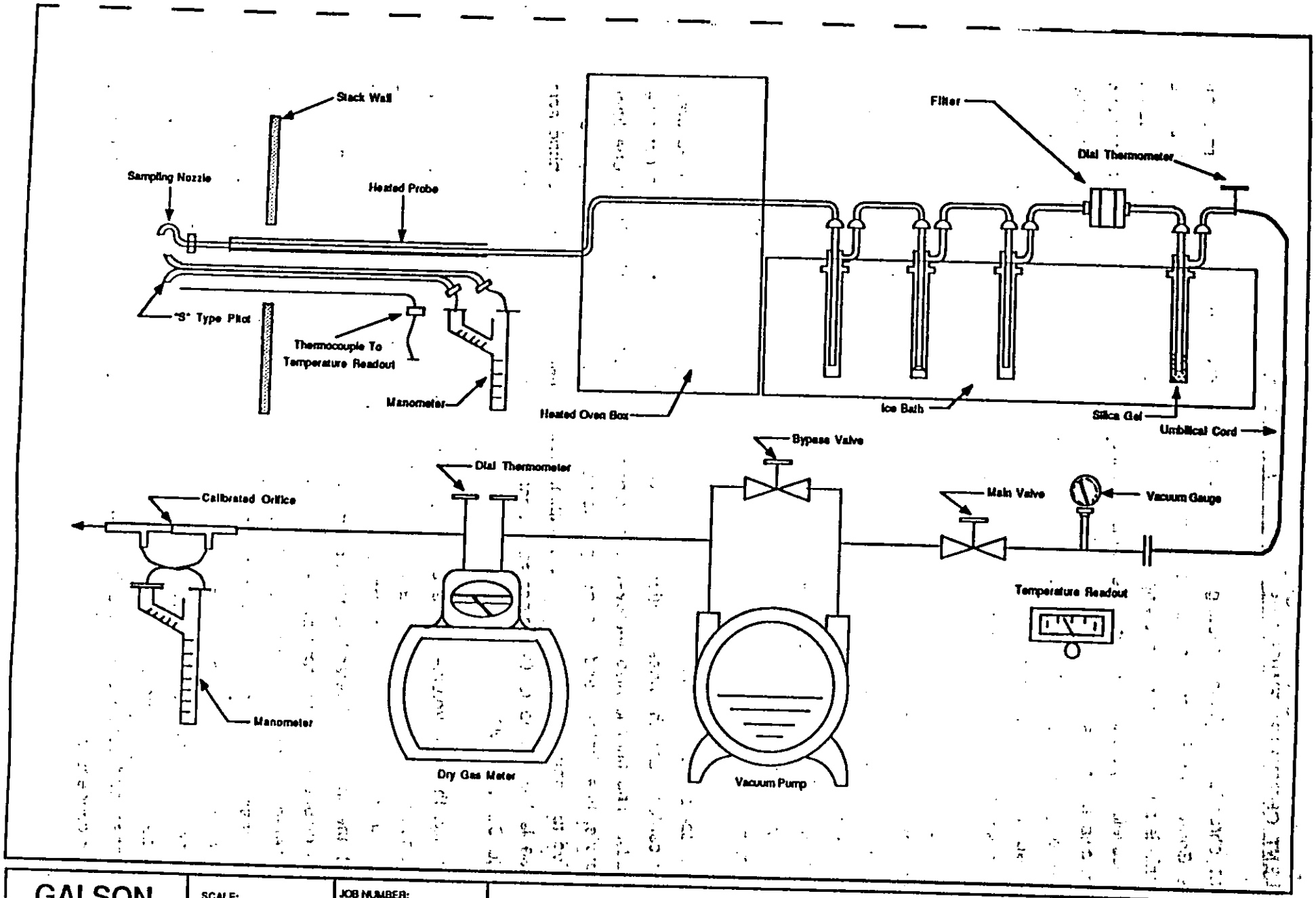
SAMPLING AND ANALYTICAL METHODS:
HEXAVALENT CHROMIUM EMISSIONS - CARB METHOD 425

Hexavalent chromium emission testing was performed in accordance with California Air Resources Board (CARB) Method 425 (amended, January 11, 1990). A schematic of the sampling train is presented on the following page. Velocity pressure of the stack gas is measured with a stausscheibe type pitot tube connected to an inclined gauge manometer. Isokinetic sampling rates are calculated using a nomograph and sample flow rate is regulated accordingly by adjusting the pressure drop across a calibrated orifice. Total sample volume is measured by a dry gas meter. Direct thermocouple read-out is provided for stack gas, impinger effluent, probe, sampling box, and the gas meter influent and effluent temperatures.

Stack gases are drawn through a glass nozzle, probe and oven assembly (non-heated) and bubbled through two impingers in series, each containing 100 milliliters of 0.1 N sodium hydroxide (NaOH) solution. Stack gases are then drawn through an empty impinger (for droplet/mist knockout) followed by an 85mm teflon-impregnated fiberglass filter (Pallflex Products #T60A20) meeting CARB specifications for removal efficiency. The sample gas then passes through a fourth impinger containing 300 grams of indicating silica gel, prior to entering the metering system.

Following the completion of sampling, the volume of the solution in the impingers is measured; the impinger contents and the rinse solution (0.1 N NaOH) are transferred to a storage container (Container #1). The filter is also removed and transferred to Container #1. The probe liner, sampling nozzle, filter holder, and connecting glassware are rinsed with 0.1 N NaOH, and the rinse is added to Container #1. The entire sampling train is then rinsed with 0.1 N nitric acid and the rinse is transferred to Container #2. Lastly, the silica gel in the fourth impinger is transferred to Container #3.

In the laboratory, the total volume of the Container #1 sample is measured. An aliquot of the sample is transferred to a beaker and acidified to a pH of approximately 1 (with 6 N sulfuric acid). After the addition of diphenylcarbazide (allowing approximately 10 minutes for color development), the sample is filtered and the absorbance is measured with a spectrophototmeter at a wavelength of 540 nm. The absorbance of the sample is compared with solutions of known amounts to determine sample quantities. Field and laboratory (internal) blank samples are prepared and analyzed in conjunction with the samples to account for potential contamination and/or background levels. A second aliquot of the Container #1 solution is analyzed for total chromium using flame atomic absorption spectroscopy (AAS). The Container #2 solution is similarly analyzed for total chromium using AAS. The pre-weighed silica gel sample (Container #3) is re-weighed and summed with the increase in impinger contents to determine the total volume of water condensed.



GALSON Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0389 Fax: (415) 848-0838	SCALE: NA	JOB NUMBER: S9-072	TIMBER ASSOCIATION OF CALIFORNIA	File: Hex Chr. Drwg
	DATE: 9/7/90	DRAWN BY: ML	HEXAVALENT CHROMIUM SAMPLING TRAIN (CARB METHOD 425)	Disk: S9-072

METHOD FOR THE DETERMINATION OF
POLYCYCLIC AROMATIC HYDROCARBON AND PHENOL EMISSIONS
(CARB METHOD 429)

Sampling and analysis for emissions of Polycyclic Aromatic Hydrocarbon (PAH) compounds and phenols was performed in accordance with the California Air Resources Board (CARB) Method 429. Stack gas samples were collected utilizing Modified Method 5 (MM5) procedures; a schematic of the train is shown on the following page. Velocity pressure of the stack gas is measured with an S-type pitot connected to an inclined gauge manometer. Isokinetic sampling rates are calculated using a nomograph, with sample flowrate regulated by adjusting the pressure drop across a calibrated orifice. Total sample volume is measured by a dry gas meter. Dial thermometers and/or thermocouples are employed to monitor stack gas, probe filter oven, XAD-2 trap effluent, impinger effluent, and dry gas meter influent and effluent temperatures.

Stack gases are drawn isokinetically through a nozzle and heated borosilicate glass probe, and then through an 85 millimeter diameter glass fiber filter meeting CARB Method 5 specifications for particulate removal efficiency. Both probe and filter are maintained at 250 ± 25°F to avoid condensation. The sample gas is then drawn through teflon tubing and an ice water-cooled condenser/solid sorbent trap containing approximately 40 grams of XAD-2 resin. The resin trap is wrapped with aluminum foil (to avoid direct exposure to light) and the temperature of the sample gas is maintained below 68°F at the trap exit. Condensate percolates through the resin and is collected in a knock-out impinger; gases are then bubbled through a series of three impingers for additional moisture removal. The second and third impingers each contain 100 ml of deionized water and the fourth impinger contains approximately 300 grams of indicating silica gel; all impingers are pre-weighed on-site and placed in an ice bath to achieve a sample effluent temperature of less than 68°F.

Following the completion of sampling, the probe liner, nozzle, and all glassware preceding the filter are brushed and sequentially rinsed with methanol, benzene, and methylene chloride; the rinses are transferred to a storage bottle (Container A). The filter is removed and transferred to a separate storage bottle (Container B). The teflon tubing, condenser, and glassware between the filter and resin trap are then rinsed with methanol, benzene, and methylene chloride; the rinses are transferred to a storage bottle (Container C). The XAD-2 resin trap is next removed and sealed (Container D). The impingers are then re-weighed to determine the quantity of moisture condensed; the contents of the knock-out impinger are transferred to a storage container (Container E) along with the methanol, benzene, and methylene chloride rinse of the impinger. The contents of the second and third impinger are transferred to a storage bottle (Container F) along with a deionized water rinse of these impingers and all connecting glassware. Lastly, the silica gel in the final impinger is transferred to a storage bottle (Container G), completing the sample recovery process.

Special precautions are taken to avoid sample contamination. All sampling train components upstream of the silical gel impinger are pre-cleaned in accordance with EPA's Manual of Analytical Methods for the Analysis of Pesticide Residues in Human and Environmental Samples, with special attention paid to removing silicon grease from the glassware joints. All glassware was then rinsed with methylene chloride prior to use. No grease is utilized in the sampling train and all gaskets coming in contact with the sample are teflon. Also, sample recovery is performed in a clean area away from the emission source (and other potential sources of contamination) being tested; all (pre-cleaned) sample storage containers have teflon-lined caps. Sampling reagents (filters and XAD-2 resin) are pre-cleaned via soxhlet extraction and spiked with surrogate standard compounds. Lastly, a blank train is assembled and recovered in the field; the blank train is analyzed in conjunction with the samples to document whether contamination occurred.

Sample containers A through F are analyzed for the following PAH and phenol compounds utilizing high resolution gas chromatography/mass spectrometry (HRGC/MS). The following compounds are quantified.

PAH compounds

Naphthalene	Acenaphthylene
Acenapthene	Fluorene
Phenanthrene	Anthracene
Fluoranthene	Benzo(a)anthracene
Chrysene	Benzo(b)fluoranthene
Benzo(k)fluoranthene	Benzo(a)pyrene
Pyrene	Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene	Benzo(g,h,i)perylene

Phenol Compounds

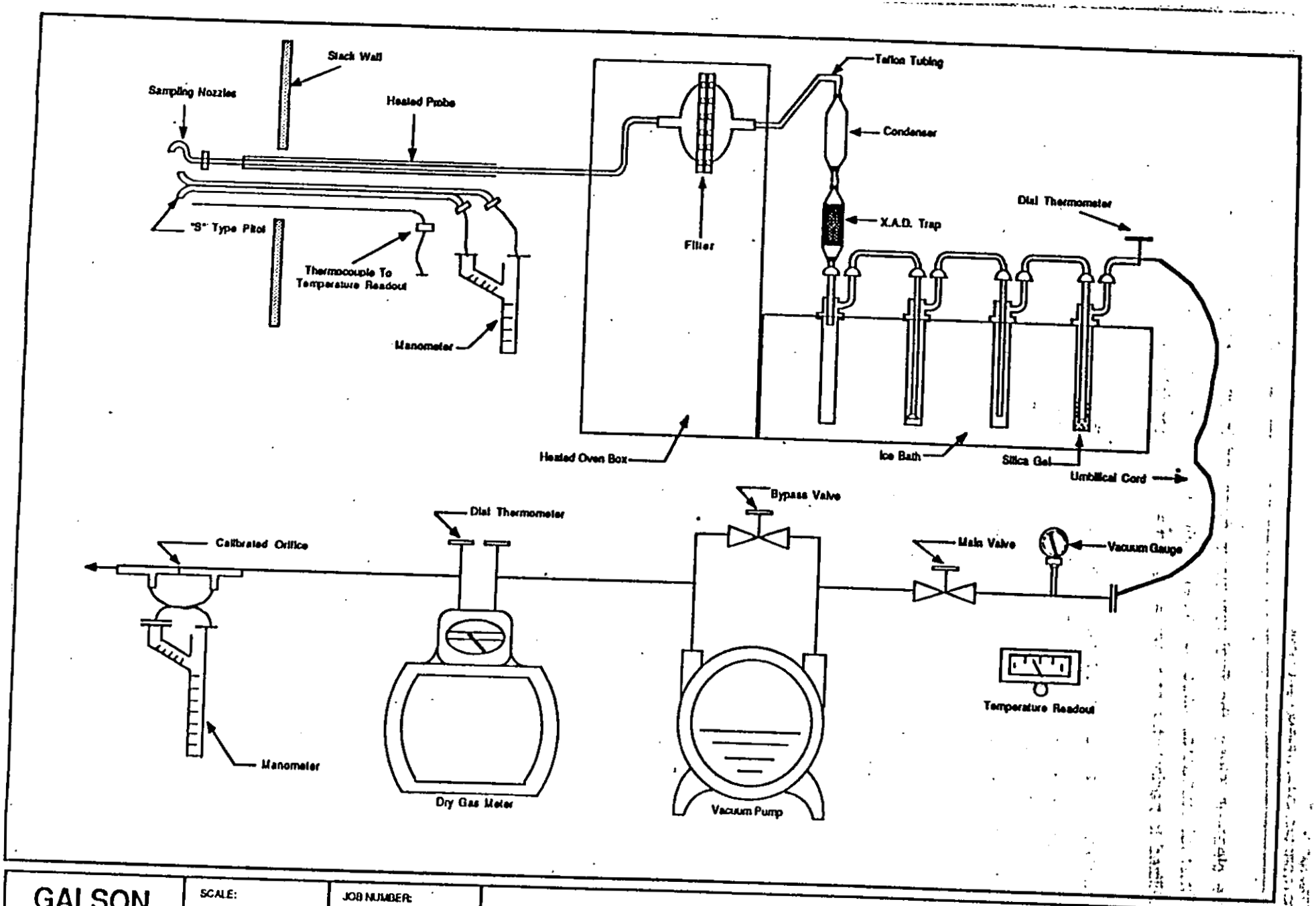
4-chloro-3-methyl phenol	Pentachlorophenol
2-chlorophenol	Phenol
2,4-dichlorophenol	2,4,6-trichlorophenol
2,4-dinitrophenol	2,4-dimethylephenol
2-methyl-4,6-dinitrophenol	2-nitrophenol
4-nitrophenol	

The silica gel sample (Container G) was re-weighed and summed with the increase in impinger contents to determine the total volume of water condensed.

In the laboratory, the samples and/or extracts corresponding to Containers A through F are combined and prepared for analysis in accordance with CARB Method 429 procedures. All samples (including the blanks) are fortified with internal and surrogate standards prior to preparation.

Following sample clean-up steps, the final residue is dissolved in 20 µl of toluene, containing carbon-labeled internal standards used for determining recovery efficiencies. The instrument and conditions utilized to perform the analyses are summarized on the following page.

Prior to sample analysis, the mass spectrometer response was calibrated with several standard solutions containing known amounts of the PAH isomers of interest. In addition, a continuing calibration was demonstrated every 12 hours using one of the solutions. Response factors used for the calculation of the analyte concentrations were obtained from the continuing calibration checks.



GALSON Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0389 Fax: (415) 848-0838	SCALE: NA	JOB NUMBER: S9-072	TIMBER ASSOCIATION OF CALIFORNIA	File: PAH. CARB 429
	DATE: 10/10/90	DRAWN BY: MSL	PAH SAMPLING TRAIN (CARB METHOD 429)	Disk: S9-072

SAMPLING AND ANALYTICAL METHODS:
OXYGEN AND CARBON DIOXIDE - CARB METHOD 100
(CONTINUOUS MONITORING PROCEDURE)

Stack gas concentrations of oxygen and carbon dioxide were determined in accordance with the California Air Resources Board (CARB) Method 100. An electrochemical oxygen analyzer manufactured by Infrared Industries, Inc. (Model IR-2200) and a nondispersive infrared radiation (NDIR) carbon dioxide analyzer manufactured by Horiba Instruments (Model PIR-2000) were utilized to perform the testing. The stack gas conditioning system consisted of a glass wool filter and a hygroscopic ion exchange membrane (PermaPure Products, Inc.) for particulate and moisture removal. Data were digitally recorded using a data logger/personal computer assembly; a strip chart recorder was also used for back-up purposes. A schematic of the sampling train is shown on the following page.

Stack gases are drawn through the probe/three-way calibration valve assembly and through a heated sampling line to the particulate/moisture removal system. The sample gas then passes through a leak-free diaphram pump and flow control valve and into the sample gas manifold. Sample gas flowrate through the system is maintained at approximately 4-5 l/min (to minimize response time); sampling rate of the analyzer is approximately 0.5 l/min. All materials in contact with the sample gas stream are either teflon or stainless steel.

The oxygen analyzer is equipped with a diffusion limited metal-air electrochemical cell; the current generated by the cell is proportional to the sample gas oxygen concentration. The CO_2 analyzer utilizes the NDIR absorption characteristics of carbon dioxide to determine stack gas concentrations; the voltage generated by the detector is proportional to the sample gas concentration. Instrument outputs include a digital (or analog) readout and 0-1V recorder terminals; the 0-25% (O_2) and 0-15% (CO_2) full scale responses for each analyzer are typically utilized The data logger and strip chart recorder are connected to the appropriate instrument terminals to record the analyzer output signals; subsequent data reduction includes converting voltage outputs to CO_2/O_2 concentrations (based on the instrument calibrations and ranges selected) and averaging concentrations for the time periods of interest.

Instrument calibrations are performed on-site utilizing purified nitrogen, zero air (20.9% O_2), oxygen (in nitrogen), and CO_2 (in air) certified gas standards. Prior to the start of testing, the instruments are calibrated directly by introducing each calibration gas to the sample gas manifold; a system bias check is then performed by introducing each gas at the probe/three-way valve assembly. The calibration checks are repeated at the conclusion of the testing; acceptable performance specifications include a zero/calibration drift of up to ± 3%. The instruments are periodically checked for interference from SO_2, NO_X, and CO with a maximum response of 2% of full scale considered acceptable. Other gases are checked on a case by case basis if they are expected to be present and/or potential interferences.

SAMPLING AND ANALYTICAL METHODS: CARBON MONOXIDE - CARB METHOD 100 (CONTINUOUS MONITORING PROCEDURE)

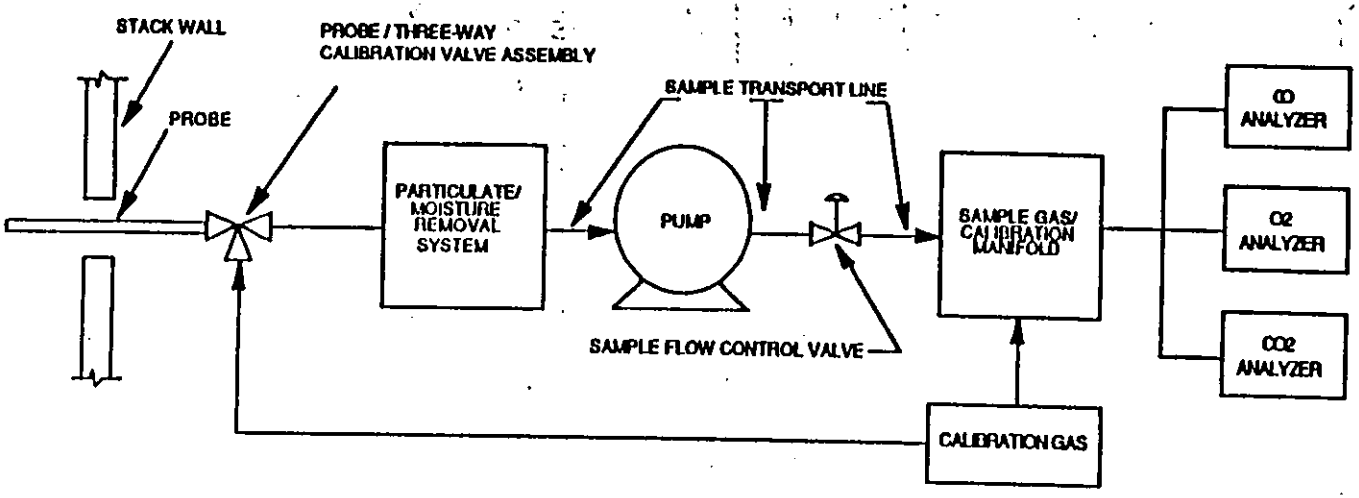
Stack gas concentrations of carbon monoxide were determined in accordance with the California Air Resources Board (CARB) Method 100. A gas correlation non-dispersive infrared analyzer manufactured by Thermo Electron Corporation (TECO Model 48) was utilized to perform the testing. The stack gas conditioning system consisted of a glass wool filter and a hygroscopic ion exchange membrane (PermaPure Products, Inc.) for particulate and moisture removal. Data were digitally recorded using a data logger/personal computer assembly; a strip chart recorder was also used for back-up purposes. A schematic of the sampling train is shown on the following page.

Stack gases are drawn through the probe/three-way calibration valve assembly and through a heated sampling line to the particulate/moisture removal system. The sample gas then passes through a leak-free diaphram pump and flow control valve and into the sample gas manifold. Sample gas flowrate through the system is maintained at approximately 4-5 l/min (to minimize response time); sampling rate of the analyzer is approximately 1 l/min. All materials in contact with the sample gas stream are either teflon or stainless steel.

The TECO analyzer determines CO concentrations by measuring the absorbance of the sample in the infrared region. Gas filter correlation is employed to improve the specificity and sensitivity of the method. Instrument outputs include a digital readout and 0-1V recorder terminals; full scale responses are selectable in ten ranges corresponding to CO concentrations spanning from 0-1 ppm to 0-10,000 ppm. The data logger and strip chart recorder are connected to the appropriate instrument terminals to record the analyzer output signal; subsequent data reduction includes converting voltage outputs to CO concentrations (based on the instrument calibration and range selected) and averaging concentrations for the time period of interest.

The instrument is periodically checked for interference from SO_2, NO_X, and CO_2, with a maximum response of 2% of full scale considered acceptable. Other gases are checked on a case-by-case basis if they are expected to be present and/or potential interferences.

Instrument calibration is performed on-site utilizing zero air and a CO in nitrogen certified gas standard. Prior to the start of testing, the instrument is calibrated directly by introducing each calibration gas to the sample gas manifold; a system bias check is then performed by introducing each gas at the probe/three-way valve assembly. The calibration check is repeated at the conclusion of the testing; acceptable performance specifications include a zero/calibration drift of up to ± 3%.



GALSON Technical Services, Inc. 2118 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0389 Fax: (415) 848-0838	SCALE: NA	JOB NUMBER: S9-072	TIMBER ASSOCIATION OF CALIFORNIA	File: CEM-D Drwg
	DATE: 10/8/90	DRAWN BY: MSL	CO, O2, AND CO2 SAMPLING TRAIN	Disk: S9-072

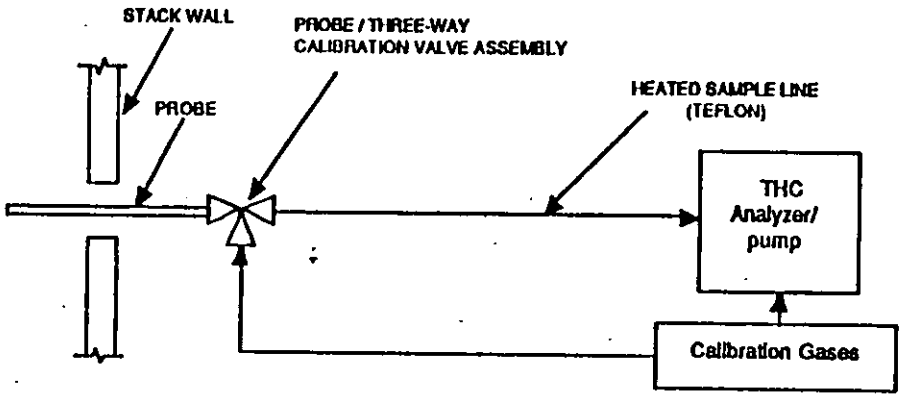
SAMPLING AND ANALYTICAL METHODS:
TOTAL HYDROCARBON EMISSIONS - CARB METHOD 100
(CONTINUOUS MONITORING PROCEDURE)

Stack gas concentrations of total gaseous hydrocarbons (THC) were determined in accordance with the California Air Resources Board (CARB) Method 100. A Ratfisch Instruments, Ltd. (Model RS 55) THC analyzer was utilized to perform the testing. Data were digitally recorded using a data logger/personal computer system; a strip chart recorder was also used for back-up purposes. A schematic of the sampling train is shown on the following page.

Stack gases are drawn through the probe and heated sampling line to the analyzer. The instrument is equipped with an integral heated filter/leak-free diaphram pump and a flame ionization detector (FID). The sampling rate of the analyzer is approximately 4 l/min. The FID is fueled with high purity hydrogen; hydrocarbon-free combustion air is also supplied to the analyzer. All materials in contact with the sample gas stream are either teflon or stainless steel.

Instrument outputs include an analog readout and 0-1V recorder terminals. The data logger and strip chart recorder are connected to the appropriate instrument terminals to record the analyzer output signals; subsequent data reduction includes converting voltage outputs to concentrations (based on the instrument calibrations and ranges selected) and averaging concentrations for the time periods of interest. Total hydrocarbons are measured on a wet basis, as methane; concentrations are corrected to dry conditions using the moisture content of the stack gas.

Instrument calibration is performed on-site utilizing zero air and methane (in air) certified gas standards. Prior to the start of testing, the instrument is calibrated directly by introducing each calibration gas directly to the instrument; a system bias check is then performed by introducing each gas at the probe/three-way valve assembly. The calibration check is repeated at the conclusion of the testing; acceptable performance specifications include a zero/calibration drift of up to ± 3%.



GALSON Technical Services, Inc. 2116 Berkeley Way Berkeley, CA 94704 Tel: (415) 848-0389 Fax: (415) 848 0838	SCALE: NA	JOB NUMBER: S9-072	TIMBER ASSOCIATION OF CALIFORNIA	File: THC. Drwg
	DATE: 10/10/00	DRAWN BY: ML	THC SAMPLING SYSTEM	Disk: S9-072

VOLUMETRIC FLOW RATE DETERMINATION - CARB METHODS 1 AND 2

Velocity traverses are performed at the sampling location in accordance with California Air Resources Board (CARB) Methods 1 (Traverse Point Determination) and 2 (Volumetric Flow Rate Determination). The velocity pressure of the stack gas is measured at each traverse point in the stack/duct with a stausscheibe or standard-type pitot tube connected to an inclined gauge manometer. Stack gas temperature is monitored with either a mercury-in-glass or a calibrated Type K thermocouple. Exhaust gas moisture content is determined using wet-bulb/dry-bulb temperature measurements.

ATTACHMENT IV: Calibration Data

PRE-TEST CALIBRATION DATA

Galson
Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389
Fax: (415) 848-0838

Orifice and Dry Test Meters

Date 8.27.90 Wet Test Meter ID G-15

Meter Box ID 001 Barometric Pressure 30.32

ORIFICE READING (ΔH_o) in. H_2O	WET TEST METER GAS VOLUME (V_w) ft³	WET TEST METER TEMP. (T_w) °F	DRY GAS METER GAS VOLUME (V_d) ft³	TEMPERATURE DATA °F Time	$T_{D\,in}$	$T_{D\,out}$	$T_{D\,avg}$	TIME Δt min.	γ	ΔH_a
.5	5	532	853.22 / 5.155		82 82 82	81 80 80	544	13.1	.971	1.87
1	5	532	858.616 / 5.135		81 81 80	80 80 81	541	9.133	.988	1.825
2	10	532	865.616 / 10.277		85 85 85	81 81 82	543.	13.28	.988	1.92
3	10	532	876.169 / 10.201		89 89 87	85 82 82	546.	10.78	.999	1.89
								Average	.985	1.876

$$\gamma = \frac{V_w}{V_D}\left(\frac{T_{D\,avg}+460}{T_w+460}\right)\frac{P_b}{\left(P_b+\frac{\Delta H_D}{13.6}\right)}$$

Technician: V.P.

$$\Delta H_a = 0.0317\,\Delta H_D\left(\frac{1}{V_w}\right)^2\frac{(T_w+460)^2}{P_b(T_D+460)}$$

Gabon
Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389
Fax: (415) 848-0838

Orifice and Dry Test Meters

Date 07-6-90 Wet Test Meter ID [illegible]

Meter Box ID 002 Barometric Pressure 30.15

ORIFICE READING (ΔH_D) in. H_2O	WET TEST METER GAS VOLUME (V_W) ft^3	WET TEST METER TEMP. (T_W) °F	DRY GAS METER GAS VOLUME (V_D) ft^3	TEMPERATURE DATA °F Time	$T_{D\,in}$	$T_{D\,out}$	$T_{D\,avg}$	TIME Δt min.	γ	ΔH_a
.5	5	534	145.85 / 5.117		81 / 81 / 80	80 / 80 / 82	541	12.02	.988	1.03
1	5	534	151.120 / 5.126		83 / 82 / 85	80 / 81 / 81	542	9.37	.987	1.04
2	10	534	156.290 / 10.168		80 / 80 / 85 / 85	80 / 80 / 81 / 81	541	13.37	.991	1.98
3	10	535	167.164 / 10.191		[illegible] / 81 / 81 / 80	[illegible] / 80 / 80 / 82	544	10.9	.992	1.96
								Average	.989	1.93

$$\gamma = \frac{V_W}{V_D}\left(\frac{T_{D\,avg}+460}{T_W+460}\right)\frac{P_b}{\left(P_b+\frac{\Delta H_D}{13.6}\right)}$$

Technician: [illegible]

$$\Delta H_a = 0.0317\,\Delta H_D\left(\frac{t}{V_W}\right)^2\frac{(T_W+460)^2}{P_b(T_D+460)}$$

Galson
Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389
Fax: (415) 848-0838

PITOT TUBE CALIBRATION
VERIFICATION OF CONSTRUCTION SPECIFICATIONS

Pitot ID: P3 (8'4½") Date: 5-30-90

1. D_t - external tubing diameter
   $0.188" < D_t < 0.375"$* D_t = 0.375 inches

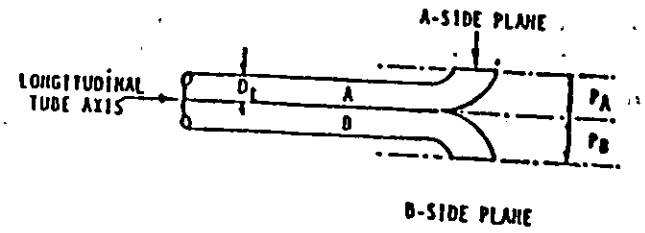
2. $P = (P_a+P_b)/2$ $P_a + P_b$ = 0.976 inches
   $1.05\ D_t < P < 1.50\ D_t$* P = 0.488 inches

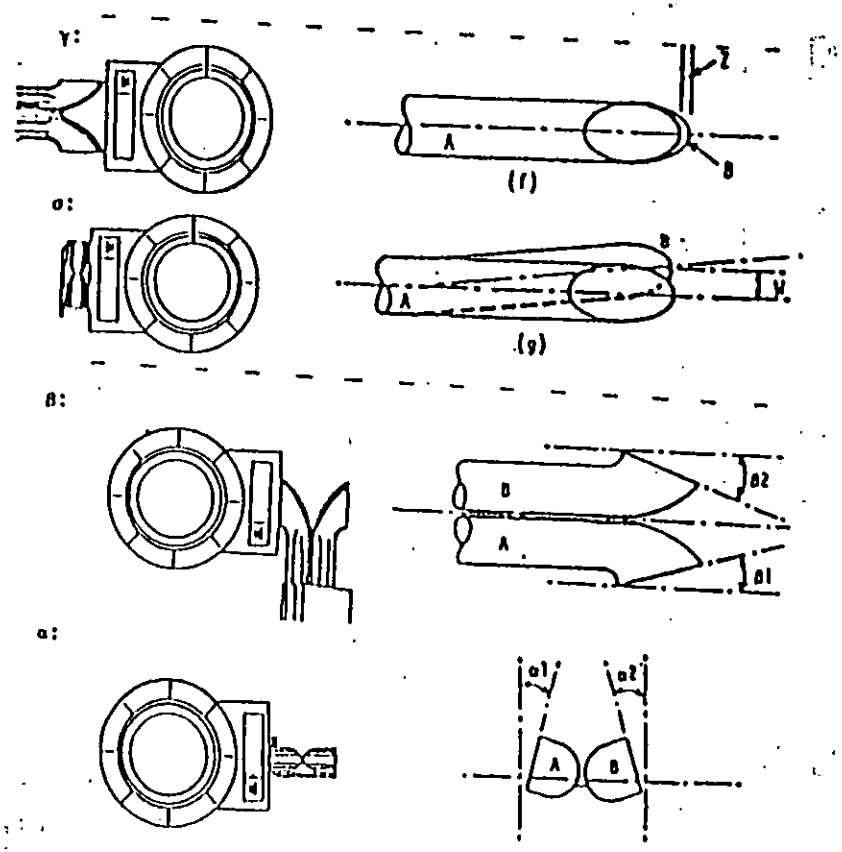
3. $Z = (P_A + P_B) \sin \gamma$ γ = 2°
   $Z < 0.125"$ ** Z = 0.034 inches

4. $W = (P_A + P_B) \sin \sigma$ σ = 1°
   $W < 0.031"$ ** W = 0.017 inches

5. $\beta_A, \beta_B < 5°$ ** β_A = 1°
   β_B = 0.5°

6. $\alpha_A, \alpha_B < 10°$ ** α_A = 1°
   α_B = 3°





*Acceptable limits; "Standards of Performance for New Stationary Sources," Federal Register, 36 (247), December 23, 1971.

**Acceptable limits; Vollaro, R. F., "The Effects of Impact Opening Misalignment on the Value of the Type-S Pitot Tube Coefficient", U.S. EPA Emission Measurement Branch, Research Triangle Park, NC, October 1976

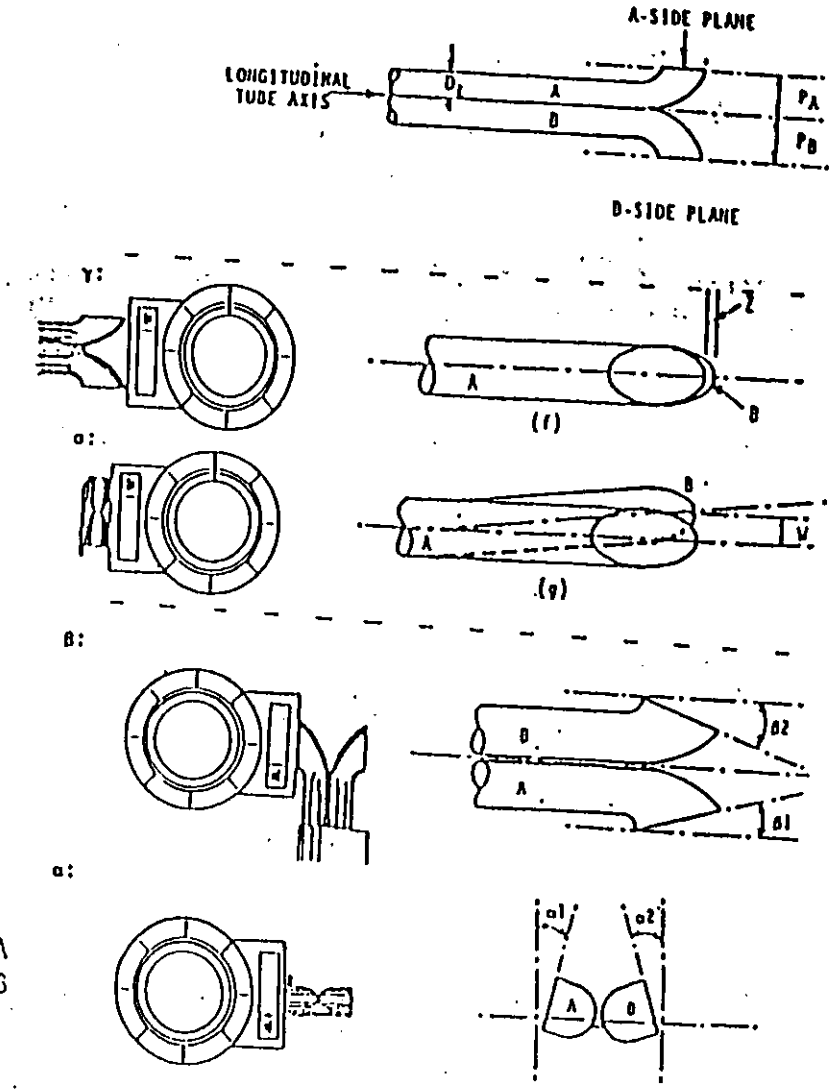
Technician: Marie Taylor

Galson
Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389
Fax: (415) 848-0838

PITOT TUBE CALIBRATION
VERIFICATION OF CONSTRUCTION SPECIFICATIONS

Pitot ID: P-2 (4.6") Date: 5-30-90

1. D_t - external tubing diameter
   $0.188" < D_t < 0.375"$* — D_t = 0.372" Inches
2. $P = (P_a+P_b)/2$ — $P_a + P_b$ = 1.036 Inches
   $1.05\ D_t < P < 1.50\ D_t$* — P = 0.518 Inches
3. $Z = (P_A + P_B) \sin \gamma$ — γ = 1
   $Z < 0.125"$ ** — Z = 0.018 Inches
4. $W = (P_A + P_B) \sin \sigma$ — σ = 1
   $W < 0.031"$ ** — W = 0.018 Inches
5. $\beta_A, \beta_B < 5°$ ** — β_A = 1, β_B = 2
6. $\alpha_A, \alpha_B < 10°$ ** — α_A = 4, α_B = 1



*Acceptable limits; "Standards of Performance for New Stationary Sources," Federal Register, 36 (247), December 23, 1971.

**Acceptable limits; Vollaro, R. F., "The Effects of Impact Opening Misalignment on the Value of the Type-S Pitot Tube Coefficient", U.S. EPA Emission Measurement Branch, Research Triangle Park, NC, October 1976

Technician: [illegible]

Thermocouple Calibration Data

Type: OOZ

ICE WATER BATH		Temp. °R
Standard	492°R	492°R
stack		
% Deviation	0%	
Standard	497°R	[illegible]
GM-I		
% Deviation	.20	
Standard	498°R	497°R
GM-O		
% Deviation	.20%	

AMBIENT		Temp. °R
Standard	532°R	534°R
stack		
% Deviation	.38%	
Standard	532°R	532°R
GM-I		
% Deviation	0%	
Standard	530°R	529°R
GM-O		
% Deviation	.189%	

HOT WATER BATH		Temp. °R
Standard	665°R	665°R
stack		
% Deivation	0%	
Standard	670°R	670°R
GM-I		
% Deviation	0%	
Standard	667°R	[illegible]
GM-O		
% Deviation	0%	

Date: [illegible]

Technician: D.S.

GMI - Gas Meter Inlet
GMO - Gas Meter Outlet

Thermocouple Calibration Data

Type: STACK

ICE WATER BATH	Temp. °R
Standard T-9	492
	492
% Deviation	0.0%
Standard T-10*	492
	492
% Deviation	0.0%
Standard T-2	492
	492
% Deviation	0.0%

AMBIENT	Temp. °R
Standard T-9	528
	527
% Deviation	0.19%
Standard T-10*	528
	527
% Deviation	0.19%
Standard T-2	528
	526
% Deviation	0.38%

HOT WATER BATH	Temp. °R
Standard T-9	672
	671
% Deivation	0.15%
Standard T-10*	672
	[illegible]
% Deviation	0.0%
Standard T-2	672
	669
% Deviation	0.44%

Date: 7/23/90

Technician: TZ

* stack temperature

Thermocouple Calibration Data

Type: T-2

ICE WATER BATH	Temp. °R
Standard	
% Deviation	
Standard	
% Deviation	
Standard	
% Deviation	

AMBIENT	Temp. °R
Standard	548
T-2	547
% Deviation	0.2%
Standard	
% Deviation	
Standard	
% Deviation	

HOT WATER BATH	Temp. °R
Standard	720 725
% Deivation	0.7%
Standard	
% Deviation	
Standard	
% Deviation	

Date: 6/13/90

Technician: C. Taylor

Condenser outlet temperature

Thermocouple Calibration Data

Type: OC 1

ICE WATER BATH		Temp. °R
Standard Strck	492°R	492°R
% Deviation	0%	
Standard GM-I	499°R	498°R
% Deviation	.20%	
Standard GM-O	499°R	497°R
% Deviation	.40%	

AMBIENT		Temp. °R
Standard Strck	534°R	534°R
% Deviation	0%	
Standard GM-I	535°R	534°R
% Deviation	.187%	
Standard GM-O	535°R	532°R
% Deviation	.56%	

HOT WATER BATH		Temp. °R
Standard Strck	665°R	665°R
% Deivation	0%	
Standard GM-I	666°R	666°R
% Deviation	0%	
Standard GM-O	669°R	669°R
% Deviation	0%	

Date: [illegible]

Technician: L S

GM-I - Gas Meter Inlet
GM-O Gas Meter Outlet

Thermocouple Calibration Data

Type: 60 1

ICE WATER BATH		Temp. °R
Standard	497°R	497°R
C outlet % Deviation	0%	
Standard % Deviation		
Standard % Deviation		

AMBIENT		Temp. °R
Standard	535°R	535°R
C outlet % Deviation	0%	
Standard % Deviation		
Standard % Deviation		

HOT WATER BATH		Temp. °R
Standard	664°R	664°R
C-outlet % Deivation	.3%	
Standard % Deviation		
Standard % Deviation		

Date: 8-8-90

Technician: D.S.

Condenser Outlet

ON-SITE MONITOR CALIBRATION DATA

Galson Technical Services

PRE-TEST & POST-TEST SYSTEM DRIFT CHECKS

Plant I. D. Catalyst Hudson Project No. 59-072.CH

Source Boiler Exhaust Operator DR

Pollutant CO Analyzer I. D. TELO Model 48

Comments:

Run No. 1 Date/Time 9/6/90 1005-1352

	Initial values			Final values		
	Analyzer Calibration Response	System Calibration Response	System bias (% of span)	System Calibration Response	System bias (% of span)	Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	768	768	0.0	770	+0.2	+0.2

Run No. 2 Date/Time 9/6/90 1535-1705

	Initial values			Final values		
	Analyzer Calibration Response	System Calibration Response	System bias (% of span)	System Calibration Response	System bias (% of span)	Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	768	768	0.0	768	0.0	0.0

Run No. 3 Date/Time 9/7/90 0915-1240

	Initial values			Final values		
	Analyzer Calibration Response	System Calibration Response	System bias (% of span)	System Calibration Response	System bias (% of span)	Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	[illegible]	768	0.0	765	-0.3	-0.3

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

Galson Technical Services

Comments:

PRE-TEST & POST-TEST SYSTEM DRIFT CHECKS

Plant I. D. Catalyst Hudson Project No. 59-072 CH

Source Boiler Exhaust Operator AR

Pollutant CO Analyzer I. D. TECO Model 48

Run No. 4 Date/Time 9/7/90 1415-1638

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	768	768	0.0	765	-0.3	-0.3

Run No. 5 Date/Time 9/8/90 0930-1157

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	765	768	0.0	762	-0.6	-0.6

Run No. 6 Date/Time 9/8/90 1250-1516

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	768	765	0.0	770	+0.2	+0.2

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

Galson Technical Services

Comments:

PRE-TEST & POST-TEST SYSTEM DRIFT CHECKS

Plant I. D. Catalyst Hudson Project No. 59-072 CH

Source Boiler Exhaust Operator DR

Pollutant CO_2 Analyzer I. D. PIR 2000 HORIBA

Run No. 1 Date/Time 9/6/90 1005-1352

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	14.3	14.3	0.0	14.4	+1.0	+1.0

Run No. 2 Date/Time 9/6/90 1535-1705

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	14.3	14.3	0.0	14.1	-1.0	-1.0

Run No. 3 Date/Time 9/7/90 0915-1240

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	[illegible]	[illegible]	[illegible]	0.0	0.0	0.0
Mid-range	[illegible]	[illegible]	[illegible]	14.3	0.0	0.0

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

Galson Technical Services

Comments:

PRE-TEST & POST-TEST SYSTEM DRIFT CHECKS

Plant I. D. Catalyst Hudson

Project No. 89-072 (1)

Source Boiler Exhaust

Operator DR

Pollutant CO_2

Analyzer I. D. HORIBA PIR-2000

Run No. 4

Date/Time 9/7/90 1415-1638

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	14.3	14.3	0.0	14.0	-2.0	-2.0

Run No. 5

Date/Time 9/8/90 0930-1157

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	14.3	14.3	0.0	14.5	+2.0	+2.0

Run No. 6

Date/Time 9/8/90 1250-1516

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	14.3	14.3	0.0	14.0	-2.0	-2.0

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

Galson Technical Services

Comments:

PRE-TEST & POST-TEST SYSTEM DRIFT CHECKS

Plant I. D. Catalyst Hudson Project No. 59-072.CH

Source Boiler Exhaust Operator DR

Pollutant O_2 Analyzer I. D. IR 2200

Run No. 1 Date/Time 9/6/90 1005-1352

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	12.0	12.0	0.0	12.3	+1.2	+1.2

Run No. 2 Date/Time 9/6/90 1535-1705

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	12.0	12.0	0.0	12.3	+1.2	+1.2

Run No. 3 Date/Time 9/7/90 0915-1240

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	12.0	12.0	0.0	12.2	+0.8	+0.8

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

Galson Technical Services

Comments:

PRE-TEST & POST-TEST SYSTEM DRIFT CHECKS

Plant I. D. Catalyst Hudson Project No. 54-072.CH

Source Boiler Exhaust Operator AR

Pollutant O_2 Analyzer I. D. IR 2200

Run No. 4 Date/Time 9/7/90 1415-1638

	Initial values			Final values		
	Analyzer Calibration Response	System Calibration Response	System bias (% of span)	System Calibration Response	System bias (% of span)	Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	12.0	12.0	0.0	11.8	-0.8	-0.8

Run No. 5 Date/Time 9/8/90 0930-1026 *

	Initial values			Final values		
	Analyzer Calibration Response	System Calibration Response	System bias (% of span)	System Calibration Response	System bias (% of span)	Drift (% of span)
Zero gas	0.0	0.0	0.0	0.1	+0.4	+0.4 **
Mid-range	12.0	12.0	0.0	12.3	+1.2	+1.2

Run No. 6 Date/Time 9/8/90 1250-1516

	Initial values			Final values		
	Analyzer Calibration Response	System Calibration Response	System bias (% of span)	System Calibration Response	System bias (% of span)	Drift (% of span)
Zero gas	0.0	0.0	0.0	0.0	0.0	0.0
Mid-range	12.0	12.0	0.0	11.9	-0.4	-0.4

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

* [illegible]
** [illegible] bypassed [illegible]

Galson Technical Services

Comments:

PRE-TEST & POST-TEST SYSTEM DRIFT CHECKS

Plant I. D. Catalyst Hudson Project No. 59-072.CH

Source Boiler Exhaust Operator DR

Pollutant THC Analyzer I. D. Rotfisch RS-55

Run No. 1 Date/Time 9/6/90 1005-1352

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	0.0	0.0	3.0	3.0	3.0
Mid-range	70.0	70.0	0.0	71.0	+1.0	+1.0

Run No. 2 Date/Time 9/6/90 1535-1705

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	1.0	1.0	-1.0	-1.0	-2.0
Mid-range	70.0	70.0	0.0	70.0	0.0	0.0

Run No. 3 Date/Time 9/7/90 0915-1240

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	2.0	2.0	3.0	3.0	+1.0
Mid-range	71.0	71.0	1.0	69.0	-1.0	-1.0

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

Galson Technical Services

Comments:

PRE-TEST & POST-TEST SYSTEM DRIFT CHECKS

Plant I. D. Catalyst Hudson

Project No. 59-072.C14

Source Boiler Exhaust

Operator DR

Pollutant THC

Analyzer I. D. Rotfisch RS55

Run No. 4

Date/Time 9/7/90 1415 - 1638

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	2.0	2.0	1.0	+1.0	-1.0
Mid-range	70.0	70.0	0.0	67.0	-3.0	-3.0

Run No. 5

Date/Time 9/8/90 9:30 - 1157

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	1.0	1.0	4.0	+4.0	+3.0
Mid-range	70.0	10.0	0.0	71.5	+1.5	+1.5

Run No. 6

Date/Time 9/8/90 1250 - 1516

	Analyzer Calibration Response	Initial values: System Calibration Response	Initial values: System bias (% of span)	Final values: System Calibration Response	Final values: System bias (% of span)	Final values: Drift (% of span)
Zero gas	0.0	2.0	2.0	5.0	5.0	+3.0
Mid-range	70.0	70.0	0.0	68.0	-2.0	-2.0

$$\text{System calibration bias} = \frac{\text{System calibration response} - \text{Analyzer calibration response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final system response} - \text{Initial system calibration response response}}{\text{Span}} \times 100$$

POST-TEST CALIBRATION DATA

Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389

Plant: Catalyst Hudson
Source: Boiler Exhaust
Barometric Pressure, in Hg: 29.82

Job #: 24-012.011
Meter Box ID: 001
Date: 9/20/99

ORIFICE READING ($\Delta H_@$) in. H2O	WET TEST METER GAS VOLUME (Vw) ft3	WET TEST METER TEMP. (Tw) °F	DRY GAS METER GAS VOLUME (Vo) ft3	TEMPERATURE DATA °F Time	$T_{D\ in}$	$T_{D\ out}$	$T_{D\ avg}$	TIME Δt min.	γ	$\Delta H_@$
.5	10	532	969.697		73	70	534	15.08	.995	1.921
			958.651		75	71				
			10.046		80	72				
					82	73				
1.5	10	532	978.838		82	75	539.6	15.31	.996	1.959
			968.697		83	76				
			10.141		84	76				
					85	76				
1.5	10	532	989.036		85	77	542.7	15.20	.996	1.92
			978.838		86	78				
			10.198		88	79				
					89	80				

$$\gamma = \frac{V_w}{V_D}\left(\frac{T_{D\ avg}+460}{T_w+460}\right)\frac{P_b}{\left(P_b+\frac{\Delta H_@}{13.6}\right)}$$

$$\Delta H_@ = 0.0317\Delta H_D\left(\frac{t}{V_w}\right)^2\frac{(T_w+460)^2}{P_b(T_D+460)}$$

Vacuum Setting, in. Hg: 3

AVERAGE	0.996	1.93
PRE-TEST γ	0.987	1.98

POST TEST CALIBRATION - TEMPERATURE SENSORS

	Ambient (°R)	% Diff.	Other (°R)	% Diff.
Reference	536	.18	492/672	.20/.14
Stack Thermocouple ID# 10	537		493/673	
Reference	534	.0	672	.0
Gas Meter Inlet ID# 001	534		672	
Reference	534	.0	672	.0
Gas Meter Outlet ID# 001	534		672	
Reference	534/534	.0/.18	492/492	.20/.0
Condenser Outlet ID# I4, I2	534/533		491/492	
Reference	534	.0		
Heated Oven Box ID#	534			

Technician: William R. Hinrichs
Date: 9/20/99

NA = Not Applicable

Gaisch
Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389

Plant: Catalyst Hudson
Source: Boiler Exhaust
Barometric Pressure, in Hg: 29.92
Job #: 54-072.CH
Meter Box ID: 002
Date: 9/20/90

ORIFICE READING ($\Delta H_@$) in. H2O	WET TEST METER GAS VOLUME (Vw) ft3	WET TEST METER TEMP. (Tw) °F	DRY GAS METER GAS VOLUME (Vo) ft3	TEMPERATURE DATA °F Time	$T_{D\ in}$	$T_{D\ out}$	$T_{D\ avg}$	TIME Δt min.	γ	$\Delta H_@$
1.5	10	534	964.804		76	74	536.7	15.28	1.000	1.97
			954.794		78	74				
			10.01		80	75				
					81	76				
1.5	10	534	975.040		82	77	540.5	15.33	0.985	1.97
			964.804		83	77				
			10.236		84	78				
					85	78				
1.5	10	534	985.257		84	79	542.5	15.03	0.990	1.89
			975.040		85	79				
			10.217		86	80				
					87	80				

$$\gamma = \frac{V_w}{V_D}\left(\frac{T_{D\ avg}+460}{T_w+460}\right)\frac{P_b}{\left(P_b+\frac{\Delta H_@}{13.6}\right)}$$

$$\Delta H_@ = 0.0317\Delta H_D\left(\frac{t}{V_w}\right)^2\frac{(T_w+460)^2}{P_b(T_D+460)}$$

Vacuum Setting, in. Hg: 3

	γ	$\Delta H_@$
AVERAGE	0.991	1.94
PRE-TEST γ	0.989	1.93

POST TEST CALIBRATION - TEMPERATURE SENSORS

	Ambient (°R)	% Diff.	Other (°R)	% Diff.
Reference	536	.0	492/672	.0/.14
Super Probe Stack Thermocouple ID#	536		492/671	
Reference	534	.37	672	.14
Gas Meter Inlet ID# 002	536		671	
Reference	534	.0	672	.0
Gas Meter Outlet ID# 002	534		672	
Reference	534	.18	492	.40
Condenser Outlet ID# I5	535		494	
Reference	534	.0		
Heated Oven Box ID#	534			

Technician: William P Hardy
Date: 9/20/90

NA = Not Applicable

ATTACHMENT V: Field Data And Calculations

NOMENCLATURE

A_s	=	Stack Cross Sectional Area (ft^2)
A_n	=	Nozzle Cross Sectional Area (ft^2)
ACFM	=	Actual cubic feet per minute
SCFM	=	Flow rate - standard cubic feet per minute.on a dry basis
C_p	=	Pitot Calibration Factor
Δt	=	Sample Time (minutes)
DSCF	=	Dry standard cubic feet
°F, °R	=	Temperature - degrees fahrenheit, Temperature (460 + °F)
ft^2, ft^3	=	square foot, cubic foot
fpm	=	Feet per minute
γ	=	meter calibration factor
gm-mole	=	gram-mole
ΔH	=	Orifice pressure drop (inches H_2O)
Hg	=	Mercury
hr, min, sec	=	Hour, minutes, seconds
in. H_2O	=	inches of water
in. Hg	=	inches of mercury
l, ml	=	liters, milliliters
l/min	=	liters per minute
m^3	=	cubic meter
gr, gm, mg, µg, ng	=	grains, grams, milligrams, micrograms, nanograms(10^{-9})
P_b	=	Barometric Pressure (inches of Mercury)
P_m	=	Absolute meter Pressure (inches of Mercury)
ppm, ppb	=	parts per million, parts per billion
P_s	=	Stack gas absolute pressure (inches of Mercury)
P_{std}	=	Pressure, standard conditions (inches of Mercury)
$\sqrt{\Delta P}$	=	Stack gas velocity head (inches of $H_2O)^{1/2}$
SG	=	Specific gravity
θ	=	Test duration (minutes)
t_m, T_m	=	Meter temperature (°F), (°R)
t_s, T_s	=	Stack gas temperature (°F), (°R)
T_{std}	=	Temperature, standard conditions (°R)
T_o	=	Average orifice temperature during test (°F)
T_{oc}	=	Average orifice temperature during calibration.(°F)
V_{lc}	=	Volume of liquid water condensed (liters)
v_s	=	Stack gas velocity (feet per minute)
13.6	=	Specific gravity of mercury

Formaldehyde, Acetaldehyde, And Benzene Emission Data

Summary of Test Data: Aldehyde Emissions

	Run # 1A	Run # 1B	Run # 1C
Sampling Data			
Duration of the Run (θ), Minutes:	45	45	45
Ambient Air Temperature, °F	90	90	85
Barometric Pressure (P_b), in. Hg	29.84	29.84	29.84
Avg Orifice Temp @ Calib Cond (T_{oc}), °F	89	88	93
Avg Orifice Temp @ Test Cond (T_o), °F	87	89	93
Avg Sampling Rate @ Calib Cond, l/min	0.93	0.91	0.92
Velocity Data			
Number of Sampling Points:	20	20	20
Pitot Calibration Factor (C_p):	0.84	0.84	0.84
Stack Diameter, Inches:	65	65	65
Stack Gas Static Pressure in Flue, In. H_2O:	0.11	0.16	0.16
Stack Gas Absolute Pressure (P_s), In. Hg:	29.85	29.85	29.85
Stack Gas Velocity Head, ($\sqrt{\Delta P}$):	0.484	0.471	0.471
Stack Gas Temperature (ts), °F:	137	138	138
Stack Gas Moisture Percent: [1]	17.50	17.50	17.50
Specific Gravity of Flue Gas (SG):	0.982	0.983	0.985

1. Source of Moisture Percentage Data: Concurent Method 5

Sampling Data and Calculations: Aldehyde Emissions

	Run # 1A	Run # 1B	Run # 1C
A. Stack Gas Cross Sectional Area (A_s), ft^2:	23.04	23.04	23.04
B. Stack Gas Moisture Percent: [1]	17.50	17.50	17.50
Avg Sampling Rate @ Calib Cond, l/min	0.93	0.91	0.92
Avg Sampling Rate @ Test Cond., l/min Avg Sampling Rate @ Calib Cond.*SQRT(T_o/T_{oc})	0.93	0.91	0.92
Volume Sampled @ Test Cond., l Avg Sampling Rate @ Test Cond. * Test Duration	42.0	40.9	41.4
Volume Sampled @ STD Cond, ft^3 [(Volume Sampled @ Test Cond./28.32) * (P_b/P_{std}) * (T_{std}/Avg Orifice Temp @ Test in °R)] [1]	1.426	1.384	1.391
C. Stack Gas Velocity, ft/min: [4005 * $\sqrt{\Delta P}$ + C_p * SQRT((T_s * P_{std})/(T_{std} * P_s * SG))]	1,749	1,701	1,699
D. Stack Gas Flow Rate (stack cond.), ACFM: [A * C]	40,296	39,193	39,159
E. Stack Gas Flow Rate (std. cond. dry), SCFM [D * (1 - B/100) * (T_{std}/T_s) * (P_s/P_{std})]	29,324	28,505	28,480

1. Source of Moisture Percentage Data: Concurent Method 5

Standard Conditions: T_{std} = 528 °R ; P_{std} = 29.92 in. Hg

$T_s = t_s + 460$; $T_m = t_m + 460$

Sampling Data and Calculations: Aldehyde Emissions

	Run # 1A	Run # 1B	Run # 1C
Organics Quantity Collected, µg			
Acetaldehyde	8.9	10	4.7
Formaldehyde	46	21	27
Organics Concentration, mg/m³ [(Mass/Vol Sampled STD) * (0.03531/1)]			
Acetaldehyde	0.220	0.255	0.119
Formaldehyde	1.14	0.536	0.686
Organics Concentrations, ppm [Concentration * 24.04358/M.W. of parameter]			
Acetaldehyde (MW= 44)	0.120	0.139	0.065
Formaldehyde (MW= 30)	0.913	0.429	0.549
Organics Concentrations (At 12% CO_2), ppm [Concentration * (12/%CO_2)]			
Acetaldehyde	0.096	0.109	0.050
Formaldehyde	0.725	0.337	0.417
Organics Emission Rate, gm/hr [Conc.* Stack Gas Flow Rate * (0.06/1000)/(0.03531/1)]			
Acetaldehyde	11.0	12.4	5.77
Formaldehyde	56.7	26.0	33.2

Stack Gas Composition and Gas Density Calculations

	Run #1.		Run #2		Run #3	
	% Dry Basis	Wet Basis	% Dry Basis	Wet Basis	% Dry Basis	Wet Basis
CO_2	15.1	12.46	15.3	12.62	15.8	13.04
O_2	6.0	4.95	5.6	4.62	5.1	4.21
CO	0.0	0.00	0.0	0.00	0.0	0.00
N_2	78.9	65.09	79.1	65.26	79.1	65.26
H_2O	---	17.50	---	17.50	---	17.50
Molecular Weight[1]	---	28.44	---	28.45	---	28.50
Specific Gravity of Stack Gas[2]	---	0.982	---	0.983	---	0.985

1. Calculated from the equation:
   Molecular Weight = $0.44*(\%CO_2) + 0.32*(\%O_2) + 0.28*(\%N_2 + \%CO) + 0.18*(\%H_2O)$
2. Calculated from the equation:
   SG = Molecular Weight of Stack Gas / Molecular Weight of Air (28.95 gm/gm-mole)

FIELD DATA — CRITICAL ORIFICE

PLANT CATALYST HUDSON RUN No. 1A AMBIENT TEMP. (°F) 90

LOCATION BOILER EXHAUST CONTAMINANTS FORMALDEHYDE BARO. PRESS. (In. Hg) 29.84

DATE 9/6/90 OPERATOR RR

CALIBRATION DATA

CALIBRATION RUN No.	BURETTE VOL. (cc)	ORIFICE TEMP. (°F)	TIME (sec)
PRE-TEST-1	200.	91	12.81
2			12.84
3			12.85
Avg.			

FLOW (l/min):

POST-TEST-1	200.	86	12.82
2			12.91
3			12.87
Avg.			

FLOW (l/min):

Average Flow (l/min)	

TEST DATA

	CLOCK TIME	SAMPLING TIME (min)	FLOWMETER RDG.	ORIFICE TEMP (°F)
START @	10.56	—	1.0	95
	11:01	5	1.0	88
	11:06	10	1.0	87
	11:11	15	1.0	87
	11:16	20	1.0	86
	11:21	25	1.0	85
	11:26	30	1.0	86
	11:31	35	1.0	86
	11:36	40	1.0	86
STOP @	11:41	45	1.0	86
		Total		Avg.

Galson Technical Services, Inc. Environmental Sciences Division

COMMENTS:

FIELD DATA – CRITICAL ORIFICE

PLANT CATALYST HUDSON RUN No. 1B AMBIENT TEMP. (°F) 90

LOCATION BOILER CATALYST CONTAMINANTS FORMALDEHYDE BARO. PRESS. (In. Hg) 29.84

DATE 9/6/90 OPERATOR RR

CALIBRATION DATA

CALIBRATION RUN No.	BURETTE VOL. (cc)	ORIFICE TEMP. (°F)	TIME (sec)
PRE-TEST-1	200	86	13.04
2			13.02
3			13.09
Avg.			

FLOW (l/min):

POST-TEST-1	200	90	13.42
2			13.38
3			13.44
Avg.			

FLOW (l/min):

Average Flow (l/min)	

TEST DATA

	CLOCK TIME	SAMPLING TIME (min)	FLOWMETER RDG.	ORIFICE TEMP (°F)
START @	12:15	—	1.0	88
	12:20	5	1.0	88
	12:25	10	1.0	88
	12:30	15	1.0	88
	12:35	20	1.0	88
	12:40	25	1.0	89
	12:45	30	1.0	90
	12:50	35	1.0	90
	12:55	40	1.0	90
STOP @	1:00	45	1.0	90
		Total		Avg.

Galson Technical Services, Inc. Environmental Sciences Division

COMMENTS:

FIELD DATA— CRITICAL ORIFICE

PLANT CATALYST FUSION RUN No. 1C AMBIENT TEMP. (°F) 85

LOCATION BOILER EXHAUST CONTAMINANTS FORMALDEHYDE BARO. PRESS. (In. Hg) 29.84

DATE 9/6/90 OPERATOR RP

CALIBRATION DATA

CALIBRATION RUN No.	BURETTE VOL. (cc)	ORIFICE TEMP. (°F)	TIME (sec)
PRE-TEST-1	200	92	13.00
2			12.88
3			12.92
Avg.			

FLOW (l/min):

POST-TEST-1	200	94	13.12
2			13.21
3			13.21
Avg.			

FLOW (l/min):

Average Flow (l/min)	

TEST DATA

START @

CLOCK TIME	SAMPLING TIME (min)	FLOWMETER RDG.	ORIFICE TEMP (°F)
1:45	—	1.0	92
1:50	5	1.0	92
1:55	10	1.0	92
2:00	15	1.01	92
2:05	20	1.0	93
2:10	25	1.0	93
2:15	30	1.0	94
2:20	35	1.0	94
2:25	40	1.0	94
2:30	45	1.0	94
	Total		Avg.

Galson Technical Services, Inc. Environmental Sciences Division

COMMENTS:

SUMMARY OF TEST DATA- BENZENE EMISSIONS

PLANT: CATALYST HUDSON STACK: WOOD-BOILER EXHAUST

		RUN #2A	RUN #2B	RUN#2C
A.	STACK GAS FLOW RATE[a], DSCFM	29,502	29,497	28,551
B.	BENZENE CONCENTRATION, PPM	0.110	0.089	0.140
C.	BENZENE EMISSION RATE, GM/HR $(A*B*M^b*60)/(10^3*35.3*24.04)$	17.9	14.5	22.0

a Based on data collected concurrently during concurrent PAH and hexavalent chromium tests.

b Molecular weight of benzene = 78.1 gm/gm-mole.

Particulate/ Metals (11) Emission Data

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed:11/21/90

Summary of Test Data: Metals (11) Emissions - EPA Draft Method

	Run: #4	Run: #5	Run: #6
Number of Sampling Points:	20	20	20
Duration of the Run (θ), Minutes:	120	120	120
Sampling Nozzle Diameter, Inches:	0.314	0.314	0.314
Pitot Calibration Factor (C_p):	0.84	0.84	0.84
Meter Calibration Factor (γ):	0.989	0.989	0.989
Stack Diameter, Inches:	65	65	65
Ambient Air Temperature, °F:	89	80	80
Barometric Pressure (P_b), In. Hg:	29.92	29.95	29.95
Stack Gas Static Pressure in Flue, In. H_2O:	-0.08	-0.07	-0.04
Stack Gas Absolute Pressure (P_s), In. Hg:	29.91	29.95	29.95
Stack Gas Velocity Head, ($\sqrt{\Delta P}$):	0.479	0.520	0.496
Orifice Pressure Drop (ΔH), In. H_2O:	1.87	2.20	2.02
Volume Sampled (V_m), ft^3 (Meter Cond.):	85.98	92.59	89.87
Stack Gas Temperature (t_s), °F:	137	138	138
Impinger Outlet Temperature, °F:	73	68	72
Meter Temperature (t_m), °F:	97	83	97
Meter Vacuum, In. Hg:	5	6	5
Volume of Water Condensed (V_{lc}), ml:	343.2	404.2	376.9
Specific Gravity of Flue Gas (SG):	0.986	0.979	0.980
Flue Gas Composition:			
$\%CO_2$	15.2	14.2	14.3
$\%O_2$	5.2	6.5	6.1
%CO	0.0	0.0	0.0

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 12/18/90

Sampling Data and Calculations: Particulate/Metal Emissions

	Run: #4	Run: #5	Run: #6
A. Stack Gas Cross Sectional Area (A_s), ft^2:	23.04	23.04	23.04
B. Volume Sampled (Meter Conditions), ft^3:	85.98	92.59	89.87
C. Volume Sampled (Std. Conditions), ft^3: [$B * \gamma * (T_{std}/P_{std}) * ((P_b + (\Delta H/13.6))/T_m)$]	80.91	89.66	84.81
D. Volume of Liquid Water Condensed, ml:	343.2	404.2	376.9
E. Vapor Volume (Std. Conditions) of Water, ft^3: [D * 0.04714]	16.18	19.05	17.77
F. Stack Gas Moisture Content, %: [(E/(E + C)) * 100]	16.66	17.53	17.32
G. Stack Gas Velocity, ft/min: [$4005 * \sqrt{\Delta P} * C_p * SQRT((T_s * P_{std})/(T_{std} * P_s * SG))$]	1,728	1,882	1,792
H. Stack Gas Flow Rate (Stack Cond.), ACFM: [A * G]	39,810	43,359	41,302
I. Stack Gas Flow Rate (Std. Cond. dry), SCFM: [$H * (1 - F/100) * (T_{std}/T_s) * (P_s/P_{std})$]	29,336	31,627	30,201

Standard Conditions: $T_{std} = 528$ °R ; $P_{std} = 29.92$ in. Hg

$T_s = t_s + 460$; $T_m = t_m + 460$

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 12/10/90

Sampling Data and Calculations: Particulate Emissions

	Run: #4	Run: #5	Run: #6
J. Particulates Quantity Collected, gm			
FRONT HALF PARTICULATE	0.0941	0.0859	0.0989
K. Particulates Concentration, gr/ft³ [J/C * (1543000/100000)]			
FRONT HALF PARTICULATE	0.0179	0.0148	0.0180
L. Particulates Concentration (At 12% CO_2), gr/ft³ [K * (12/%CO_2)]			
FRONT HALF PARTICULATE	0.0142	0.0125	0.0151
M. Particulates Emission Rate, lb/hr [K * I * (132300/1000000)/(1543000/100000)]			
FRONT HALF PARTICULATE	4.51	4.01	4.66

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Gaison Project#: S9-072.CH

Date Printed:12/18/90

Sampling Data and Calculations: Particulate/Metal Emissions

	Run: #4	Run: #5	Run: #6
J. Partic Metal Quantity Collected, mg			
Arsenic	0.027	0.018	0.019
Beryllium	< 0.001	< 0.001	< 0.001
Cadmium	0.004	0.006	0.003
Chromium	0.058	0.057	0.06
Copper	0.049	0.047	0.047
Lead	0.148	0.098	0.108
Manganese	4.3	0.25	0.41
Mercury	0.0029	< 0.0013	0.0013
Nickel	0.012	0.012	0.012
Selenium	< 0.01	< 0.01	< 0.01
Zinc	1.366	0.566	0.556

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Gaison Project#: S9-072.CH

Date Printed:12/18/90

Sampling Data and Calculations: Particulate/Metal Emissions

	Run: #4	Run: #5	Run: #6
K. Partic Metal Concentration, mg/m³			
[J/C * (35.31/1)]			
Arsenic	0.012	0.007	0.008
Beryllium	< 0.0004	< 0.0004	< 0.0004
Cadmium	0.002	0.002	0.001
Chromium	0.025	0.022	0.025
Copper	0.021	0.019	0.020
Lead	0.065	0.039	0.045
Manganese	1.88	0.098	0.171
Mercury	0.0013	< 0.0005	0.0005
Nickel	0.0052	0.005	0.005
Selenium	< 0.004	< 0.004	< 0.004
Zinc	0.596	0.223	0.231

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 12/18/90

Sampling Data and Calculations: Particulate/Metal Emissions

	Run: #4	Run: #5	Run: #6
L. Partic Metal Concentration (At 12% CO_2), mg/m³			
[K * (12/%CO_2)]			
Arsenic	0.009	0.006	0.007
Beryllium	< 0.0003	< 0.0003	< 0.0003
Cadmium	0.001	0.002	0.0010
Chromium	0.020	0.019	0.021
Copper	0.017	0.016	0.016
Lead	0.051	0.033	0.038
Manganese	1.48	0.083	0.143
Mercury	0.00100	< 0.0004	0.0005
Nickel	0.0041	0.004	0.004
Selenium	< 0.003	< 0.003	< 0.003
Zinc	0.471	0.188	0.194

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed:12/18/90

Sampling Data and Calculations: Particulate/Metal Emissions

	Run: #4	Run: #5	Run: #6
M. Partic Metal Emission Rate, gm/hr			
[K * I * (60/1000)/(35.31/1)]			
Arsenic	0.59	0.38	0.41
Beryllium	< 0.02	< 0.02	< 0.02
Cadmium	0.09	0.13	0.06
Chromium	1.3	1.2	1.3
Copper	1.1	0.99	1.0
Lead	3.2	2.1	2.3
Manganese	94	5.3	8.8
Mercury	0.063	< 0.03	0.03
Nickel	0.26	0.25	0.26
Selenium	< 0.22	< 0.21	< 0.21
Zinc	30	12	12

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 12/10/90

Isokinetic Variation Calculation

	Run: #4	Run: #5	Run: #6
Stack Gas Absolute Temperature (T_s), °R:	597	598	598
Volume of Liquid Water Condensed (V_{lc}), ml:	343.2	404.2	376.9
Meter Calibration Factor (γ):	0.989	0.989	0.989
Volume Sampled (Meter Cond.) (V_m), ft^3:	85.98	92.59	89.87
Meter Absolute Temperature (T_m), °R:	557	543	557
Meter Absolute Pressure (P_m), In. Hg: ($P_b + \Delta H / 13.6$)	30.06	30.11	30.10
Stack Gas Velocity (v_s), ft/min:	1,728	1,882	1,792
Stack Gas Absolute Pressure (P_s), In. Hg:	29.91	29.95	29.95
Cross-Sectional Area of Nozzle, (A_n), ft^2:	0.00054	0.00054	0.00054
Duration of the Run (θ), minutes:	120	120	120
Isokinetic Percentage (I), %: [1]	98.5	101.2	100.3

1. Calculated from the Equation:

$$I = [T_s * 100 * ((K_3 * V_{lc}) + (V_m / T_m * \gamma * P_m))] / (\theta * v_s * P_s \bullet A_n)$$

where $K_3 = 0.002669$

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 12/10/90

Stack Gas Composition and Gas Density Calculations

	Run: #4		Run: #5		Run: #6	
	% Dry Basis	Wet Basis	% Dry Basis	Wet Basis	% Dry Basis	Wet Basis
CO_2	15.2	12.67	14.2	11.71	14.3	11.82
O_2	5.2	4.33	6.5	5.36	6.1	5.04
CO	0.0	0.00	0.0	0.00	0.0	0.00
N_2	79.6	66.34	79.3	65.40	79.6	65.81
H_2O	---	16.66	---	17.53		17.32
Molecular Weight[1]	---	28.53	---	28.34		28.36
Specific Gravity of Stack Gas[2]	---	0.986	---	0.979		0.980

1. Calculated from the equation:
   Molecular Weight = $0.44*(\%CO_2) + 0.32*(\%O_2) + 0.28*(\%N_2 + \%CO) + 0.18*(\%H_2O)$
2. Calculated from the equation:
   SG = Molecular Weight of Stack Gas / Molecular Weight of Air (28.95 gm/gm-mole)

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:

Plant: Christ Hudson
Location: Boiler exhaust
Date: 8/7/90
Run Number: #4 MM
Operator: DS RF
Sample Box ID:
Meter Box ID: 002
Probe ID:
Filter #:

Meter Ø: .989
Meter ΔH@: 1.93
Pitot C.F.: .84
Assumed Moisture %:
Nozzle Diameter in.: .314
C Factor: .23
Ambient Temperature: 90°F
Barometric Pressure: 29.92
Silica Gel #:

Static Pressure:
Traverse Pt.: A5
Pwake: -.12
Pstatic: -0.06

Water Collected:
FU-1J
Impingers, ml.: 304
Silica Gel, gms.: 39.2
343.2

Start: 2:17 VI: 570.580

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP In. H2O	Orifice ΔH In. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. In Hg.
A1	6	137	.19	1.55	574.4	96	97	244	265	71	2
2	12	136	.17	1.40	578.2	98	98	247	262	71	2
3	18	136	.19	1.55	582.1	99	98	247	263	73	2
4	24	136	.21	1.7	586.1	99	97	247	261	74	3
5	30	137	.20	1.6		100	98	247	262	74	3
6	36	136	.20	1.6	594.2	100	99	248	262	77	3
7	42	136	.23	1.85		100	98	250	259	78	4
8	48	138	.24	1.9	602.9	101	98	250	265	75	4
9	54	137	.24	1.9	607.1	100	98	250	250	74	5
10	60	138	.18	1.45		100	98	252	252	70	4
			1.42	3:17	VF:	610.934					
Averages											

Galson Technical Services

SAMPLE COLLECTION DATA

Comments: Post test L.K. rate - .01% cfm @ 14 Hg

Plant: Catalyst Hudson
Location: [illegible] Furnace
Date: 9/7/90
Run Number: #4 AM
Operator: DS TT
Sample Box ID:
Meter Box ID: 002
Probe ID:
Filter #:

Meter Ø: .989
Meter ΔH@: 1.93
Pitot C.F.: .84
Assumed Moisture %: 18
Nozzle Diameter in.: .514
C Factor: .23
Ambient Temperature: 90°F
Barometric Pressure:
Silica Gel #:

Static Pressure:
Traverse Pt. 13 ____
Pwake -.16 ____
Pstatic -0.10 ____

Water Collected:
Impingers, ml. ____
Silica Gel, gms. ____

Start: 03:34 VI = 610.934

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
B 10	6	136	.21	1.70	614.9	95	95	253	257	75	4
9	12	137	.22	1.80	619.1	96	96	253	252	69	5
8	18	137	.25	2.00	623.5	98	97	249	253	70	5
7	24	136	.21	1.70	627.8	98	97	249	253	71	6
6	30	137	.26	2.10	632.5	99	97	249	254	71	6
5	36	137	.27	2.20	637.2	97	96	249	252	73	6
4	42	139	.28	2.30	642.0	96	94	248	252	73	7
3	48	138	.30	2.40	646.8	98	93	249	251	74	8
2	54	137	.32	2.60	651.9	99	94	249	253	73	8
1	60	137	.26	2.10		98	93	249	253	75	9
			Stop @	4:34	VF =	656.561					
Averages		137	0.479	1.87	85.98	97					

Galson Technical Services

SAMPLE COLLECTION DATA

Comments:

Plant: Catalyst Hudson
Location: Boiler exhaust
Date: 9/8/90
Run Number: #5 MM
Operator: D.S. R.P.
Sample Box ID:
Meter Box ID: 002
Probe ID:
Filter #:

Meter Ø: .981
Meter ΔH@: 1.1
Pitot C.F.: .84
Assumed Moisture %: 18
Nozzle Diameter in.: .314
C Factor: .23
Ambient Temperature: 80°F
Barometric Pressure:
Silica Gel #:

Static Pressure:
Traverse Pt. B7
Pwake -.15
Pstatic -0.08

Water Collected:
Fu - IV
Impingers, ml. 365
Silica Gel, gms. 39.2
404.2

Start @ 9:33 VI = 664.725

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP In. H2O	Orifice ΔH In. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. In Hg.
B10	6	137	.24	1.95	669.0	73	73	233	239	62	4
1	12	136	.24	1.95	673.4	74	73	243	255	64	4
1	18	138	.27	2.20	677.5	77	74	246	258	65	4
7	24	136	.26	2.10	681.9	78	74	247	255	65	5
6	30	137	.26	2.10	686.4	81	76	249	256	67	5
[illegible]	36	[illegible]	.28	2.30	691.3	84	78	248	253	67	5
1	[illegible]	138	.29	2.40	696.1	85	80	248	253	69	6
3	[illegible]	138	.31	2.50	701.2	86	81	247	256	70	6
2	[illegible]	137	.30	2.40	705.9	87	82	249	252	72	6
1	[illegible]	137	.23	1.85		89	83	249	252	73	5
			stop @	10:33	VF: 710.275						
Averages											

Galson Technical Services

SAMPLE COLLECTION DATA

Comments: [illegible]

Plant: Catalyst Hudson
Location: Stack exhaust
Date: 11/8/10
Run Number: #5 MM
Operator: D.S. R.P.
Sample Box ID:
Meter Box ID: 702
Probe ID:
Filter #:

Meter δ: .987
Meter ΔH@: 1.93
Pitot C.F.: .84
Assumed Moisture %: 8
Nozzle Diameter in.: .314
C Factor: .23
Ambient Temperature: 75°F
Barometric Pressure:
Silica Gel #:

Static Pressure:
Traverse Pt.: A5
Pwake: -.12
Pstatic: -0.05

Water Collected:
Impingers, ml.:
Silica Gel, gms.:

[illegible] 10:53 VI: 710.275

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP In. H2O	Orifice ΔH In. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. In Hg.
A1	[illegible]	137	.30	2.10	715.1	83	84	248	254	73	6
2	[illegible]	138	.24	1.95	719.6	86	84	247	253	70	6
[illegible]	18	137	.26	2.10	724.1	85	83	245	252	68	6
1	24	137	.28	2.30	728.9	85	84	248	255	64	6
[illegible]	30	137	.24	1.95	733.3	88	85	246	251	65	7
6	36	131	.26	2.10	737.7	85	82	248	251	67	7
7	42	134	.31	2.50		86	84	249	252	68	8
8	48	138	.32	2.60		93	88	250	250	69	8
1	54	137	.30	2.40	752.7	91	87	250	248	72	10
10	60	137	.24	1.95		90	87	248	249	73	10
			Stop 6	1153	VF: 75	7.314					
Averages	120	138	0.52	2.20	92.59	83					

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:

Plant: Colstrip Hudson
Location: Boiler exhaust
Date: 4/8/90
Run Number: #6 MM
Operator: D.S.
Sample Box ID:
Meter Box ID: 002
Probe ID:
Filter #:

Meter Ø: .989
Meter ΔH@: 1.93
Pitot C.F.: .84
Assumed Moisture %: 18
Nozzle Diameter in.: .314
C Factor: .23
Ambient Temperature: 90°F
Barometric Pressure: 29.95
Silica Gel #:

Static Pressure:
Traverse Pt. B6
Pwake -.10
Pstatic -0.02

Water Collected:
FV-7V
Impingers, ml. 349
Silica Gel, gms. ~~279~~ 376.9

Start: 12:50 VI: 757.599

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
B10	6	137	.14	1.15	761.1	88	87	237	246	68	2
9	12	138	.25	2.0	765.5	90	88	242	247	69	3
8	18	138	.24	1.95	769.9	94	90	243	245	70	3
7	24	138	.24	1.95	774.2	96	92	249	254	70	3
6	30	137	.27	2.20	778.9	98	94	250	253	71	4
5	36	137	.24	1.95	783.4	98	94	250	253	71	4
4	42	139	.27	2.20	788.0	98	95	251	252	73	5
3	48	138	.28	2.30	793.0	98	96	251	252	75	5
2	54	138	.25	2.00	797.5	100	97	251	257	77	5
1	60	137	.17	1.4		101	98	251	252	78	4
			Stop 1:50			801.372					
Averages											

Galson Technical Services

SAMPLE COLLECTION DATA

Comments: post test
LK check = .009
cfm @ 13 Hg

Plant: Catalyst Hudson
Location: Boiler exhaust
Date: 9/8/90
Run Number: #6 MM
Operator: D.S
Sample Box ID:
Meter Box ID: 062
Probe ID:
Filter #:

Meter δ: .989
Meter ΔH@: 1.93
Pitot C.F.: .84
Assumed Moisture %: 18
Nozzle Diameter in.: .314
C Factor: .23
Ambient Temperature:
Barometric Pressure:
Silica Gel #:

Static Pressure:
Traverse Pt. A3
Pwake = .11
Pstatic = 0.05

Water Collected:
Impingers, ml.:
Silica Gel, gms.:

Start = 2:11 . VI = 801.372

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP In. H2O	Orifice ΔH In. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. In Hg.
A 1	[illegible]	136	.15	1.2	801.9	96	98	254	254	70	4
2	[illegible]	136	.17	1.4	808.7	96	97	253	253	68	4
3	[illegible]	138	.23	1.85	813.1	97	97	254	252	68	4
4	24	137	.26	2.10	817.5	99	97	252	252	70	5
5	30	137	.22	1.80	821.9	100	98	253	253	71	6
6	[illegible]	137	.29	2.35	826.7	100	98	254	253	72	7
7	42	139	.32	2.60	831.8	102	99	254	252	74	8
8	48	138	.31	2.50	836.8	101	99	250	252	71	8
9	54	137	.33	2.65	842.0	101	100	252	250	71	9
10	[illegible]	139	.36	2.90		101	100	252	250	73	10
			stop @	3:11	VF =	847.472					
Averages	120	138	0.496	2.023	89.87	97					

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed:12/10/90

Summary of Test Data: Condensable Particulate Emissions

	Run #6 CD
Number of Sampling Points:	20
Duration of the Run (θ), Minutes:	120
Sampling Nozzle Diameter, Inches:	0.314
Pitot Calibration Factor (C_p):	0.84
Meter Calibration Factor (γ):	0.986
Stack Diameter, Inches:	65
Ambient Air Temperature, °F:	80
Barometric Pressure (P_b), In. Hg:	29.95
Stack Gas Static Pressure in Flue, In. H_2O:	-0.06
Stack Gas Absolute Pressure (P_s), In. Hg:	29.95
Stack Gas Velocity Head, ($\sqrt{\Delta P}$):	0.484
Orifice Pressure Drop (ΔH), In. H_2O:	1.86
Volume Sampled (V_m), ft^3 (Meter Cond.):	86.72
Stack Gas Temperature (t_s), °F:	137
Impinger Outlet Temperature, °F:	72
Meter Temperature (t_m), °F:	99
Meter Vacuum, In. Hg:	5
Volume of Water Condensed (V_{lc}), ml:	331.5
Specific Gravity of Flue Gas (SG):	0.985
Flue Gas Composition:	
% CO_2	14.3
% O_2	6.1
% CO	0.0

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed:12/10/90

Sampling Data and Calculations: Condensable Particulate Emissions

	Run #6 CD
A. Stack Gas Cross Sectional Area (A_s), ft^2:	23.04
B. Volume Sampled (Meter Conditions), ft^3:	86.72
C. Volume Sampled (Std. Conditions), ft^3: [$B * \gamma * (T_{std}/P_{std}) * ((P_b + (\Delta H/13.6))/T_m)$]	81.22
D. Volume of Liquid Water Condensed, ml:	331.5
E. Vapor Volume (Std. Conditions) of Water, ft^3: [$D * 0.04714$]	15.63
F. Stack Gas Moisture Content, %: [$(E/(E + C)) * 100$]	16.14
G. Stack Gas Velocity, ft/min: [$4005 * \sqrt{\Delta P} * C_p * SQRT((T_s * P_{std})/(T_{std} * P_s * SG))$]	1,743
H. Stack Gas Flow Rate (Stack Cond.), ACFM: [$A * G$]	40,173
I. Stack Gas Flow Rate (Std. Cond. dry), SCFM: [$H * (1 - F/100) * (T_{std}/T_s) * (P_s/P_{std})$]	29,801

Standard Conditions: $T_{std} = 528$ °R ; $P_{std} = 29.92$ in. Hg

$T_s = t_s + 460$; $T_m = t_m + 460$

Sampling Data and Calculations: Condensable Particulate Emissions

Run #6 CD

J. Particulates Quantity Collected, gm

2. Condensable Partic. 0.0041

K. Particulates Concentration, gr/ft^3
[J/C * (1543000/100000)]

2. Condensable Partic. 0.0008

L. Particulates Concentration (At 12% CO_2), gr/ft^3
[K * (12/%CO_2)]

2. Condensable Partic. 0.0007

M. Particulates Emission Rate, lb/hr
[K * I * (132300/1000000)/(1543000/100000)]

2. Condensable Partic. 0.199

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 12/10/90

Stack Gas Composition and Gas Density Calculations

	Run #6					
	% Dry Basis	Wet Basis	% Dry Basis	Wet Basis	% Dry Basis	Wet Basis
CO_2	14.3	11.99				
O_2	6.1	5.12				
CO	0.0	0.02				
N_2	79.6	66.74				
H_2O	- - -	16.14				
Molecular Weight[1]	- - -	28.51				
Specific Gravity of Stack Gas[2]	- - -	0.985				

1. Calculated from the equation:
   Molecular Weight = $0.44*(\%CO_2) + 0.32*(\%O_2) + 0.28*(\%N_2 + \%CO) + 0.18*(\%H_2O)$
2. Calculated from the equation:
   SG = Molecular Weight of Stack Gas / Molecular Weight of Air (28.95 gm/gm-mole)

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 12/10/90

Isokinetic Variation Calculation

Run #6

Stack Gas Absolute Temperature (T_s), °R:	597
Volume of Liquid Water Condensed (V_{lc}), ml:	331.5
Meter Calibration Factor (γ):	0.986
Volume Sampled (Meter Cond.) (V_m), ft^3:	86.72
Meter Absolute Temperature (T_m), °R:	559
Meter Absolute Pressure (P_m), In. Hg: ($P_b + \Delta H / 13.6$)	30.09
Stack Gas Velocity (v_s), ft/min:	1,743
Stack Gas Absolute Pressure (P_s), In. Hg:	29.95
Cross-Sectional Area of Nozzle, (A_n), ft^2:	0.00054
Duration of the Run (θ), minutes:	120
Isokinetic Percentage (I), %: [1]	97.3

1. Calculated from the Equation:

$$I = [T_s * 100 * ((K_3 * V_{lc}) + (V_m / T_m * \gamma * P_m))] / (\theta * v_s * P_s * A_n)$$

where $K_3 = 0.002669$

Galson Technical Services

SAMPLE COLLECTION DATA 12

Comments:

Plant: Catalyst Huntsman
Location: Boiler exhaust
Date: 9-8-90
Run Number: #6 Cadi
Operator: T.P./D.S.
Sample Box ID:
Meter Box ID: 001
Probe ID:
Filter #:

Meter θ: .986
Meter ΔH@: 1.876
Pitot C.F.: .84
Assumed Moisture %: 18
Nozzle Diameter in.: .314
C Factor: 24
Ambient Temperature: 85
Barometric Pressure: 29.95
Silica Gel #:

Static Pressure:
Traverse Pt.: A4
Pwake: -.20
Pstatic: -0.10

Water Collected:
Fr - Ir
Impingers, ml.: 278
Silica Gel, gms.: 53.5
331.5

Start: 12:50 VI = 589.512

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP In. H2O	Orifice ΔH In. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. In Hg.
A 1	6	138	.31	2.40		97	97	232	260	74	4
2	12	138	.35	2.75	591.4	97	98	233	260	69	3
3	18	137	.34	2.65	599.8	100	97	234	261	71	3
4	24	138	.35	2.75	605.3	103	99	235	263	72	5
5	30	137	.32	2.50	611.0	106	100	235	265	72	5
6	36	139	.34	2.65	616.0	105	101	238	263	75	5
7	42	137	.25	1.95	621.3	104	101	237	264	74	4
8	48	141	.28	2.20	625.8	105	102	237	268	75	5
9	54	140	.24	1.85	630.5	105	101	238	268	77	5
10	60	139	.20	1.55	635.0	106	102	237	265	79	4
				VF =	638.648						
	Stop	1:50									
Averages											

Galson Technical Services

SAMPLE COLLECTION DATA 2/2

Comments: Dark .002 / Rule 9 .00 / Pm Out 14" Hg

Plant: Pinehurst - Hudson
Location: Boiler exhaust
Date: 9.8.90
Run Number: 4-6 Cad
Operator: RPTO
Sample Box ID:
Meter Box ID: 90r
Probe ID:
Filter #:

Meter Ø: 986
Meter ΔH@: 1.876
Pitot C.F.: 1.01
Assumed Moisture %: 18
Nozzle Diameter in.: .314
C Factor: .24
Ambient Temperature: 85.
Barometric Pressure:
Silica Gel #:

Static Pressure:
Traverse Pt.: B7
Pwake: -.07
Pstatic: -0.01

Water Collected:
Impingers, ml.:
Silica Gel, gms.:

IF = 638.648

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP In. H2O	Orifice ΔH In. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. In Hg.
10	6	136	.13	1.0		101	101	236	266	67	3
9	12	137	.23	1.80	642.2	97	99	235	264	72	4
8	18	136	.21	1.60	646.4	97	97	234	261	67	5
7	24	137	.21	1.60	650.2	99	98	235	265	70	5
6	30	136	.22	1.70		98	96	233	262	71	5
5	36	136	.20	1.55	658.4	96	96	234	261	71	5
4	42	136	.16	1.25	662.4	96	94	233	259	71	5
3	48	137	.15	1.15	666.0	95	94	234	262	71	5
2	54	137	.15	1.15	669.5	95	94	234	265	71	5
1	60	138	.15	1.15	672.5	96	93	232	261	69	5
	Stop	3:14		IF -	676.234						
Averages	120	137	0.484	1.86	86.72	99					

Hexavalent Chromium Emission Data

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed:12/10/90

Summary of Test Data: Hexavalent and Total Chromium Emissions

	Run: #1	Run: #2	Run: #3
Number of Sampling Points:	20	20	20
Duration of the Run (θ), Minutes:	180	180	180
Sampling Nozzle Diameter, Inches:	0.314	0.314	0.314
Pitot Calibration Factor (C_p):	0.84	0.84	0.84
Meter Calibration Factor (γ):	0.989	0.989	0.989
Stack Diameter, Inches:	65	65	65
Ambient Air Temperature, °F:	85	89	89
Barometric Pressure (P_b), In. Hg:	29.84	29.84	29.92
Stack Gas Static Pressure in Flue, In. H_2O:	0.15	-0.08	-0.07
Stack Gas Absolute Pressure (P_s), In. Hg:	29.85	29.83	29.91
Stack Gas Velocity Head, ($\sqrt{\Delta P}$):	0.478	0.476	0.493
Orifice Pressure Drop (ΔH), In. H_2O:	1.85	1.84	1.97
Volume Sampled (V_m), ft^3 (Meter Cond.):	129.63	127.84	131.83
Stack Gas Temperature (t_s), °F:	137	136	136
Impinger Outlet Temperature, °F:	76	72	71
Meter Temperature (t_m), °F:	90	97	93
Meter Vacuum, In. Hg:	6	3	4
Volume of Water Condensed (V_{lc}), ml:	561.8	542.5	563.8
Specific Gravity of Flue Gas (SG):	0.982	0.982	0.983
Flue Gas Composition:			
$\%CO_2$	15.2	15.3	15.3
$\%O_2$	5.8	5.0	5.8
%CO	0.0	0.0	0.0

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed:12/10/90

Sampling Data and Calculations: Hexavalent and Total Chromium Emissions	Run: #1	Run: #2	Run: #3
A. Stack Gas Cross Sectional Area (A_s), ft^2:	23.04	23.04	23.04
B. Volume Sampled (Meter Conditions), ft^3:	129.63	127.84	131.83
C. Volume Sampled (Std. Conditions), ft^3: [$B * \gamma * (T_{std}/P_{std}) * ((P_b + (\Delta H/13.6))/T_m)$]	123.39	120.11	125.09
D. Volume of Liquid Water Condensed, ml:	561.8	542.5	563.8
E. Vapor Volume (Std. Conditions) of Water, ft^3: [D * 0.04714]	26.48	25.57	26.58
F. Stack Gas Moisture Content, %: [(E/(E + C)) * 100]	17.67	17.55	17.52
G. Stack Gas Velocity, ft/min: [$4005 * \sqrt{\Delta P} * C_p * SQRT((T_s * P_{std})/(T_{std} * P_s * SG))$]	1,729	1,720	1,779
H. Stack Gas Flow Rate (Stack Cond.), ACFM: [A * G]	39,832	39,635	40,997
I. Stack Gas Flow Rate (Std. Cond. dry), SCFM: [$H * (1 - F/100) * (T_{std}/T_s) * (P_s/P_{std})$]	28,934	28,847	29,932

Standard Conditions: $T_{std} = 528$ °R ; $P_{std} = 29.92$ in. Hg

$T_s = t_s + 460$; $T_m = t_m + 460$

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 12/18/90

Sampling Data and Calculations: Hexavalent and Total Chromium Emissions

	Run: #1	Run: #2	Run: #3
J. Partic Metal Quantity Collected, mg			
Chromium	0.054	0.085	0.083
Hexavalent Chromium	< 0.02	< 0.02	0.047
K. Partic Metal Concentration, mg/m^3 [J/C * (35.31/1)]			
Chromium	0.015	0.025	0.023
Hexavalent Chromium	< 0.0057	< 0.0059	0.0133
L. Partic Metal Concentration (At 12% CO_2), mg/m^3 [K * (12/%CO_2)]			
Chromium	0.012	0.020	0.018
Hexavalent Chromium	< 0.0045	< 0.0046	0.0104
M. Partic Metal Emission Rate, gm/hr [K * I * (60/1000)/(35.31/1)]			
Chromium	0.76	1.2	1.2
Hexavalent Chromium	< 0.28	< 0.29	0.67

Source Test Report
(TAC) CATALYST HUDSON
Galson Project #: S9-072.CH

Date Printed: 1/17/91

Sampling Data and Calculations: Hexavalent and Total Chromium Emissions

	Run #1	Run #2	Run #3
N. Equivalent Particulate Quantity Collected, gm (See Note (a) below)	0.142	0.141	0.145
O. Metal to Particulate Ratio, ug/gm [J/N]			
Total Chromium	380	603	572
Hexavalent Chromium	<140	<140	320

Note (a): Based on: (i) the average particulate grain loading observed during the multiple metals testing (corrected to 12% CO2); (ii) the hexavalent chromium sample volume; and (iii) the average CO2 concentration observed during the hexavalent chromium test.

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 12/10/90

Isokinetic Variation Calculation

	Run: #1	Run: #2	Run: #3
Stack Gas Absolute Temperature (T_s), °R:	597	596	596
Volume of Liquid Water Condensed (V_{lc}), ml:	561.8	542.5	563.8
Meter Calibration Factor (γ):	0.989	0.989	0.989
Volume Sampled (Meter Cond.) (V_m), ft^3:	129.63	127.84	131.83
Meter Absolute Temperature (T_m), °R:	550	557	553
Meter Absolute Pressure (P_m), In. Hg: ($P_b + \Delta H/13.6$)	29.98	29.98	30.06
Stack Gas Velocity (v_s), ft/min:	1,729	1,720	1,779
Stack Gas Absolute Pressure (P_s), In. Hg:	29.85	29.83	29.91
Cross-Sectional Area of Nozzle, (A_n), ft^2:	0.00054	0.00054	0.00054
Duration of the Run (θ), minutes:	180	180	180
Isokinetic Percentage (I), %: [1]	101.5	99.1	99.5

1. Calculated from the Equation:

$$I = [T_s * 100 * ((K_3 * V_{lc}) + (V_m/T_m * \gamma * P_m))]/(\theta * v_s * P_s * A_n)$$

where $K_3 = 0.002669$

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 12/10/90

Stack Gas Composition and Gas Density Calculations

	Run: #1		Run: #2		Run: #3	
	% Dry Basis	Wet Basis	% Dry Basis	Wet Basis	% Dry Basis	Wet Basis
CO_2	15.2	12.51	15.3	12.61	15.3	12.62
O_2	5.8	4.78	5.0	4.12	5.8	4.78
CO	0.0	0.02	0.0	0.02	0.0	0.02
N_2	79.0	65.02	79.7	65.69	78.9	65.06
H_2O	- - -	17.67	- - -	17.55	- - -	17.52
Molecular Weight[1]	- - -	28.43	- - -	28.43	- - -	28.46
Specific Gravity of Stack Gas[2]	- - -	0.982	- - -	0.982	- - -	0.983

1. Calculated from the equation:
   Molecular Weight = $0.44*(\%CO_2) + 0.32*(\%O_2) + 0.28*(\%N_2 + \%CO) + 0.18*(\%H_2O)$
2. Calculated from the equation:
   SG = Molecular Weight of Stack Gas / Molecular Weight of Air (28.95 gm/gm-mole)

Galson Technical Services

Comments:

SAMPLE COLLECTION DATA 1/2

Plant: CATALYST HUDSON
Location: BOILER EXHAUST
Date: 9/6/90
Run Number: #1 HRX CR
Operator: RR
Sample Box ID: NT
Meter Box ID: 002
Probe ID:
Filter #:

Meter Ø: 0.989
Meter ΔH@: 1.73
Pitot C.F.: 0.84
Assumed Moisture %: 18
Nozzle Diameter in.: 0.314
C Factor: 0.23
Ambient Temperature: 85
Barometric Pressure: 29.84
Silica Gel #:

Static Pressure:
Traverse Pt. B4 B6
Pwake +0.11 +0.12
Pstatic

Water Collected:
FJ-1V
Impingers, ml. 510
Silica Gel, gms. 51.8
TOTAL 561.8

START @ 10:17 Vi = 178.584

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
B1	9	135	0.20	1.60		79	80	245	253	77	5
2	18	137	0.21	1.70	190.7	82	81	244	250	74	5
3	27	137	0.21	1.70	196.8	86	83	245	252	74	5
x.11 4	36	136	0.20	1.60	202.9	91	86	246	249	76	5
5	45	137	0.22	1.75	209.1	90	87	245	251	79	6
x12 6	54	136	0.22	1.75		93	89	246	250	81	6
7	63	137	0.25	2.00	222.3	92	89	244	249	76	6
8	72	138	0.28	2.20	229.4	92	89	244	250	73	7
9	81	137	0.27	2.15	236.5	93	89	244	249	75	7
10	90	137	0.23	1.85	243.030	92	89	244	249	77	6
STP @ 11:46											
Averages											

Galson Technical Services

SAMPLE COLLECTION DATA

2/2

Comments: POST TEST LEAK RATE = 0.014 CFM @ 15 in Hg

Plant CATALYST HUDSON
Location BOILER EXHAUST
Date 7/16/90
Run Number #1 Hex Cr
Operator RR
Sample Box ID NT
Meter Box ID DD2
Probe ID
Filter #

Meter Ø 0.989
Meter ΔH@ 1.93
Pitot C.F. 0.84
Assumed Moisture % 18
Nozzle Diameter in. 0.314
C Factor 0.23
Ambient Temperature 85
Barometric Pressure 29.84
Silica Gel #

Static Pressure:
Traverse Pt. A4
Pwake +0.07
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

START @ 12:26 Vi = 243.304

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP In. H2O	Orifice ΔH In. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. In Hg.
A1	9	137	0.12	0.95	248.0	86	86	245	249	80	3
2	18	136	0.16	1.30	253.5	87	87	243	250	76	5
3	27	138	0.22	1.75	259.7	89	87	243	248	70	6
4	36	139	0.16	1.30	265.2	93	90	243	249	72	5
5	45	137	0.19	1.50	271.0	92	89	243	248	72	5
6	54	139	0.27	2.15	278.1	92	89	245	248	73	7
7	63	136	0.28	2.20	285.2	96	91	245	249	75	7
8	72	137	0.32	2.55	293.0	97	93	246	249	77	8
9	81	137	0.34	2.70	—	99	95	244	246	80	8
10	90	138	0.29	2.30	308.220	100	96	245	247	82	8
STOP @		1:56									
Averages											

SAMPLE COLLECTION DATA

1/2

Galson Technical Services

Comments:

Plant: Catalyst Hudson
Location: Boiler exhaust
Date: 9/6/90
Run Number: #2 Hi Cr
Operator: D.S. / R.P
Sample Box ID:
Meter Box ID: 002
Probe ID:
Filter #:

Meter Ø: .989
Meter ΔH@: 1.93
Pitot C.F.: .84
Assumed Moisture %: 18
Nozzle Diameter in.: .314
C Factor: .23
Ambient Temperature: 89°
Barometric Pressure:
Silica Gel #:

Static Pressure:
Traverse Pt. 36
Pwake -.09
Pstatic

Water Collected:
Fv-Iv
Impingers, ml. 508
Silica Gel, gms. 34.5
TOTAL 542.5

Start Clock 3:39 VI = 308.793

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP In. H2O	Orifice ΔH In. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. In Hg.
5 in	9	136	.11	.89	313.3	96	95	245	260	72	1
1	18	136	.15	1.2		95	95	244	259	67	2
2	27	137	.17	1.35		97	95	244	260	72	2
3	36	138	.20	1.6		99	96	245	260	73	2
-.09 6	45	137	.17	1.35	335.8	99	97	244	260	77	2
5	54	139	.21	1.7	341.7	100	98	244	259	70	3
4	63	135	.23	1.85	348.2	101	98	243	259	71	3
3	72	136	.22	1.75		101	98	244	261	74	3
2	81	137	.25	2.00	360.2	101	99	244	258	74	4
	90	137	.20	1.6		100	98	243	257	77	3
			Stop C	5:11	VF = 367.484						
Averages											

Galson Technical Services

SAMPLE COLLECTION DATA

2/2

Comments: post test
LK check - 0.017
[illegible] at 15 mg

Plant: Catalyst Hudson
Location: Boiler Exhaust
Date: 8/1/[illegible]
Run Number: #12 Hatch
Operator: D.S. [illegible]
Sample Box ID:
Meter Box ID: 003
Probe ID:
Filter #:

Meter Ø: .987
Meter ΔH@: 1.93
Pitot C.F.: [illegible]
Assumed Moisture %: 17
Nozzle Diameter in.: .314
C Factor: .23
Ambient Temperature: 90° F
Barometric Pressure:
Silica Gel #:

Static Pressure:
Traverse Pt. A5
Pwake -.17
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Start @ 5:30 VI: 367.666

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
A	9	137	.23	1.85	374.0	96	95	244	259	69	3
	18	136	.25	2.0		98	96	243	257	66	4
	27	135	.24	1.95	387.1	98	95	243	258	68	4
	36	135	.24	1.95	393.6	98	96	244	259	69	4
	45	136	.22	1.75	400.0	97	95	243	257	70	4
	[illegible]	138	.30	2.40		98	95	243	258	71	5
		134	.29	2.30	414.5	98	94	244	256	71	5
	72	134	.33	2.65		97	93	243	257	73	5
	81	137	.30	2.40		96	93	243	257	76	5
	90	136	.29	2.30		96	92	243	255	76	5
		Stop	@ 7:00		VF = 436.815						
Averages											

1/2

SAMPLE COLLECTION DATA

Galson Technical Services

Comments:

Plant [illegible]
Location Boiler Stack
Date 4 7 10
Run Number #3 Hexane
Operator U.S. R.P.
Sample Box ID
Meter Box ID [illegible]
Probe ID
Filter #

Meter Ø .991
Meter ΔH@ 1.93
Pitot C.F. [illegible]
Assumed Moisture % 1X
Nozzle Diameter in. .314
C Factor .23
Ambient Temperature [illegible]
Barometric Pressure 29.92
Silica Gel #

Static Pressure:
Traverse Pt. ____ ____
Pwake ____ ____
Pstatic ____ ____

Water Collected:
FJ-IW
Impingers, ml. 519
Silica Gel, gms. 44.8
TOTAL 563.8

[illegible] 10:11 VF= 457.172

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
B 10	9	135	.25	2.0	443.7	74	73	239	252	66	4
9	18	136	.22	1.80	450.1	142	140	269	270	70	4
8	27	137	.22	1.90	456.4	125	124	254	262	75	4
7	36	136	.21	2.10		105	104	250	257	74	4
6	[illegible]	136	.23	1.95	469.6	119	115	250	257	67	4
5	54	134	.23	1.85	476.2	82	82	240	250	70	4
4	63	136	.26	2.10	482.9	85	84	255	254	72	4
3	72	137	.25	2.00	489.6	87	85	256	252	72	4
2	81	134	.26	2.10	496.4	87	85	257	252	73	4
1	90	137	.24	1.95		89	86	256	251	75	4
			[illegible]	10:49	VF=5	02.906					
Averages											

Galson Technical Services

SAMPLE COLLECTION DATA

2/2

Comments: Post test LK [illegible] .017 at 12 lb

Plant: Catalyst Hudson
Location: Boiler [illegible]
Date: 9/7/10
Run Number: 1-3 [illegible]
Operator: B.S. R.T.
Sample Box ID:
Meter Box ID: 002
Probe ID:
Filter #:

Meter Ø: .989
Meter ΔH@: 1.73
Pitot C.F.: .84
Assumed Moisture %: 18
Nozzle Diameter in.: .314
C Factor: .23
Ambient Temperature: 89°F
Barometric Pressure:
Silica Gel #:

Static Pressure:
Traverse Pt. A7
Pwake -.14
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Start @ 1104 VT = 502.906

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
A	7	134	.22	1.80	509.1	84	84	256	252	70	4
	18	136	.23	1.85	515.4	87	85	254	250	70	4
3	27	135	.16	1.30	520.8	88	85	253	250	68	3
4	36	136	.20	1.60	527.4	89	86	253	252	71	4
5	45	137	.27	2.20	533.6	89	86	253	249	73	5
6	54	137	.26	2.10	540.6	89	86	253	252	73	5
7	[illegible]	139	.26	2.10		89	86	253	250	73	5
8	72	138	.26	2.10	554.3	90	86	253	250	69	5
9	81	139	.29	2.30	561.6	92	87	254	250	69	6
10	90	138	.32	2.5		92	88	252	249	72	6
			Stop @ 1236 VF =			569.006					
Averages											

PAH and Phenolic Compounds Emission Data

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 2/4/91

Summary of Test Data: PAH Emissions

	Run: #1	Run: #2	Run: #3
Number of Sampling Points:	20	20	20
Duration of the Run (θ), Minutes:	180	180	180
Sampling Nozzle Diameter, Inches:	0.314	0.314	0.314
Pitot Calibration Factor (C_p):	0.84	0.84	0.84
Meter Calibration Factor (γ):	0.986	0.986	0.986
Stack Diameter, Inches:	65	65	65
Ambient Air Temperature, °F:	87	83	83
Barometric Pressure (P_b), In. Hg:	29.84	29.84	29.92
Stack Gas Static Pressure in Flue, In. H_2O:	0.10	-0.1	-0.06
Stack Gas Absolute Pressure (P_s), In. Hg:	29.85	29.83	29.92
Stack Gas Velocity Head, ($\sqrt{\Delta P}$):	0.476	0.489	0.503
Orifice Pressure Drop (ΔH), In. H_2O:	1.78	1.90	1.98
Volume Sampled (V_m), ft^3 (Meter Cond.):	126.80	131.29	136.38
Stack Gas Temperature (t_s), °F:	138	138	138
Impinger Outlet Temperature, °F:	64	74	72
Meter Temperature (t_m), °F:	93	95	94
Meter Vacuum, In. Hg:	13	14	12
Volume of Water Condensed (V_{lc}), ml:	528.7	583.5	610.5
Specific Gravity of Flue Gas (SG):	0.984	0.979	0.980
XAD-2 Outlet Temperature, °F:	57	63	61
Flue Gas Composition:			
$\%CO_2$	15.2	15.3	15.3
$\%O_2$	5.8	5.0	5.8
%CO	0.0	0.0	0.0

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Gaison Project#: S9-072.CH

Date Printed: 2/4/91

Sampling Data and Calculations: PAH Emissions

	Run: #1	Run: #2	Run: #3
A. Stack Gas Cross Sectional Area (A_s), ft^2:	23.04	23.04	23.04
B. Volume Sampled (Meter Conditions), ft^3:	126.80	131.29	136.38
C. Volume Sampled (Std. Conditions), ft^3: [$B * \gamma * (T_{std}/P_{std}) * ((P_b + (\Delta H/13.6))/T_m)$]	119.61	123.51	128.89
D. Volume of Liquid Water Condensed, ml:	528.7	583.5	610.5
E. Vapor Volume (Std. Conditions) of Water, ft^3: [D * 0.04714]	24.92	27.51	28.78
F. Stack Gas Moisture Content, %: [(E/(E + C)) * 100]	17.24	18.21	18.25
G. Stack Gas Velocity, ft/min: [$4005 * \sqrt{\Delta P} * C_p * SQRT((T_s * P_{std})/(T_{std} * P_s * SG))$]	1,721	1,772	1,821
H. Stack Gas Flow Rate (Stack Cond.), ACFM: [A * G]	39,650	40,842	41,966
I. Stack Gas Flow Rate (Std. Cond. dry), SCFM: [$H * (1 - F/100) * (T_{std}/T_s) * (P_s/P_{std})$]	28,918	29,397	30,271

Standard Conditions: $T_{std} = 528$ °R ; $P_{std} = 29.92$ in. Hg

$T_s = t_s + 460$; $T_m = t_m + 460$

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Gaison Project#: S9-072.CH

Date Printed: 2/4/91

Sampling Data and Calculations: PAH Emissions

	Run: #1	Run: #2	Run: #3
J. PAH Quantity Collected, µg			
Acenaphthene	0.87	0.34	0.14
Acenaphthylene	1.6	1.6	1
Anthracene	0.12	0.08	0.08
Benzo(a)anthracene	0.035	< 0.02	< 0.02
Benzo(a)pyrene	< 0.02	< 0.02	< 0.02
Benzo(b)fluoranthene	0.19	0.31	< 0.02
Benzo(g,h,i)perylene	< 0.02	< 0.02	< 0.02
Benzo(k)fluoranthene	< 0.02	0.24	< 0.02
Chrysene	0.05	< 0.02	< 0.02
Dibenzo(a,h)anthracene	< 0.02	< 0.02	< 0.02
Fluoranthene	0.47	0.44	0.18
Fluorene	0.31	0.15	0.28
Indeno(1,2,3-cd)pyrene	< 0.02	< 0.02	< 0.02
Naphthalene	1300	< 2900	< 2900
Phenanthrene	1.19	0.99	0.89
Pyrene	0.46	0.51	0.32

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 2/4/91

Sampling Data and Calculations: PAH Emissions

	Run: #1	Run: #2	Run: #3
K. PAH Concentration, µg/m³			
[J/C * (35.31/1)]			
Acenaphthene	0.257	0.097	0.038
Acenaphthylene	0.472	0.457	0.274
Anthracene	0.035	0.023	0.022
Benzo(a)anthracene	0.010	< 0.006	< 0.005
Benzo(a)pyrene	< 0.006	< 0.006	< 0.005
Benzo(b)fluoranthene	0.056	0.089	< 0.005
Benzo(g,h,i)perylene	< 0.006	< 0.006	< 0.005
Benzo(k)fluoranthene	< 0.006	0.069	< 0.005
Chrysene	0.015	< 0.006	< 0.005
Dibenzo(a,h)anthracene	< 0.006	< 0.006	< 0.005
Fluoranthene	0.139	0.126	0.049
Fluorene	0.092	0.043	0.077
Indeno(1,2,3-cd)pyrene	< 0.006	< 0.006	< 0.005
Naphthalene	384	< 829	< 797
Phenanthrene	0.351	0.283	0.244
Pyrene	0.136	0.146	0.088

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 2/4/91

Sampling Data and Calculations: PAH Emissions

	Run: #1	Run: #2	Run: #3
L. PAH Concentration (At 12% CO_2), µg/m³			
[K * (12/%CO_2)]			
Acenaphthene	0.203	0.076	0.030
Acenaphthylene	0.373	0.359	0.215
Anthracene	0.028	0.018	0.017
Benzo(a)anthracene	0.008	< 0.004	< 0.004
Benzo(a)pyrene	< 0.005	< 0.004	< 0.004
Benzo(b)fluoranthene	0.044	0.070	< 0.004
Benzo(g,h,i)perylene	< 0.005	< 0.004	< 0.004
Benzo(k)fluoranthene	< 0.005	0.054	< 0.004
Chrysene	0.012	< 0.004	< 0.004
Dibenzo(a,h)anthracene	< 0.005	< 0.004	< 0.004
Fluoranthene	0.110	0.099	0.039
Fluorene	0.072	0.033	0.060
Indeno(1,2,3-cd)pyrene	< 0.005	< 0.004	< 0.004
Naphthalene	303	< 642	< 625
Phenanthrene	0.277	0.219	0.192
Pyrene	0.107	0.113	0.069

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 2/4/91

Sampling Data and Calculations: PAH Emissions

	Run: #1	Run: #2	Run: #3
M. PAH Emission Rate, mg/hr			
[K * I * (0.06/1)/(35.31/1)]			
Acenaphthene	12.6	4.83	1.97
Acenaphthylene	23.2	22.7	14.1
Anthracene	1.74	1.14	1.13
Benzo(a)anthracene	0.508	< 0.284	< 0.282
Benzo(a)pyrene	< 0.290	< 0.284	< 0.282
Benzo(b)fluoranthene	2.76	4.40	< 0.282
Benzo(g,h,i)perylene	< 0.290	< 0.284	< 0.282
Benzo(k)fluoranthene	< 0.290	3.41	< 0.282
Chrysene	0.725	< 0.284	< 0.282
Dibenzo(a,h)anthracene	< 0.290	< 0.284	< 0.282
Fluoranthene	6.82	6.25	2.54
Fluorene	4.50	2.13	3.95
Indeno(1,2,3-cd)pyrene	< 0.290	< 0.284	< 0.282
Naphthalene	18900	< 41170	< 40900
Phenanthrene	17.3	14.1	12.6
Pyrene	6.67	7.24	4.51

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 2/5/91

Sampling Data and Calculations: Phenol Emissions

	Run #1	Run #2	Run #3
J. Phenol Quantity Collected, µg			
2,4,6 - Trichlorophenol	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	< 0.1	< 0.17	< 0.1
2,4-Dimethyl phenol	< 1	< 1	< 1
2,4-Dinitrophenol	4.2	< 1	< 1
2-Chlorophenol	< 0.1	< 0.1	< 0.2
2-Nitrophenol	< 0.25	< 0.21	< 0.1
4,6-Dinitro-o-cresol	< 0.2	< 0.2	< 0.2
4-Chloro-3-methyl phenol	< 0.1	< 0.1	< 0.1
4-Nitrophenol	< 0.5	< 0.5	< 0.5
Pentachlorophenols	< 0.2	< 0.2	< 0.2
Phenol	138	328	72

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 2/5/91

Sampling Data and Calculations: Phenol Emissions

	Run #1	Run #2	Run #3
K. Phenol Concentration, $\mu g/m^3$			
[J/C * (35.31/1)]			
2,4,6 - Trichlorophenol	< 0.030	< 0.029	< 0.027
2,4-Dichlorophenol	< 0.030	< 0.049	< 0.027
2,4-Dimethyl phenol	< 0.295	< 0.286	< 0.274
2,4-Dinitrophenol	1.24	< 0.286	< 0.274
2-Chlorophenol	< 0.030	< 0.029	< 0.055
2-Nitrophenol	< 0.074	< 0.060	< 0.027
4,6-Dinitro-o-cresol	< 0.059	< 0.057	< 0.055
4-Chloro-3-methyl phenol	< 0.030	< 0.029	< 0.027
4-Nitrophenol	< 0.148	< 0.143	< 0.137
Pentachlorophenols	< 0.059	< 0.057	< 0.055
Phenol	40.7	93.8	19.7

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 2/5/91

Sampling Data and Calculations: Phenol Emissions

	Run #1	Run #2	Run #3
L. Phenol Concentration (At 12% CO_2), $\mu g/m^3$			
[K * (12/%CO_2)]			
2,4,6 - Trichlorophenol	< 0.023	< 0.022	< 0.021
2,4-Dichlorophenol	< 0.023	< 0.038	< 0.021
2,4-Dimethyl phenol	< 0.233	< 0.224	< 0.215
2,4-Dinitrophenol	0.979	< 0.224	< 0.215
2-Chlorophenol	< 0.023	< 0.022	< 0.043
2-Nitrophenol	< 0.058	< 0.047	< 0.021
4,6-Dinitro-o-cresol	< 0.047	< 0.045	< 0.043
4-Chloro-3-methyl phenol	< 0.023	< 0.022	< 0.021
4-Nitrophenol	< 0.117	< 0.112	< 0.107
Pentachlorophenols	< 0.047	< 0.045	< 0.043
Phenol	32.2	73.5	15.5

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Galson Project#: S9-072.CH

Date Printed: 2/5/91

Sampling Data and Calculations: Phenol Emissions

	Run #1	Run #2	Run #3
M. Phenol Emission Rate, mg/hr			
[K * I * (0.06/1)/(35.31/1)]			
2,4,6 - Trichlorophenol	< 1.45	< 1.43	< 1.41
2,4-Dichlorophenol	< 1.45	< 2.43	< 1.41
2,4-Dimethyl phenol	< 14.5	< 14.3	< 14.1
2,4-Dinitrophenol	60.9	< 14.3	< 14.1
2-Chlorophenol	< 1.45	< 1.43	< 2.82
2-Nitrophenol	< 3.63	< 3.00	< 1.41
4,6-Dinitro-o-cresol	< 2.90	< 2.86	< 2.82
4-Chloro-3-methyl phenol	< 1.45	< 1.43	< 1.41
4-Nitrophenol	< 7.25	< 7.14	< 7.05
Pentachlorophenols	< 2.90	< 2.86	< 2.82
Phenol	2000	4680	1010

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Gaison Project#: S9-072.CH

Date Printed: 2/4/91

Isokinetic Variation Calculation

	Run #1	Run #2	Run #3
Stack Gas Absolute Temperature (T_s), °R:	598	598	598
Volume of Liquid Water Condensed (V_{lc}), ml:	528.7	583.5	610.5
Meter Calibration Factor (γ):	0.986	0.986	0.986
Volume Sampled (Meter Cond.) (V_m), ft^3:	126.80	131.29	136.38
Meter Absolute Temperature (T_m), °R:	553	555	554
Meter Absolute Pressure (P_m), In. Hg: ($P_b + \Delta H/13.6$)	29.97	29.98	30.07
Stack Gas Velocity (v_s), ft/min:	1,721	1,772	1,821
Stack Gas Absolute Pressure (P_s), In. Hg:	29.85	29.83	29.92
Cross-Sectional Area of Nozzle, (A_n), ft^2:	0.00054	0.00054	0.00054
Duration of the Run (θ), minutes:	180	180	180
Isokinetic Percentage (I), %: [1]	98.5	100.0	101.4

1. Calculated from the Equation:

$$I = [T_s * 100 * ((K_3 * V_{lc}) + (V_m / T_m * \gamma * P_m))] / (\theta * v_s * P_s * A_n)$$

where $K_3 = 0.002669$

Source Test Report:
TAC - CATALYST HUDSON, ANDERSON, CA
Gaison Project#: S9-072.CH

Date Printed: 2/4/91

Stack Gas Composition and Gas Density Calculations

	Run: #1		Run: #2		Run: #3	
	% Dry Basis	Wet Basis	% Dry Basis	Wet Basis	% Dry Basis	Wet Basis
CO_2	15.2	12.58	15.3	12.51	15.3	12.51
O_2	5.8	4.80	5.0	4.09	5.8	4.74
CO	0.0	0.02	0.0	0.02	0.0	0.02
N_2	79.0	65.36	79.7	65.17	78.9	64.48
H_2O	---	17.24	---	18.21	---	18.25
Molecular Weight[1]	---	28.48	---	28.34	---	28.37
Specific Gravity of Stack Gas[2]	---	0.984	---	0.979	---	0.980

1. Calculated from the equation:
   Molecular Weight = $0.44*(\%CO_2) + 0.32*(\%O_2) + 0.28*(\%N_2 + \%CO) + 0.18*(\%H_2O)$
2. Calculated from the equation:
   SG = Molecular Weight of Stack Gas / Molecular Weight of Air (28.95 gm/gm-mole)

Galson Technical Services

Comments:

SAMPLE COLLECTION DATA

1/2

Plant: Catalyst Hudson
Location: Boiler Exhaust
Date: 9-6-90
Run Number: #1 PAH
Operator: D.S., L.A.
Sample Box ID:
Meter Box ID: 001
Probe ID:
Filter #:
Start @ 10:14

Meter Δ: .986
Meter ΔH@: 1.876
Pitot C.F.: .84
Assumed Moisture %: 18
Nozzle Diameter in.: .314
C Factor: .24
Ambient Temperature: 85 °F
Barometric Pressure:
Silica Gel #:
VI = 005.382

Static Pressure:
Traverse Pt. A6
Pwake -.08
Pstatic

Water Collected:
Impingers, ml. 480.7
Silica Gel, gms. 48.0
TOTAL 528.7

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F (XAD/IO)	Pump Vac. in Hg.
A1	9	137	.26	2.00		80	82	236	246	57/60	8
2	18	137	.30	2.30	611.8	84	83	242	245	53/57	11
3	27	138	.35	2.70	019.2	87	84	244	250	54/59	14
4	36	137	.31	2.40		91	86	243	246	56/60	15
5	45	137	.27	2.10	0341	93	87	243	246	57/61	14
A6	54	139	.25	1.95	041.3	94	88	242	249	56/64	14
7	63	136	.18	1.4	048.0	96	90	240	247	56/65	11
8	72	140	.23	1.8		96	91	242	247	53/61	12
9	81	137	.18	1.4		97	92	241	247	54/63	11
10	90	138	.12	.92		97	93	243	248	57/65	9
			Stop @	11:41	VF =	071.3	09				
Averages											

Galson Technical Services

SAMPLE COLLECTION DATA

2/2

Comments: Post test leak V Rate @ .008 CFM @ 17" Hg.

Plant: Cogent Hudson
Location: Boiler Exhaust
Date: 9/6/90
Run Number: #1 PM
Operator: D.S., R.F.
Sample Box ID:
Meter Box ID: 001
Probe ID:
Filter #:

Meter Ø: .986
Meter ΔH@: 1.876
Pitot C.F.: .84
Assumed Moisture %: 18
Nozzle Diameter in.: .314
C Factor: .24
Ambient Temperature: 89
Barometric Pressure: 29.84
Silica Gel #:

Static Pressure:
Traverse Pt. B7
Pwake +.13
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Start @ 12:22 VI = 071.422

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP In. H2O	Orifice ΔH In. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F (VAP/IO)	Pump Vac. In Hg.
10	9	138	.24	1.85		92	93	243	248	61/68	14
9	18	137	.27	2.10		94	93	242	248	55/62	16
8	27	138	.26	2.0	085.8	96	94	243	248	57/62	17
7	36	138	.26	2.0	089.0	98	94	244	249	54/60	17
6	45	135	.22	1.70	097.2	97	95	243	247	54/61	15
5	54	139	.23	1.80	103.9	97	95	243	247	56/67	15
4	63	137	.18	1.40	110.3	96	100	244	246	56/69	13
3	72	138	.19	1.45	116.5	101	97	243	245	61/72	14
2	81	138	.17	1.32	122.3	99	96	240	248	62/73	14
1	90	139	.14	1.10	127.2	96	96	243	247	64/73	12
			Stop	1:52	VF = 132.293						
Averages											

Galson Technical Services

Comments: Started 4:60 [illegible] 8-4-78

SAMPLE COLLECTION DATA 1/2

Plant Catalast Hudson
Location Trailer extension
Date 2-6-D
Run Number #2 Pre
Operator [illegible]
Sample Box ID
Meter Box ID 001
Probe ID
Filter #

Meter Ø .986
Meter ΔH@ 1.876
Pitot C.F. .84
Assumed Moisture % 18
Nozzle Diameter in. .314
C Factor .24
Ambient Temperature 85
Barometric Pressure 29.84
Silica Gel #

Static Pressure:
Traverse Pt. A4
Pwake -.25
Pstatic

Water Collected:
Fv - IV
Impingers, ml. 523.9
Silica Gel, gms. 59.6
TOTAL 583.5

Strt. : 3:35 VI = 133.721 XriD / I.O

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
A1	9	139	.31	2.40		92	92	235	266	65 / 72	12
2	18	138	.36	2.80	141.7	94	92	236	262	62 / 74	15
3	27	140	.39	3.0	149.6	96	93	235	266	62 / 74	17
.25 4	36	138	.34	2.65	156.1	95	93	238	264	63 / 77	15
5	45	139	.31	2.40	164.7	96	94	236	265	61 / 70	15
6	54	139	.31	2.40	172.3	97	93	238	266	60 / 71	15
7	[illegible]	141	.24	1.85	179.8	98	94	240	266	64 / 72	13
8	72	139	.25	1.95	185.9	98	94	242	267	65 / 69	13
9	81	138	.27	2.15	192.8	95	93	241	267	66 / 72	15
10	90	138	.23	1.80	199.5	98	95	237	266	68 / 74	15
				VF -	205.794						
			Stop 5:05								
Averages											

Galson Technical Services

SAMPLE COLLECTION DATA 2/2

Comments: Start time 5:30 5:40 Post Test leak ✓ Rate of collection (.17" Hg.

Plant Catalyst Hudson
Location Boiler Exhaust
Date 9.6.90
Run Number #2 PAH
Operator KP
Sample Box ID
Meter Box ID 001
Probe ID
Filter #

Meter Ø .986
Meter ΔH@ 1.876
Pitot C.F. .84
Assumed Moisture % 18
Nozzle Diameter in. .314
C Factor .24
Ambient Temperature 80
Barometric Pressure 29.84
Silica Gel #

Static Pressure:
Traverse Pt. B6
Pwake -.11
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Start: 5:35 VI = 205.908 XAD/2.0

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP In. H2O	Orifice ΔH In. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. In Hg.
B 10	9	138	.14	1.10		95	94	240	269	60 / 76	9
9	18	138	.19	1.45	210.5	94	94	239	268	58 / 75	9
8	27	138	.24	1.85	216.8	96	94	240	267	64 / 78	12
7	36	138	.22	1.70	223.8	95	93	241	267	61 / 78	15
.11 6	45	139	.23	1.80	229.7	95	93	239	267	60 / 77	15
5	54	137	.21	1.65	236.7	93	95	239	266	62 / 77	15
4	63	136	.19	1.45	242.9	96	93	239	267	65 / 75	15
3	72	136	.17	1.35	250.6	100	94	235	265	67 / 76	14
2	81	137	.17	1.35	254.9	95	92	238	266	69 / 78	13
1	90	138	.12	.94	260.2	95	92	240	266	65 / 76	11
				VF =	265.124						
			stop 7:05								
Averages											

Galson Technical Services

Comments:

SAMPLE COLLECTION DATA

Plant [illegible]
Location [illegible]
Date 9/7/[illegible]
Run Number [illegible]
Operator [illegible]
Sample Box ID [illegible]
Meter Box ID 001
Probe ID [illegible]
Filter # [illegible]

Meter δ [illegible]
Meter ΔH@ [illegible]
Pitot C.F. [illegible]
Assumed Moisture % 3
Nozzle Diameter in. [illegible]
C Factor [illegible]
Ambient Temperature [illegible]
Barometric Pressure 29.84
Silica Gel # [illegible]

Static Pressure:
Traverse Pt. A1
Pwake [illegible]
Pstatic [illegible]

Water Collected:
FU-IV
Impingers, ml. 559.7
Silica Gel, gms. 50.8
TOTAL 610.5

[illegible] 7.15 VI = 768.321

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP In. H2O	Orifice ΔH In. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. In Hg.
A1	[illegible]	132	.34	2.60		79	80	242	249	54/13	10
[illegible]	1.0	142	.35	2.70	277.0	95	92	238	266	59/77	10
	[illegible]	141	.32	2.50	284.5	98	92	243	267	62/83	11
		140	.33	2.55	292.0	92	87	239	266	62/76	11
		139	.27	2.10	299.6	90	87	241	270	65/75	10
		135	.28	2.20	306.5	85	83	240	274	51/63	10
		141	.29	2.25	313.5	91	87	245	277	54/67	10
		139	.24	1.85	321.0	87	93	242	273	56/65	10
		136	.25	1.95	327.4	95	89	244	275	56/67	10
		137	.24	1.85	334.5	92	98	243	267	62/71	10
			[illegible]	1045							
				VF =	340.087						
Averages											

Galson Technical Services

SAMPLE COLLECTION DATA

2/2.

Comments: [illegible]

Plant Catalyst - Hudson
Location Kiln Exhaust
Date 3-10-90
Run Number 1-3 Pm
Operator K.P.
Sample Box ID
Meter Box ID 001
Probe ID
Filter #

Meter Ø .986
Meter ΔH@ 1.6116
Pitot C.F. .84
Assumed Moisture % 18
Nozzle Diameter in. .314
C Factor .24
Ambient Temperature 55
Barometric Pressure
Silica Gel #

Static Pressure:
Traverse Pt. B5
Pwake -.11
Pstatic

Water Collected:
Impingers, ml.
Silica Gel, gms.

Start 11:10 Vf = 310.147 XAS/1.0

Traverse Point Number	Sampling Time min.	Stack Temp. (Ts) °F	Stack ΔP in. H2O	Orifice ΔH in. H2O	Meter Reading (Vm) ft3	Dry Gas Meter Temp. T in °F	Dry Gas Meter Temp. T out °F	Sample Box Temp. °F	Probe Temp. °F	Impinger Outlet °F	Pump Vac. in Hg.
B-6	9	137	.26	2.0		92	92	243	269	54/73	12
2	1[illegible]	138	.26	2.0	346.4	94	93	239	267	57/68	13
8	[illegible]	139	.27	2.10	354.0	95	98	241	268	59/70	14
7	[illegible]	137	.24	1.85	361.1	100	96	242	267	62/71	14
6	[illegible]	139	.24	1.85	368.2	98	96	242	267	65/73	14
5	[illegible]	138	.21	1.65	374.5	100	97	243	267	71/79	13
4	[illegible]	140	.23	1.80	381.3	101	97	243	267	69/73	15
3	[illegible]	139	.22	1.70	387.5	101	99	242	266	70/74	15
2	[illegible]	130	.17	1.32	393.3	102	99	241	265	64/69	12
1	[illegible]	138	.12	.93	400.1	100	99	237	259	62/67	9
				Vf = 404.757							
		Stop 12:40									
Averages											

CO and THC Emission Data Summary

Supporting Data and Calculations (CO and THC Emission Summary)

Test #	Date	Time	Flowrate* SDCFM	%CO2	Concentration, ppm (dry) CO	Concentration, ppm (dry) THC**	Concentration, ppm @ 12% CO2 CO	Concentration, ppm @ 12% CO2 THC**	Emission Rate, lbs/hr CO	Emission Rate, lbs/hr THC**
1	9/6/90	1017-1356	28,926	15.2	223	11	176	9	28.0	0.8
2	9/6/90	1539-1900	29,040	15.3	226	7	177	5	28.5	0.5
3	9/7/90	0919-1236	30,102	15.3	193	9	151	7	25.2	0.7
4	9/7/90	1417-1634	29,336	15.2	231	5	182	4	29.4	0.4
5	9/8/90	0933-1153	31,627	14.2	202	6	171	5	27.7	0.5
6	9/8/90	1250-1511	30,201	14.3	225	7	189	6	29.5	0.5

Notes:

* The Tests 1,2, and 3 flow rate data is based on the average flow rates observed during the PAH and Hexavalent Chromium sampling. The Tests 4, 5 and 6 flow rate data is based on the average flow rates observed during the Multiple Metals sampling.

** As methane

lbs/hr = ppm x Molecular Weight x SDCFM x 1.55 x 10-7; where the molecular weight of CO = 28, and THC as methane = 16

ppm at 12% CO2 = ppm x (12 ÷ %CO2)

ATTACHMENT VI: Laboratory Data

LABORATORY NOMENCLATURE

Sample ID - A uniform code was used to identify all field samples.

(i.e. 72.CH-6-Ben-A)

First part - GTS Job number abbreviation (i.e. 72.CH)

Second part - Sequential run number (i.e. Run 6)

Third part - Parameter(s) tested for:

- BEN - Benzene
- CS - Crystalline Silica
- FORM (F) -Formaldehyde/Acetaldehyde
- HC - Hexavalent Chromium
- MM - Multiple Metals Including:
  - As - Arsenic
  - Be - Beryllium
  - Cd - Cadmium
  - Cr - Chromium
  - Cu - Copper
  - Pb - Lead
  - Mn - Manganese
  - Hg - Mercury
  - Ni - Nickel
  - Se - Selenium
  - Zn - Zinc
- PAH - Polycyclic Aromatic Hydrocarbons/Phenols

Fourth part - Container Identification, as defined below:

<u>Benzene samples</u> -

A - Tedlar bag

<u>Crystalline Silica samples</u> -

A - Acetone rinse of nozzle, probe, and filter bell

B - Filter

C - Impinger contents and methylene chloride rinse of three impingers

D. - Silica gel

<u>Formaldehyde samples</u> -

A - DNPH solution from all impingers

<u>Hexavalent Chromium samples</u> -

A. - Impinger solutions; nozzle, probe and filter bell rinse with 0.1N sodium hydroxide; and filter.

B. - 0.1N Nitric acid rinse of entire sampling train

C. - Silica gel

Multiple Metals samples-

A. - Acetone rinse of nozzle, probe and filter bell

B. - Nitric acid/hydrogen peroxide rinse of nozzle, probe and filter bell.

C. - Filter

D. - 1st, 2nd, and 3rd impinger solutions and rinse with nitric acid/hydrogen peroxide

E - 4th impinger solution and rinse with potassium permangenate and sulfuric acid.

F. - Silica gel

Polycyclic Aromatic Hydrocarbon samples -

A. - Methanol, benzene, and methylene chloride rinse of nozzle, probe and filter bell

B. - Filter

C. - Methanol, benzene, and methylene chloride rinse of filter outlet, teflon tubing, and condenser.

D. - XAD-2 resin trap

E - Impinger #1 contents and the methanol, benzene, and methylene chloride rinse of this impinger.

F. - Contents of 2nd and 3rd impingers along with methanol, benzene, and methylene chloride rinse of impingers and connecting glassware.

G. - Silica gel

MDL	=	Minimum detection limit
ppbv	=	parts per billion by volume
µg, uG	=	micrograms
gm, G	=	grams

See specific reports for all other abbreviations.

AIR TOXICS LTD.

Stationary Source Test Method - Formaldehyde

(CARB Method 430)

High Pressure Liquid Chromatography

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Extraction Date	Analysis Date	Analyzed For	Dilution Factor	MDL (uG)	Amount (uG)
72.CH-1A-F-A	900904-01A	4091208	9/6/90	9/10/90	9/12/90	Formaldehyde	6.1	6.1	46
						Acetaldehyde	6.1	6.1	8.9
72.CH-1B-F-A	900904-02A	4091206	9/6/90	9/10/90	9/12/90	Formaldehyde	3.4	3.4	21
						Acetaldehyde	3.4	3.4	10
72.CH-1C-F-A	900904-03A	4091205	9/6/90	9/10/90	9/12/90	Formaldehyde	2.9	2.9	27
						Acetaldehyde	2.9	2.9	4.7
72.CH-B-F-A	900904-04A	4091204	9/6/90	9/10/90	9/12/90	Formaldehyde	1.9	1.9	ND
						Acetaldehyde	1.9	1.9	ND
Lab Blank	900904-05A	4091202	NA	9/10/90	9/12/90	Formaldehyde	1.0	1.0	ND
						Acetaldehyde	1.0	1.0	ND
									Recovery (%)
Method Spike	900904-05B	4091203	NA	9/10/90	9/12/90	Formaldehyde	1.0	1.0	109
						Acetaldehyde	1.0	1.0	96

COMMENTS: NA=Not Applicable
ND=Not Detected

AIR TOXICS LTD.

Stationary Source Test Method - Low Level Benzene

(CARB Method 410A)

Cryofocusing Full Scan GC/MS

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analysis Date	Analyzed For	Dilution Factor	MDL (ppbv)	Amount (ppbv)
72.CH-2A-BEN-A	900903-01A	1090706	9/6/90	9/7/90	BENZENE	8.5	**8.5**	**110**
72.CH-2B-BEN-A	900903-02A	1090707	9/6/90	9/7/90	BENZENE	9.3	**9.3**	**89**
72.CH-2C-BEN-A	900903-03A	1090705	9/6/90	9/7/90	BENZENE	9.3	**9.3**	**140**
72.CH-B-BEN-A	900903-04A	1090704	9/6/90	9/7/90	BENZENE	2.0	**2.0**	**ND**
Lab Blank	900903-05A	1090703	NA	9/7/90	BENZENE	1.0	**1.0**	**ND**

COMMENTS:

NA=Not Applicable

ND=Not Detected

E=Exceeds instrument calibration range

Galson
Technical Services

PARTICULATE ANALYSIS REPORT - RINSE SAMPLES

Galson Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389
FAX: (415) 848-0838

Project Name: TAC - Catalyst Hudson
Project No.: S9-072.CH

Sample ID	Lab ID	Sample Date	Tare (gm)	Final (gm)	Diff. (gm)	Blk-Correct. Diff. (gm)
Blank	141	9/8/90	109.1832	109.1843	0.0011	NA
Test #4	132	9/8/90	103.4151	103.4238	0.0087	0.0076
Test #5	135	9/8/90	103.6253	103.6321	0.0068	0.0057
Test #6	136	9/8/90	106.3712	106.3774	0.0062	0.0051

Note: The samples were collected using the EPA Multiple Metals Sampling Train

Method: EPA Multiple Metals/CARB 5
Date : 9/20-21/1990
Analyst: K. Acquistapace
Reviewed: M. Ludwiczak

Galson
Technical Services

Galson Technical Services, Inc.
2116 Berkeley Way
Berkeley, CA 94704
Tel: (415) 848-0389
FAX: (415) 848-0838

PARTICULATE ANALYSIS REPORT - FILTER SAMPLES

Project Name: TAC - Catalyst Hudson
Project No.: S9-072.CH

Sample ID	Filter ID	Sample Date	Tare (gm)	Final (gm)	Diff. (gm)	Blk-Correct. Diff. (gm)
Blank	186	9/8/90	0.5119	0.5129	0.0010	NA
Test #4	183	9/7/90	0.5068	0.5943	0.0875	0.0865
Test #5	191	9/8/90	0.4964	0.5776	0.0812	0.0802
Test #6	189	9/8/90	0.4948	0.5896	0.0948	0.0938

Note: The samples were collected using the EPA Multiple Metals Sampling Train.

NA: Not applicable

Method: EPA Multiple Metals/CARB 5
Date : 9/20-21/1990
Analyst: K. Acquistapace
Reviewed: M. Ludwiczak

Galson Laboratories
6601 Kirkville Road
E. Syracuse, NY 13057
Tel: (315) 432-0506
1-800-950-0506

LABORATORY ANALYSIS REPORT

Client: TIMBER ASSOCIATION OF CALIFORNIA
Task Number: 90092427 Job Number: S9072.CHLL
Location: CATALYST HUDSON Date Sampled: 9/7-8/90

Lab ID:	J20031	J20032	J20033	J20034BL	METHOD BLANK
Client ID:	72.CH-4-MM-A-D	72.CH-5-MM-A-D	72.CH-6-MM-A-D	72.CH-B-MM-A-D	NA
ARSENIC TOTAL MG	0.027	0.018	0.019	<0.001	<0.001
BERYLLIUM	<0.001	<0.001	<0.001	<0.001	<0.001
CADMIUM	0.004	0.006	0.003	<0.001	<0.001
CHROMIUM	0.058	0.057	0.060	<0.002	0.003
COPPER	0.049	0.047	0.047	<0.005	<0.005
LEAD	0.17	0.12	0.13	0.022	0.002
MANGANESE	4.3	0.25	0.41	<0.02	<0.02
MERCURY	0.0029	<0.0013	0.0013	<0.0011	<0.0006
NICKEL	0.012	0.012	0.012	<0.008	<0.008
SELENIUM	<0.01	<0.01	<0.01	<0.01	<0.01
ZINC	1.4	0.60	0.59	0.034	1.6

Method(s): EPA DRAFT MULTIPLE METALS METHOD DATED AUGUST 28, 1989.

Footnotes: CONTAINERS A/C, B & D WERE COMBINED PRIOR TO ANALYSIS.
* RESULTS ARE THE TOTAL VALUES FROM COMBINED CONTAINERS A-D & CONTAINER E. RESULTS FOR THE FRACTIONS ARE PRESENTED ON THE FOLLOWING PAGE.

Submitted by: AJN, KSB, KMB, PH
Approved by: S Bateman
Date: 9-OCT-1990

(<) - Less Than
(>) - Greater Than
NA - Not Applicable
ND - Not Detectable
NS - Not Specified
MG - Milligrams
L - Liters
M^3 - Cubic Meter
MG/M^3 - Milligrams Per Cubic Meter
PPM - Parts Per Million
UG - Micrograms
NG - Nanograms
BL - Blank

1971 - 1991 20th Anniversary
A division of Galson Technical Services, Inc

Galson Laboratories

6601 Kirkville Road
E. Syracuse, NY 13057
Tel: (315) 432-0506
1-800-950-0506

LABORATORY ANALYSIS REPORT

Client: TIMBER ASSOCIATION OF CALIFORNIA
Task Number: 90092726 Job Number: S9072.CHLL
Location: CATALYST HUDSON Date Sampled: 9/8/90 & 9/20/90

CONDENSIBLE PARTICULATE-WATER SOLUBLE FRACTION

Sample ID	Lab ID	AVE TARE G	AVE FINAL G	WEIGHT GAIN G	BLANK CORRECTED G
CH-6-CD-C	J20465	52.7386	52.7403	0.0017	0.0011
CH-B-CD-C	J20466BL	51.8635	51.8641	0.0006	NA

Method(s): CARB 5.4.3.1
Footnotes:

(<) - Less Than
(>) - Greater Than
NA - Not Applicable
ND - Not Detectable
NS - Not Specified
MG - Milligrams
L - Liters
M3 - Cubic Meter
MG/M3 - Milligrams Per Cubic Meter
PPM - Parts Per Million
UG - Micrograms
NG - Nanograms
G - Grams
WT - Weight

Submitted by: BB, PP
Approved by: O. Bedosta
Date: 18-OCT-1990

20th Anniversary
A division of Galson Technical Services, Inc

Galson Laboratories

6601 Kirkville Road
E. Syracuse, NY 13057
Tel: (315) 432-0506
1-800-950-0506

LABORATORY ANALYSIS REPORT

Client: TIMBER ASSOCIATION OF CALIFORNIA
Task Number: 90092726 Job Number: S9072.CHLL
Location: CATALYST HUDSON Date Sampled: 9/8/90 & 9/20/90

CONDENSIBLE PARTICULATE-ORGANIC FRACTION

Sample ID	Lab ID	AVE TARE G	AVE FINAL G	WEIGHT GAIN G	BLANK CORRECTED G
CH-6-CD-C	J20465	48.9523	48.9562	0.0039	0.0030
CH-B-CD-C	J20466BL	51.9678	51.9687	0.0009	NA

Method(s): CARB 5.4.3.1
Footnotes:

(<) - Less Than
(>) - Greater Than
NA - Not Applicable
ND - Not Detectable
NS - Not Specified
MG - Milligrams
L - Liters
M3 - Cubic Meter
MG/M3 - Milligrams Per Cubic Meter
PPM - Parts Per Million
UG - Micrograms
NG - Nanograms
G - Grams
WT - Weight

Submitted by: BB, PP
Approved by: G. Bodenka
Date: 18-OCT-1990

20th Anniversary
A division of Galson Technical Services, Inc

Galson Laboratories

6601 Kirkville Road
E. Syracuse, NY 13057
Tel: (315) 432-0506
1-800-950-0506

LABORATORY ANALYSIS REPORT

Client: TIMBER ASSOCIATION OF CALIFORNIA
Task Number: 90091016 Job Number: S9072.CHLL
Location: CATALYST HUDSON Date Sampled: 9/6-7/90

Lab ID:	J18749A	J18750A	J18751A	J18752ABL
Client ID:	72.CH-1-HC	72.CH-2-HC	72.CH-3-HC	72.CH-B-HC
HEXAVALENT CHROMIUM STACK				
CONTAINER A TOTAL MG	<0.02	<0.02	0.047	<0.007
TOTAL CHROMIUM				
CONTAINER A	0.051	0.082	0.080	<0.003
CONTAINER B	0.003	0.003	0.003	<0.001

HEXAVALENT CHROMIUM QC DATA

ID	% RECOVERY
EPA QC	101
BLANK SPIKE	98
J18751 SPIKE	82

Method(s): CARB 425
Footnotes:

Submitted by: AJN, SM
Approved by: Mary Clarkson
Date: 20-SEP-1990

(<) - Less Than
(>) - Greater Than
NA - Not Applicable
ND - Not Detectable
NS - Not Specified
MG - Milligrams
L - Liters
M^3 - Cubic Meter
MG/M^3 - Milligrams Per Cubic Meter
PPM - Parts Per Million
UG - Micrograms
NG - Nanograms
BL - Blank

TRACE ORGANIC ANALYSIS IN MM5 TRAINS FOR GALSON TECHNICAL SERVICES

A report by

ZENON ENVIRONMENTAL LABORATORIES
5555 North Service Rd.
Burlington, Ontario
L7L 5H7

November 12, 1990

3.0 Analytical Results

The results generated for each of the sample trains submitted under this project are presented ahead.

All sites were determined to contain high levels of naphthalene in the samples, with high levels also being found in the field blank and occasionally in the method blank, which contained XAD-2 resin. As a result of these findings and the shared concern regarding the source of the high naphthalene levels, Zenon undertook several experiments to determine the cause and to ensure that no cross contamination was occurring during the sample processing in the laboratory.Experiments were carried out with several portions of solvent spiked with mg levels of naphthalene and processing through the solvent evaporation steps in conjunction with an equal number of blank portions of solvent. No trace of cross-contamination could be determined, even though the design was such as to encourage evidence of that. A review of the cleaning procedure for the resin indicated that immediately after cleaning, no naphthalene was found, but on standing at room temperature, and stored according to the CARB protocol, naphthalene started to develop within a few days and increased over time. It should be noted that this phenomenon is not related to adsorption from the laboratory air supply, but is a result of resin degradation. This would indicate that, during the time after the resin is shipped to Galson and before and during sampling and transportation back to the laboratory, production of naphthalene may be possible and become a major contributing factor in the analysis of this parameter. Currently we are investigating alternative suppliers to replace our historical supplier of XAD-2 resin, in order to evaluate whether different manufacturers produce different quality of resin in regard to naphthalene production. It would appear from our studies that the protocol for resin preparation and storage in the CARB methodology does not preclude the problems of high naphthalene blanks which are being generated within very short time frames after resin cleaning.

Site 72.CH (Table 3.4)

In the samples from site CH, all presented with high positive levels of naphthalene in the range of 2500-4200 µg total . In addition, samples CH 1;2 and 3 contained low and sub-µg levels of a range of PAH including phenanthrene, .fluoranthene, pyrene, acenaphthylene, benzo(b)fluoranthene and benzo(k)fluoranthene. Sample CH-B contained only naphthalene at significant levels. The method blank contained a very low level of naphthalene, but was found to be free of other PAH. The recovery of the field spike ranged from 70-100% The analysis of phenols on these samples indicated a positive, level of phenol in all the samples analysed.The level ranged from a low of 12 µg in the field blank to 340µg in sample CH-2. One of the samples, CH-1, also presented with a positive result for 2,4-dinitrophenol. The method blank contained no positive identifications for any of the target phenols.

ANALYTICAL RESULTS REPORT

CLIENT INFORMATION
Name: GALSON TECHNICAL SERVICES
Project:

LAB INFORMATION
Contact: GF
Project: AN898849
Date: Nov.07 1990

Notes: "-" = Not Analysed
"<" = Less than MDL
"*NA"=Surrogate not Added

			Client ID:	METHOD	72-CH-1-PAH	72-CH-2-PAH	72-CH-3-PAH	72-CH BLANK-PAH
			Lab ID:	BLANK	022124 90	022125 90	022126 90	022127 90
Component	MDL	Units						
Naphthalene	0.025	ug		0.59	4200	2800	2500	2900
Acenaphthylene	0.025			<	1.6	1.6	1.0	<
Acenaphthene	0.025			<	0.87	0.34	0.14	<
Fluorene	0.025			<	0.5	0.34	0.47	0.19
Phenanthrene	0.025			<	1.5	1.3	1.2	0.31
Anthracene	0.025			<	0.17	0.13	0.13	0.05
Fluoranthene	0.025			<	0.47	0.44	0.18	<
Pyrene	0.025			<	0.46	0.51	0.32	<
Chrysene	0.025			<	0.05	<	<	<
Benz(a)anthracene	0.025			<	0.035	<	<	<
Benzo(b)fluoranthene	0.025			<	0.66	0.78	0.35	0.47
Benzo(k)fluoranthene	0.025			<	0.35	0.59	0.26	0.35
Benzo(a)pyrene	0.025			<	<	<	0.27	<
Indeno(1,2,3-cd)pyrene	0.025			<	<	<	<	<
Dibenzo(ah)anthracene	0.025			<	<	<	<	<
Benzo(ghi)perylene	0.025			<	<	<	<	<
SURROGATE RECOVERIES		%						
d10 Acenaphthene				-	70	100	80	70
d10 Anthracene				65	60	74	68	68
d12 Chysene				72	62	87	63	63
d12 Benzo(a)pyrene				81	64	63	67	71
2,4,6-Trichlorophenol	0.1	ug		<	<	<	<	<
2,4-Dimethylphenol	1.0			<	<	<	<	<
2,4-Dinitrophenol	1.0			<	4.2	<	<	<
2,4-Dichlorophenol	0.1			<	<	<0.17	<	<
4,6-Dinitro-o-cresol	0.2			<	<	<	<	<
2-Chlorophenol	0.1			<	<	<	<0.2	<
4-Chloro-3-methylphenol	0.1			<	<	<	<	<
2-Nitrophenol	0.1			<	<0.25	<0.21	<	<
4-Nitrophenol	0.5			<	<	<	<	<
Pentachlorophenol	0.2			<	<	<	<	<
Phenol	0.2			<	150	340	84	12
SURROGATE RECOVERIES		%						
d3-1,2-Dichlorophenol				63	122	93	84	79

Galson
Technical Services

SILICA GEL ANALYSIS REPORT

Project Name: TAC - Catalyst Hudson
Project No.: S9-072.CH

Sample ID	Lab ID	Sample Date	Tare (gm)	Final (gm)	Diff. (gm)	Blk-Correct. Diff. (gm)
Blank	1428	9/8/90	300.0	300.0	0.0	NA
Test #1 (HC)	1378	9/6/90	300.0	351.8	51.8	51.8
Test #2 (HC)	1376	9/6/90	300.0	334.5	34.5	34.5
Test #3 (HC)	1337	9/7/90	300.0	344.8	44.8	44.8
Test #1 (PAH)	1375	9/6/90	300.0	348.0	48.0	48.0
Test #2 (PAH)	1383	9/6/90	300.0	359.6	59.6	59.6
Test #3 (PAH)	1379	9/7/90	300.0	350.8	50.8	50.8
Test #4 (MM)	1367	9/7/90	300.0	339.2	39.2	39.2
Test #5 (MM)	1372	9/8/90	300.0	339.2	39.2	39.2
Test #6 (MM)	1377	9/8/90	300.0	327.9	27.9	27.9
Test #6 (Part) CP	1380	9/8/90	300.0	353.5	53.5	53.5

Note: MM-Multiple Metals Sampling Train
Part-Condensable Particulate Sampling Train

Method: CARB 4
Date : 9/20-21/1990
Analyst: K. Acquistapace
Reviewed: M. Ludwiczak

ATTACHMENT VII: Project Personnel

ATTACHMENT VII

PROJECT PERSONNEL

Catalyst Hudson, Inc.

Ed Deedon ..... Plant Manager

Timber Association of California

Chuck Sassenrath, PE ..... Consulting Engineer

Galson Technical Services, Inc.

David Galson, PE ..... Department Manager
Mark Ludwiczak ..... Project Manager
Dale Roberts ..... Environmental Engineer
Robert Ramer ..... Environmental Scientist
Richard Partlow ..... Environmental Scientist
David Stewart ..... Environmental Technician
Kyle Acquistapace ..... Laboratory Analyst
Ed Stuber ..... Laboratory Coordinator

Zenon Environmental, Inc.

John Coburn ..... President
Rod Thomson ..... Project Manager
Henri Huneault ..... Head, GC/MS Services

Air Toxics, Ltd

Linda Freeman ..... Laboratory Director