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ARB/ML-89-028

Evaluation Test on a Small Hospital
Refuse Incinerator Saint Bernardines
Hospital San Bernardino, California

July 1989

CALIFORNIA AIR RESOURCES BOARD
MONITORING AND LABORATORY DIVISION
1927 13TH STREET, SACRAMENTO, CA 95814

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TABLE III

Charging Log

date	time	charge		primary burner	comments
		amount	% redbag		
12/01/87	0940	40 lb's	100%	on for five minutes	
	1010	35 lb's	100%	off	
	1115	0 lb's		off	
	1145	30 lb's	20%	off	rake
	1220	30 lb's	25%	off	
	1317	35 lb's	0%	off	
	1342	35	5	off	
	1420	0		off	
	1445	35	0%	off	rake
	1515	0		off	
	1545	0		off	rake
	1615	0		off	rake
	1645	0		off	rake
	1715	0		off	rake

date	time	charge		primary burner	comments
		amount	% redbag		
12/02/87	0830	45 lb's	100%	on for 5 minutes	
	0900	35 lb's	100%	off	
	0930	25 lb's	50%	off	
	1003	0		off	
	1045	30	33%	off	rake
	1105	35	100%	off	
	1130	25	0%	off	
	1200	34	0%	off	
	1230	0		off	
	1255	40	100%	off	rake
	1333	0		off	
	1430	0		off	rake
	1500	34	0%	off	rake

date	time	charge		primary burner	comments
		amount	% redbag		
12/03/87	0700	40 lb's	100%	on for 10 minutes	
	0732	24 lb's	100	off	
	0755	30 lb's		off	
	0830	0 lb's		off	
	0900	lb's		off	rake
	0930	41 lb's	50	off	
	1000	24 lb's	50	off	
	1035	31 lb's	25	off	
	1100	28 lb's	0	off	
	1130	0 lb's		off	rake
	1200	0 lb's		off	rake

1245	0 lb's	off	rake
1330	45 lb's	off	
1400	0 lb's	off	rake
1431	0 lb's	off	rake

<u>date</u>	<u>time</u>	<u>charge</u>		<u>primary burner</u>	<u>comments</u>
		<u>amount</u>	<u>% redbag</u>		
12/04/87	0700	40 lb's	100%	on for 10 minutes	
	0735	31 lb's	100%	off	
	0800	32 lb's	100%	off	
	0830	0 lb's		off	rake
	0920	37 lb's	100%	off	
	1035	34 lb's	100%	off	
	1100	0 lb's		off	rake
	1130	40 lb's	100%	off	
	1200	25 lb's	0%	off	

Table VII

sampling trains raw data and calculated data

***** FIELD RAW DATA *****										***** CALCULATED RESULTS *****							
RUN NUMBER	DATE	SAMPLING		AVG. SQ. RT. TIME VOLUME MIN. CU. FT	PITOT	DELTA P IN. H ₂ O	ORIFICE IN. H ₂ O	AVERAGE STACK TEMP	VOL. OF H ₂ O	PRESS. BAR.	In Hg	SAMPLE VOLUME DSCF	PERCENT ISO- KINETIC %	MW GAS	X H ₂ O	AVERAGE STACK VELOCITY FT/SEC	STACK FLOW DSCFM
		MIN.	CU. FT														
DT-1S	12/01/87	240	143.9	0.128	1.31	1552	444*	28.94				139.19	103.15	12.6	28.17	14.09	331.2
DT-2S	12/01/87	240	135.9	0.128	1.31	1550	444*	28.94				131.46	97.996	13.3	28.10	14.10	329.3
DT-3S	12/03/87	320	211.7	0.1414	1.5	1714	592*	28.92				204.69	106.05	11.6	28.27	16.16	355.5
DT-4S	12/03/87	320	180.1	0.1323	1.2	1706	592*	28.92				181.84	101.69	12.9	28.14	15.13	329.1
BUG-1S	12/01/87	24	11.3	0.128	1.26	1600	44.4*	28.94				10.93	84.396	15.6	27.87	14.34	318.0
BUG-2S	12/01/87	24	13.43	0.122	1.17	1600	44.4*	28.92				12.96	102.94	13.4	28.09	13.62	309.5
BUG-3S	12/01/87	16	7.355	0.128	1.27	1600	20.6*	28.92				7.11	82.649	15.9	27.84	14.35	316.9
PT-1S	12/02/87	60	38.25	0.1346	1.36	1486	100.	28.94				37.00	101.72	11.8	28.25	14.55	357.1
PT-2S	12/02/87	60	37.6	0.1414	1.5	1656	109.	28.94				36.37	99.499	12.0	28.23	15.95	359.0
PT-3S	12/03/87	60	36.56	0.1323	1.31	1573	115.	28.94				35.36	102.21	12.9	28.14	14.65	339.7
HCL-1S	12/02/87	60	38.14	0.137	1.41	1710	111*	28.94				36.89	105.48	12.0	28.23	15.65	343.5
HCL-2S	12/02/87	60	37.3	0.1414	1.5	1652	111*	28.94				36.08	98.853	12.2	28.21	15.94	358.5
HCL-3S	12/03/87	60	40.9	0.1414	1.5	1632	111*	28.92				39.54	106.85	11.3	28.30	15.84	363.4
PS-1	12/01/87	5	3.31	0.1414	1.5	1465	9.3*	28.86				3.19	99.802	11.6	28.27	15.22	377.2
PS-2	12/01/87	5	3.33	0.1414	1.5	1500	9.3*	28.86				3.21	101.25	11.6	28.27	15.36	374.0
PS-3	12/01/87	5	3.36	0.1414	1.5	1425	9.3*	28.86				3.24	100.10	11.5	28.28	15.06	381.7
RT-1S	12/02/87	120	79.9	0.1414	1.5	1500	222*	28.94				77.29	103.32	11.5	28.28	15.65	367.3
RT-2S	12/02/87	120	72.3	0.137	1.4	1606	222*	28.94				69.94	99.988	12.6	28.17	15.58	343.5
RT-3S	12/04/87	120	80.5	0.1414	1.5	1643	222*	28.86				77.65	105.51	11.4	28.29	15.91	361.5
HG-1S	12/04/87	120	76.5	0.1414	1.5	1458	222*	28.86				73.79	96.250	12.0	28.23	15.20	376.6
HG-2S	12/04/87	120	81.1	0.1414	1.41	1621	222*	28.86				78.23	105.64	11.4	28.29	15.82	363.7
HG-3S	12/04/87	120	71.6	0.132	1.31	1643	222*	28.86				69.07	101.71	12.7	28.16	14.88	333.5

notes

stack area = 1.76 ft²

stack diameter = 18 inches

diff stack pressure = 0.02 inches of H₂OO₂ concentration = 8%CO₂ concentration = 7%

CO concentration = 6%

nozzle diameter = 0.75 inches

* estimated from moisture trains and method five runs

TABLE XV
DIOXINS AND FURANS MASS EMISSION RATES
(ng/sec)

RUN #	DT-1S	DT-2S	DT-3S	DT-4S
DIOXINS				
2,3,7,8-TCDD	< 0.003	< 0.024	< 0.004	0.004
Total TCDD	0.250	0.349	0.213	< 0.008
1,2,3,7,8-PeCDD	< 0.083 *	< 0.067	0.038	0.022
Total PeCDD	0.504	0.918	0.541	0.142
1,2,3,4,7,8-HxCDD	< 0.147	< 0.159	0.052	0.045
1,2,3,6,7,8-HxCDD	< 0.135	0.205	0.101	0.055
1,2,3,7,8,9-HxCDD	< 0.151	< 0.142	0.043	0.010
Total HxCDD	1.630	2.363	1.282	0.570
1,2,3,4,6,7,8-HpCDD	1.073	2.814	1.575	0.658
Total HpCDD	2.134	5.603	3.123	1.294
Total OCDD	1.991	8.241	6.200	2.190
Total PCDD	6.508	17.474	11.360	4.204 **
FURANS				
2,3,7,8-TCDF	0.063	0.058	0.038	0.023
Total TCDF	1.777	2.809	1.101	0.293
1,2,3,7,8-PeCDF	0.246	0.328	0.896	0.084
2,3,4,7,8-PeCDF	0.254	0.379	0.596	0.103
Total PeCDF	4.168	5.674	3.016	1.119
1,2,3,4,7,8-HxCDF	0.440	0.634	0.339	0.206
1,2,3,6,7,8-HxCDF	0.496	0.581	0.479	0.214
1,2,3,7,8,9-HxCDF	< 0.171 *	0.326	0.125	0.090
2,3,4,6,7,8-HxCDF	0.741	1.248	0.886	0.323
Total HxCDF	5.227	8.613	5.329	2.102
1,2,3,4,6,7,8-HpCDF	3.006	< 6.521	4.145	1.415
1,2,3,4,7,8,9-HpCDF	0.667	1.866	1.097	0.299
Total HpCDF	5.647	13.351	7.002	2.682
Total OCDF	3.236	11.978	7.789	1.813
Total PCDF	20.055	42.425	24.238	8.009

NOTES

- < - indicates below minimum detection limit (MDL)
- * - Maximum possible emission rate
- ** - Total includes MDLs for homologues below the detection limit

TABLE XXV
CONCENTRATIONS AND MASS EMISSION RATES OF HYDROGEN CHLORIDE

RUN NUMBER	IMPINGER CATCH mg	**** RESULTS ****		lbs/hr	mg/sec
		gr/DSCF	PPMV		
HC1-1S	1111	4.65E-01	714	1.37	0.31
HC1-2S	1173	4.91E-01	770	1.51	0.331
HC1-3S	1165	4.88E-01	699	1.52	0.306

PARTICULATE AND TRACE METAL MASS EMISSIONS

POLLUTANT	***** PT-15 *****		***** *****		***** PT-25 *****		***** *****		***** PT-35 *****		***** *****		**	BLANK
	MASS CATCH	EMISSIONS gr/decf	MASS lbs/hr	CATCH	EMISSIONS gr/decf	MASS lbs/hr	CATCH	EMISSIONS gr/decf	MASS lbs/hr	CATCH	EMISSIONS gr/decf	MASS lbs/hr		
PARTICULATE	90.4 ug	3.8E-02	1.2E-01	82.2 mg	3.5E-02	1.1E-01	101.8 mg	4.4E-02	1.3E-01	0 mg				
ARSENIC	0.7 ug	2.91E-07	8.9E-07	0.0 ug	3.4E-07	1.0E-06	0.5 ug	2.2E-07	6.3E-07	<0.01 ug				
CADMIUM	17.3 ug	7.20E-06	2.2E-05	18.1 ug	7.7E-06	2.4E-05	22.4 ug	9.8E-06	2.8E-05	< 1.3 ug				
CHROME	< 5 ug	<2.00E-06	<0.4E-06	< 5 ug	<2.1E-06	<0.5E-06	< 22.4 ug	<9.8E-06	<2.8E-05	< 5 ug				
IRON	45.9 ug	1.91E-05	5.0E-05	41 ug	1.7E-05	5.3E-05	50.1 ug	2.2E-05	6.4E-05	52.6 ug				
MAGANESE	2.0 ug	1.21E-06	3.7E-06	< 2.5 ug	<1.1E-06	<3.3E-06	2.9 ug	1.3E-06	3.7E-06	< 2.5 ug				
NICKLE	< 7.5 ug	<3.12E-06	<0.0E-06	< 7.5 ug	<3.2E-06	<0.0E-06	< 7.5 ug	<3.3E-06	<0.5E-06	< 7.5 ug				
LEAD	203.9 ug	8.49E-05	2.6E-04	198.9 ug	8.4E-05	2.6E-04	314.4 ug	1.4E-04	4.9E-04	< 25 ug				

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LB/HR=|MASS LOADING (GR/DSCF)|*|STACK FLOWRATE(DSCFM)|*0.70606  
MASS LOADING (GR/DSCF)=0.01945*|MASS(MG)|/|SAMPLE VOL (DSCF)|
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TABLE XXIX

Particle Size Distribution

estimated aerodynamic diameter microns	<u>sample number</u>		
	PS-1	PS-2	PS-3
0.01	1	1	1
0.0121	0	0	0
0.0146	0	0	0
0.0176	0	0	0
0.0212	0	0	0
0.0256	0	0	0
0.0309	0	0	0
0.0373	0	0	0
0.045	0	0	0
0.0543	0	0	0
0.0655	0	0	0
0.0791	0	0	0
0.0954	0	0	0
0.1151	0	0	0
0.1389	0	0	0
0.1677	0	0	0
0.2024	0	0	0
0.2442	0	0	0
0.2947	0	0	0
0.3556	0	0	0
0.4292	2	2	2
0.5179	1	10	2
0.6251	16	61	14
0.7543	19	55	30
0.9103	15	78	33
1.098	27	83	39
1.325	38	119	26
1.599	44	150	23
1.930	49	179	19
2.33	57	111	16
2.811	48	88	18
3.393	70	83	24
4.094	39	62	15
4.941	48	32	17
5.963	30	31	10
7.196	22	24	4
8.685	18	35	6
10.48	16	26	4
12.64	9	19	3
15.26	4	11	2
18.42	7	5	2
22.23	1	6	1
26.82	7	0	0
32.37	1	0	0
39.06	2	0	0
47.14	0	0	0
56.89	1	0	0
68.66	2	0	0
82.86	1	1	0
100.	1	0	0

TABLE XXX
CONCENTRATIONS AND MASS EMISSION RATES OF MERCURY

RUN NUMBER	***	CATCH	****	***** RESULTS *****			
	FILTER ug	IMPINGER ug	TOTAL ug	gr/dscf	PPMV	lbs/hr	ug/sec
HG-1S	< 1	496	496	0.00010	0.0285	0.000335	42.2
HG-2S	< 1	544	544	0.00011	0.0295	0.000334	42.2
HG-3S	< 1	762	762	0.00017	0.0468	0.000487	61.4
BLANK	< 1	< 5	< 6	< 0.00000	<0.00035	<0.000001	<0.24

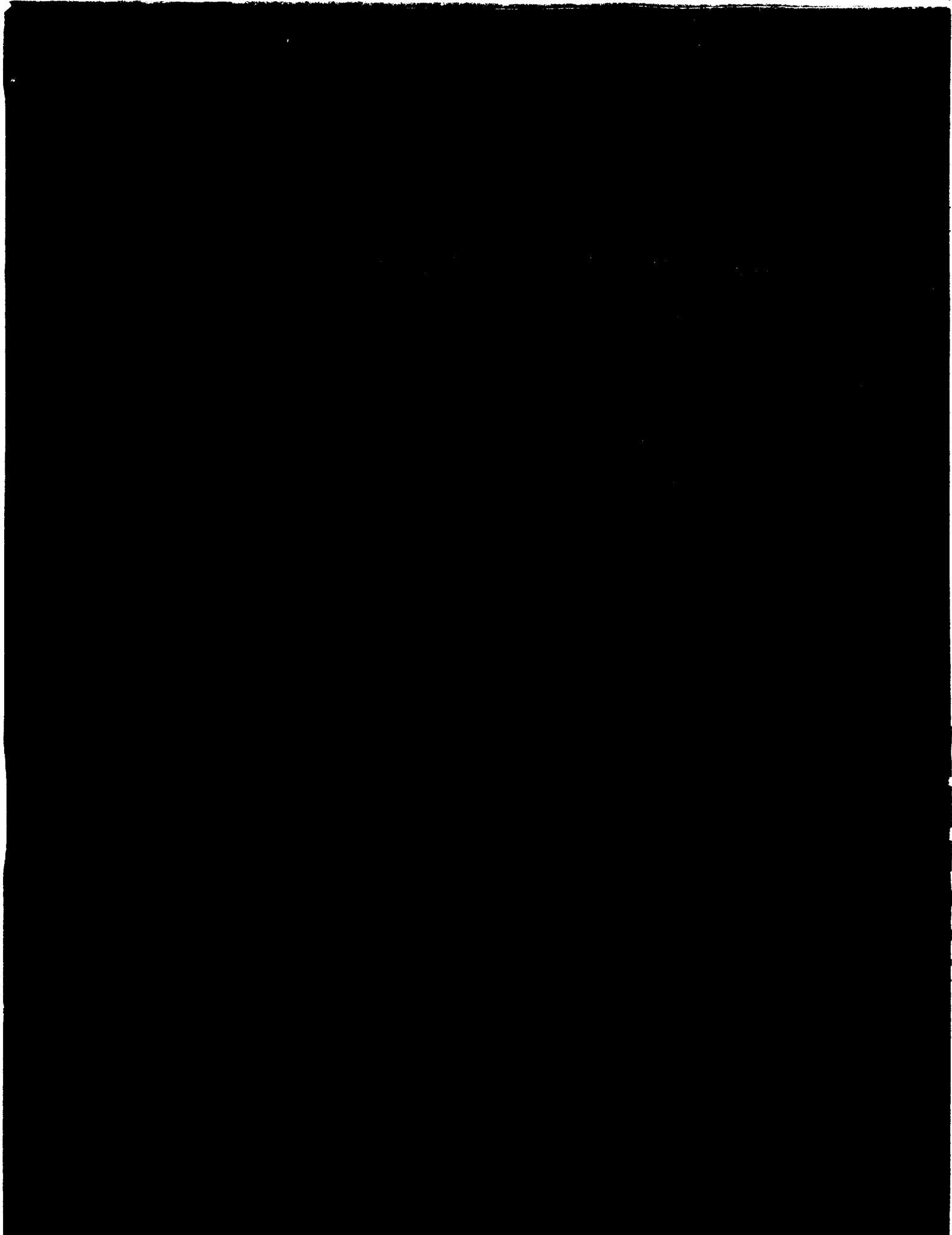


TABLE 2-6. CDD/CDF STACK GAS CONCENTRATIONS AND EMISSIONS RATES AT CONDITION 1;
CENTRAL CAROLINA HOSPITAL (1990)

CONGENER	CONCENTRATION ^a (ng/dscm, as measured)				EMISSIONS (ng/hr)			
	RUN 1	RUN 3	RUN 10	AVERAGE	RUN 1	RUN 3	RUN 10	AVERAGE
DIOXINS								
2378 TCDD	0.22	(0.419)	(0.130)	0.26	0.34	(0.688)	(0.208)	0.41
Other TCDD	6.17	54.5	6.77	22.5	9.73	89.5	10.8	36.7
12378 PCDD	0.52	1.61	0.42	0.85	0.82	2.64	0.68	1.38
Other PCDD	5.45	44.9	6.84	19.1	8.61	73.7	11.0	31.1
123478 HxCDD	0.34	1.57	0.49	0.80	0.53	2.58	0.79	1.30
123678 HxCDD	0.52	2.55	0.99	1.35	0.82	4.19	1.58	2.20
123789 HxCDD	1.10	4.89	1.48	2.49	1.74	8.03	2.37	4.05
Other HxCDD	5.12	35.4	9.45	16.6	8.07	58.1	15.1	27.1
1234678-HpCDD	2.93	14.6	7.30	8.27	4.63	23.9	11.7	13.4
Other HpCDD	3.52	17.9	8.21	9.89	5.56	29.4	13.2	16.1
Octa-CDD	3.45	18.7	9.13	10.4	5.45	30.6	14.6	16.9
Total CDD	29.3	197	51.2	92.5	46.3	323	82.1	151
FURANS								
2378 TCDF	0.72	2.73	0.85	1.43	1.14	4.47	1.36	2.32
Other TCDF	24.7	165	30.9	73.6	38.9	271	49.5	120
12378 PCDF	1.10	3.95	1.37	2.14	1.74	6.48	2.20	3.48
23478 PCDF	2.11	10.4	3.31	5.27	3.32	17.0	5.31	8.56
Other PCDF	23.5	125	27.4	58.7	37.1	205	44.0	95.5
123478 HxCDF	2.59	18.2	4.55	8.44	4.08	29.8	7.29	13.7
123678 HxCDF	1.35	7.55	2.33	3.74	2.12	12.39	3.73	6.08
234678 HxCDF	1.66	15.65	4.69	7.33	2.61	25.7	7.51	11.9
123789 HxCDF	0.06	0.45	0.20	0.24	0.10	0.75	0.32	0.39
Other HxCDF	7.98	51.5	15.4	25.0	12.6	84.5	24.7	40.6
1234678-HpCDF	3.31	28.4	8.49	13.4	5.23	46.6	13.6	21.8
1234789-HpCDF	0.41	4.40	1.87	2.23	0.65	7.23	2.99	3.63
Other HpCDF	2.38	24.8	8.81	12.0	3.76	40.8	14.1	19.6
Octa-CDF	2.00	29.0	12.9	14.6	3.16	47.6	20.6	23.8
TOTAL CDF	73.9	467	125	228	117	800	197	371
TOTAL CDD+CDF	103	664	174	321	163	1,120	279	522

^a ng/dscm = nanogram per dry standard cubic meter. Standard conditions are defined as 1 atm and 68° F.

() = estimated maximum possible concentration. [] = minimum detection limit

TABLE 2-7. CDD/CDF STACK GAS CONCENTRATIONS AND EMISSIONS RATES AT CONDITION 2;
CENTRAL CAROLINA HOSPITAL (1990)

CONGENER	CONCENTRATION ^a (ng/dscm, as measured)				EMISSIONS (ug/hr)			
	RUN 2	RUN 4	RUN 8	AVERAGE	RUN 2	RUN 4	RUN 8	AVERAGE
DIOXINS								
2378 TCDD	7.27	19.2	8.54	11.7	10.8	30.9	14.2	18.6
Other TCDD	171	341	215	242	254	549	357	387
12378 PCDD	22.6	75.1	43.4	47.0	33.6	121	72.0	75.6
Other PCDD	150	503	280	311	223	810	465	499
123478 HxCDD	21.5	64.6	50.5	45.5	32.0	104	83.8	73.3
123678 HxCDD	25.4	82.3	52.5	53.4	37.8	133	87.2	85.9
123789 HxCDD	45.1	156.4	94.2	98.6	67.3	252	156	159
Other HxCDD	209	614	406	410	312	990	674	658
1234678-HpCDD	120	335	292	249	180	540	485	402
Other HpCDD	126	365	318	270	188	589	528	435
Octa-CDD	156	254	366	259	233	409	608	416
Total CDD	1,030	2,810	2,130	2,000	1,570	4,530	3,530	3,210
FURANS								
2378 TCDF	22.1	70.8	3.86	32.2	32.9	114	6.41	51.2
Other TCDF	659	1991	151	934	982	3210	250	1481
12378 PCDF	63.5	288	96.5	149	94.6	465	160	240
23478 PCDF	88.3	341	123	184	132	550	205	296
Other PCDF	1015	4596	1491	2367	1512	7409	2476	3799
123478 HxCDF	189	831	403	474	282	1339	670	764
123678 HxCDF	114	524	244	294	169	844	406	473
234678 HxCDF	111	372	214	233	166	600	356	374
123789 HxCDF	7.88	32.5	14.8	18.4	11.7	52.5	24.6	29.6
Other HxCDF	649	2809.6	1382.9	1613.8	967	4529	2297	2598
1234678-HpCDF	301	1058	684	681	449	1706	1137	1097
1234789-HpCDF	45.5	128	87.4	86.9	67.8	206	145	140
Other HpCDF	242	743	516	500	361	1197	856	805
Octa-CDF	210	324	322	285	313	523	535	457
TOTAL CDF	3,720	14,100	5,730	7,830	5,540	22,700	9,920	12,600
TOTAL CDD+CDF	4,770	16,900	7,860	9,830	7,110	27,300	13,100	15,800

^a ng/dscm = nanogram per dry standard cubic meter. Standard conditions are defined as 1 atm and 68° F.

() = estimated maximum possible concentration

TABLE 2-8. CDD/CDF STACK GAS CONCENTRATIONS AND EMISSIONS RATES AT CONDITION 3;
CENTRAL CAROLINA HOSPITAL (1990)

CONGENER	CONCENTRATION ^a (ng/dscm, as measured)				EMISSIONS (ug/hr)			
	RUN 5	RUN 6	RUN 9	AVERAGE	RUN 5	RUN 6	RUN 9	AVERAGE
DIOXINS								
2378 TCDD	0.25	(0.074)	0.83	0.38	0.41	(0.125)	1.37	0.64
Other TCDD	19.7	3.77	48.1	23.9	32.6	6.38	80.0	39.7
12378 PCDD	0.66	0.23	1.92	0.94	1.09	0.39	3.19	1.56
Other PCDD	12.4	3.87	38.4	18.2	20.5	6.56	63.9	30.3
123478 HxCDD	0.42	0.19	1.12	0.58	0.69	0.32	1.87	0.96
123678 HxCDD	0.63	0.32	1.72	0.89	1.04	0.55	2.86	1.48
123789 HxCDD	1.29	0.61	2.84	1.58	2.13	1.03	4.73	2.63
Other HxCDD	8.25	3.93	20.3	10.8	13.6	6.65	33.8	18.0
1234678-HpCDD	4.31	2.12	7.80	4.75	7.14	3.59	13.0	7.90
Other HpCDD	4.66	2.49	9.39	5.51	7.71	4.22	15.6	9.18
Octa-CDD	5.98	2.56	10.1	6.21	9.90	4.33	16.8	10.3
Total CDD	58.6	20.2	143	73.8	96.9	34.1	237	123
FURANS								
2378 TCDF	1.18	0.29	3.77	1.75	1.96	0.49	6.27	2.91
Other TCDF	44.7	9.77	147	67.2	74.0	16.6	245	112
12378 PCDF	1.43	0.54	4.13	2.03	2.36	0.91	6.87	3.38
23478 PCDF	2.44	0.94	6.45	3.28	4.03	1.60	10.72	5.45
Other PCDF	22.1	8.31	84.0	38.1	36.6	14.1	140	63.4
123478 HxCDF	3.17	1.62	8.00	4.26	5.24	2.74	13.3	7.09
123678 HxCDF	1.64	0.81	4.20	2.21	2.71	1.37	6.98	3.69
234678 HxCDF	2.26	1.28	5.56	3.03	3.74	2.17	9.24	5.05
123789 HxCDF	0.11	0.06	0.27	0.15	0.19	0.10	0.45	0.25
Other HxCDF	9.28	4.62	26.6	13.5	15.4	7.82	44.3	22.5
1234678-HpCDF	6.19	2.86	11.08	6.71	10.2	4.84	18.4	11.2
1234789-HpCDF	0.80	0.57	1.46	0.94	1.32	0.97	2.42	1.57
Other HpCDF	4.63	2.32	8.50	5.15	7.66	3.93	14.1	8.57
Octa-CDF	4.18	4.51	8.76	5.82	6.91	7.64	14.6	9.71
TOTAL CDF	104	38.5	320	154	172	65.2	592	256
TOTAL CDD+CDF	163	58.7	462	228	269	99.3	789	379

^a ng/dscm = nanogram per dry standard cubic meter. Standard conditions are defined as 1 atm and 68° F.

() = estimated maximum possible concentration

**TABLE 2-15. METALS STACK GAS CONCENTRATIONS AND EMISSION RATES FOR
CONDITION 1;
CENTRAL CAROLINA HOSPITAL (1990)**

DATE TIME RUN NUMBER	08/20/90 14:00-18:18 RUN 1	08/22/90 09:47-14:00 RUN 3	10/02/90 10:15-14:21 RUN 10	
O ₂ CONCENTRATION (%V)	15.8	16.1	15.7	
FLOW RATE (dscmm)	27.1	24.1	25.0	AVERAGE
Antimony (ug/dscm)	20.8	32.3	103	51.9
(ug/dscm @7% O ₂)	56.3	94.1	275	142
(g/hr)	0.034	0.047	0.154	0.078
Arsenic (ug/dscm)	43.7	4.20	0.48	16.1
(ug/dscm @7% O ₂)	118	12.2	1.30	43.9
(g/hr)	0.071	0.006	0.001	0.026
Barium (ug/dscm)	8.82	16.2	0.275	8.43
(ug/dscm @7% O ₂)	23.9	47.2	0.737	23.9
(g/hr)	0.014	0.023	0.000	0.013
Beryllium (ug/dscm)	[0.076]	[0.084]	[0.080]	[0.080]
(ug/dscm @7% O ₂)	[0.206]	[0.245]	[0.215]	[0.222]
(g/hr)	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Cadmium (ug/dscm)	5.94	173	[0.197]	89.5
(ug/dscm @7% O ₂)	16.1	504	[0.529]	260
(g/hr)	0.010	0.250	[0.000]	0.130
Chromium (ug/dscm)	5.87	19.84	0.509	8.74
(ug/dscm @7% O ₂)	15.9	57.8	1.37	25.0
(g/hr)	0.010	0.029	0.001	0.013
Lead (ug/dscm)	189	279	[0.116]	234
(ug/dscm @7% O ₂)	512	814	[0.311]	663
(g/hr)	0.308	0.404	[0.000]	0.356
Mercury (ug/dscm)	1.60	[0.316]	43.3	22.5
(ug/dscm @7% O ₂)	4.32	[0.921]	116	60.3
(g/hr)	0.003	[0.000]	0.065	0.034
Nickel (ug/dscm)	[0.763]	10.0	[0.801]	10.0
(ug/dscm @7% O ₂)	[2.063]	29.2	[2.149]	29.2
(g/hr)	[0.001]	0.014	[0.001]	0.014
Silver (ug/dscm)	[1.249]	[1.376]	[1.310]	[1.312]
(ug/dscm @7% O ₂)	[3.378]	[4.010]	[3.515]	[3.634]
(g/hr)	[0.002]	[0.002]	[0.002]	[0.002]
Thallium (ug/dscm)	2.34	[2.254]	[2.111]	2.34
(ug/dscm @7% O ₂)	6.34	[6.568]	[5.665]	6.34
(g/hr)	0.004	[0.003]	[0.003]	0.004

Note: Run 10 Values do not include the front half catch and therefore are biased low

Values enclosed in brackets represent the minimum detection limits for compounds not detected in the samples. Detection limits are included in the averages unless otherwise indicated.

**TABLE 2-16. METALS STACK GAS CONCENTRATIONS AND EMISSION RATES FOR
CONDITION 2;
CENTRAL CAROLINA HOSPITAL (1990)**

DATE TIME	09/21/90 09:46-13:57	09/23/90 11:40-15:47	09/27/90 13:45-17:50	
RUN NUMBER	2	4	8	
O2 CONCENTRATION (%V)	15.69	15.16	15.56	
FLOW RATE (dscmm)	24.45	26.26	27.04	AVERAGE
Antimony (ug/dscm)	265	164	282	237
(ug/dscm @7% O2)	706	398	733	612
(g/hr)	0.388	0.259	0.457	0.368
Arsenic (ug/dscm)	6.40	3.81	2.65	4.29
(ug/dscm @7% O2)	17.1	9.23	6.90	11.1
(g/hr)	0.009	0.006	0.004	0.007
Barium (ug/dscm)	40.3	31.4	28.9	33.5
(ug/dscm @7% O2)	108	76.1	75.1	86.2
(g/hr)	0.059	0.049	0.047	0.052
Beryllium (ug/dscm)	[0.083]	0.446	0.437	0.442
(ug/dscm @7% O2)	[0.221]	1.08	1.14	1.11
(g/hr)	[0.0001]	0.001	0.001	0.001
Cadmium (ug/dscm)	20.8	17.5	25.8	21.3
(ug/dscm @7% O2)	55.4	42.4	67.1	55.0
(g/hr)	0.030	0.028	0.042	0.033
Chromium (ug/dscm)	16.3	12.9	13.1	14.1
(ug/dscm @7% O2)	43.6	31.2	34.1	36.3
(g/hr)	0.024	0.020	0.021	0.022
Lead (ug/dscm)	891	500	786	726
(ug/dscm @7% O2)	2380	1210	2050	1880
(g/hr)	1.31	0.787	1.28	1.12
Mercury (ug/dscm)	4.02	2.14	[0.266]	3.08
(ug/dscm @7% O2)	10.7	5.19	[0.692]	7.96
(g/hr)	0.006	0.003	[0.0004]	0.005
Nickel (ug/dscm)	5.34	5.28	19.4	10.0
(ug/dscm @7% O2)	14.2	12.8	50.5	25.8
(g/hr)	0.008	0.008	0.031	0.016
Silver (ug/dscm)	7.11	3.93	[1.258]	5.52
(ug/dscm @7% O2)	19.0	9.51	[3.275]	14.2
(g/hr)	0.010	0.006	[0.002]	0.008
Thallium (ug/dscm)	[2.180]	[2.106]	[2.062]	[2.116]
(ug/dscm @7% O2)	[5.816]	[5.100]	[5.367]	[5.428]
(g/hr)	[0.003]	[0.003]	[0.003]	[0.003]

Note:

Values enclosed in brackets represent the minimum detection limits for compounds not detected in the samples. Detection limits are not included in the averages unless otherwise indicated.

**TABLE 2-17. METALS STACK GAS CONCENTRATIONS AND EMISSION RATES FOR
CONDITION 3;
CENTRAL CAROLINA HOSPITAL (1990)**

DATE TIME RUN NUMBER O2 CONCENTRATION (%V) FLOW RATE (dscmm)	09/24/90 11:45-15:52 5 15.60 27.49	09/25/90 10:10-14:15 6 15.70 25.90	09/28/90 11:00-15:05 9 15.28 28.21	AVERAGE
Antimony (ug/dscm)	22.0	21.0	25.6	22.8
(ug/dscm @7% O2)	57.6	56.1	63.3	59.0
(g/hr)	0.036	0.033	0.043	0.037
Arsenic (ug/dscm)	3.78	4.90	91.7	33.5
(ug/dscm @7% O2)	9.92	13.1	227	83.3
(g/hr)	0.006	0.008	0.155	0.056
Barium (ug/dscm)	9.00	13.5	11.9	11.5
(ug/dscm @7% O2)	23.6	36.0	29.4	29.7
(g/hr)	0.015	0.021	0.020	0.019
Beryllium (ug/dscm)	[0.075]	[0.078]	[0.073]	[0.075]
(ug/dscm @7% O2)	[0.197]	[0.209]	[0.181]	[0.196]
(g/hr)	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Cadmium (ug/dscm)	5.11	9.72	8.91	7.91
(ug/dscm @7% O2)	13.4	26.0	22.0	20.5
(g/hr)	0.008	0.015	0.015	0.013
Chromium (ug/dscm)	14.1	189	11.5	71.6
(ug/dscm @7% O2)	37.1	506	28.4	190
(g/hr)	0.023	0.294	0.019	0.112
Lead (ug/dscm)	125	75.6	157	119
(ug/dscm @7% O2)	329	202	389	307
(g/hr)	0.207	0.117	0.266	0.197
Mercury (ug/dscm)	69.6	[0.273]	[0.215]	69.6
(ug/dscm @7% O2)	182	[0.730]	[0.532]	182
(g/hr)	0.115	[0.0004]	[0.0004]	0.115
Nickel (ug/dscm)	12.2	292	33.3	112
(ug/dscm @7% O2)	32.0	780	82.4	298
(g/hr)	0.020	0.454	0.056	0.177
Silver (ug/dscm)	[1.226]	[1.277]	[1.188]	[1.230]
(ug/dscm @7% O2)	[3.215]	[3.414]	[2.938]	[3.189]
(g/hr)	[0.002]	[0.002]	[0.002]	[0.002]
Thallium (ug/dscm)	[2.010]	[2.057]	[1.947]	[2.005]
(ug/dscm @7% O2)	[5.272]	[5.499]	[4.816]	[5.196]
(g/hr)	[0.003]	[0.003]	[0.003]	[0.003]

Note:

Values enclosed in brackets represent the minimum detection limits for compounds not detected in the samples. Detection limits are not included in the averages unless otherwise indicated.

TABLE 2-20. METALS AND PM EMISSIONS SAMPLING AND FLUE GAS PARAMETERS
CENTRAL CAROLINA HOSPITAL (1990)

RUN NUMBER DATE	TEST CONDITION 1			
	1 09/20/90	3 09/22/90	10 10/02/90	AVERAGE
Total Sampling Time (min.)	240	240	240	NA
Average Sampling Rate (dscfm)	0.42	0.39	0.40	0.40
Metered Volume (dscf)	101.81	92.41	97.02	97.08
Metered Volume (dscm)	2.883	2.617	2.748	2.749
Average Stack Temperature (°F)	751.5	759.0	749.4	753.3
O2 Concentration (%V)	15.8	16.1	15.7	15.9
CO2 Concentration (%V)	3.1	3.1	3.4	3.2
Stack Gas Moisture (%V)	9.4	9.9	8.1	9.1
Volumetric Flow Rate (dscfm)	956.00	850.54	882.08	896.21
Volumetric Flow Rate (dscmm)	27.07	24.09	24.98	25.38
Percent Isokinetic	97.0	98.9	100	NA
RUN NUMBER DATE	TEST CONDITION 2			
	2 09/21/90	4 09/23/90	8 09/27/90	AVERAGE
Total Sampling Time (min.)	240	240	240	NA
Average Sampling Rate (dscfm)	0.39	0.41	0.42	0.41
Metered Volume (dscf)	93.92	98.89	101.01	97.94
Metered Volume (dscm)	2.660	2.801	2.861	2.774
Average Stack Temperature (°F)	809.4	778.9	766.3	784.9
O2 Concentration (%V)	15.7	15.2	15.6	15.5
CO2 Concentration (%V)	3.76	4.0	3.9	3.9
Stack Gas Moisture (%V)	8.4	7.8	6.8	7.7
Volumetric Flow Rate (dscfm)	863.34	927.14	954.69	915.05
Volumetric Flow Rate (dscmm)	24.45	26.26	27.04	25.91
Percent Isokinetic	99.1	97.1	96.3	NA
RUN NUMBER DATE	TEST CONDITION 3			
	5 09/24/90	6 09/25/90	9 09/28/90	AVERAGE
Total Sampling Time (min.)	240	240	240	NA
Average Sampling Rate (dscfm)	0.43	0.42	0.45	0.43
Metered Volume (dscf)	103.67	99.55	106.98	103.40
Metered Volume (dscm)	2.936	2.819	3.030	2.928
Average Stack Temperature (°F)	746.4	724.6	770.9	747.3
O2 Concentration (%V)	15.6	15.7	15.3	15.5
CO2 Concentration (%V)	3.5	3.4	3.7	3.5
Stack Gas Moisture (%V)	8.3	8.6	9.0	8.6
Volumetric Flow Rate (dscfm)	970.52	914.65	996.12	960.43
Volumetric Flow Rate (dscmm)	27.49	25.90	28.21	27.20
Percent Isokinetic	97.3	99.1	97.8	NA

NA = Not Applicable

TABLE 2-22. PARTICULATE MATTER CONCENTRATIONS AND EMISSIONS RESULTS;
CENTRAL CAROLINA HOSPITAL (1990)

DATE	SAMPLING CONCENTRATION	TIME INTERVAL	TIME	FLUE GAS CONCENTRATION			FLUE GAS EMISSION RATE	
				(ppm/ft ³)	(ppm/ft ³) (7% O ₂)	(ppm/ft ³) (7% O ₂)	(lb/hr)	(lb/hr)
09/20/90	1	1	14:00-18:18	0.015	0.042	0.035	0.095	0.126
09/22/90	1	3	09:47-14:00	0.015	0.044	0.035	0.101	0.110
10/02/90	1	10	10:15-14:21	0.015	0.042	0.035	0.095	0.117
			AVERAGES:	0.015	0.043	0.035	0.097	0.118
09/21/90	2	2	09:46-13:57	0.068	0.181	0.155	0.413	0.501
09/23/90	2	4	11:40-15:47	0.384	0.931	0.879	2.129	3.054
09/27/90	2	8	13:45-17:50	0.093	0.243	0.213	0.555	0.763
			AVERAGES:	0.182	0.451	0.416	1.033	1.439
09/24/90	3	5	11:45-15:52	0.015	0.038	0.033	0.088	0.122
09/25/90	3	6	10:10-14:15	0.023	0.061	0.052	0.140	0.179
09/28/90	3	9	11:00-15:05	0.019	0.048	0.044	0.109	0.165
			AVERAGES:	0.019	0.049	0.043	0.112	0.155
								0.070

**TABLE 2-25. SUMMARY OF HCl RESULTS FOR EACH CONDITION;
CENTRAL CAROLINA HOSPITAL (1990)**

TEST RUN NUMBER	MEASURED CONCENTRATIONS				EMISSION RATE (g/hr)
	(mg/dscm)	(mg/dscm @7% O ₂)	(ppmv)	(ppmv @7% O ₂)	
RUN 1A	29.4	79.3	19.4	52.3	47.1
RUN 1B	54.1	135	35.7	88.9	86.6
RUN 1C	62.3	169	41.1	111	99.8
AVERAGE	48.6	128	32.1	84.1	77.8
RUN 2A	802	1,764	529	1,164	1,186
RUN 2B	674	2,109	444	1,391	996
RUN 2C	NA	NA	NA	NA	NA
AVERAGE	738	1,936	487	1,277	1,091
RUN 3A	101	278	66.8	184	156
RUN 3B	96.7	285	63.8	188	149
RUN 3C	NA	NA	NA	NA	NA
AVERAGE	99.0	282	65.3	186	153
RUN 4A	327	715	216	471	521
RUN 4B	1,276	3,068	841	2,024	2,033
RUN 4C	1,342	3,415	885	2,253	2,138
AVERAGE	981	2,399	647	1,583	1,564
RUN 5A	49.7	131	32.8	86.4	82.0
RUN 5B	48.1	117	31.7	77.1	79.4
RUN 5C	73.1	206	48.2	136	121
AVERAGE	57.0	151	37.6	100	94.1
RUN 6A	47.8	125	31.5	82.2	77.6
RUN 6B	43.3	111	28.6	73.1	70.3
RUN 6C	50.5	134	33.3	88.2	82.0
AVERAGE	47.2	123	31.1	81.2	76.6
RUN 8A	630	1,334	416	880	1,035
RUN 8B	868	2,436	572	1,607	1,424
RUN 8C	1,430	4,201	943	2,771	2,347
AVERAGE	976	2,657	644	1,733	1,602
RUN 9A	120	283	79.1	187	201
RUN 9B	60.0	141	39.6	93.0	101
RUN 9C	104	271	68.4	179	174
AVERAGE	94.5	232	62.3	153	159
RUN 10A	97.0	252	64.0	166	150
RUN 10B	40.0	97.9	26.4	64.6	62.0
RUN 10C	36.1	100.5	23.8	66.3	56.0
AVERAGE	57.7	150.1	38.1	99.8	89.5

NA = Not Applicable (Runs not completed)

**TABLE 2-26. SUMMARY OF HF RESULTS FOR EACH CONDITION;
CENTRAL CAROLINA HOSPITAL (1990)**

TEST RUN NUMBER	MEASURED CONCENTRATIONS				EMISSION RATE (g/hr)
	(mg/dccm)	(mg/dccm @7% O2)	(ppmv)	(ppmv @7% O2)	
RUN 1A	(0.628)	(1.695)	(0.755)	(2.038)	(1.006)
RUN 1B	(1.075)	(2.678)	(1.292)	(3.218)	(1.721)
RUN 1C	(1.216)	(3.288)	(1.462)	(3.954)	(1.947)
AVERAGE	0.97	2.53	1.17	3.07	1.56
RUN 2A	7.23	15.9	8.69	19.1	10.7
RUN 2B	19.7	61.7	23.7	74.2	29.1
RUN 2C	NA	NA	NA	NA	NA
AVERAGE	13.5	38.8	16.2	46.6	19.9
RUN 3A	(1.825)	(5.013)	(2.194)	(6.027)	(2.817)
RUN 3B	3.35	9.90	4.03	11.9	5.18
RUN 3C	NA	NA	NA	NA	NA
AVERAGE	2.59	7.45	3.11	8.96	4.00
RUN 4A	7.17	15.7	8.61	18.8	11.4
RUN 4B	2.98	7.17	3.58	8.62	4.75
RUN 4C	4.21	10.7	5.06	12.9	6.71
AVERAGE	4.79	11.2	5.75	13.4	7.63
RUN 5A	(0.835)	(2.202)	(1.004)	(2.648)	(1.379)
RUN 5B	(1.296)	(3.149)	(1.558)	(3.786)	(2.141)
RUN 5C	(1.439)	(4.057)	(1.730)	(4.878)	(2.377)
AVERAGE	1.19	3.14	1.43	3.77	1.97
RUN 6A	(0.734)	(1.914)	(0.882)	(2.300)	(1.192)
RUN 6B	(0.670)	(1.715)	(0.805)	(2.061)	(1.088)
RUN 6C	(0.948)	(2.510)	(1.140)	(3.018)	(1.539)
AVERAGE	0.78	2.05	0.94	2.46	1.27
RUN 8A	8.89	18.8	10.7	22.6	14.6
RUN 8B	6.96	19.5	8.37	23.5	11.4
RUN 8C	3.99	11.7	4.79	14.1	6.54
AVERAGE	6.61	16.7	7.95	20.1	10.9
RUN 9A	(0.939)	(2.220)	(1.129)	(2.669)	(1.576)
RUN 9B	(1.279)	(3.008)	(1.538)	(3.617)	(2.146)
RUN 9C	(1.416)	(3.707)	(1.702)	(4.455)	(2.376)
AVERAGE	1.21	2.98	1.46	3.58	2.03
RUN 10A	3.32	8.63	3.99	10.4	5.15
RUN 10B	(0.955)	(2.337)	(1.148)	(2.809)	(1.481)
RUN 10C	(1.117)	(3.111)	(1.343)	(3.741)	(1.732)
AVERAGE	1.80	4.69	2.16	5.64	2.79

NA = Not Applicable (runs not completed)

() = Maximum estimated concentration

TABLE 2-27. SUMMARY OF HBr RESULTS AT EACH CONDITION;
CENTRAL CAROLINA HOSPITAL (1990)

TEST RUN NUMBER	MEASURED CONCENTRATIONS				EMISSION RATE (g/hr)
	(mg/dscm)	(mg/dscm @7% O ₂)	(ppmv)	(ppmv @7% O ₂)	
RUN 1A	0.69	1.85	0.20	0.55	1.10
RUN 1B	0.73	1.82	0.22	0.54	1.17
RUN 1C	0.66	1.78	0.20	0.53	1.05
AVERAGE	0.69	1.82	0.21	0.54	1.11
RUN 2A	2.32	5.11	0.69	1.52	3.43
RUN 2B	0.85	2.65	0.25	0.79	1.25
RUN 2C	NA	NA	NA	NA	NA
AVERAGE	1.58	3.88	0.47	1.15	2.34
RUN 3A	0.66	1.82	0.20	0.54	1.02
RUN 3B	0.74	2.20	0.22	0.65	1.15
RUN 3C	NA	NA	NA	NA	NA
AVERAGE	0.70	2.01	0.21	0.60	1.09
RUN 4A	1.80	3.93	0.53	1.17	2.86
RUN 4B	2.02	4.85	0.60	1.44	3.22
RUN 4C	0.89	2.26	0.26	0.67	1.41
AVERAGE	1.57	3.68	0.47	1.09	2.50
RUN 5A	[0.108]	[0.285]	[0.032]	[0.084]	[0.178]
RUN 5B	[0.109]	[0.265]	[0.032]	[0.078]	[0.180]
RUN 5C	[0.108]	[0.305]	[0.032]	[0.090]	[0.178]
AVERAGE	[0.108]	[0.285]	[0.032]	[0.084]	[0.179]
RUN 6A	(0.530)	(1.382)	(0.158)	(0.412)	(0.861)
RUN 6B	[0.109]	[0.279]	[0.032]	[0.082]	[0.177]
RUN 6C	[0.111]	[0.294]	[0.033]	[0.087]	[0.180]
AVERAGE	0.53	1.38	0.16	0.41	0.86
RUN 8A	2.10	4.43	0.62	1.32	3.44
RUN 8B	2.48	6.96	0.74	2.07	4.07
RUN 8C	2.57	7.54	0.76	2.24	4.21
AVERAGE	2.38	6.31	0.71	1.88	3.91
RUN 9A	0.63	1.49	0.19	0.44	1.06
RUN 9B	[0.113]	[0.266]	[0.034]	[0.080]	[0.190]
RUN 9C	(0.521)	(1.364)	(0.155)	(0.406)	(0.874)
AVERAGE	0.58	1.43	0.17	0.42	0.96
RUN 10A	0.62	1.60	0.18	0.48	0.96
RUN 10B	0.73	1.80	0.22	0.53	1.14
RUN 10C	(0.541)	(1.507)	(0.161)	(0.448)	(0.839)
AVERAGE	0.63	1.64	0.19	0.49	0.98

NA = Not applicable (runs not completed)

[] = Minimum detection limit; () = maximum estimated concentration

TABLE 2-29. CONTINUOUS EMISSIONS MONITORING TEST AVERAGES FOR O₂, CO₂, CO, and HCl;
CENTRAL CAROLINA HOSPITAL (1990)

DATE	RUN NUMBER/ MANUAL TEST TYPE	CONDITION	TEST TIME ^a	MOISTURE	OXYGEN (% vol. dry)	CO ₂ (% vol. dry)	CO actual (ppm V, dry)	CO corrected ^b (ppm V, dry) @ 7% O ₂	HCl ^c actual (ppm V, wet)	HCl ^c corrected ^d (ppm V, dry) @ 7% O ₂
09/20/90	1	1	14:00 - 18:18	9.39	15.8	3.14	42.1	119	107	305
09/22/90	3	1	9:47 - 14:00	9.57	16.1	3.07	14.9	40.6	33.6	110
10/02/90	10	1	10:15-14:21	7.88	15.7	3.37	30.6	81	64.6	143
	AVERAGE			8.93	15.9	3.19	29.2	80.2	68.4	186
09/21/90	2	2	9:45 - 13:57	7.98	15.7	3.76	132	407	413	1273
09/23/90	4	2	11:43 - 15:47	7.35	15.2	4.01	1187	2780	568	1490
09/27/90	8	2	13:45 - 17:50	6.78	15.6	3.87	181	453	445	1350
	AVERAGE			7.37	15.3	3.88	500	1213	475	1368
09/24/90	5	3	11:45 - 15:52	7.96	15.6	3.46	37.6	104	33.9	90.3
09/25/90	6	3	10:10 - 14:15	8.29	15.7	3.40	65.3	196	45.8	138
09/28/90	9	3	11:00 - 15:05	8.93	15.3	3.67	36.1	107	55.6	164
	AVERAGE			8.39	15.3	3.51	46.3	136	45.1	131

^a For metals/CDD/CDF runs.

^b Averages are corrected to 7% oxygen (corrected value = actual * (13.9 / (20.9 - O₂)). 30 second values were corrected and then averaged.

^c HCl concentrations were determined by manual methods as well. A comparison of CEM vs. manual results is presented in Section 2.6.

^d Averages are corrected to 7% oxygen and for moisture, where the corrected value = actual * 13.9 / (20.9 - O₂) * (1 / (1 - moist)). Thirty second values were corrected and then averaged.

TABLE 2-30. CONTINUOUS EMISSIONS MONITORING TEST AVERAGES FOR O₂, SO₂, NO_x, and THC;
CENTRAL CAROLINA HOSPITAL (1990)

DATE	RUN NUMBER	CONCENTRATION	TEST TIME ^a	MOISTURE (H ₂ O volume)	OXYGEN (H ₂ O vol. dry)	SO ₂ actual (ppm V, dry)	SO ₂ corrected ^b (ppm V, dry)	NO _x actual mV/d	NO _x corrected ^b (ppm V, dry)	THC actual (ppm C, wet)	THC corrected ^c (ppm C, dry)
09/20/90	1	1	14:00-18:18	9.39	15.8	40.2	106	132	340	7.15	23.0
09/22/90	3	1	9:47-14:00	9.57	16.1	42.1	119	109	289	9.84	32.3
10/02/90	10	1	10:15-14:21	7.88	15.7	31.4	80.7	125	313	2.52	7.74
AVERAGE				8.95	15.9	37.9	102	122	314	6.50	21.0
09/21/90	2	2	9:45-13:57	7.98	15.7	15.0	37.2	79.9	208	23.0	82.7
09/23/90	4	2	11:40-15:47	7.35	15.2	18.2	44.2	62.9	143	60.2	183
09/27/90	8	2	13:45-17:50	6.78	15.6	19.0	47.0	73.7	195	30.0	91.3
AVERAGE				7.37	15.5	17.4	42.8	72.2	182	37.7	119
09/24/90	5	3	11:45-15:52	7.96	15.6	51.5	134	150	384	3.79	11.7
09/25/90	6	3	10:10-14:15	8.29	15.7	51.1	135	153	402	5.63	17.9
09/28/90	9	3	11:00-15:05	8.93	15.3	43.1	108	165	397	3.62	11.7
AVERAGE				8.39	15.5	48.6	126	156	394	4.35	13.8

^a Time is for metals and CDD/CDF runs.
^b SO₂ and NO_x are corrected to 7.0% oxygen, where the corrected value = actual * 13.9/(20.9 - O₂).
^c THC is corrected to 7.0% oxygen and corrected for moisture where the corrected value = actual * 13.9/(20.9 - O₂) * 1/(1 - moist).

NOTE: For all CEM Data, 30 second values were corrected and then averaged.

TABLE 3-1. PROCESS DATA SUMMARY FOR EMISSIONS TESTING AT AM CENTRAL CAROLINA HOSPITAL

Test Run No.	Test Date	Target Test Conditions				Daily Generation (a)					Actual Test Conditions (b)							Avg gas Rec. time in Sec (sec)	
		Change Rate		Change Type (c)	Change Flow (gpm)	Secondary Chamber Setpoint Temp (°F)	Produce time (min)	Change Time before test (min)	Hours of Changing (min)	Total Waste Changed (gals)	Ash (No of Waste Changed)	Change Rate		Change Flow (gpm)	Avg Primary Chamber Temp (°F)	Avg Sec. Chamber Temp (°F)	Stack Gas Conditions		
		(g/hr)	(g/min)									(g/hr)	(g/min)				Flow Rate (gpm)		Avg Temp (°F)
1	080000	100	25	P	15	1000	20	0	4.3	803	4.2	100	20	1416	1405	1405	2435	752	0.12
2	081000	100	40	H	15	1000	20	0	0	1010	13.7 (a)	103	41	1307	1734	1734	2270	800	0.11
3	082000	100	25	P	15	1000	20	0	4.5	806	3.8	116	46	1400	1400	1400	2301	756	0.13
4	083000	100	40	H	15	1000	20	0	6.1	806	10.1 (a)	153	30	1556	1570	1570	2303	770	0.11
5	084000	100	40	P	15	1000	20	0	4.1	875	6.7 (a)	100	40	1444	1481	1481	2423	740	0.12
6	085000	100	40	P	15	1000	20	0	4.1	807	5.0	144	40	1421	1462	1462	2233	725	0.12
7	090000	100	40	H	15	1000	20	0	4.5	700	10.1 (a)	103	41	1397	1000	1000	(f)	(f)	0.11
8	091000	100	40	H	15	1000	20	0	4.3	727	10.9 (a)	101	40	1408	1001	1001	2303	700	0.11
9	092000	100	40	P	15	1000	20	0	4.5	807	9.9	100	42	1445	1523	1523	2556	771	0.11
10	100000	100	25	P	15	1000	20	0	4.3	454	3.8	100	20	1445	1474	1474	2272	740	0.12

(a) From start-up until burnout is initiated.

(b) Includes post change and times for all tests; not just the method 5 tests.

(c) P = Pathological waste and H = Hospital waste.

(d) Residence time is based on the secondary chamber volume of 0.21 m³ (7.5 ft³) and is calculated as follows for Run 1:

$$\text{Res. time, sec} = \frac{[7.5 \text{ m}^3] \times [1000 \text{ g/m}^3]}{[2435 \text{ gpm}] \times [60 \text{ min/hr}]}$$

(e) Ash was wet due to quenching.

(f) Not reported because Run 7 was investigated.

000000 7/6/00

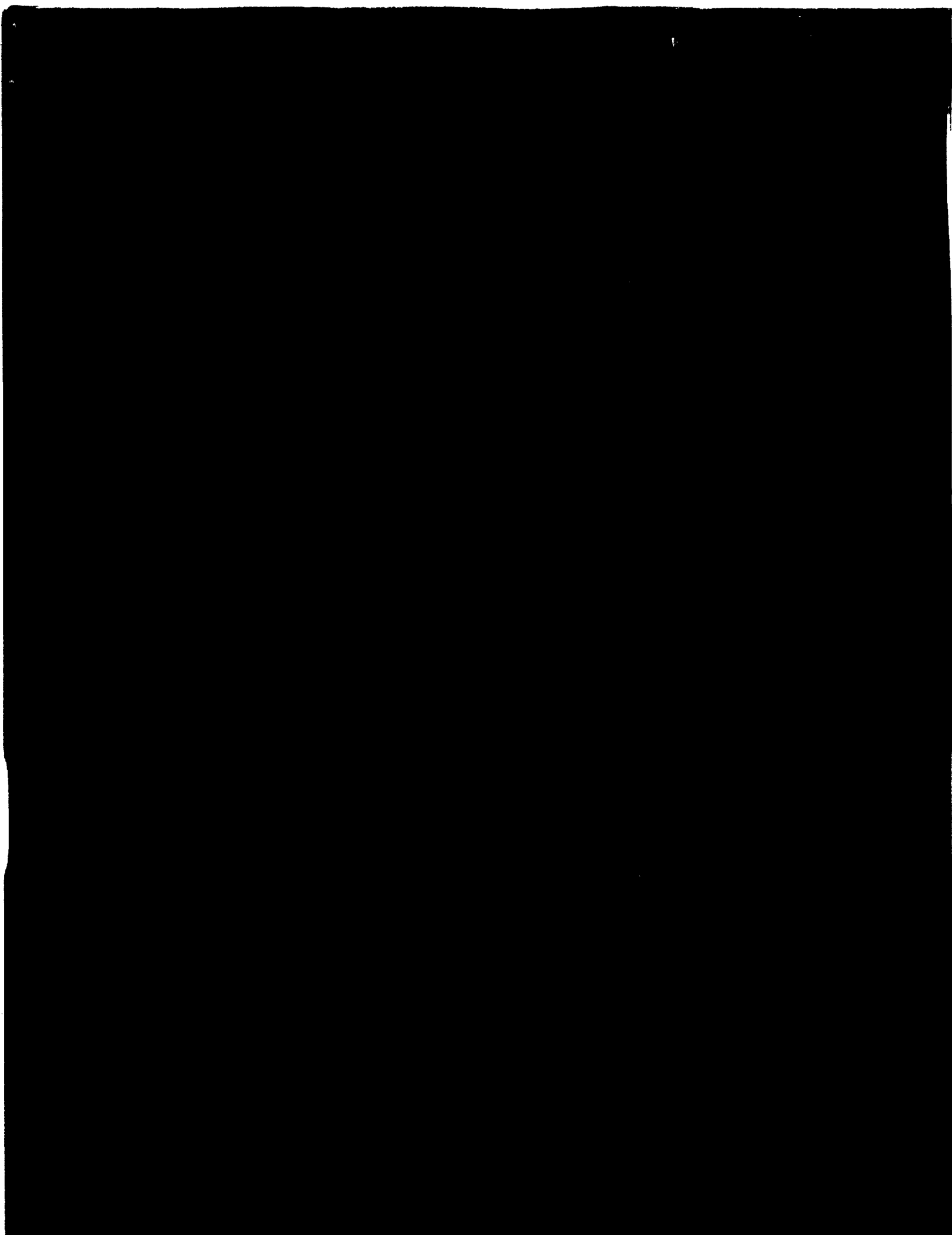


TABLE 2-1. EMISSIONS TEST LOG;
JORDAN HOSPITAL (1991)

DATE	RUN NO./ CONDITION	TEST TYPE *	INLET		OUTLET	
			RUN TIME	PORT CHANGES	RUN TIME	PORT CHANGES
3/05/91	1/Burn	PM/TM	09:50-16:49	13:26-14:10	09:47-16:49	13:07-13:10
3/05/91	1/Burn	CDD/CDF	09:44-16:49	13:20-14:09	09:45-16:49	13:06-13:15
3/05/91	1A/Burn	HCI	09:56-11:26		09:45-11:15	
3/05/91	1B/Burn	HCI	12:43-13:43		11:25-12:55	
3/05/91	1C/Burn	HCI	14:21-15:51		14:21-15:51	
3/05/91	1D/Burn	HCI	16:20-16:49		16:21-16:49	
3/05/91	1/Burn	Spore	09:38-16:18			
3/05/91	1/Burn	PSD	11:28-11:58			
	Burn Period		09:47-16:49			
3/05/91	2/Burndown	PM/TM	17:35-22:10	20:23-20:48	16:49-22:13	20:09-20:12
3/05/91	2/Burndown	CDD/CDF	17:35-22:10	20:23-20:48	16:49-22:13	20:09-20:14
3/05/91	2A/Burndown	HCI	17:45-19:15		17:45-19:15	
3/05/91	2B/Burndown	HCI	19:23-20:53		19:24-20:54	
3/05/91	2/Burndown	Spore	16:45-22:05			
	Burndown Period		16:49-22:11			
3/07/91	3/Burn	PM/TM	09:32-16:30	13:08-13:22	09:32-16:30	12:52-13:01
3/07/91	3/Burn	CDD/CDF	09:30-16:30	13:06-13:22	09:32-16:30	13:01-13:04
3/07/91	3A/Burn	HCI	09:31-11:01		09:32-11:02	
3/07/91	3B/Burn	HCI	11:12-12:42		11:13-12:43	
3/07/91	3C/Burn	HCI	12:53-14:23		12:58-14:28	
3/07/91	3D/Burn	HCI	14:35-16:05		14:35-16:05	
3/07/91	3/Burn	Spore	09:31-16:11			
	Burn Period		09:30-16:38			
3/07/91	4/Burndown	PM/TM	16:35-21:57	19:23-19:34	16:34-22:00	19:54-20:15
3/07/91	4/Burndown	CDD/CDF	16:34-21:58	19:22-19:34	16:33-21:59	19:53-20:15
3/07/91	4A/Burndown	HCI	16:59-18:29		17:00-18:30	
3/07/91	4B/Burndown	HCI	18:42-20:12		18:42-20:12	
3/07/91	4C/Burndown	HCI	20:20-21:57		20:20-21:50	
3/07/91	4/Burndown	Spore	16:30-22:59			
3/07/91	4/Burndown	PSD	15:02-17:42			
	Burndown Period		16:38-21:58			

**TABLE 2-1. EMISSIONS TEST LOG (continued);
JORDAN HOSPITAL (1991)**

DATE	RUN NO./ CONDITION	TEST TYPE *	INLET		OUTLET	
			RUN TIME	PORT CHANGES	RUN TIME	PORT CHANGES
3/09/91	5/Burn	PM/TM	09:25-16:30	13:01-13:08	09:27-16:32	12:47-12:53
3/09/91	5/Burn	CDD/CDF	09:25-16:29	13:01-13:08	09:27-16:32	12:47-12:52
3/09/91	5A/Burn	HCI	09:43-11:13		09:37-11:07	
3/09/91	5B/Burn	HCI	11:33-13:03		11:33-13:03	
3/09/91	5C/Burn	HCI	13:19-14:49		13:19-14:49	
3/09/91	5D/Burn	HCI	15:08-16:29		15:08-16:32	
3/09/91	5/Burn	Spore	09:26-16:06			
	Burn Period		09:25-16:25			
3/09/91	6/Burndown	PM/TM	16:31-21:44	19:19-19:27	16:44-21:46	20:04-20:11
3/09/91	6/Burndown	CDD/CDF	16:29-21:44	19:17-19:27	16:42-21:46	20:02-20:10
3/09/91	6A/Burndown	HCI	17:03-18:33		17:08-18:38	
3/09/91	6B/Burndown	HCI	18:48-20:18		18:48-20:18	
3/09/91	6C/Burndown	HCI	20:26-21:44		20:26-21:46	
3/09/91	6/Burndown	Spore	16:28-21:46			
3/09/91	6/Burndown	PSD	11:14-13:46			
	Burndown Period		16:25-21:44			

* HCI = manual HCI/HBr/HF tests

PM/TM = Particulate Matter/Toxic Metals tests

CDD/CDF = Tetra - Octa polychlorinated dibenzo-p-dioxins/dibenzo furans tests

Spore = Indicator Spore Microbial Survivability tests

PSD = Particle Size Distribution tests

TABLE 2-7. CDD/CDF EMISSIONS AVERAGED OVER EACH TEST DAY;
JORDAN HOSPITAL (1991)

CONGENER	DAY 1 (RUNS 1 & 2)		DAY 2 (RUNS 3 & 4)		DAY 3 (RUNS 5 & 6)	
	Inlet (ug/hr)	Outlet (ug/hr)	Inlet (ug/hr)	Outlet (ug/hr)	Inlet (ug/hr)	Outlet (ug/hr)
DIOXINS						
2378 TCDD	(0.064)	1.121	(0.156)	1.906	0.499	0.922
Other TCDD	0.053	471.472	4.504	648.288	4.774	483.748
12378 PCDD	[0.029]	6.789	0.890	12.871	2.131	4.147
Other PCDD	(0.109)	470.229	9.374	663.518	12.072	325.052
123478 HxCDD	[0.043]	3.700	1.700	8.506	2.602	3.348
123678 HxCDD	0.020	6.109	1.410	12.533	2.781	5.240
123789 HxCDD	[0.036]	9.932	4.590	21.776	5.090	9.130
Other HxCDD	0.153	191.522	13.426	401.833	24.306	174.528
1234678-HpCDD	0.110	11.851	11.566	30.664	40.064	10.787
Other Hepta-CDD	0.000	20.692	0.074	51.356	0.000	17.698
Octa-CDD	0.312	4.378	46.470	10.265	132.643	4.969
Total CDD	0.775	1197.793	63.372	1863.517	226.961	1039.568
FURANS						
2378 TCDF	0.063	12.188	1.078	18.700	3.799	8.420
Other TCDF	0.737	867.766	51.160	1254.464	97.873	687.347
12378 PCDF	(0.034)	15.112	1.125	28.469	12.611	9.972
23478 PCDF	0.093	26.177	2.709	60.423	11.846	16.351
Other PCDF	0.523	379.780	23.153	810.764	142.402	303.518
123478 HxCDF	0.207	50.956	8.304	93.655	51.977	34.080
123678 HxCDF	0.070	14.560	2.781	27.595	26.587	10.317
234678 HxCDF	0.143	19.901	6.262	40.393	25.201	14.297
123789 HxCDF	[0.026]	0.474	0.960	1.108	2.115	0.328
Other HxCDF	0.347	126.954	14.396	227.011	132.138	81.657
1234678-HpCDF	0.299	18.140	11.247	41.591	85.886	19.651
1234789-HpCDF	0.270	1.247	2.854	3.099	18.227	1.746
Other Hepta-CDF	0.433	10.465	7.240	23.565	64.989	11.352
Octa-CDF	0.651	2.242	24.180	4.760	195.247	2.551
TOTAL CDF	3.718	1545.961	156.900	2635.596	870.898	1201.589
TOTAL CDD+CDF	4.493	2743.754	220.272	4499.113	1097.859	2241.157

[] = Minimum Detection Limit

() = Estimated Maximum Possible Concentration.

TABLE 2-15. CDD/CDF STACK EMISSIONS AND OUTLET/INLET EMISSIONS RATIOS FOR
THE BURNDOWN CONDITION (RUNS 2,4,6); JORDAN HOSPITAL (1991)

CONGENER	RUN 2 EMISSIONS			RUN 4 EMISSIONS			RUN 6 EMISSIONS			BURNDOWN AVG EMISSIONS		
	INLET (ug/hr)	OUTLET (ug/hr)	OUT/IN RATIO	INLET (ug/hr)	OUTLET (ug/hr)	OUT/IN RATIO	INLET (ug/hr)	OUTLET (ug/hr)	OUT/IN RATIO	INLET (ug/hr)	OUTLET (ug/hr)	OUT/IN RATIO
DIOXINS												
2378 TCDD	(0.064)	0.83	12.93	(0.156)	(0.859)	5.51	1.09	0.34	0.31	0.44	0.39	6.25
Other TCDD	0.03	274.0	8567.17	10.4	267.0	25.59	8.9	122.4	13.77	6.45	221.12	2868.84
12378 PCDD	[0.015]	6.5	433.40	0.9	8.6	9.66	4.7	2.3	0.49	2.81	5180	147.85
Other PCDD	(0.087)	380.0	4367.96	21.8	407.1	18.71	26.0	174.6	6.72	15.95	320.58	1464.46
123478 HxCDD	[0.024]	3.4	140.36	1.7	5.4	3.19	5.7	1.3	0.23	3.69	3.38	47.93
123678 HxCDD	0.02	5.1	214.36	3.3	8.5	2.62	5.9	2.2	0.38	3.06	5.29	72.45
123789 HxCDD	[0.015]	8.7	579.18	4.6	14.8	3.23	10.8	3.7	0.34	7.72	9.08	194.25
Other HxCDD	0.01	160.1	20024.55	31.4	271.4	8.65	49.4	71.7	1.45	26.94	167.76	6678.22
1234678-HpCDD	0.10	9.8	102.25	26.9	19.3	0.72	88.1	5.2	0.06	38.35	11.41	34.34
Other Hepta-CDD	0.00	17.8	NA	0.0	31.3	NA	0.0	7.9	NA	0.00	19.01	NA
Octa-CDD	0.38	3.5	9.24	46.5	6.3	0.14	296.3	2.0	0.01	114.40	3.95	3.13
Total CDD	0.7	869.8	1252.14	147.5	1040.6	7.06	497.0	393.7	0.79	215.06	768.05	420.00
FURANS												
2378 TCDF	0.06	9.6	149.69	2.4	9.1	3.75	8.2	3.7	0.45	3.58	7.49	51.30
Other TCDF	0.74	538.9	732.60	118.9	476.3	4.01	207.3	236.3	1.14	108.98	417.16	245.91
12378 PCDF	(0.040)	13.2	329.48	2.6	16.5	6.36	28.6	5.1	0.18	10.41	11.57	112.01
23478 PCDF	0.09	22.5	255.36	6.2	36.0	5.80	25.6	7.8	0.31	10.62	22.10	87.15
Other PCDF	0.36	328.4	912.81	54.0	465.5	8.62	315.0	134.7	0.43	123.12	309.55	307.29
123478 HxCDF	0.19	43.0	223.91	19.2	65.8	3.42	116.5	16.3	0.14	45.31	41.66	75.82
123678 HxCDF	0.06	12.7	198.66	6.4	19.2	2.98	60.3	4.9	0.08	22.26	12.25	67.24
234678 HxCDF	0.12	17.7	147.84	14.5	27.2	1.87	55.4	6.0	0.11	23.34	16.98	49.94
123789 HxCDF	[0.015]	0.5	33.88	1.0	0.9	0.89	4.8	0.2	0.04	2.88	0.52	11.61
Other HxCDF	0.36	108.1	300.50	33.6	153.5	4.57	299.6	38.5	0.13	111.19	100.04	101.73
1234678-HpCDF	0.35	16.0	45.36	26.0	30.0	1.15	193.7	6.6	0.03	73.36	17.50	15.51
1234789-HpCDF	0.27	1.1	3.91	6.6	2.1	0.32	41.0	(0.552)	0.01	15.95	1.06	1.42
Other Hepta-CDF	0.90	9.3	10.36	16.8	16.9	1.01	146.9	4.0	0.03	54.85	10.07	3.80
Octa-CDF	1.28	1.7	1.29	55.9	3.2	0.06	439.8	1.0	0.00	165.66	1.94	0.45
TOTAL CDF	4.82	1122.5	232.82	364.3	1322.1	3.63	1942.5	465.6	0.24	770.5	970.1	78.90
TOTAL CDD+CDF	5.52	1992.3	361.20	511.8	2362.7	4.62	2439.5	859.3	0.35	985.6	1738.1	122.06

(1) = Minimum Detection Limit

TABLE 2-24. AVERAGE METALS EMISSION RATES AND REMOVAL EFFICIENCIES FOR BURN AND BURNDOWN CONDITIONS;
JORDAN HOSPITAL (1991)

CONDITION	BURN									
	RUN 1			RUN 3			RUN 5			AVERAGE
LOCATION	INLET (g/hr)	OUTLET (g/hr)	REMOVAL EFFICIENCY (%)	INLET (g/hr)	OUTLET (g/hr)	REMOVAL EFFICIENCY (%)	INLET (g/hr)	OUTLET (g/hr)	REMOVAL EFFICIENCY (%)	
Antimony	0.023	0.004	82.5	0.016	0.004	77.3	0.017	0.005	68.4	0.019
Arsenic	0.001	[0.0002]	> 80	[0.0002]	[0.0002]	NA	[0.001]	[0.0002]	NA	0.001
Barium	0.007	0.002	62.3	0.018	0.002	89.1	0.004	0.002	54.4	0.010
Beryllium	[0.0001]	[0.00005]	NA	[0.0001]	[0.00005]	NA	[0.0001]	[0.00005]	NA	[0.0001]
Cadmium	0.059	0.004	93.8	0.023	0.002	92.1	0.017	0.001	92.5	0.033
Chromium	0.019	0.005	72.9	0.013	0.003	78.0	0.014	0.003	80.8	0.015
Lead	0.966	0.007	99.3	0.642	0.011	98.2	0.787	0.008	98.9	0.798
Mercury	0.710	0.241	66.1	2.897	0.514	82.3	0.283	0.035	87.8	1.297
Nickel	0.003	0.004	-28.9	0.003	0.019	-517.5	0.016	0.008	50.3	0.007
Silver	[0.0005]	0.007	NA	0.003	0.001	54.0	0.002	[0.0003]	> 85	0.002
Thallium	[0.001]	[0.0005]	NA	[0.001]	[0.0005]	NA	[0.001]	[0.0005]	NA	[0.001]
CONDITION	BURNDOWN									
	RUN 2			RUN 4			RUN 6			AVERAGE
LOCATION	INLET (g/hr)	OUTLET (g/hr)	REMOVAL EFFICIENCY (%)	INLET (g/hr)	OUTLET (g/hr)	REMOVAL EFFICIENCY (%)	INLET (g/hr)	OUTLET (g/hr)	REMOVAL EFFICIENCY (%)	
Antimony	0.053	0.004	92.1	0.089	0.006	93.0	0.118	[0.001]	> 99.2	0.087
Arsenic	0.003	[0.0002]	> 93.3	0.001	[0.0002]	> 80	0.007	[0.0002]	> 97.1	0.004
Barium	0.015	0.003	80.1	0.103	0.003	97.0	0.058	0.005	92.0	0.059
Beryllium	[0.0001]	[0.00005]	NA	[0.0001]	[0.00006]	NA	[0.0001]	[0.00007]	NA	[0.0001]
Cadmium	0.168	0.002	98.9	0.179	0.002	98.9	0.170	0.003	98.1	0.172
Chromium	0.031	0.002	94.3	0.016	0.004	76.9	0.017	0.003	81.7	0.021
Lead	5.75	0.039	99.3	3.57	0.022	99.4	5.06	0.051	99.0	4.791
Mercury	0.725	0.285	60.7	6.12	1.22	80.1	0.716	0.214	70.1	2.520
Nickel	0.011	0.001	91.7	0.008	0.002	79.9	0.015	0.004	72.7	0.011
Silver	0.002	0.004	-95.2	[0.001]	[0.0003]	NA	0.006	[0.0004]	> 93.3	0.003
Thallium	[0.001]	[0.001]	NA	[0.001]	[0.001]	NA	[0.001]	[0.001]	NA	[0.001]

Note: Values enclosed in brackets represent the minimum detection limits for compounds not detected in the samples. Detection limits are not included in the averages unless otherwise indicated.

NA = Not applicable

[] = Minimum Detection Limit

TABLE 2-37. METALS/PM EMISSIONS SAMPLING AND FLUE GAS
PARAMETERS AT INLET; JORDAN HOSPITAL (1991)

RUN NUMBER DATE	BURN CONDITION			
	Run 1 03/05/91	Run 3 03/07/91	Run 5 03/09/91	AVERAGE
Total Sampling Time (min.)	375	403	418	NA
Average Sampling Rate (dscfm)	0.20	0.20	0.15	0.18
Metered Volume (dscf)	74.21	79.22	63.4	72.28
Metered Volume (dscm)	2.102	2.244	1.795	2.047
Average Stack Temperature (F)	1171	1195	1183	1183
O2 Concentration (% V)	8.8	9.6	11.2	9.9
CO2 Concentration (% V)	7.5	5.9	5.1	6.2
Stack Gas Moisture (% V)	9.0	10.8	9.6	9.8
Volumetric Flow Rate (dscfm)	910	733	625	756
Volumetric Flow Rate (dscmm)	25.77	20.75	17.69	21.40
Percent Isokinetic	90.9	111	101	NA
RUN NUMBER DATE	BURNDOWN CONDITION			
	Run 2 03/05/91	Run 4 03/07/91	Run 6 03/09/91	AVERAGE
Total Sampling Time (min.)	250	311	305	NA
Average Sampling Rate (dscfm)	0.18	0.11	0.11	0.13
Metered Volume (dscf)	44.74	33.07	33.63	37.15
Metered Volume (dscm)	1.267	0.936	0.952	1.052
Average Stack Temperature (F)	1108	1130	1228	1155
O2 Concentration (% V)	8.9	10.3	8.6	9.3
CO2 Concentration (% V)	8.9	6.3	7.7	7.6
Stack Gas Moisture (% V)	8.0	10.2	6.5	8.3
Volumetric Flow Rate (dscfm)	756	548	524	609
Volumetric Flow Rate (dscmm)	21.40	15.52	14.85	17.26
Percent Isokinetic	99.0	81.1	87.1	NA

NA = Not applicable.

**TABLE 2-38. METALS/PM EMISSIONS SAMPLING AND FLUE GAS
PARAMETERS AT OUTLET; JORDAN HOSPITAL (1991)**

RUN NUMBER DATE	BURN CONDITION			
	Run 1 03/05/91	Run 3 03/07/91	Run 5 03/09/91	AVERAGE
Total Sampling Time (min.)	415	404	419	NA
Average Sampling Rate (dscfm)	0.43	0.41	0.42	0.42
Metered Volume (dscf)	176.47	165.54	177.41	173.14
Metered Volume (dscm)	4.998	4.688	5.024	4.903
Average Stack Temperature (F)	181	192	176	183
O2 Concentration (%V)	17.6	17.1	17.3	17.3
CO2 Concentration (%V)	1.8	2.2	2.2	2.1
Stack Gas Moisture (%V)	15.8	16.2	13.2	15.0
Volumetric Flow Rate (dscfm)	1368	1232	1333	1311
Volumetric Flow Rate (dscmm)	38.74	34.90	37.75	37.13
Percent Isokinetic	96.4	103	100	NA
RUN NUMBER DATE	BURNDOWN CONDITION			
	Run 2 03/05/91	Run 4 03/07/91	Run 6 03/09/91	AVERAGE
Total Sampling Time (min.)	321	305	295	NA
Average Sampling Rate (dscfm)	0.47	0.39	0.3	0.39
Metered Volume (dscf)	152.22	118.72	89.84	120.26
Metered Volume (dscm)	1.311	3.362	2.544	2.406
Average Stack Temperature (F)	187	193	180	186
O2 Concentration (%V)	17.8	17.5	17.4	17.6
CO2 Concentration (%V)	1.9	2.1	2.4	2.1
Stack Gas Moisture (%V)	13.92	14.65	11.95	13.5
Volumetric Flow Rate (dscfm)	1434	1153	1028	1205
Volumetric Flow Rate (dscmm)	40.60	32.66	29.12	34.13
Percent Isokinetic	103	105	93.3	NA

NA = Not applicable

TABLE 2-43. PARTICULATE MATTER CONCENTRATIONS AND EMISSIONS FOR BURN CONDITION;
JORDAN HOSPITAL (1991)

DATE	LOCATION	RUN NUMBER	TIME	FLUE GAS CONCENTRATION			FLUE GAS EMISSION RATE		REMOVAL EFFICIENCY (%)
				(grains/dscf) @ 7% O ₂	(grains/dscf) @ 7% O ₂	(grams/dscm) @ 7% O ₂	(lb/hr)	(kg/hr)	
03/05/91	INLET	1	09:50-16:49	0.0035	0.0040	0.0080	0.027	0.012	
03/07/91	INLET	3	09:32-16:30	0.0028	0.0035	0.0064	0.018	0.0080	
03/09/91	INLET	5	09:25-16:30	0.0029	0.0041	0.0065	0.015	0.0069	
			AVERAGES	0.0031	0.0039	0.0070	0.020	0.0091	
03/05/91	OUTLET	1	09:47-16:49	NA	NA	NA	NA	NA	NA
03/07/91	OUTLET	3	09:32-16:30	0.00045	0.0016	0.0010	0.0048	0.0022	72.7
03/09/91	OUTLET	5	09:25-16:30	0.00058	0.0022	0.0013	0.0066	0.0030	56.9
			AVERAGES	0.00052	0.0019	0.0012	0.0057	0.0026	64.8

NA = Not applicable, particulate matter was not detected in this sample.

a = Removal efficiency is based on inlet and outlet emission rates. $\{(1 - \text{out/in}) * 100\}$

TABLE 2-44. PARTICULATE MATTER CONCENTRATIONS AND EMISSIONS FOR BURNDOWN CONDITION;
JORDAN HOSPITAL (1991)

DATE	LOCATION	RUN NUMBER	TIME	FLUE GAS CONCENTRATION			FLUE GAS EMISSION RATE		a REMOVAL EFFICIENCY (%)
				(grains/dec-f) @ 7% O ₂	(grains/dec-f) @ 7% O ₂	(grams/dec-m) @ 7% O ₂	(lb/hr)	(kg/hr)	
03/05/91	INLET	2	17:35-22:10	0.014	0.016	0.033	0.092	0.042	
03/07/91	INLET	4	16:35-21:57	0.017	0.022	0.038	0.078	0.035	
03/09/91	INLET	6	16:31-21:44	0.037	0.042	0.084	0.165	0.075	
			AVERAGES	0.023	0.027	0.052	0.112	0.051	
03/05/91	OUTLET	2	16:49-22:13	0.00017	0.00076	0.00039	0.0021	0.00090	97.7
03/07/91	OUTLET	4	16:34-22:00	0.00044	0.0018	0.0010	0.0043	0.0020	94.5
03/09/91	OUTLET	6	16:44-21:46	0.00093	0.0037	0.0021	0.0082	0.0037	95.0
			AVERAGES	0.00051	0.0021	0.0012	0.0049	0.0022	95.7

a = Removal efficiency is based on inlet and outlet emission rates. $\{(1 - \text{out/in}) * 100\}$

TABLE 2-47. SUMMARY OF HCl RESULTS AT THE INLET;
JORDAN HOSPITAL (1991)

HCl TEST RUN NUMBER	MEASURED CONCENTRATIONS				EMISSION RATES	
	(mg/dscm)	(mg/dscm @7% O ₂)	(ppmv)	(ppmv @7% O ₂)	(g/hr)	(lb/hr)
1A	60.5	65.2	39.9	43.0	83.5	0.184
1B	65.7	75.5	43.4	49.8	90.8	0.200
1C	185.9	228.6	122.6	150.8	256.7	0.566
1D	150.9	189.0	99.6	124.7	194.0	0.428
AVERAGE	115.7	139.6	76.3	92.1	156.3	0.345
2A	610.9	653.2	403.0	430.9	785.4	1.731
2B	46.6	61.1	30.8	40.3	59.9	0.132
AVERAGE	328.8	357.2	216.9	235.6	422.7	0.932
3A	27.8	32.5	18.3	21.4	33.0	0.073
3B	76.5	90.1	50.4	59.4	90.8	0.200
3C	236.2	285.6	155.8	188.4	280.4	0.618
3D	178.2	223.1	117.5	147.2	211.4	0.466
AVERAGE	194.4	238.9	128.2	157.6	230.7	0.509
4A	327.6	367.2	216.1	242.2	336.8	0.743
4B	300.8	394.5	198.4	260.2	309.4	0.682
4C	269.8	364.1	178.0	240.2	277.5	0.612
AVERAGE	299.4	375.3	197.5	247.5	307.9	0.679
5A	31.81	68.025	20.982	44.870	36.054	0.0795
5B	14.2	18.5	9.4	12.2	16.1	0.036
5C	140.9	179.6	92.9	118.5	159.7	0.352
5D	202.9	261.1	133.8	172.3	230.0	0.507
AVERAGE	97.3	131.5	64.2	86.7	110.3	0.243
6A	412.5	374.7	272.1	247.2	371.2	0.818
6B	397.7	536.7	262.3	354.0	357.9	0.789
6C	574.5	760.5	378.9	501.7	517.1	1.140
AVERAGE	461.5	557.3	304.4	367.6	415.4	0.916

TABLE 2-48. SUMMARY OF HCl RESULTS AT THE OUTLET (STACK);
JORDAN HOSPITAL (1991)

HCl TEST RUN NUMBER	MEASURED CONCENTRATIONS				EMISSION RATES	
	(mg/dscm)	(mg/dscm @7% O ₂)	(ppmv)	(ppmv @7% O ₂)	(g/hr)	(lb/hr)
1A	4.12	15.47	2.72	10.21	9.19	0.020
1B	5.19	20.62	3.43	13.60	11.58	0.026
1C	5.76	26.68	3.80	17.60	12.84	0.028
1D	8.68	38.91	5.72	25.66	22.25	0.049
AVERAGE	5.94	25.42	3.92	16.77	13.96	0.031
2A	47.82	207.70	31.54	137.00	122.59	0.270
2B	7.94	38.07	5.24	25.11	20.36	0.045
AVERAGE	27.88	122.88	18.39	81.05	71.48	0.158
3A	3.84	12.12	2.53	7.99	9.10	0.020
3B	6.16	21.96	4.06	14.49	14.61	0.032
3C	21.71	86.24	14.32	56.88	51.48	0.114
3D	9.73	38.63	6.42	25.48	23.06	0.051
AVERAGE	10.36	39.74	6.83	26.21	24.56	0.054
4A	40.39	160.41	26.64	105.81	87.61	0.193
4B	49.50	208.52	32.65	137.54	107.38	0.237
4C	38.48	137.14	25.38	90.46	83.46	0.184
AVERAGE	42.79	168.69	28.22	111.27	92.82	0.205
5A	8.48	22.36	5.59	14.75	19.37	0.043
5B	NC	NC	NC	NC	NC	NC
5C	4.86	13.70	3.20	9.03	11.10	0.024
5D	6.20	17.49	4.09	11.54	14.18	0.031
AVERAGE	6.51	17.85	4.30	11.77	14.88	0.033
6A	15.16	39.53	10.00	26.07	27.43	0.060
6B	10.45	26.75	6.89	17.65	18.91	0.042
6C	7.16	18.97	4.73	12.51	12.97	0.029
AVERAGE	10.92	28.42	7.21	18.74	19.77	0.044

NC = Analysis not completed due to improper sample recovery.

TABLE 2-49. SUMMARY OF HF RESULTS AT THE INLET;
JORDAN HOSPITAL (1991)

TEST RUN NUMBER	MEASURED CONCENTRATIONS				EMISSION RATE	
	(mg/dscm)	(mg/dscm @7% O ₂)	(ppmv)	(ppmv @7% O ₂)	(g/hr)	(lb/hr)
1A	[0.4448]	[0.4788]	[0.5348]	[0.5758]	[0.6138]	[0.0018]
1B	[0.6348]	[0.7288]	[0.7628]	[0.8758]	[0.8768]	[0.0028]
1C	[0.4368]	[0.5368]	[0.5248]	[0.6458]	[0.6028]	[0.0018]
AVERAGE	[0.505]	[0.581]	[0.607]	[0.698]	[0.697]	[0.001]
2A	[1.1489]	[1.4389]	[1.3809]	[1.7289]	[1.4769]	[0.0039]
2B	[0.4339]	[0.4639]	[0.5219]	[0.5579]	[0.5579]	[0.0019]
2C	[0.4098]	[0.5368]	[0.4928]	[0.6458]	[0.5268]	[0.0018]
AVERAGE	[0.6642]	[0.8132]	[0.7985]	[0.9775]	[0.8539]	[0.0025]
3A	[0.4408]	[0.5148]	[0.5298]	[0.6188]	[0.5228]	[0.0018]
3B	[0.4328]	[0.5098]	[0.5198]	[0.6118]	[0.5138]	[0.0018]
3C	[0.4680]	[0.5660]	[0.5630]	[0.6800]	[0.5550]	[0.0010]
3D	[0.4419]	[0.5529]	[0.5309]	[0.6649]	[0.5239]	[0.0019]
AVERAGE	[0.445]	[0.535]	[0.535]	[0.643]	[0.528]	[0.001]
4A	[0.5119]	[0.5739]	[0.6149]	[0.6889]	[0.5269]	[0.0019]
4B	[0.4520]	[0.5930]	[0.5430]	[0.7120]	[0.4650]	[0.0010]
4C	[0.3990]	[0.5380]	[0.4800]	[0.6480]	[0.4100]	[0.0010]
AVERAGE	[0.454]	[0.568]	[0.546]	[0.683]	[0.467]	[0.001]
5A	1.165	2.491	1.400	2.995	1.320	0.003
5B	[0.4430]	[0.5750]	[0.5330]	[0.6920]	[0.5020]	[0.0010]
5C	[0.4430]	[0.5650]	[0.5330]	[0.6800]	[0.5020]	[0.0010]
5D	[0.4680]	[0.6020]	[0.5630]	[0.7250]	[0.5300]	[0.0010]
AVERAGE	1.165	2.491	1.400	2.995	1.320	0.003
6A	[0.4169]	[0.3789]	[0.5009]	[0.4549]	[0.3749]	[0.0019]
6B	[0.4312]	[0.5822]	[0.5182]	[0.6992]	[0.3882]	[0.0012]
6C	[0.4792]	[0.6342]	[0.5762]	[0.7632]	[0.4312]	[0.0012]
AVERAGE	[0.442]	[0.531]	[0.531]	[0.639]	[0.398]	[0.001]

[] = Minimum detection limit.

TABLE 2-50. SUMMARY OF HF RESULTS AT THE OUTLET;
JORDAN HOSPITAL (1991)

TEST RUN NUMBER	MEASURED CONCENTRATIONS				EMISSION RATE	
	(mg/dscm)	(mg/dscm @7% O ₂)	(ppmv)	(ppmv @7% O ₂)	(g/hr)	(lb/hr)
1A	[0.2579]	[0.9659]	[0.3099]	[1.1619]	[0.5739]	[0.0019]
1B	[0.2438]	[0.9658]	[0.2928]	[1.1608]	[0.5428]	[0.0018]
1C	[0.2218]	[1.0248]	[0.2668]	[1.2328]	[0.4938]	[0.0018]
AVERAGE	[0.240]	[0.985]	[0.289]	[1.184]	[0.536]	[0.001]
2A	[0.7188]	[3.2198]	[0.8638]	[3.8708]	[1.8418]	[0.0048]
2B	[0.2216]	[0.9606]	[0.2666]	[1.1556]	[0.5676]	[0.0016]
2C	[0.2216]	[0.9606]	[0.2666]	[1.1556]	[0.5676]	[0.0016]
AVERAGE	[0.3873]	[1.7137]	[0.4657]	[2.0607]	[0.9923]	[0.0027]
3A	[0.2198]	[0.6928]	[0.2638]	[0.8318]	[0.5198]	[0.0018]
3B	[0.2198]	[0.7818]	[0.2638]	[0.9378]	[0.5198]	[0.0018]
3C	[0.2199]	[0.8709]	[0.2639]	[1.0449]	[0.5199]	[0.0019]
3D	[0.2258]	[0.8948]	[0.2708]	[1.0728]	[0.5348]	[0.0018]
AVERAGE	[0.221]	[0.809]	[0.265]	[0.971]	[0.523]	[0.001]
4A	[0.2048]	[0.8108]	[0.2458]	[0.9738]	[0.4428]	[0.0018]
4B	[0.2699]	[1.1339]	[0.3239]	[1.3619]	[0.5839]	[0.0019]
4C	[0.2008]	[0.7138]	[0.2408]	[0.8558]	[0.4348]	[0.0018]
AVERAGE	[0.224]	[0.885]	[0.289]	[1.063]	[0.486]	[0.001]
5A	[0.2401]	[0.6331]	[0.2891]	[0.7621]	[0.5481]	[0.0011]
5B	[0.2138]	[0.5188]	[0.2568]	[0.6228]	[0.4878]	[0.0018]
5C	[0.2188]	[0.6158]	[0.2628]	[0.7398]	[0.4988]	[0.0018]
5D	[0.2391]	[0.6741]	[0.2871]	[0.8091]	[0.5461]	[0.0011]
AVERAGE	[0.228]	[0.610]	[0.274]	[0.733]	[0.520]	[0.001]
6A	[0.2239]	[0.5829]	[0.2689]	[0.6999]	[0.4049]	[0.0019]
6B	[0.2228]	[0.5688]	[0.2678]	[0.6838]	[0.4028]	[0.0018]
6C	[0.2428]	[0.6418]	[0.2918]	[0.7708]	[0.4388]	[0.0018]
AVERAGE	[0.229]	[0.597]	[0.275]	[0.717]	[0.415]	[0.001]

[] = Minimum detection limit.

TABLE 2-51. SUMMARY OF HBr RESULTS AT THE INLET;
JORDAN HOSPITAL (1991)

TEST RUN NUMBER	MEASURED CONCENTRATIONS				EMISSION RATE	
	(mg/dscm)	(mg/dscm @7% O ₂)	(ppmv)	(ppmv @7% O ₂)	(g/hr)	(lb/hr)
1A	[0.1306]	[0.1406]	[0.0396]	[0.0426]	[0.1806]	[0.0006]
1B	[0.1867]	[0.2147]	[0.0557]	[0.0637]	[0.2577]	[0.0017]
1C	[0.1286]	[0.1576]	[0.0386]	[0.0476]	[0.1776]	[0.0006]
AVERAGE	[0.148]	[0.170]	[0.044]	[0.051]	[0.205]	[0.000]
2A	[0.3367]	[0.4217]	[0.1007]	[0.1257]	[0.4327]	[0.0017]
2B	[0.1277]	[0.1367]	[0.0387]	[0.0417]	[0.1637]	[0.0007]
2C	[0.1207]	[0.1577]	[0.0367]	[0.0477]	[0.1547]	[0.0007]
AVERAGE	[0.1950]	[0.2387]	[0.0587]	[0.0717]	[0.2504]	[0.0010]
3A	[0.1296]	[0.1516]	[0.0386]	[0.0446]	[0.1536]	[0.0006]
3B	[0.1266]	[0.1486]	[0.0376]	[0.0446]	[0.1506]	[0.0006]
3C	(0.1569)	(0.1899)	(0.0469)	(0.0569)	(0.1859)	(0.0009)
3D	[0.1297]	[0.1627]	[0.0387]	[0.0487]	[0.1537]	[0.0007]
AVERAGE	0.156	0.189	0.046	0.056	0.185	0.001
4A	[0.1507]	[0.1687]	[0.0457]	[0.0507]	[0.1547]	[0.0007]
4B	[0.1297]	[0.1697]	[0.0387]	[0.0507]	[0.1337]	[0.0007]
4C	[0.1147]	[0.1547]	[0.0347]	[0.0467]	[0.1177]	[0.0007]
AVERAGE	[0.131]	[0.164]	[0.039]	[0.049]	[0.135]	[0.000]
5A	[0.1257]	[0.2677]	[0.0377]	[0.0797]	[0.1427]	[0.0007]
5B	[0.1277]	[0.1657]	[0.0387]	[0.0497]	[0.1447]	[0.0007]
5C	[0.1267]	[0.1617]	[0.0377]	[0.0477]	[0.1437]	[0.0007]
5D	[0.1346]	[0.1726]	[0.0406]	[0.0516]	[0.1526]	[0.0006]
AVERAGE	[0.128]	[0.191]	[0.038]	[0.057]	[0.145]	[0.000]
6A	[0.1227]	[0.1117]	[0.0367]	[0.0337]	[0.1107]	[0.0007]
6B	[0.1237]	[0.1667]	[0.0377]	[0.0507]	[0.1117]	[0.0007]
6C	[0.1376]	[0.1816]	[0.0416]	[0.0546]	[0.1236]	[0.0006]
AVERAGE	[0.127]	[0.153]	[0.038]	[0.046]	[0.115]	[0.000]

[] = Minimum detection limit.

() = Estimated maximum possible concentration.

TABLE 2-52. SUMMARY OF HBr RESULTS AT THE OUTLET;
JORDAN HOSPITAL (1991)

TEST RUN NUMBER	MEASURED CONCENTRATIONS				EMISSION RATE	
	(mg/dscm)	(mg/dscm @7% O2)	(ppmv)	(ppmv @7% O2)	(g/hr)	(lb/hr)
1A	[0.0757]	[0.2827]	[0.0227]	[0.0837]	[0.1677]	[0.0007]
1B	[0.0716]	[0.2826]	[0.0216]	[0.0836]	[0.1586]	[0.0006]
1C	[0.0656]	[0.3016]	[0.0196]	[0.0886]	[0.1456]	[0.0006]
AVERAGE	[0.070]	[0.288]	[0.021]	[0.085]	[0.157]	[0.000]
2A	[0.2106]	[0.9426]	[0.0626]	[0.2786]	[0.5386]	[0.0016]
2B	[0.0656]	[0.2826]	[0.0196]	[0.0836]	[0.1676]	[0.0006]
2C	[0.0656]	[0.3126]	[0.0196]	[0.0916]	[0.1676]	[0.0006]
AVERAGE	[0.1139]	[0.5126]	[0.0339]	[0.1513]	[0.2913]	[0.0009]
3A	[0.0646]	[0.2026]	[0.0196]	[0.0606]	[0.1526]	[0.0006]
3B	0.910	3.244	0.271	0.964	2.158	0.005
3C	1.036	4.114	0.308	1.223	2.457	0.005
3D	[0.0666]	[0.2626]	[0.0206]	[0.0796]	[0.1566]	[0.0006]
AVERAGE	0.973	3.679	0.289	1.094	2.307	0.005
4A	[0.0606]	[0.2386]	[0.0186]	[0.0716]	[0.1306]	[0.0006]
4B	[0.0797]	[0.3337]	[0.0237]	[0.0977]	[0.1717]	[0.0007]
4C	[0.0596]	[0.2106]	[0.0186]	[0.0646]	[0.1286]	[0.0006]
AVERAGE	[0.066]	[0.260]	[0.020]	[0.077]	[0.143]	[0.000]
5A	[0.0697]	[0.1827]	[0.0217]	[0.0557]	[0.1587]	[0.0007]
5B	[0.0626]	[0.1516]	[0.0186]	[0.0446]	[0.1426]	[0.0006]
5C	[0.0646]	[0.1806]	[0.0196]	[0.0546]	[0.1466]	[0.0006]
5D	[0.0687]	[0.1927]	[0.0207]	[0.0567]	[0.1557]	[0.0007]
AVERAGE	[0.066]	[0.176]	[0.020]	[0.052]	[0.150]	[0.000]
6A	[0.0657]	[0.1707]	[0.0197]	[0.0507]	[0.1187]	[0.0007]
6B	[0.0656]	[0.1666]	[0.0196]	[0.0496]	[0.1186]	[0.0006]
6C	[0.0716]	[0.1886]	[0.0216]	[0.0566]	[0.1286]	[0.0006]
AVERAGE	[0.067]	[0.175]	[0.020]	[0.052]	[0.121]	[0.000]

[] = Minimum detection limit.

TABLE 2-54. CONTINUOUS EMISSIONS MONITORING TEST AVERAGES AS MEASURED;
JORDAN HOSPITAL (1991)

TIME	INLET SO ₂ (ppm V/dry)	OUTLET SO ₂ (ppm V/dry)	INLET O ₂ (ppm V/dry)	OUTLET O ₂ (ppm V/dry)	INLET CO ₂ (ppm V/dry)	OUTLET CO ₂ (ppm V/dry)	INLET NO _x (ppm V/dry)	OUTLET NO _x (ppm V/dry)	INLET CO (ppm V/dry)	OUTLET HCl (ppm V/wet) ^a	INLET HCl (ppm V/wet)	OUTLET HCl (ppm V/wet)	INLET THC (ppm V/wet)	OUTLET THC (ppm V/wet)
RUN 1 BURN AVG	6.16	0.71	8.80	17.63	7.51	1.78	76.74		7.03	323.00	NA	12.11	0.85	
RUN 2 BURNDOWN AVG	33.29	3.50	8.85	17.77	8.88	1.86	108.85		6.16	266.40	NA		0.84	
RUN 3 BURN AVG	8.84	0.35	9.56	17.06	5.91	2.20	65.28		8.87	211.02	NA	NA	NA	
RUN 4 BURNDOWN AVG	23.05	1.11	10.32	17.46	6.30	2.11	75.43		0.09	452.24	NA	NA	NA	
RUN 5 BURN AVG	4.60	0.53	11.18	17.26	5.13	2.16	60.41		1.72	422.47	NA	5.94	NA	
RUN 6 BURNDOWN AVG	41.30	5.27	8.61	17.41	7.75	2.38	103.41		53.46	485.98	NA	8.58	NA	

^a HCl concentrations were determined by manual methods as well. A comparison of CEM vs. manual results is presented in Section 2.6.

NA = Not available; THC instrument was not operating during that time interval.

The outlet HCl instrument showed poor resolution in the lower concentration ranges.

TABLE 2-58. SUMMARY OF INCINERATOR FEED AMOUNTS AND ASH GENERATION PER RUN;
JORDAN HOSPITAL (1991)

RUN NUMBER	TEST DAY	DATE	DESIGN LOAD RATE (lbs)	TIMES	WET SPORE ^b SPIKE AMOUNTS (total spores)	DRY SPORE SPIKE AMOUNTS (total spores)	TOTAL WASTE FEED (lbs)	TOTAL ASH WEIGHT (lbs) ^c
1,2	1	03/05/91	750	08:45	1.71E+12	1.7E+8 ^d	719.07	70.34
3,4	2	03/07/91	750	08:30	1.71E+12	9.0E+7 ^e	702.21	94.87
5,6	3	03/09/91	750	08:25	1.58E+12	2.6E+8 ^f	729.38	60.35

^a Two indicator spore emissions test runs were conducted every day. One during the Burn and one during the Burndown.

^b Wet spores were added in eight ~250 ml aliquots spread over separate waste bags.

^c Total ash weight includes relatively large pieces of material (glass, metal, etc.)

^d Eight mesh containers were placed in each of the eight wet spike bags. Nine pipes were placed on the floor.

^e Nine pipes were placed on the floor.

^f Eight mesh containers were placed in each of eight wet spore spike bags. Nine pipes and nine mesh containers were placed on the floor.

United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park, NC 27711

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Air



Medical Waste Incineration Emission Test Report

Lenoir Memorial Hospital
Kinston, North Carolina



TABLE 2-6. CDD/CDF STACK GAS CONCENTRATIONS AND EMISSIONS RATES AT CONDITION 1

CONGENER	CONCENTRATION ^a (ng/dscm, as measured)				EMISSIONS (µg/hr)			
	RUN 1	RUN 2	RUN 3	AVERAGE	RUN 1	RUN 2	RUN 3	AVERAGE
DIOXINS								
2378 TCDD	0.79	3.76	2.64	2.40	1.60	8.19	5.53	5.11
Other TCDD	9.7	42.5	26.6	26.3	19.7	92.5	55.8	56.0
12378 PCDD	6.04	28.0	11.8	15.3	12.3	60.8	24.8	32.6
Other PCDD	30.8	106.3	55.5	64.2	62.8	231.2	116	136.7
123478 HxCDD	13.3	34.3	16.1	21.3	27.2	74.7	33.7	45.2
123678 HxCDD	9.64	33.6	19.4	20.9	19.7	73.0	40.6	44.4
123789 HxCDD	18.6	78.1	42.5	46.4	37.9	169.8	88.9	98.9
Other HxCDD	56.1	205.0	122.4	128	114.5	445.8	256	272.3
1234678-HpCDD	85.0	228.1	168.3	160	173.3	496.2	353	340.7
Other Hepta-CDD	73.9	211.9	150.1	145	150.7	460.8	315	308.7
Octa-CDD	212.5	345.9	282.2	280	433.4	752.3	591	592.3
TOTAL CDD	516	1,317	897	910	1,053	2,865	1,880	1,933
FURANS								
2378 TCDF	4.39	20.1	11.9	12.1	8.94	43.7	24.9	25.9
Other TCDF	166	687	436	430	339	1494	913	916
12378 PCDF	18.0	66.9	39.3	41.4	36.8	145.5	82.4	88.2
23478 PCDF	31.1	104.5	60.8	65.5	63.5	227.3	127	139.4
Other PCDF	316.3	1,080	537	644	645.0	2,349	1,124	1,373
123478 HxCDF	116.4	343.3	228	229	237.4	746.8	478	487.3
123678 HxCDF	57.9	205.7	122	129	118.1	447.5	256	273.9
234678 HxCDF	72.0	205.5	181	153	146.9	446.9	379	324.3
123789 HxCDF	3.3	14.4	10.2	9.3	6.8	31.3	21.3	19.8
Other HxCDF	337.8	1,027	691	685	688.8	2,233	1,447	1,456
1234678-HpCDF	265.8	653.6	533	484	542.1	1,422	1,117	1,027
1234789-HpCDF	38.2	88.0	102	76.1	77.8	191.4	214	161.0
Other Hepta-CDF	183.3	410.5	452	349	373.8	892.8	947	737.8
Octa-CDF	201.4	253.3	525	327	410.7	550.9	1,101	687.5
TOTAL CDF	1,810	5,160	3,930	3,630	3,700	11,200	8,230	7,720
TOTAL CDD+CDF	2,330	6,480	4,830	4,540	4,750	14,100	10,110	9,650

^a ng/dscm = nanogram per dry standard cubic meter. Standard conditions are defined as 1 atm and 68° F.

TABLE 2-7. CDD/CDF STACK GAS CONCENTRATIONS AND EMISSIONS RATES AT CONDITION 2

CONGENER	CONCENTRATION ^a (ng/dscm, as measured)				EMISSIONS (µg/hr)			
	RUN 4	RUN 5R	RUN 6	AVERAGE	RUN 4	RUN 5R	RUN 6	AVERAGE
DIOXINS								
2378 TCDD	(1.331)	0.84	1.42	1.20	(2.783)	1.72	2.92	2.48
Other TCDD	12.7	7.98	17.8	12.8	26.5	16.3	36.6	26.5
12378 PCDD	7.83	7.40	10.7	8.64	16.4	15.2	22.0	17.8
Other PCDD	45.0	42.2	55.8	47.7	94.1	86.5	114.7	98.4
123478 HxCDD	12.8	23.5	22.0	19.4	26.7	48.1	45.1	40.0
123678 HxCDD	15.2	21.3	18.3	18.2	31.8	43.6	37.5	37.6
123789 HxCDD	26.1	37.1	39.2	34.1	54.5	75.9	80.5	70.3
Other HxCDD	95.4	132.7	115.9	115	199.4	271.9	238.0	236
1234678-HpCDD	167.3	345.0	166.2	226	349.8	707.0	341.1	466
Other Hepta-CDD	150.2	353.4	112.3	205	314.0	724.2	230.6	423
Octa-CDD	355.5	1160.3	306.9	608	743.4	2377.5	630.2	1,250
TOTAL CDD	889	2,132	867	1,296	1,859	4,368	1,779	2,669
FURANS								
2378 TCDF	5.32	4.05	8.50	5.96	11.1	8.29	17.5	12.3
Other TCDF	177	235	230	214	370	481	473	442
12378 PCDF	20.2	21.0	33.8	25.0	42.1	43.0	69.4	51.5
23478 PCDF	39.9	55.3	63.8	53.0	83.5	113.4	131.1	109
Other PCDF	343.0	645.0	583.1	524	717.1	1,322	1,197	1,079
123478 HxCDF	122.4	289.3	164.6	192	256.0	592.8	338.0	396
123678 HxCDF	66.5	112.2	86.2	88.3	139.1	229.9	176.9	182
234678 HxCDF	129.3	299.6	135.8	188	270.3	613.9	278.8	388
123789 HxCDF	5.51	5.76	7.00	6.09	11.5	11.8	14.4	12.6
Other HxCDF	394.9	743.5	552.6	564	825.7	1,523	1,135	1,161
1234678-HpCDF	344.5	805.3	415.4	522	720.3	1,650	852.9	1,074
1234789-HpCDF	73.8	114.1	83.8	90.6	154.2	233.8	172.2	187
Other Hepta-CDF	308.0	656.9	385.4	450	644.0	1,346	791.3	927
Octa-CDF	380.2	1,958	442.3	927	795.1	4012.0	908.1	1,905
TOTAL CDF	2,410	5,950	3,190	3,850	5,040	12,200	6,560	7,930
TOTAL CDD+CDF	3,300	8,080	4,060	5,150	6,900	16,500	8,330	10,590

^a ng/dscm = nanogram per dry standard cubic meter. Standard conditions are defined as 1 atm and 68° F.
() = estimated maximum possible concentration.

TABLE 2-8. CDD/CDF STACK GAS CONCENTRATIONS AND EMISSIONS RATES AT CONDITION 3

CONGENER	CONCENTRATION ^a (ng/dscm, as measured)				EMISSIONS (µg/hr)			
	RUN 7	RUN 8	RUN 9	AVERAGE	RUN 7	RUN 8	RUN 9	AVERAGE
DIOXINS								
2378 TCDD	13.9	15.7	19.1	16.2	25.4	29.9	36.8	30.7
Other TCDD	165.5	179.2	254.7	200	302.5	342.1	490.2	378
12378 PCDD	88.0	81.0	97.1	88.7	160.8	154.6	186.8	167
Other PCDD	441.7	311.8	358.4	371	807.3	595.2	689.6	697
123478 HxCDD	99.5	81.9	76.4	86.0	181.9	156.4	147.0	162
123678 HxCDD	109.4	71.0	75.2	85.2	199.9	135.4	144.7	160
123789 HxCDD	230.2	165.3	197.8	198	420.8	315.6	380.6	372
Other HxCDD	722.8	418.7	495.7	546	1,321	799.2	953.7	1,025
1234678-HpCDD	645.0	338.0	335.6	440	1,179	645.2	645.8	823
Other Hepta-CDD	619.4	280.1	281.7	394	1,132	534.8	542.0	736
Octa-CDD	627.9	266.7	218.5	371	1,148	509.2	420.3	692
TOTAL CDD	3,763	2,210	2,410	2,794	6,879	4,218	4,638	5,245
FURANS								
2378 TCDF	74.8	78.6	85.4	79.6	137	150	164	150
Other TCDF	2053	1572	2030	1885	3752	3000	3907	3553
12378 PCDF	229.4	173.6	237.9	214	419.3	331.3	457.8	403
23478 PCDF	359.7	227.8	323.6	304	657.4	434.8	622.7	572
Other PCDF	3,734	2,144	3,409	3,096	6,825	4,093	6,559	5,826
123478 HxCDF	1,290	587.7	806.1	894.62	2,358	1,122	1,551	1,677
123678 HxCDF	786.0	380.6	512.4	559.69	1436.6	726.6	986.0	1049.7
234678 HxCDF	717.6	347.1	455.5	506.76	1311.7	662.6	876.4	950
123789 HxCDF	(69.63)	(42.63)	(56.94)	(56.39)	(127.3)	(81.4)	(109.5)	(106.0)
Other HxCDF	4,028	1,888	2,520	2,812	7,363	3,604	4,849	5,272
1234678-HpCDF	5,186	1,526	2,212	2,974	9,479	2,912	4,255	5,549
1234789-HpCDF	811.6	221.1	308.7	447	1,483	422.0	593.9	833
Other Hepta-CDF	3,695	969.5	1,343	2,002	6,754	1,851	2,583	3,729
Octa-CDF	982.5	158.0	238.8	460	1,796	301.7	459.6	852
TOTAL CDF	24,000	10,300	14,500	16,300	43,900	19,700	28,000	30,500
TOTAL CDD+CDF	27,800	12,500	16,900	19,100	50,800	23,900	32,600	35,800

^a ng/dscm = nanogram per dry standard cubic meter. Standard conditions are defined as 1 atm and 68° F.

() = estimated maximum possible concentration.

TABLE 2-16. QUALITATIVE PCB FLUE GAS RESULTS
 CDD/CDF RUN 7
 LENOIR MEMORIAL HOSPITAL (1990)

ISOMER	COMPOUND DETECTED (Yes/No)
TOTAL MONO PCB	No
TOTAL DI PCB	No
TOTAL TRI PCB	NA
TOTAL TETRA PCB	No
TOTAL PENTA PCB	No
TOTAL HEXA PCB	Yes
TOTAL HEPTA PCB	Yes
TOTAL OCTA PCB	Yes
TOTAL NONA PCB	Yes
DECA PCB	NA

NA = Results not confirmed

**TABLE 2-18. METALS/STACK GAS CONCENTRATIONS AND EMISSION RATES
FOR CONDITION 1; LENOIR MEMORIAL HOSPITAL (1990)**

Date	05/30/90	05/31/90	06/01/90	
Time	14:56-20:22	12:47-17:11	10:19-14:40	
Run No.	1	2	3	
O ₂ Concentration (%V)	10.9	10.1	14.3	
Flow Rate (dscmm)	32.99	32.69	34.49	AVERAGE
Antimony (ug/dscm)	381.97	547.50	330.83	420
(ug/dscm @7% O ₂)	532.54	704.66	699.94	646
(g/hr)	0.76	1.07	0.68	0.838
Arsenic (ug/dscm)	4.35	9.05	5.82	6.40
(ug/dscm @7% O ₂)	6.06	11.65	12.30	10.0
(g/hr)	0.01	0.02	0.01	0.013
Barium (ug/dscm)	45.55	93.70	57.94	65.7
(ug/dscm @7% O ₂)	63.50	120.60	122.58	102
(g/hr)	0.09	0.18	0.12	0.131
Beryllium (ug/dscm)	[0.059]	[0.089]	[0.087]	[0.078]
(ug/dscm @7% O ₂)	[0.082]	[0.115]	[0.184]	[0.127]
(g/hr)	[0.0001]	[0.0002]	[0.0002]	[0.0002]
Cadmium (ug/dscm)	78.95	304.35	66.32	150
(ug/dscm @7% O ₂)	110.07	391.71	140.32	214
(g/hr)	0.16	0.60	0.14	0.297
Chromium (ug/dscm)	17.79	11.47	17.05	15.4
(ug/dscm @7% O ₂)	24.80	14.77	36.08	25.2
(g/hr)	0.04	0.02	0.04	0.031
Lead (ug/dscm)	943.80	1441.43	1152.78	1,180
(ug/dscm @7% O ₂)	1315.83	1855.17	2438.92	1,870
(g/hr)	1.87	2.83	2.39	2.36
Mercury (ug/dscm)	109.21	96.70	66.01	90.6
(ug/dscm @7% O ₂)	152.26	124.46	139.65	139
(g/hr)	0.22	0.19	0.14	0.181
Nickel (ug/dscm)	17.78	9.46	9.47	12.2
(ug/dscm @7% O ₂)	24.78	12.18	20.05	19.0
(g/hr)	0.035	0.019	0.020	0.024
Silver (ug/dscm)	[0.980]	[1.449]	[1.421]	[1.283]
(ug/dscm @7% O ₂)	[1.366]	[1.865]	[3.006]	[2.079]
(g/hr)	[0.002]	[0.003]	[0.003]	[0.003]
Thallium (ug/dscm)	[1.624]	[2.335]	[2.290]	[2.083]
(ug/dscm @7% O ₂)	[2.264]	[3.005]	[4.845]	[3.371]
(g/hr)	[0.003]	[0.005]	[0.005]	[0.004]

Note: Values enclosed in brackets represent the minimum detection limit for elements not detected in the samples. Detection limits are not included in the averages unless otherwise indicated.

TABLE 2-19. METALS/STACK GAS CONCENTRATIONS AND EMISSION RATES FOR
CONDITION 2; LENOIR MEMORIAL HOSPITAL (1990)

Date	06/04/90	06/06/90	06/05/90	
Time	15:43-19:47	16:57-21:07	11:21-15:32	
Run Number	4R	5R	6	
O2 Concentration (% V)	14.1	13.9	12.0	
Flow Rate (dscmm)	32.20	33.33	31.21	AVERAGE
Antimony ($\mu\text{g/dscm}$)	254.54	517.11	155.76	309
($\mu\text{g/dscm @7\% O}_2$)	521.08	1032.73	242.72	599
(g/hr)	0.49	1.03	0.29	0.606
Arsenic ($\mu\text{g/dscm}$)	5.96	6.34	4.04	5.45
($\mu\text{g/dscm @7\% O}_2$)	12.21	12.67	6.29	10.4
(g/hr)	0.01	0.01	0.01	0.011
Barium ($\mu\text{g/dscm}$)	87.27	58.04	92.59	79.3
($\mu\text{g/dscm @7\% O}_2$)	178.65	115.91	144.28	146
(g/hr)	0.17	0.12	0.17	0.153
Beryllium ($\mu\text{g/dscm}$)	[0.064]	[0.058]	[0.061]	[0.061]
($\mu\text{g/dscm @7\% O}_2$)	[0.131]	[0.116]	[0.095]	[0.114]
(g/hr)	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Cadmium ($\mu\text{g/dscm}$)	79.83	300.60	110.82	164
($\mu\text{g/dscm @7\% O}_2$)	163.41	600.33	172.69	312
(g/hr)	0.15	0.60	0.21	0.321
Chromium ($\mu\text{g/dscm}$)	25.81	12.74	15.64	18.1
($\mu\text{g/dscm @7\% O}_2$)	52.83	25.44	24.38	34.2
(g/hr)	0.05	0.03	0.03	0.035
Lead ($\mu\text{g/dscm}$)	3425.40	1029.21	994.15	1,820
($\mu\text{g/dscm @7\% O}_2$)	7012.24	2055.46	1549.18	3,540
(g/hr)	6.62	2.06	1.86	3.51
Mercury ($\mu\text{g/dscm}$)	101.98	137.47	48.54	96.0
($\mu\text{g/dscm @7\% O}_2$)	208.77	274.54	75.64	186
(g/hr)	0.20	0.27	0.09	0.188
Nickel ($\mu\text{g/dscm}$)	15.33	4.73	8.29	9.45
($\mu\text{g/dscm @7\% O}_2$)	31.38	9.44	12.92	17.9
(g/hr)	0.03	0.01	0.02	0.018
Silver ($\mu\text{g/dscm}$)	12.42	11.49	[1.023]	12.0
($\mu\text{g/dscm @7\% O}_2$)	25.43	22.94	[1.594]	24.2
(g/hr)	0.02	0.02	[0.002]	0.023
Thallium ($\mu\text{g/dscm}$)	[1.684]	[1.613]	[1.696]	[1.664]
($\mu\text{g/dscm @7\% O}_2$)	[3.447]	[3.221]	[2.643]	[3.104]
(g/hr)	[0.003]	[0.003]	[0.003]	[0.003]

Note: Values enclosed in brackets represent the minimum detection limits for elements not detected in the samples. Detection limits are not included in the averages unless otherwise indicated.

TABLE 2-20. METALS/STACK GAS CONCENTRATIONS AND EMISSION RATES FOR
CONDITION 3; LENOIR MEMORIAL HOSPITAL (1990)

Date	06/06/90	06/07/90	06/08/90	
Time	10:14-14:33	12:55-17:04	11:20-15:27	
Run Number	7	8	9	
O ₂ Concentration (%V)	13.0	14.6	13.1	
Flow Rate (dscmm)	30.33	31.63	30.80	AVERAGE
Antimony ($\mu\text{g/dscm}$)	796.64	854.78	1524.01	1,060
($\mu\text{g/dscm @7\% O}_2$)	1392.86	1894.97	2719.35	2,000
(g/hr)	1.45	1.62	2.82	1.96
Arsenic ($\mu\text{g/dscm}$)	11.69	9.33	8.71	9.91
($\mu\text{g/dscm @7\% O}_2$)	20.45	20.68	15.53	18.89
(g/hr)	0.02	0.02	0.02	0.018
Barium ($\mu\text{g/dscm}$)	60.50	85.81	126.13	90.8
($\mu\text{g/dscm @7\% O}_2$)	105.77	190.24	225.05	174
(g/hr)	0.11	0.16	0.23	0.169
Beryllium ($\mu\text{g/dscm}$)	[0.063]	[0.065]	[0.066]	[0.065]
($\mu\text{g/dscm @7\% O}_2$)	[0.110]	[0.144]	[0.118]	[0.124]
(g/hr)	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Cadmium ($\mu\text{g/dscm}$)	246.02	215.76	113.03	192
($\mu\text{g/dscm @7\% O}_2$)	430.15	478.32	201.69	370
(g/hr)	0.45	0.41	0.21	0.355
Chromium ($\mu\text{g/dscm}$)	19.28	14.52	63.40	32.4
($\mu\text{g/dscm @7\% O}_2$)	33.71	32.19	113.13	59.7
(g/hr)	0.04	0.03	0.12	0.060
Lead ($\mu\text{g/dscm}$)	1991.59	956.58	1354.26	1,430
($\mu\text{g/dscm @7\% O}_2$)	3482.15	2120.65	2416.46	2,670
(g/hr)	3.62	1.82	2.50	2.65
Mercury ($\mu\text{g/dscm}$)	3389.31	38.52	96.63	1,170
($\mu\text{g/dscm @7\% O}_2$)	5925.96	85.39	172.42	2,060
(g/hr)	6.17	0.07	0.18	2.14
Nickel ($\mu\text{g/dscm}$)	15.47	9.89	60.84	28.7
($\mu\text{g/dscm @7\% O}_2$)	27.05	21.92	108.56	52.5
(g/hr)	0.03	0.02	0.11	0.053
Silver ($\mu\text{g/dscm}$)	3.03	[1.063]	10.11	6.57
($\mu\text{g/dscm @7\% O}_2$)	5.30	[2.357]	18.04	11.7
(g/hr)	0.01	[0.002]	0.02	0.012
Thallium ($\mu\text{g/dscm}$)	[1.742]	[1.741]	[1.730]	[1.738]
($\mu\text{g/dscm @7\% O}_2$)	[3.046]	[3.860]	[3.087]	[3.331]
(g/hr)	[0.003]	[0.003]	[0.003]	[0.003]

Note: Values enclosed in brackets represent the minimum detection limits for elements not detected in the samples. Detection limits are not included in the averages unless otherwise indicated.

TABLE 2-23. METALS AND PM EMISSIONS SAMPLING AND FLUE GAS PARAMETERS
LENOIR MEMORIAL HOSPITAL (1990)

TEST CONDITION 1				
Run Number	1	2	3	Average
Date	05/30/90	05/31/90	06/01/90	
Total Sampling Time (min.)	240	240	240	240
Average Sampling Rate (dscfm)	0.526	0.366	0.373	0.422
Metered Volume (dscm)	3.572	2.484	2.533	2.863
Average Stack Temperature (°F)	1,289	1,341	1,341	1,324
O2 Concentration (% V)	10.9	10.1	14.3	11.8
CO2 Concentration (% V)	6.9	7.2	4.5	6.2
Stack Gas Moisture (% V)	12.2	12.7	13.2	12.7
Volumetric Flow Rate (acfm)	4,421	4,498	4,811	4,577
Volumetric Flow Rate (dscfm)	1,165	1,154	1,218	1,179
Volumetric Flow Rate (dscmm)	32.99	32.69	34.49	33.39
Percent Isokinetic	99.3	103	99.9	100.7
TEST CONDITION 2				
Run Number	4R	5R	6	Average
Date	06/04/90	06/06/90	06/05/90	
Total Sampling Time (min.)	240	240	240	240
Average Sampling Rate (dscfm)	0.507	0.529	0.503	0.513
Metered Volume (dscm)	3.445	3.595	3.420	3.487
Average Stack Temperature (°F)	1,282	1,312	1,254	1,283
O2 Concentration (% V)	14.1	13.9	12.0	13.3
CO2 Concentration (% V)	4.6	4.9	6.0	5.2
Stack Gas Moisture (% V)	11.6	11.8	10.9	11.4
Volumetric Flow Rate (acfm)	4,277	4,460	4,017	4,251
Volumetric Flow Rate (dscfm)	1,137	1,177	1,102	1,139
Volumetric Flow Rate (dscmm)	32.20	33.33	31.21	32.25
Percent Isokinetic	98.1	98.9	100	99.0
TEST CONDITION 3				
Run Number	7	8	9	Average
Date	06/06/90	06/07/90	06/08/90	
Total Sampling Time (min.)	240	240	240	240
Average Sampling Rate (dscfm)	0.490	0.498	0.493	0.494
Metered Volume (dscm)	3.329	3.388	3.353	3.357
Average Stack Temperature (°F)	1,312	1,268	1,289	1,289
O2 Concentration (% V)	13.0	14.6	13.1	13.6
CO2 Concentration (% V)	5.9	4.6	5.9	5.5
Stack Gas Moisture (% V)	12.6	13.0	13.1	12.9
Volumetric Flow Rate (acfm)	4,092	4,198	4,138	4,143
Volumetric Flow Rate (dscfm)	1,071	1,117	1,087	1,092
Volumetric Flow Rate (dscmm)	30.33	31.63	30.80	30.92
Percent Isokinetic	98.1	98.9	100	99.0

TABLE 2-25. PARTICULATE MATTER CONCENTRATIONS AND EMISSIONS RESULTS
LENOIR MEMORIAL HOSPITAL (1990)

DATE	SAMPLING CONDITION	RUN NUMBER	TIME	FLUE GAS CONCENTRATION				FLUE GAS EMISSION RATE		
				(grains/decf)	(grains/decf) @7 %O ₂	(grams/decim)	(grams/decim) @7 %O ₂	(lb/hr)	(kg/hr)	
5/30/90	1	1	14:56-20:22	0.068	0.095	0.156	0.218	0.681	0.309	
5/31/90	1	2	12:47-17:11	0.131	0.169	0.300	0.386	1.298	0.589	
6/1/90	1	3	10:19-14:40	0.086	0.182	0.197	0.417	0.900	0.408	
		AVERAGES:		0.095	0.149	0.218	0.340	0.960	0.435	
6/4/90	2	4R	15:47-19:47	0.082	0.168	0.188	0.385	0.802	0.364	
6/6/90	2	5R	16:57-21:07	0.071	0.142	0.163	0.326	0.719	0.326	
6/5/90	2	6	11:21-15:32	0.066	0.103	0.152	0.237	0.627	0.284	
		AVERAGES:		0.073	0.138	0.168	0.316	0.716	0.325	
6/6/90	3	7	10:14-14:33	0.252	0.441	0.577	1.010	2.317	1.051	
6/7/90	3	8	12:55-17:04	0.218	0.483	0.499	1.106	2.087	0.947	
6/9/90	3	9	11:20-15:27	0.242	0.432	0.553	0.988	2.246	1.023	
		AVERAGES:		0.237	0.452	0.543	1.034	2.217	1.007	

**TABLE 2-28. SUMMARY OF HCl RESULTS FOR EACH TEST RUN
LENOIR MEMORIAL HOSPITAL (1990)**

TEST RUN NUMBER	MEASURED CONCENTRATIONS				EMISSION RATE (g/hr)
	(mg/dscm)	(mg/dscm @7% O ₂)	(ppmv)	(ppmv @7% O ₂)	
RUN 1A	989	1280	652	844	1987
RUN 1B	1350	1820	892	1290	2716
RUN 1C	1090	1640	716	1080	2181
AVERAGE	1140	1580	753	1040	2295
RUN 2A	610	793	402	523	1261
RUN 2B	1130	1290	746	853	2339
RUN 2C	1360	1850	893	1220	2802
AVERAGE	1030	1310	680	866	2134
RUN 3A	1180	2750	776	1810	2450
RUN 3B	2130	6000	1410	3960	4439
RUN 3C	1160	2050	762	1350	2406
AVERAGE	1490	3600	982	2370	3099
RUN 4A	892	1290	588	853	1864
RUN 4B	1010	1460	663	965	2103
RUN 4C	1080	1630	710	1080	2250
AVERAGE	991	1460	654	964	2072
RUN 5RA	1170	2240	770	1480	2363
RUN 5RB	906	1770	598	1170	1835
RUN 5RC	NA	NA	NA	NA	NA
AVERAGE	1040	2010	684	1320	2099
RUN 6A	1110	1950	732	1290	2180
RUN 6B	878	1320	579	871	1724
RUN 6C	978	1360	645	896	1919
AVERAGE	989	1540	652	1020	1941
RUN 7A	1340	2175	885	1440	2446
RUN 7B	1770	3391	1170	2240	3226
RUN 7C	1190	2343	783	1550	2164
AVERAGE	1430	2636	945	1740	2612
RUN 8A	1690	4392	1110	2900	3211
RUN 8B	1290	2878	849	1900	2451
RUN 8C	1650	3224	1040	2130	3138
AVERAGE	1540	3498	1020	2310	2934
RUN 9A	1270	2160	836	1430	2391
RUN 9B	882	1419	582	936	1664
RUN 9C	1570	3022	1040	1990	2969
AVERAGE	1240	2200	819	1450	2341

NA = Not Analyzed; Run 5RC was not analyzed due to strong organics.

**TABLE 2-29. SUMMARY OF HF RESULTS FOR EACH TEST RUN
LENOIR MEMORIAL HOSPITAL (1990)**

TEST RUN NUMBER	MEASURED CONCENTRATIONS				EMISSION RATE (g/hr)
	(mg/dscm)	(mg/dscm @7% O ₂)	(ppmv)	(ppmv @7% O ₂)	
RUN 1A	1.72	2.22	2.06	2.67	3.45
RUN 1B	(0.916)	(1.23)	(1.10)	(1.48)	(1.841)
RUN 1C	2.12	3.19	2.55	3.83	4.26
AVERAGE	1.58	2.21	1.90	2.66	3.18
RUN 2A	1.80	2.34	2.16	2.82	3.72
RUN 2B	13.3	15.2	16.0	18.3	27.5
RUN 2C	3.04	4.15	3.65	4.99	6.28
AVERAGE	6.04	7.23	7.26	8.69	12.50
RUN 3A	6.19	14.5	7.44	17.4	12.90
RUN 3B	6.39	18.0	7.68	21.6	13.31
RUN 3C	3.77	6.68	4.54	8.04	7.86
AVERAGE	5.45	13.0	6.55	15.7	11.35
RUN 4A	1.64	2.38	1.97	2.86	3.43
RUN 4B	(1.47)	(2.14)	(1.77)	(2.57)	(3.076)
RUN 4C	13.5	20.5	16.3	24.6	28.3
AVERAGE	5.55	8.34	6.67	10.0	11.60
RUN 5RA	4.37	8.38	5.25	10.1	8.84
RUN 5RB	2.02	3.94	2.42	4.73	4.08
RUN 5RC	NA	NA	NA	NA	NA
AVERAGE	3.19	6.16	3.84	7.41	6.46
RUN 6A	(0.910)	(1.60)	(1.09)	(1.92)	(1.786)
RUN 6B	3.21	4.82	3.86	5.80	6.29
RUN 6C	3.23	4.49	3.88	5.39	6.34
AVERAGE	2.45	3.64	2.94	4.37	4.81
RUN 7A	9.52	15.4	11.4	18.6	17.36
RUN 7B	9.18	17.6	11.0	21.2	16.75
RUN 7C	4.46	8.80	5.36	10.6	8.13
AVERAGE	7.72	13.9	9.28	16.8	14.08
RUN 8A	2.33	6.06	2.80	7.28	4.43
RUN 8B	2.30	5.14	2.76	6.17	4.37
RUN 8C	(2.06)	(4.03)	(2.48)	(4.84)	(3.921)
AVERAGE	2.23	5.07	2.68	6.10	4.24
RUN 9A	9.52	16.2	11.4	19.5	17.95
RUN 9B	8.98	14.4	10.8	17.4	16.94
RUN 9C	5.26	10.1	6.32	12.1	9.91
AVERAGE	7.92	13.6	9.52	16.3	14.93

NA = Not Analyzed; Run 5RC was not analyzed due to strong organics.

() = maximum estimated concentration

TABLE 2-30. SUMMARY OF HB_r RESULTS AT EACH TEST RUN
LENOIR MEMORIAL HOSPITAL (1990)

TEST RUN NUMBER	MEASURED CONCENTRATIONS				EMISSION RATE (g/hr)
	(mg/dscm)	(mg/dscm @7% O ₂)	(ppmv)	(ppmv @7% O ₂)	
RUN 1A	[0.064]	[0.083]	[0.019]	[0.025]	[0.129]
RUN 1B	[0.089]	[0.120]	[0.026]	[0.035]	[0.179]
RUN 1C	[0.066]	[0.099]	[0.020]	[0.030]	[0.133]
AVERAGE	[0.073]	[0.101]	[0.022]	[0.030]	[0.147]
RUN 2A	[0.060]	[0.078]	[0.018]	[0.023]	[0.124]
RUN 2B	[0.095]	[0.109]	[0.028]	[0.032]	[0.196]
RUN 2C	[0.073]	[0.100]	[0.022]	[0.030]	[0.151]
AVERAGE	[0.076]	[0.096]	[0.023]	[0.028]	[0.157]
RUN 3A	[0.101]	[0.236]	[0.030]	[0.070]	[0.210]
RUN 3B	[0.101]	[0.284]	[0.030]	[0.084]	[0.210]
RUN 3C	[0.104]	[0.184]	[0.031]	[0.055]	[0.217]
AVERAGE	[0.102]	[0.235]	[0.030]	[0.070]	[0.212]
RUN 4A	[0.075]	[0.109]	[0.022]	[0.032]	[0.157]
RUN 4B	[0.091]	[0.132]	[0.027]	[0.039]	[0.190]
RUN 4C	[0.084]	[0.127]	[0.025]	[0.038]	[0.176]
AVERAGE	[0.083]	[0.123]	[0.025]	[0.036]	[0.174]
RUN 5RA	[0.077]	[0.148]	[0.023]	[0.044]	[0.156]
RUN 5RB	[0.068]	[0.133]	[0.020]	[0.039]	[0.138]
RUN 5RC	NA	NA	NA	NA	NA
AVERAGE	[0.073]	[0.141]	[0.022]	[0.042]	[0.147]
RUN 6A	0.590	1.036	0.175	0.308	1.157
RUN 6B	0.231	0.348	0.069	0.103	0.454
RUN 6C	[0.076]	[0.106]	[0.023]	[0.032]	[0.149]
AVERAGE	0.411	0.692	0.122	0.206	0.806
RUN 7A	2.57	4.17	0.763	1.24	4.68
RUN 7B	[0.056]	[0.107]	[0.017]	[0.033]	[0.102]
RUN 7C	[0.102]	[0.201]	[0.030]	[0.059]	[0.186]
AVERAGE	2.57	4.17	0.763	1.24	4.68
RUN 8A	1.52	3.96	0.452	1.18	2.90
RUN 8B	0.615	1.37	0.183	0.408	1.17
RUN 8C	[0.129]	[0.252]	[0.038]	[0.074]	[0.246]
AVERAGE	1.07	2.67	0.317	0.793	2.03
RUN 9A	2.10	3.58	0.624	1.06	3.96
RUN 9B	1.87	3.01	0.556	0.89	3.53
RUN 9C	1.87	3.58	0.555	1.07	3.52
AVERAGE	1.95	3.39	0.578	1.01	3.67

NA = Not Analyzed; Run 5RC was not analyzed due to strong organics
[] = minimum detection limit

TABLE 2-32. CONTINUOUS EMISSIONS MONITORING DAILY TEST AVERAGES FOR O₂, CO, CO₂, AND HCl
LENOIR MEMORIAL HOSPITAL (1990)

DATE	RUN NUMBER/ MANUAL TEST TYPE	CONDITION	TEST a TIME	MOISTURE	OXYGEN (% V, dry)	CO ₂ (% V, dry)	CO actual (ppmv, dry)	CO corrected b (ppmv, dry) @ 7% O ₂	HCl c actual (ppmv, wet) p _i	HCl c corrected d (ppmv, dry) @ 7% O ₂
05/30/90	1	1	14:56-20:22	12.03	10.93	6.91	145.8 (wet) e	167.0 d	25.3	34.8
05/31/90	2	1	12:47-17:11	12.72	10.10	7.20	112.8 (wet) e	149.0 d	208.5	321.0
06/01/90	3	1	10:19-14:40	13.38	14.33	4.49	25.9 (wet) e	63.8 d	129.3	355.0
	AVERAGE:				11.79	6.20	94.8 (wet) e	126.6 d	121.0	236.9
06/02/90	4	2	10:02-14:23	11.74	11.38	6.35	36.0	54.4	33.3	61.7
06/04/90	4R f	2	15:43-19:47	11.61	14.11	4.55	65.5	97.4		
06/06/90	5R	2	16:57-21:07	11.64	13.94	4.89	62.7	105.0	8.8	18.0
06/05/90	6	2	11:21-15:32	11.03	11.98	6.01	48.3	75.0	90.1	116.0
	AVERAGE:				12.43	5.75	49.0	78.1	44.1	65.2
06/06/90	7	3	10:14-14:33	12.67	12.95	5.94	1698.4	2193.0	21.7	44.3
06/07/90	8	3	12:55-17:04	12.99	14.63	4.59	491.0	774.0	92.6	279.0
06/08/90	9	3	11:20-15:27	13.24	13.11	5.86	1330.5	2061.0	140.8	339.0
	AVERAGE:				13.56	5.46	1173.3	1676.0	85.0	220.8

a For metals/CDD/CDF runs.

b 30 second averages were corrected to 7% oxygen (corrected value = actual * (13.9 / (20.9 - O₂)).

c HCl concentrations were determined by manual methods as well. A comparison of CEM vs. manual results is presented in Section 2.6.

d 30 second averages were corrected to 7% oxygen and for moisture, where the corrected value = actual * 13.9 / (20.9 - O₂) * (1 / (1 - moist)).

e These values were determined using a dilution probe system. Because the CEM concentration trends were extremely noisy with very high, sharp peaks, this system may not have been able to fully resolve CO concentrations and values may be biased low.

f Toxic metals Run 4 originally scheduled to be performed on 6/02 was performed on 6/04. CEM values for this run are not included in condition averages.

TABLE 2-33. CONTINUOUS EMISSIONS MONITORING DAILY TEST AVERAGES FOR O₂, SO₂, NO_x AND THC
LENOIR MEMORIAL HOSPITAL (1990)

DATE	RUN NUMBER	CONDITION	TEST TIME ^a	MOISTURE (% V)	OXYGEN (% V, dry)	SO ₂ actual (ppmv, dry)	SO ₂ corrected ^b (ppmv, dry)	NO _x actual (ppmv, dry)	NO _x corrected ^b (ppmv, dry)	THC actual (ppmC, wet)	THC corrected ^c (ppmC, dry)
05/30/90	1	1	14:56-20:22	12.03	10.93	10.96	12.60	44.6	62.2	7.43	10.90
05/31/90	2	1	12:47-17:11	12.72	10.10	16.09	15.30	66.7	88.0	12.61	19.00
06/01/90	3	1	10:19-14:40	13.38	14.33	3.92	7.83	43.7	94.6	12.02	29.50
	AVERAGE:				11.79	10.32	11.91	51.7	81.6	10.69	19.80
06/02/90	4	2	10:02-14:23	11.74	11.38	5.20	6.71	56.3	85.5	2.43	4.11
06/04/90	4R	2	15:43-19:47	11.61	14.11	7.41	10.99	31.6	70.2	18.47	16.60
06/06/90	5R	2	16:57-21:07	11.64	13.94	8.60	12.76	45.8	93.8	e	e
06/05/90	6	2	11:21-15:32	11.03	11.98	4.78	4.59	51.1	84.2	6.66	10.90
	AVERAGE:g				12.43	6.19	8.02	51.0	87.8	4.55	7.51
06/06/90	7	3	10:14-14:33	12.67	12.95	12.37	16.50	56.9	95.8	11.39	17.80
06/07/90	8	3	12:55-17:04	12.99	14.63	6.28	8.61	43.4	95.5	e	e
06/08/90	9	3	11:20-15:27	13.24	13.11	23.14	31.90	56.6	102.0	48.3 f	75.80
	AVERAGE:				13.56	13.93	19.00	52.3	97.8	11.39	46.80

^a Time is for metals and CDD/CDF runs.

^b SO₂ and NO_x are corrected to 7% oxygen, where the corrected value = actual * 13.9/(20.9 - O₂).

^c THC is corrected to 7% oxygen and corrected for moisture where the corrected value = actual * 13.9/(20.9 - O₂) * 1/(1 - moist).

^d Toxic metals Run 4 originally scheduled to be performed on 6/02 was performed on 6/04. CEM values for this run are not included in condition averages.

^e THC analyzer failure

^f The total hydrocarbon concentration was recorded on a wet basis for all test days except 6/08 in which the sample stream was conditioned and therefore THC was monitored on a dry basis.

^g Averages do not include Run 4R.

TABLE 3-1. OPERATING PARAMETERS FOR EMISSIONS TESTS

Condition	Proposed operating parameters				Revised operating parameters			
	Feed rate, kg/hr (lb/hr)	Charge rate, kg/charge (lb/charge)	Charge cycle, min	Secondary chamber burner setpoint temp., °C (°F)	Feed rate, kg/hr (lb/hr)	Charge rate, kg/charge (lb/charge)	Charge cycle, min	Secondary chamber burner setpoint temp., °C (°F)
I	136 (300)	14 (30)	6	1038-1093 (1900-2000)	136 (300)	14 (30)	6	1038 (1900)
II	91 (200)	9.1 (20)	6	1038-1093 (1900-2000)	91 (200)	9.1 (20)	6	1038 (1900)
III	145 (320)	36 (80)	15	870 (1600)	136 (300)	23 (50)	10	870 (1600)
IV	136 (300)	23 (50)	10	1093 (2000)	None			

United States
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Agency

Office of Air Quality
Planning and Standards
Research Triangle Park, NC 27711

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Medical Waste Incineration Emission Test Report

Cape Fear Memorial Hospital
Wilmington, North Carolina

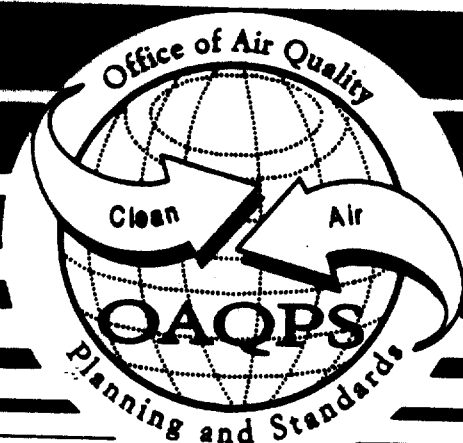


TABLE 2-6. CDD/CDF STACK GAS CONCENTRATIONS AND EMISSIONS RATES AT CONDITION 1;
CAPE FEAR MEMORIAL HOSPITAL (1990)

CONGENER	CONCENTRATION ^a (ng/dscm, as measured)				EMISSIONS (µg/hr)			
	RUN 1	RUN 5	RUN 6	AVERAGE	RUN 1	RUN 5	RUN 6	AVERAGE
DIOXINS								
2378 TCDD	(1.52)	0.80	[1.02]	1.16	(2.66)	1.58	[1.88]	2.12
Other TCDD	16.0	9.82	[1.02]	12.9	28.0	19.4	[1.88]	23.7
12378 PCDD	(6.00)	5.159	[1.20]	5.579	(10.5)	10.18	[2.21]	10.4
Other PCDD	30.0	25.7	[1.20]	27.8	52.6	50.8	[2.21]	51.7
123478 HxCDD	7.75	7.92	[3.25]	7.83	13.60	15.62	[5.97]	14.6
123678 HxCDD	9.39	9.74	[2.81]	9.57	16.50	19.22	[5.17]	17.9
123789 HxCDD	20.6	17.0	[3.39]	18.8	36.1	33.5	[6.24]	34.8
Other HxCDD	63.2	48.7	[3.13]	55.9	111	96.0	[5.76]	103
1234678-HpCDD	72.8	86.6	9.50	56.3	128	171	17.5	105
Other HpCDD	73.8	80.8	0.00	77.3	130	160	0.000	145
Octa-CDD	133	165	48.5	116	234	326	89.3	216
Total CDD	434	457	58	317	763	902	107	591
FURANS								
2378 TCDF	5.17	5.43	[0.32]	5.30	9.09	10.7	[0.59]	9.91
Other TCDF	192	200	10.7	134	338	395	19.69	251
12378 PCDF	30.6	27.2	1.52	19.8	53.7	53.7	2.80	36.7
23478 PCDF	33.9	41.9	2.69	26.2	59.6	82.7	4.95	49.1
Other PCDF	413	414	24.4	284	726	816	44.88	529
123478 HxCDF	139	149	(13.5)	101	245	293	(24.9)	188
123678 HxCDF	79.8	88.8	6.26	58.3	140	175	11.5	109
234678 HxCDF	98.5	160	19.4	92.7	173	316	35.8	175
123789 HxCDF	4.65	6.57	[3.45]	5.61	8.16	12.96	[6.35]	10.56
Other HxCDF	406	435	22.5	288	713	857	41.5	537
1234678-HpCDF	306	314	43.3	221	538	621	79.6	413
1234789-HpCDF	37.6	51.3	(6.99)	32.0	66.0	101	(12.9)	60.0
Other HpCDF	220	233	47.9	167	386	459	88.2	311
Octa-CDF	343	406	152	300	602	800	280	561
TOTAL CDF	2,310	2,530	350	1,730	4,060	4,990	647	3,230
TOTAL CDD+CDF	2,740	2,990	410	2,050	4,820	5,900	753	3,820

^a ng/dscm = nanogram per dry standard cubic meter. Standard conditions are defined as 1 atm and 68°F.
 () = estimated maximum possible concentration. [] = minimum detection limit

2-7. CDD/CDF STACK GAS CONCENTRATIONS AND EMISSIONS RATES AT CONDITION 2;
CAPE FEAR MEMORIAL HOSPITAL (1990)

POLLUTANT	CONCENTRATION μ (ng/dscm, as measured)				EMISSIONS (μ g/hr)			
	RUN 2	RUN 3	RUN 4	AVERAGE	RUN 2	RUN 3	RUN 4	AVERAGE
PCB	1.66	6.41	4.08	4.05	2.39	11.2	7.42	6.99
PCB	74.0	94.7	57.6	75.4	106	165	105	125
PCB	7.00	26.5	17.8	17.1	10.1	46.2	32.3	29.5
PCB	69.4	149	106	108	100	260	193	184
CDD	9.16	28.4	19.1	18.9	13.2	49.4	34.7	32.4
CDD	14.4	33.6	22.5	23.5	20.7	58.5	40.9	40.0
CDD	25.0	60.9	47.5	44.5	36	106	86.3	76.1
CDD	93.4	197	139	143	134	344	252	243
CDD	124	156	100	127	178	272	182	211
CDD	128	157	94.4	127	184	274	172	210
CDD	312	152	75.0	180	448	265	136	283
	858	1,062	683	868	1,233	1,850	1242	1442
PCB	5.71	26.3	19.3	17.1	8.2	45.8	35.1	29.7
PCB	292	765	615	557	420	1332	1118	956
PCB	26.3	115	90.6	77.2	37.80	200	165	134
PCB	35.0	117	100	84.1	50.36	204	182	145
PCB	468	1290	1211	990	673	2248	2200	1710
PCB	157	392	307	285	225	683	558	489
PCB	68.9	247	199	172	99.0	430	362	297
PCB	158	223	180	187	227	388	327	314
PCB	3.86	15.1	(12.5)	10.5	5.55	26.3	(22.7)	18.2
PCB	419	1107	1014	847	602	1930	1843	1457
CDF	350	606	455	470	503	1055	826	795
CDF	55.2	82.9	63.4	67.2	79.4	144	115	113
CDF	306	376	287	323	441	654	522	539
CDF	817	290	206	438	1175	505	374	684
	3,160	5,650	4,760	4,520	4,550	9,840	8,650	7,680
+CDF	4,020	6,710	5,440	5,390	5,780	11,700	9,890	9,120

nanogram per dry standard cubic meter. Standard conditions are defined as 1 atm and 68°F.
ed maximum possible concentration

TABLE 2-8. CDD/CDF STACK GAS CONCENTRATIONS AND EMISSIONS RATES AT CONDITION 3;
CAPE FEAR MEMORIAL HOSPITAL (1990)

CONGENER	CONCENTRATION ^a (ng/dscm, as measured)				EMISSIONS (µg/hr)			
	RUN 7	RUN 8	RUN 9	AVERAGE	RUN 7	RUN 8	RUN 9	AVERAGE
DIOXINS								
2378 TCDD	4.04	[1.46]	4.13	4.08	6.62	[2.21]	6.34	6.48
Other TCDD	47.6	10.5	55.3	37.8	78.0	16.0	85.0	59.7
12378 PCDD	15.8	6.55	25.1	15.8	25.9	10.0	38.6	24.8
Other PCDD	82.9	31.8	126.6	80.4	136	48.5	194	126
123478 HxCDD	17.3	(8.06)	31.6	19.0	28.4	(12.3)	48.5	29.7
123678 HxCDD	19.5	8.34	36.0	21.3	32.0	12.7	55.2	33.3
123789 HxCDD	36.7	18.0	75.5	43.4	60.2	27.4	116	67.8
Other HxCDD	102	55.3	245	134	167	84.2	376	209
1234678-HpCDD	84.4	48.2	188	107	138	73.3	289	167
Other HpCDD	77.1	41.9	193	104	126	63.8	296	162
Octa-CDD	66.5	50.1	118	78.2	109	76.2	181	122
Total CDD	554	279	1,098	644	908	424	1,686	1,006
FURANS								
2378 TCDF	16.4	9.07	15.4	13.6	26.9	13.8	23.7	21.4
Other TCDF	397	272	522	397	651	414	802	622
12378 PCDF	53.3	33.4	78.3	55.0	87.4	50.8	120	86
23478 PCDF	68.9	40.3	97.9	69.0	113	61.4	150	108
Other PCDF	666	423	1,113	734	1,091	643	1,710	1,150
123478 HxCDF	187	129	392	236	306	196	601	368
123678 HxCDF	125	84	236	149	206	128	362	232
234678 HxCDF	159	75	217	150	261	114	333	236
123789 HxCDF	7.85	4.76	12.1	8.22	12.9	7.24	18.5	12.9
Other HxCDF	610	429	1,114	727	1,000	654	1,750	1,140
1234678-HpCDF	266	200	584	350	437	304	897	546
1234789-HpCDF	36.1	29.3	75.1	46.8	59.2	44.6	115	73.0
Other HpCDF	171	132	374	226	280	201	573	352
Octa-CDF	108	102	206	139	176	156	317	216
Total CDF	2,870	1,960	5,060	3,300	4,710	2,990	7,770	5,160
Total CDD+CDF	3,430	2,240	6,160	3,940	5,620	3,410	9,460	6,160

^a ng/dscm = nanogram per dry standard cubic meter. Standard conditions are defined as 1 atm and 68° F.

() = estimated maximum possible concentration [] = minimum detection limit.

TABLE 2-17. POLYAROMATIC HYDROCARBONS FLUE GAS RESULTS
CDD/CDF RUN 8; CAPE FEAR MEMORIAL HOSPITAL (1990)

CONGENER	ANALYSIS (total μg)	GAS CONC. ($\mu\text{g}/\text{dscm}$)	GAS CONC. @7% O ₂ ($\mu\text{g}/\text{dscm}$)	EMISSIONS (mg/hr)
Naphthalene	607	340	406	517
2-Methylanaphthalene	[0.230]	[0.129]	[0.154]	[0.196]
2-Chloronaphthalene	[0.290]	[0.162]	[0.193]	[0.247]
Acenaphthylene	20.3	11.3	13.5	17.3
Acenaphthene	[0.260]	[0.145]	[0.173]	[0.221]
Fluorene	[0.260]	[0.145]	[0.173]	[0.221]
Phenanthrene	72.3	40.5	48.3	61.6
Anthracene	[0.170]	[0.095]	[0.113]	[0.145]
Fluoranthene	76.9	43.0	51.4	65.5
Pyrene	[0.090]	[0.050]	[0.060]	[0.076]
Benzo(a)anthracene	[0.100]	[0.056]	[0.067]	[0.085]
Chrysene	[0.100]	[0.056]	[0.067]	[0.085]
Benzo(b)fluoranthene	[0.140]	[0.078]	[0.093]	[0.119]
Benzo(k)fluoranthene	[0.140]	[0.078]	[0.093]	[0.119]
Benzo(a)pyrene	[0.150]	[0.084]	[0.100]	[0.128]
Benzo(e)pyrene	[0.160]	[0.090]	[0.107]	[0.137]
Perylene	[0.260]	[0.145]	[0.173]	[0.221]
Indeno(1,2,3-cd)pyrene	[0.200]	[0.112]	[0.134]	[0.170]
Dibenz(a,h)anthracene	[0.180]	[0.101]	[0.121]	[0.154]
Benzo(g,h,i)perylene	[0.160]	[0.090]	[0.107]	[0.137]
TOTAL	776.5	434.5	518.9	661.2

[] = minimum detection limit.

() = estimated maximum possible concentration.

TABLE 2-18. CHLORINATED PHENOLS AND CHLORINATED BENZENES FLUE GAS RESULTS
CDD/CDF RUN 8; CAPE FEAR MEMORIAL HOSPITAL (1990)

CONGENER	ANALYSIS (total μg)	GAS CONC. ($\mu\text{g}/\text{dscm}$)	GAS CONC. @7% O ₂ ($\mu\text{g}/\text{dscm}$)	EMISSIONS (mg/hr)
2-Chlorophenol	[0.410]	[0.229]	[0.273]	[0.348]
3-Chlorophenol	[0.380]	[0.213]	[0.254]	[0.324]
4-Chlorophenol	[0.380]	[0.213]	[0.254]	[0.324]
2,4-Dichlorophenol	[0.580]	[0.325]	[0.388]	[0.495]
2,5-Dichlorophenol	[0.580]	[0.325]	[0.388]	[0.495]
2,3-Dichlorophenol	[0.280]	[0.157]	[0.187]	[0.239]
2,6-Dichlorophenol	[0.550]	[0.308]	[0.368]	[0.469]
3,5-Dichlorophenol	[0.590]	[0.330]	[0.394]	[0.502]
3,4-Dichlorophenol	[0.600]	[0.336]	[0.401]	[0.511]
2,3,5-Trichlorophenol	[0.890]	[0.498]	[0.595]	[0.758]
2,4,6-Trichlorophenol	[0.970]	[0.543]	[0.648]	[0.826]
2,4,5-Trichlorophenol	[0.810]	[0.453]	[0.541]	[0.689]
2,3,4-Trichlorophenol	[0.880]	[0.492]	[0.588]	[0.749]
2,3,6-Trichlorophenol	[0.980]	[0.548]	[0.654]	[0.834]
2,3,5,6-Tetrachlorophenol	[1.110]	[0.621]	[0.742]	[0.945]
2,3,4,6-Tetrachlorophenol	[1.080]	[0.604]	[0.721]	[0.919]
Pentachlorophenol	[1.410]	[0.789]	[0.942]	[1.201]
Total Chlorophenols	none detected			
1,3-Dichlorobenzene	[0.380]	[0.213]	[0.254]	[0.324]
1,4-Dichlorobenzene	[0.360]	[0.201]	[0.240]	[0.306]
1,2-Dichlorobenzene	[0.390]	[0.218]	[0.260]	[0.332]
1,3,5-Trichlorobenzene	[0.540]	[0.302]	[0.361]	[0.460]
1,2,4-Trichlorobenzene	[0.530]	[0.297]	[0.355]	[0.452]
1,2,3-Trichlorobenzene	[0.550]	[0.308]	[0.368]	[0.469]
1,2,3,5-Tetrachlorobenzene	[0.290]	[0.162]	[0.193]	[0.247]
1,2,4,5-Tetrachlorobenzene	[0.400]	[0.224]	[0.267]	[0.341]
1,2,3,4-Tetrachlorobenzene	[0.530]	[0.297]	[0.355]	[0.452]
Pentachlorobenzene	[0.740]	[0.414]	[0.494]	[0.630]
Hexachlorobenzene	[0.800]	[0.448]	[0.535]	[0.682]
Total Chlorobenzenes	none detected			

[] = minimum detection limit.

() = estimated maximum possible concentration.

TABLE 2-19. PCB FLUE GAS RESULTS;
CDD/CDF RUN 8, CAPE FEAR MEMORIAL HOSPITAL (1990)

CONGENER	ANALYSIS (total ng)	GAS CONC. (ng/dscm)	GAS CONC. @7% O ₂ (ng/dscm)	EMISSIONS (µg/hr)
TOTAL MONO PCB	[0.008]	[0.004]	[0.005]	[0.006]
TOTAL DI PCB	[0.010]	[0.006]	[0.007]	[0.009]
TOTAL TRI PCB	[0.020]	[0.011]	[0.013]	[0.017]
TOTAL TETRA PCB	(0.550)	(0.308)	(0.368)	(0.469)
TOTAL PENTA PCB	(0.370)	(0.207)	(0.247)	(0.315)
TOTAL HEXA PCB	[0.030]	[0.017]	[0.020]	[0.026]
TOTAL HEPTA PCB	[0.020]	[0.011]	[0.013]	[0.017]
TOTAL OCTA PCB	0.030	0.017	0.020	0.026
TOTAL NONA PCB	[0.020]	[0.011]	[0.013]	[0.017]
DECA PCB	[0.020]	[0.011]	[0.013]	[0.017]
TOTAL	0.950	0.532	0.635	0.810

[] = minimum detection limit.

() = estimated maximum possible concentration.

TABLE 2-20. AVERAGE METALS/STACK GAS CONCENTRATIONS AND
EMISSION RATES AT EACH CONDITION;
CAPE FEAR MEMORIAL HOSPITAL (1990)

TEST CONDITION RUN NUMBERS		1	2	3
		1,5,6	2,3,4	7,8,9
Antimony	($\mu\text{g/dscm}$)	1190	1480	1390
	($\mu\text{g/dscm @ 7\% O}_2$)	1360	1640	1730
	(g/hr)	2.16	2.43	2.28
Arsenic	($\mu\text{g/dscm}$)	10.2	22.6	13.3
	($\mu\text{g/dscm @ 7\% O}_2$)	11.9	25.0	16.7
	(g/hr)	0.019	0.039	0.022
Barium	($\mu\text{g/dscm}$)	220	558	235
	($\mu\text{g/dscm @ 7\% O}_2$)	256	605	294
	(g/hr)	0.412	0.930	0.388
Beryllium	($\mu\text{g/dscm}$)	[0.060]	[0.070]	0.846
	($\mu\text{g/dscm @ 7\% O}_2$)	[0.071]	[0.076]	1.29
	(g/hr)	[0.0001]	[0.0001]	0.001
Cadmium	($\mu\text{g/dscm}$)	237	351	447
	($\mu\text{g/dscm @ 7\% O}_2$)	280	385	584
	(g/hr)	0.462	0.588	0.748
Chromium	($\mu\text{g/dscm}$)	27.6	30.9	21.3
	($\mu\text{g/dscm @ 7\% O}_2$)	32.6	33.9	27.4
	(g/hr)	0.054	0.052	0.036
Lead	($\mu\text{g/dscm}$)	3950	5700	4240
	($\mu\text{g/dscm @ 7\% O}_2$)	4660	6250	5350
	(g/hr)	7.73	9.69	7.04
Mercury	($\mu\text{g/dscm}$)	157	456	1820
	($\mu\text{g/dscm @ 7\% O}_2$)	184	510	2640
	(g/hr)	0.297	0.695	3.14
Nickel	($\mu\text{g/dscm}$)	11.3	7.03	7.28
	($\mu\text{g/dscm @ 7\% O}_2$)	13.6	7.70	9.37
	(g/hr)	0.023	0.012	0.012
Silver	($\mu\text{g/dscm}$)	6.61	16.3	8.68
	($\mu\text{g/dscm @ 7\% O}_2$)	7.79	17.9	10.9
	(g/hr)	0.013	0.026	0.014
Thallium	($\mu\text{g/dscm}$)	93.4	109	270
	($\mu\text{g/dscm @ 7\% O}_2$)	112	118	365
	(g/hr)	0.186	0.187	0.455

Note:

Values enclosed in brackets represent the minimum detection limits for compounds not detected in the samples. Detection limits are included in the averages unless otherwise indicated.

TABLE 2-21. METALS/STACK GAS CONCENTRATIONS AND EMISSION RATES FOR
CONDITION 1;
CAPE FEAR MEMORIAL HOSPITAL (1990)

DATE TIME RUN NUMBER O ₂ CONCENTRATION (% V) FLOW RATE (dscmm)	08/15/90 12:32-16:52 1 8.5 28.71	08/21/90 10:32-14:48 5 9.2 34.93	08/22/90 10:30-14:42 6 9.8 34.33	AVERAGE
Antimony ($\mu\text{g/dscm}$)	2668.03	730.70	176.42	1190
($\mu\text{g/dscm}$ @ 7 % O ₂)	2998.03	871.07	221.13	1360
(g/hr)	4.60	1.53	0.36	2.16
Arsenic ($\mu\text{g/dscm}$)	17.78	8.68	4.21	10.2
($\mu\text{g/dscm}$ @ 7 % O ₂)	19.97	10.35	5.27	11.9
(g/hr)	0.03	0.02	0.01	0.019
Barium ($\mu\text{g/dscm}$)	389.22	167.11	104.47	220
($\mu\text{g/dscm}$ @ 7 % O ₂)	437.36	199.21	130.94	256
(g/hr)	0.67	0.35	0.22	0.412
Beryllium ($\mu\text{g/dscm}$)	[0.072]	[0.054]	[0.055]	[0.060]
($\mu\text{g/dscm}$ @ 7 % O ₂)	[0.081]	[0.064]	[0.069]	[0.071]
(g/hr)	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Cadmium ($\mu\text{g/dscm}$)	263.39	281.44	167.02	237
($\mu\text{g/dscm}$ @ 7 % O ₂)	295.97	335.50	209.33	280
(g/hr)	0.45	0.59	0.34	0.462
Chromium ($\mu\text{g/dscm}$)	27.06	40.39	15.29	27.6
($\mu\text{g/dscm}$ @ 7 % O ₂)	30.41	48.15	19.16	32.6
(g/hr)	0.05	0.08	0.03	0.054
Lead ($\mu\text{g/dscm}$)	4230.64	5345.25	2284.79	3950
($\mu\text{g/dscm}$ @ 7 % O ₂)	4753.91	6372.13	2863.71	4660
(g/hr)	7.29	11.20	4.71	7.73
Mercury ($\mu\text{g/dscm}$)	254.82	100.70	116.76	157
($\mu\text{g/dscm}$ @ 7 % O ₂)	286.34	120.04	146.35	184
(g/hr)	0.44	0.21	0.24	0.297
Nickel ($\mu\text{g/dscm}$)	4.26	22.98	6.77	11.3
($\mu\text{g/dscm}$ @ 7 % O ₂)	4.79	27.39	8.48	13.6
(g/hr)	0.01	0.05	0.01	0.023
Silver ($\mu\text{g/dscm}$)	6.18	11.49	2.17	6.61
($\mu\text{g/dscm}$ @ 7 % O ₂)	6.94	13.70	2.73	7.79
(g/hr)	0.01	0.02	0.004	0.013
Thallium ($\mu\text{g/dscm}$)	69.94	113.87	96.45	93.4
($\mu\text{g/dscm}$ @ 7 % O ₂)	78.59	135.74	120.88	112
(g/hr)	0.12	0.24	0.20	0.186

Note:

Values enclosed in brackets represent the minimum detection limits for compounds not detected in the samples. Detection limits are not included in the averages unless otherwise indicated.

TABLE 2-22. METALS/STACK GAS CONCENTRATIONS AND EMISSION RATES FOR
CONDITION 2;
CAPE FEAR MEMORIAL HOSPITAL (1990)

DATE	08/18/90	08/19/90	08/20/90	
TIME	09:46-16:31	10:00-15:19	12:10-16:42	
RUN NUMBER	2	3	4	
O2 CONCENTRATION (% V)	7.17	9.38	7.67	
FLOW RATE (dscmm)	24.01	26.10	33.54	AVERAGE
Antimony ($\mu\text{g/dscm}$)	1191.46	2078.42	1158.64	1480
($\mu\text{g/dscm @ 7 \% O}_2$)	1206.21	2507.81	1217.31	1640
(g/hr)	1.72	3.25	2.33	2.43
Arsenic ($\mu\text{g/dscm}$)	16.26	26.34	25.34	22.6
($\mu\text{g/dscm @ 7 \% O}_2$)	16.47	31.78	26.62	25.0
(g/hr)	0.02	0.04	0.05	0.039
Barium ($\mu\text{g/dscm}$)	614.61	508.12	550.35	558
($\mu\text{g/dscm @ 7 \% O}_2$)	622.22	613.10	578.22	605
(g/hr)	0.89	0.80	1.11	0.930
Beryllium ($\mu\text{g/dscm}$)	[0.079]	[0.073]	[0.057]	[0.070]
($\mu\text{g/dscm @ 7 \% O}_2$)	[0.080]	[0.088]	[0.060]	[0.076]
(g/hr)	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Cadmium ($\mu\text{g/dscm}$)	328.96	381.68	343.80	351
($\mu\text{g/dscm @ 7 \% O}_2$)	333.04	460.53	361.21	385
(g/hr)	0.47	0.60	0.69	0.588
Chromium ($\mu\text{g/dscm}$)	29.49	33.95	29.26	30.9
($\mu\text{g/dscm @ 7 \% O}_2$)	29.86	40.96	30.75	33.9
(g/hr)	0.04	0.05	0.06	0.052
Lead ($\mu\text{g/dscm}$)	4421.13	6246.41	6416.47	5700
($\mu\text{g/dscm @ 7 \% O}_2$)	4475.87	7536.90	6741.42	6250
(g/hr)	6.37	9.78	12.91	9.69
Mercury ($\mu\text{g/dscm}$)	605.46	729.91	34.00	456
($\mu\text{g/dscm @ 7 \% O}_2$)	612.96	880.71	35.72	510
(g/hr)	0.87	1.14	0.07	0.695
Nickel ($\mu\text{g/dscm}$)	7.04	7.81	6.23	7.03
($\mu\text{g/dscm @ 7 \% O}_2$)	7.13	9.42	6.54	7.70
(g/hr)	0.01	0.01	0.01	0.012
Silver ($\mu\text{g/dscm}$)	19.52	20.06	9.23	16.3
($\mu\text{g/dscm @ 7 \% O}_2$)	19.76	24.20	9.70	17.9
(g/hr)	0.03	0.03	0.02	0.026
Thallium ($\mu\text{g/dscm}$)	92.54	97.85	136.44	109
($\mu\text{g/dscm @ 7 \% O}_2$)	93.69	118.06	143.35	118
(g/hr)	0.13	0.15	0.27	0.187

Note:

Values enclosed in brackets represent the minimum detection limits for compounds not detected in the samples. Detection limits are not included in the averages unless otherwise indicated.

TABLE 2-23. METALS/STACK GAS CONCENTRATIONS AND EMISSION RATES FOR
CONDITION 3;
CAPE FEAR MEMORIAL HOSPITAL (1990)

DATE TIME RUN NUMBER O2 CONCENTRATION (%V) FLOW RATE (dscmm)	08/26/90 11:40-15:58 7	08/27/90 10:59-15:06 8	08/28/90 10:05-14:30 9	
	11.77	9.26	9.00	
	29.24	27.73	26.23	AVERAGE
Antimony ($\mu\text{g/dscm}$)	776.24	1414.34	1976.90	1390
($\mu\text{g/dscm}$ @ 7 % O2)	1181.79	1688.94	2309.15	1730
(g/hr)	1.36	2.35	3.11	2.28
Arsenic ($\mu\text{g/dscm}$)	8.64	15.25	16.13	13.3
($\mu\text{g/dscm}$ @ 7 % O2)	13.16	18.21	18.85	16.7
(g/hr)	0.02	0.03	0.03	0.022
Barium ($\mu\text{g/dscm}$)	137.95	290.90	277.62	235
($\mu\text{g/dscm}$ @ 7 % O2)	210.02	347.38	324.27	294
(g/hr)	0.24	0.48	0.44	0.388
Beryllium ($\mu\text{g/dscm}$)	0.85	[0.107]	[0.071]	0.846
($\mu\text{g/dscm}$ @ 7 % O2)	1.29	[0.128]	[0.083]	1.29
(g/hr)	0.001	[0.0002]	[0.0001]	0.001
Cadmium ($\mu\text{g/dscm}$)	480.15	518.56	343.07	447
($\mu\text{g/dscm}$ @ 7 % O2)	731.00	619.24	400.73	584
(g/hr)	0.84	0.86	0.54	0.748
Chromium ($\mu\text{g/dscm}$)	19.64	26.17	18.11	21.3
($\mu\text{g/dscm}$ @ 7 % O2)	29.90	31.25	21.16	27.4
(g/hr)	0.03	0.04	0.03	0.036
Lead ($\mu\text{g/dscm}$)	2834.72	6456.53	3431.35	4240
($\mu\text{g/dscm}$ @ 7 % O2)	4315.73	7710.12	4008.05	5350
(g/hr)	4.97	10.74	5.40	7.04
Mercury ($\mu\text{g/dscm}$)	4297.94	786.63	370.47	1820
($\mu\text{g/dscm}$ @ 7 % O2)	6543.41	939.36	432.73	2640
(g/hr)	7.54	1.31	0.58	3.14
Nickel ($\mu\text{g/dscm}$)	6.71	8.90	6.23	7.28
($\mu\text{g/dscm}$ @ 7 % O2)	10.22	10.62	7.28	9.37
(g/hr)	0.01	0.01	0.01	0.012
Silver ($\mu\text{g/dscm}$)	5.23	13.47	7.34	8.68
($\mu\text{g/dscm}$ @ 7 % O2)	7.97	16.09	8.57	10.9
(g/hr)	0.01	0.02	0.01	0.014
Thallium ($\mu\text{g/dscm}$)	406.28	173.87	229.62	270
($\mu\text{g/dscm}$ @ 7 % O2)	618.54	207.63	268.21	365
(g/hr)	0.71	0.29	0.36	0.455

Note:

Values enclosed in brackets represent the minimum detection limits for compounds not detected in the samples. Detection limits are not included in the averages unless otherwise indicated.

TABLE 2-26. METALS AND PM EMISSIONS SAMPLING AND FLUE GAS PARAMETERS
CAPE FEAR MEMORIAL HOSPITAL (1990)

RUN NUMBER DATE	TEST CONDITION 1			AVERAGE
	1 08/15/90	5 08/21/90	6 08/22/90	
Total Sampling Time (min.)	220	240	240	NA
Average Sampling Rate (dscfm)	0.47	0.57	0.56	0.533
Metered Volume (dscf)	103.49	136.74	135.08	125.10
Metered Volume (dscm)	2.931	3.873	3.826	3.543
Average Stack Temperature (°F)	1397.8	1427.2	1395.6	1406.9
O2 Concentration (% V)	8.5	9.2	9.8	9.2
CO2 Concentration (% V)	8.0	7.6	7.2	7.6
Stack Gas Moisture (% V)	13.9	14.4	14.7	14.3
Volumetric Flow Rate (dscfm)	1013.75	1233.33	1212.10	1153.06
Volumetric Flow Rate (dscmm)	28.71	34.93	34.33	32.66
Percent Isokinetic	101	101	101	NA
RUN NUMBER DATE	TEST CONDITION 2			AVERAGE
	2 08/18/90	3 08/19/90	4 08/20/90	
Total Sampling Time (min.)	240	240	240	NA
Average Sampling Rate (dscfm)	0.39	0.42	0.54	0.450
Metered Volume (dscf)	94.25	101.77	130.44	108.82
Metered Volume (dscm)	2.669	2.882	3.694	3.082
Average Stack Temperature (°F)	1423.2	1486.8	1442.2	1450.7
O2 Concentration (% V)	7.2	9.4	7.7	8.1
CO2 Concentration (% V)	7.8	7.7	9.2	8.2
Stack Gas Moisture (% V)	15.3	14.8	15.5	15.2
Volumetric Flow Rate (dscfm)	847.91	921.42	1184.34	984.56
Volumetric Flow Rate (dscmm)	24.01	26.10	33.54	27.88
Percent Isokinetic	101	100	100	NA
RUN NUMBER DATE	TEST CONDITION 3			AVERAGE
	7 08/26/90	8 08/27/90	9 08/28/90	
Total Sampling Time (min.)	240	155	240	NA
Average Sampling Rate (dscfm)	0.480	0.45	0.43	0.453
Metered Volume (dscf)	114.72	69.44	103.96	96.04
Metered Volume (dscm)	3.249	1.967	2.944	2.720
Average Stack Temperature (°F)	1240.5	1269.1	1292.9	1267.5
O2 Concentration (% V)	11.8	9.3	9.0	10.0
CO2 Concentration (% V)	6.9	8.5	8.7	8.0
Stack Gas Moisture (% V)	12.6	13.0	13.1	12.9
Volumetric Flow Rate (dscfm)	1070.93	1116.79	1087.48	1091.73
Volumetric Flow Rate (dscmm)	30.33	31.63	30.80	30.92
Percent Isokinetic	98.1	98.9	100	NA

NA = Not Applicable

TABLE 2-28. PARTICULATE MATTER CONCENTRATIONS AND EMISSIONS RESULTS;
CAPE FEAR MEMORIAL HOSPITAL (1990)

DATE	SAMPLING CONDITION	RUN NUMBER	TIME	FLUE GAS CONCENTRATION				FLUE GAS EMISSION RATE	
				(grains/dscf)	(grains/dscf @7% O ₂)	(grains/dscm)	(grains/dscm @7% O ₂)	(lb/hr)	(lb/hr)
08/15/90	1	1	12:32-16:52	0.010	0.112	0.228	0.256	0.866	0.393
08/21/90	1	5	10:32-14:48	0.079	0.095	0.181	0.216	0.838	0.380
08/22/90	1	6	10:30-14:42	0.034	0.042	0.076	0.096	0.347	0.157
			AVERAGES:	0.071	0.083	0.162	0.189	0.684	0.310
08/18/90	2	2	9:46-16:31	0.094	0.095	0.215	0.217	0.682	0.309
08/19/90	2	3	10:00-15:19	0.230	0.278	0.526	0.635	1.816	0.824
08/20/90	2	4	12:10-16:42	0.187	0.197	0.429	0.450	1.902	0.863
			AVERAGES:	0.170	0.190	0.390	0.434	1.467	0.665
08/26/90	3	7	11:40-15:58	0.013	0.158	0.237	0.360	0.916	0.415
08/27/90	3	8	10:59-15:06	0.187	0.223	0.427	0.510	1.568	0.711
08/28/90	3	9	10:05-14:30	0.179	0.209	0.410	0.479	1.423	0.645
			AVERAGES:	0.157	0.197	0.358	0.450	1.302	0.591

TABLE 2-30. SUMMARY OF HALOGEN ACID TESTING RESULTS;
CAPE FEAR MEMORIAL HOSPITAL (1990)

TEST RUN NUMBER	HCl CONCENTRATION		HF CONCENTRATION		HBr CONCENTRATION	
	(ppmv)	(ppmv @7% O ₂)	(ppmv)	(ppmv @7% O ₂)	(ppmv)	(ppmv @7% O ₂)
AVERAGE 1	1,102	1,225	7.11	7.83	2.03	2.24
AVERAGE 5	902	1,070	11.64	13.77	[0.034]	[0.041]
AVERAGE 6	764	937	3.11	3.85	[0.027]	[0.034]
AVERAGE COND 1	923	1,077	7.29	8.48	2.03	2.24
AVERAGE 2	968	1,003	9.47	10.01	0.26	0.26
AVERAGE 3	1,152	1,360	7.19	8.58	1.90	2.41
AVERAGE 4	1,445	1,590	25.99	27.67	2.92	3.07
AVERAGE COND 2	1,118	1,318	14.2	15.4	1.69	1.91
AVERAGE 7	1,168	1,746	6.17	8.66	[0.031]	[0.046]
AVERAGE 8	1,145	1,353	4.52	5.31	[0.028]	[0.033]
AVERAGE 9	1,278	1,490	13.10	15.46	0.36	0.41
AVERAGE COND 3	1,197	1,530	7.93	9.81	0.36	0.41

() = estimated value (less than 5 times the detection limit). [] = minimum detection limit

TABLE 2-31. SUMMARY OF HCl RESULTS FOR EACH TEST RUN;
CAPE FEAR MEMORIAL HOSPITAL (1990)

TEST RUN NUMBER	MEASURED CONCENTRATIONS				EMISSION RATE (g/hr)
	(mg/dscm)	(mg/dscm @7% O ₂)	(ppmv)	(ppmv @7% O ₂)	
RUN 1A	1,569	1,686	1,035	1,112	2,730
RUN 1B	1,772	2,027	1,169	1,337	3,081
RUN 1C	a				
AVERAGE	1,670	1,856	1,102	1,225	2,906
RUN 2A	2,116	1,979	1,395	1,305	3,044
RUN 2B	1,254	1,410	827	930	1,805
RUN 2C	1,032	1,174	681	774	1,486
AVERAGE	1,467	1,521	968	1,003	2,112
RUN 3A	1,977	2,303	1,304	1,519	3,270
RUN 3B	1,794	1,817	1,183	1,198	2,966
RUN 3C	1,470	2,064	970	1,361	2,430
AVERAGE	1,747	2,061	1,152	1,360	2,889
RUN 4A	1,853	2,166	1,222	1,429	3,549
RUN 4B	2,529	2,656	1,668	1,752	4,843
RUN 4C	a				
AVERAGE	2,191	2,411	1,445	1,590	4,196
RUN 5RA	634	846	418	558	1,290
RUN 5RB	1,894	2,197	1,249	1,449	3,853
RUN 5RC	1,575	1,827	1,039	1,205	3,204
AVERAGE	1,368	1,623	902	1,070	2,782
RUN 6A	747	1,059	493	698	1,457
RUN 6B	1,278	1,508	843	995	2,493
RUN 6C	1,449	1,695	956	1,118	2,826
AVERAGE	1,158	1,420	764	937	2,259
RUN 7A	1,947	3,127	1,285	2,063	3,305
RUN 7B	2,121	3,194	1,399	2,107	3,599
RUN 7C	1,245	1,622	821	1,070	2,112
AVERAGE	1,771	2,647	1,168	1,746	3,005
RUN 8A	1,290	1,515	851	999	2,055
RUN 8B	2,182	2,589	1,439	1,707	3,475
RUN 8C	a				
AVERAGE	1,736	2,052	1,145	1,353	2,765
RUN 9A	1,778	2,055	1,173	1,356	2,764
RUN 9B	1,757	2,013	1,159	1,328	2,731
RUN 9C	2,277	2,707	1,502	1,785	3,540
AVERAGE	1,937	2,258	1,278	1,490	3,012

a Third run was not completed for these tests.

TABLE 2-32. SUMMARY OF HF RESULTS FOR EACH TEST RUN;
CAPE FEAR MEMORIAL HOSPITAL (1990)

TEST RUN NUMBER	MEASURED CONCENTRATIONS				EMISSION RATE (g/hr)
	(mg/dscm)	(mg/dscm @7% O ₂)	(ppmv)	(ppmv @7% O ₂)	
RUN 1A	7.39	7.94	8.89	9.55	12.86
RUN 1B	4.44	5.08	5.33	6.10	7.72
RUN 1C	a				
AVERAGE	5.91	6.51	7.11	7.83	10.29
RUN 2A	8.86	8.29	10.65	9.96	12.75
RUN 2B	8.31	9.35	9.99	11.24	11.97
RUN 2C	6.45	7.34	7.76	8.82	9.29
AVERAGE	7.88	8.33	9.47	10.01	11.34
RUN 3A	5.83	6.78	7.00	8.15	9.63
RUN 3B	6.14	6.21	7.38	7.47	10.15
RUN 3C	5.99	8.41	7.20	10.12	9.91
AVERAGE	5.98	7.14	7.19	8.58	9.90
RUN 4A	5.25	6.14	6.31	7.38	10.05
RUN 4B	38.00	39.90	45.67	47.96	72.76
RUN 4C	a				
AVERAGE	21.62	23.02	25.99	27.67	41.41
RUN 5RA	3.80	5.06	4.56	6.09	7.72
RUN 5RB	4.75	5.51	5.72	6.63	9.67
RUN 5RC	20.50	23.78	24.65	28.59	41.72
AVERAGE	9.69	11.45	11.64	13.77	19.70
RUN 6A	2.05	2.91	2.47	3.50	4.00
RUN 6B	3.11	3.67	3.74	4.41	6.06
RUN 6C	2.59	3.03	3.11	3.64	5.05
AVERAGE	2.58	3.20	3.11	3.85	5.04
RUN 7A	2.54	4.08	3.05	4.90	4.31
RUN 7B	3.92	5.91	4.72	7.10	6.66
RUN 7C	8.93	11.64	10.74	13.99	15.16
AVERAGE	5.13	7.21	6.17	8.66	8.71
RUN 8A	7.05	8.28	8.48	9.96	11.23
RUN 8B	(0.469)	(0.556)	(0.564)	(0.669)	(0.747)
RUN 8C	a				
AVERAGE	3.76	4.42	4.52	5.31	5.99
RUN 9A	4.42	5.11	5.31	6.14	6.87
RUN 9B	2.66	3.05	3.20	3.66	4.13
RUN 9C	25.61	30.44	30.79	36.59	39.81
AVERAGE	10.90	12.86	13.10	15.46	16.94

a The third run was not completed for these tests.

() = Maximum estimated concentration

TABLE 2-33. SUMMARY OF HBr RESULTS AT EACH TEST RUN;
CAPE FEAR MEMORIAL HOSPITAL (1990)

TEST RUN NUMBER	MEASURED CONCENTRATIONS				EMISSION RATE (g/hr)
	(mg/dscm)	(mg/dscm @7% O ₂)	(ppmv)	(ppmv @7% O ₂)	
RUN 1A	8.36	8.98	2.48	2.67	14.54
RUN 1B	5.30	6.06	1.57	1.80	9.21
RUN 1C	a				
AVERAGE	6.83	7.52	2.03	2.24	11.88
RUN 2A	1.44	1.34	0.43	0.40	2.07
RUN 2B	(0.342)	(0.385)	(0.102)	(0.115)	(0.492)
RUN 2C	[0.114]	[0.130]	[0.034]	[0.039]	[0.164]
AVERAGE	0.89	0.86	0.26	0.26	1.28
RUN 3A	4.93	5.74	1.46	1.71	8.15
RUN 3B	3.71	3.76	1.10	1.12	6.14
RUN 3C	10.54	14.80	3.13	4.40	17.43
AVERAGE	6.39	8.10	1.90	2.41	10.57
RUN 4A	[0.119]	[0.139]	[0.035]	[0.041]	[0.228]
RUN 4B	9.83	10.32	2.92	3.07	18.82
RUN 4C	a				
AVERAGE	9.83	10.32	2.92	3.07	18.82
RUN 5RA	[0.111]	[0.148]	[0.033]	[0.044]	[0.226]
RUN 5RB	[0.115]	[0.133]	[0.034]	[0.039]	[0.234]
RUN 5RC	[0.115]	[0.133]	[0.034]	[0.039]	[0.234]
AVERAGE	[0.114]	[0.138]	[0.034]	[0.041]	[0.231]
RUN 6A	[0.091]	[0.129]	[0.027]	[0.038]	[0.177]
RUN 6B	[0.092]	[0.109]	[0.027]	[0.032]	[0.179]
RUN 6C	[0.093]	[0.109]	[0.028]	[0.033]	[0.181]
AVERAGE	[0.092]	[0.116]	[0.027]	[0.034]	[0.179]
RUN 7A	[0.097]	[0.156]	[0.029]	[0.047]	[0.165]
RUN 7B	[0.100]	[0.151]	[0.030]	[0.045]	[0.170]
RUN 7C	[0.118]	[0.154]	[0.035]	[0.046]	[0.200]
AVERAGE	[0.105]	[0.154]	[0.031]	[0.046]	[0.178]
RUN 8A	[0.097]	[0.114]	[0.029]	[0.034]	[0.154]
RUN 8B	[0.091]	[0.108]	[0.027]	[0.032]	[0.145]
RUN 8C	a				
AVERAGE	[0.094]	[0.111]	[0.028]	[0.033]	[0.150]
RUN 9A	1.08	1.25	0.32	0.37	1.68
RUN 9B	1.34	1.54	0.40	0.46	2.09
RUN 9C	[0.101]	[0.120]	[0.030]	[0.036]	[0.157]
AVERAGE	1.21	1.39	0.36	0.41	1.88

a The third run for these tests were not completed.

[] = Minimum detection limit

TABLE 2-35. CEM DAILY TEST RUN AVERAGES FOR OXYGEN, CO, CO2 AND HCl;
CAPE FEAR MEMORIAL HOSPITAL (1990)

DATE	RUN NUMBER/ MANUAL TEST TYPE	CONDITION	TEST TIME ^a	MOISTURE	OXYGEN (% vol. dry)	CO2 (% vol. dry)	CO actual (ppm V, dry)	CO corrected ^b (ppm V, dry) @7% O2	HCL ^c actual (ppm V, wet)	HCL ^c corrected ^d (ppm V, dry) @7% O2
08/15/90	1	1	12:32-16:51	14.00	8.53	8.01	116	88.40	359	341.00
08/21/90	5	1	10:30-14:45	14.10	9.24	7.61	239	185.00	17.4	18.40
08/22/90	6	1	10:30-14:40	14.60	9.81	7.19	21.8	22.00	189	188
AVERAGE:					9.19	7.60	125.60	98.47	188	182
08/18/90	2	2	09:45-16:17	15.10	7.17	7.81	322	245	397	299.00
08/19/90	3	2	10:01-15:21	14.60	9.38	7.72	616	583	354	411
08/20/90	4	2	12:10-16:42	15.10	7.67	9.17	632	472	89.2	74.90
AVERAGE:					8.07	8.23	523	433	280	262
08/26/90	7	3	11:40-15:58	14.80	11.77	6.89	128	159	ND	ND
08/27/90	8	3	11:00-15:06	14.80	9.26	8.44	505	494	337	338
08/28/90	9	3	10:05-14:30	14.70	9.00	8.72	631	427	577	601
AVERAGE:					10.01	8.02	421	360	457	470

^a For metals/CDD/CDF runs.

^b Thirty-second CEM averages were corrected to 7% oxygen (corrected value = actual * (13.9 / (20.9 - O2))).

^c HCl concentrations were determined by manual methods as well. A comparison of CEM vs. manual results is presented in Section 2.6.

^d Thirty-second CEM averages were corrected to 7% oxygen and for moisture, where the corrected value = actual * 13.9 / (20.9 - O2) * (1 / (1 - moist)).

ND = Not Determined

TABLE 2-36. CEM DAILY TEST RUN AVERAGES FOR OXYGEN, SO₂, NO_x AND THC;
CAPE FEAR MEMORIAL HOSPITAL (1990)

DATE	RUN NUMBER	CONDITION	TEST TIME ^a	MOISTURE	OXYGEN (% vol. dry)	SO ₂ actual (ppm V, dry)	SO ₂ corrected ^b (ppm V, dry)	NO _x actual (ppm V, dry)	NO _x corrected ^b (ppm V, dry)	THC actual (ppm C, wet)	THC corrected ^c (ppm C, dry)
08/15/90	1	1	12:32-16:51	14.00	8.53	24.90	25.70	74.00	83.80	2.51	2.31
08/21/90	5	1	10:30-14:45	14.10	9.24	16.20	16.80	59.40	70.00	4.13	4.18
08/22/90	6	1	10:30-14:40	14.60	9.81	8.66	10.30	53.60	66.60	2.36	2.72
AVERAGE:					9.19	16.59	17.60	62.33	73.47	3.00	3.07
08/18/90	2	2	09:45-16:17	15.10	7.17	18.20	17.50	68.20	75.10	1.33	1.08
08/19/90	3	2	10:01-15:21	14.60	9.38	35.30	38.40	68.10	81.60	41.20	48.10
08/20/90	4	2	12:10-16:42	15.10	7.67	29.20	29.30	92.80	96.50	51.80	46.70
AVERAGE:					8.07	27.57	28.40	76.37	84.40	31.44	31.96
08/26/90	7	3	11:40-15:58	14.80	11.77	12.60	16.60	63.40	92.90	9.43	12.40
08/27/90	8	3	11:00-15:06	14.80	9.26	35.90	32.30	78.60	90.90	12.60	9.46
08/28/90	9	3	10:05-14:30	14.70	9.00	28.30	21.10	84.70	96.00	12.7	9.03
AVERAGE:					10.01	25.60	23.33	75.57	93.27	11.58	10.30

^a Time is for metals and CDD/CDF runs.

^b SO₂ and NO_x are corrected to 7% oxygen, where the corrected value = actual * 13.9/(20.9 - O₂).

^c THC is corrected to 7% oxygen and corrected for moisture where the corrected value = actual * 13.9/(20.9 - O₂) * (1/(1 - moist)).

Table 3.1 Process Data Summary for Emissions Testing at Cape Fear Memorial Hospital

Test Run No.	Test Date	Target Test Conditions			Daily Operation (a)				Actual Test Conditions (b)						
		Charge Rate (lb/hr)	Charge Freq (min)	Secondary Chamber Setpoint Temp (F)	Preheat time (min)	Charge Time before test (min)	Hours of Charging (hr/d)	Total Waste Charged (lb/d)	Ash (% of Waste Charged)	Charge Rate (lb/hr)		Charge Freq (min)	Avg Primary Chamber Temp (F)	Avg Sec. Chamber Temp (F)	Black Gas Conditions Flow Rate (acfm)
1	8/15/90	200	20	1800	17	141	6.5	1228	8.3	176	20.6	7	1885	2019	4110
2	8/18/90	300	30	1800	9	155	9.3	1897	-	167	27.4	9.8	1898	2088	3546
3	8/19/90	300	30	1800	9	63	6.5	1548	-	212	28.7	8.1	1857	2039	3899
4	8/20/90	300	30	1800	14	0	4.7	1305	-	268	30.3	6.9	1585	1858	5010
5	8/21/90	200	20	1800	15	0	4.7	897	-	183	20.6	6.4	1611	1833	5103
6	8/22/90	200	20	1800	24	0	5.7	1105	-	182	21.2	6.6	1589	1898	4858
7	8/26/90	300	50	1800	58	0	4.4	1348	8.8	297	49.9	10.1	1673	1837	3878
8	8/27/90	300	50	1800	42	0	5	1248	8.9	290	50.2	10.4	1637	1898	3709
9	8/28/90	300	50	1800	45	0	4.4	1382	-	303	51.2	10.1	1659	1878	3817

(a) From start-up until shutdown is initiated.

(b) Includes port changes and times for all trains; not just the method 5 trains.

(c) Some of the ash percentages could not be determined because portions of the ash bed were still burning and could not be removed.

(d) Residence time is based on the secondary chamber volume of 2.38 m³ (84 ft³) and is calculated as follows for Run 1:

$$\text{Res. time, sec} = \frac{(84 \text{ ft}^3)(60 \text{ min})(1398 + 480 \text{ F})}{(4110 \text{ acfm})(2019 + 480 \text{ F})}$$

ROYAL JUBILEE HOSPITAL INCINERATOR

VICTORIA, BC

2/22/83 - 3/3/83

Consumat Model C-760 pathological incinerator

controlled air principle 2 stage combustion

 61 ft³ feed box w/ hydraulic ram

batch feed about every 5 min 150 LB PLASTIC/DAY

 primary chamber 9' x 12' = 763 ft³

800 lb. loading oil burners used to ignite

 combustion rate controlled by air ~~rate~~ rate

1400°F air flow rate is below stoichiometric rate

secondary stack 29" i.d.

excess air 400% - 475% BUT MOSTLY FROM DILUTION AFTER COMBUSTION

TABLE 3 - SUMMARY OF PROCESS OPERATIONS

ROYAL JURILEE HOSPITAL INCINERATOR									
DATE (1983)	Feb. 23	Feb. 24	Feb. 25	Feb. 28	March 1	March 2	March 3		
RUN NUMBER	1	2	3	4	5	6	7		
GENERAL PROCESS DATA									
RURN PERIOD *	0945-1501	0930-1500	0935-1435	1025-1500	0940-1422	0953-1500	0945-1230		
GARRAGE FED (kg)	3948	5266	5001	5316	4658	4386	2263		
SAMPLING PERIOD	1053-1508	1103-1528	1015-1445	1047-1501	0953-1403	1015-1425	1007-1212		
FED DURING SAMPLING (kg)	3036	3875	3976	4155	3836	3691	1827		
FEED RATE DURING SAMPLING (kg/h)	714	876	882	984	918	888	876		
VOLUME BOTTOM ASH (m3)	1.4	2.0	2.0	1.7	1.3	1.5	0.8		
OIL USED (L)	750	700	400	450	450	450	150		
AVERAGE PROCESS TEMPERATURES (°C)									
PRIMARY CHAMBER	701	745	763	727	775	767	n.a.		
SECONDARY CHAMBER	909	900	918	926	922	942	n.a.		
COLD SIDE HEAT EXCHANGER	294	340	324	328	334	337	n.a.		
SECONDARY STACK	153	167	152	149	155	158	161		

* The Run Period is time from firing the first load to the time of the last load (does not include burn down).

TABLE 4 - SUMMARY OF STACK TESTING DATA

ROYAL JUBILEE HOSPITAL INCINERATOR									
DATE (1983)		Feb. 23	Feb. 24	Feb. 25	Feb. 28	March 1	March 2	March 3	
SAMPLING DATA									
RUN NUMBER		1	2	3	4	5	6	7	
TYPE		Part/HCl	Dioxin	Dioxin	Dioxin	Dioxin	PAH/PCB	Part/HCl	
SAMPLING PERIOD		1053-1508	1103-1528	1015-1445	1047-1501	0953-1403	1015-1425	1007-1212	
TEST DURATION (min)		240	240	240	240	240	240	120	
SAMPLE VOLUME (m ³)*		3.39	3.55	3.50	3.56	3.39	3.39	1.70	
ISO KINETICITY (%)		95.8	105.2	101.2	99.0	99.9	100.1	98.1	
STACK GAS DATA									
VELOCITY (m/s)		11.7	11.8	11.5	11.4	11.7	11.8	12.1	
FLOWRATE (m ³ /min)*		200	192	195	202	199	199	202	
TEMPERATURE (°C)		153	161	152	149	155	158	161	
MOISTURE (vol %)		6.3	9.5	6.8	4.0	5.7	6.0	6.2	
CO ₂ (vol % - dry)		3.2	3.1	3.5	3.4	3.2	2.9	3.4	
O ₂ (vol % - dry)		17.0	17.3	17.1	17.2	17.2	17.5	17.0	
N ₂ (vol % - dry)		79.8	79.6	79.4	79.4	79.6	79.6	79.6	
MOL. WEIGHT		29.19	29.19	29.24	29.23	29.20	29.16	29.22	
EXCESS AIR (%)		402.2	446.6	425.3	438.7	432.9	476.4	407.3	

* Values reported are on a dry basis corrected to standard conditions of 25°C and 760 mmHg.

TABLE 5 - SUMMARY OF PARTICULATE AND HCl TEST RESULTS

ROYAL JUBILEE HOSPITAL INCINERATOR		
DATE (1983)	Feb. 23	March 3
SAMPLING DATA		
RUN NUMBER	1	7
SAMPLING PERIOD	1053-1508	1007-1212
TEST DURATION (min)	240	120
SAMPLE VOLUME (m ³)*	3.39	1.70
ISOKINETICITY (%)	95.8	98.1
STACK GAS DATA		
VELOCITY (m/s)	11.7	12.1
FLOWRATE (m ³ /min)*	200	202
TEMPERATURE (°C)	153	161
MOISTURE (%)	6.3	6.2
EXCESS AIR (%)	402.2	407.3
PROCESS DATA		
AMOUNT WASTE FED (kg)	3036	1827
WASTE FEED RATE (kg/hr)	714	876
PARTICULATE RESULTS		
AMOUNT COLLECTED (mg)	169.5	112.0
CONCENTRATION		
- MEASURED (mg/m ³)*	49.9	65.9
- CORR. 50% E.A. (mg/m ³)	167.1	222.9
EMISSION RATE (kg/hr)	0.60	0.80
EMISSION FACTOR (g/kg waste)	0.84	0.91
HCl RESULTS		
AMOUNT COLLECTED (mg)	1490	1140
CONCENTRATION		
- MEASURED (mg/m ³)*	438.2	670.6
- CORR. 50% E.A. (mg/m ³)	1467	2268
(ppm)	983	1520
EMISSION RATE (kg/hr)	5.3	8.0
EMISSION FACTOR (g/kg waste)	7.4	9.1

*Values reported are on a dry basis corrected to standard conditions of 25°C and 760 mm Hg.

TABLE 6 HEAVY METAL TEST RESULTS - STACK SAMPLES

	Amount Collected		Concentration*		Emission Rate	
	Run 1	Run 7	Run 1	Run 7	Run 1	Run 7
	(mg)		(mg/m ³)		(g/hr)	
Ca	25.62	27.31	7.56	16.06	90.7	194.6
Na	20.74	19.28	6.12	11.34	73.4	137.4
Al	19.84	23.28	5.85	13.69	70.2	165.9
K	13.85	16.01	4.09	9.42	49.1	114.2
Zn	10.26	7.55	3.03	4.44	36.4	53.8
Mg	7.57	8.34	2.23	4.91	26.8	59.5
Fe	4.74	5.61	1.33	1.87	17.2	19.9
Si	2.29	1.41	0.67	0.65	0.0	7.12
	(μ g)		(μ g/m ³)		(mg/hr)	
Al	904	554	266.7	325.9	3200.4	3949.9
Cu	372	454	109.7	267.1	1316.4	3237.3
Sn	142	151	41.9	88.8	502.8	1076.3
Mn	141	48	41.6	28.2	499.2	341.8
Cr	126	120	37.2	70.6	446.4	855.7
Pb	83	12	24.5	7.1	294.0	86.1
Sb	46	40	13.6	23.5	163.2	284.8
Bi	45	31	13.2	18.2	163.2	284.8
Ag	36	16	10.6	9.4	127.2	113.9
Li	17	10	5.0	5.9	60.0	71.5
Mo	10	11	3.0	6.5	36.0	78.8
Sr	9	57	2.7	33.5	32.4	406.0
Rb	6	4	1.8	2.4	21.6	29.1
Ta	6	ND	1.8		21.6	
Se	5	5	1.5	2.9	18.0	35.1
Nb	3.0	4.5	0.9	2.6	10.8	31.5
Hg	2.8	1.6	0.8	0.9	9.6	10.9
Co	2.3	2.3	0.7	1.4	8.4	17.0
V	0.3	0.2	0.1	0.1	1.2	1.2
Be	ND	ND				
W	ND	ND				
U	ND	ND				
As	ND	ND				
Te	ND	ND				

ND = not detected

* Concentrations are reported at dry and standard conditions (25°C and 760 mm Hg) but have not been corrected for excess air.

The dioxin and furan stack sampling results are presented in Table 8. These results are reported for five homologues - tetrachloro, pentachloro, hexachloro, heptachloro and octachloro. The total PCDD and PCDF reported are the sum of these five specific homologues and therefore exclude any of the monochloro, dichloro or trichloro groups which were not analyzed.

With the exception of the octachloro homologue, there were more furans than dioxins found in the source emission samples. A listing of the average concentrations and emission rates over all four test runs is given in Table 9 below.

TABLE 9 AVERAGE CONCENTRATIONS AND EMISSION RATES OF DIOXINS AND FURANS

Homologue	Concentration (ng/m ³)		Emission rate (µg/h)	
	Dioxin	Furan	Dioxin	Furan
Tetra CD-	ND	27.0	ND	319.0
Penta CD-	15.7	46.2	183.3	544.6
Hexa CD-	13.8	42.9	162.6	505.7
Hepta CD-	16.7	25.7	197.1	304.8
Octa CD-	22.8	13.8	269.4	163.5
TOTAL PCD	68.9	155.6	811.2	1,837.5

The average concentration of polychlorinated dibenzofurans was 155.6 ng/m³ amounting to an emission rate of 1,837.5 µg/h. The average concentration of polychlorinated dibenzo-p-dioxins was 68.9 ng/m³ for an emission rate of 811.2 µg/h. Generally, the incinerator was emitting about twice as much furans as dioxins during the testing period. As all of the isomers in each of the five homologous groups were not quantified it would be difficult to describe the significance of these results in terms of toxicity. However, one significant fact is apparent. There were no detectable amounts of the tetrachloro-dioxin homologue which contains 2,3,7,8-TCDD - the most toxic dioxin congener.

4.5.1.2 PCB and PAH. The PCB and PAH results, obtained from Run 6 on March 2, 1983, are given in Tables 10 and 11 respectively. Data are reported in terms of the amount collected, the concentration and the emission rate.

TABLE 10 PCB TEST RESULTS

ROYAL JUBILEE HOSPITAL INCINERATOR			
Component	Amount Collected (μg)	Concentration ($\mu\text{g}/\text{m}^3$)	Emission Rate (mg/h)
Aroclor 1242 (3Cl - 5Cl)	3.41	1.01	12.06
Aroclor 1260 (5Cl - 8Cl)	3.96	1.17	13.97
Total PCB	7.37	2.17	25.91

The PCB data have been clarified into the low chlorinated biphenyls (based on an Aroclor 1242 standard), the high chlorinated biphenyls (based on the Aroclor 1260 standard), and the total PCB which are the sum of these two groups. The distribution of total PCB in the sampling train is given in Figure 6. The majority (> 90%) was found in the back-half of the sampling train suggesting that the PCB in the stack emissions exist primarily in the gaseous state. Also significant, is the fact that the back-up glycol impingers collected almost three times more PCB than the Amberlite cartridges. This suggests that the Amberlite is relatively inefficient for PCB sampling. Further, since most was found in the impingers, there is the possibility that some of the PCB in the stack samples may have escaped collection in the train. A large amount of PCB were also found in the back-half glassware rinse. All these facts suggest that a different sampling train using impingers as the primary collection media for PCB, would be preferred over the Amberlite system used during this study.

The PAH results are reported for 23 individual PAH compounds. Of these 23 compounds analyzed for, a total of 13 were not detected. Of the remaining 10 PAH which were found, the emission rates varied from 1 to 8 mg/h. The sampling train was very efficient in trapping all of the PAH identified. All of the PAH were found in the back-half of the train which means they all were emitted from the source in the gaseous state. Further, all of the PAH were found in the Amberlite cartridges. There were none detected in the condensate trap, the impingers or the back-half glassware rinse.

4.5.2 **Ash Samples.** The fly ash and bottom ash samples, collected on February 28, were analyzed for dioxins and furans. A listing of these results for the five homologues and total PCDD/PCDF is given in Table 12. There was very little dioxins or furans found

TABLE 12 DIOXIN AND FURAN RESULTS - ASH SAMPLES

Compound Sample Code	ROYAL JUBILEE HOSPITAL INCINERATOR							
	DIOXIN				FURAN			
	A	B	C	D	A	B	C	D
CONCENTRATION (ng/g)								
Tetra (T ₄ CD-)	6.3	125.8	0.1	ND	32.9	937.5	1.0	0.7
Penta (P ₅ CD-)	26.6	489.1	0.2	ND	70.1	1599.0	1.1	1.3
Hexa (H ₆ CD-)	87.0	933.8	0.4	0.3	61.8	1732.8	0.7	3.0
Hepta (H ₇ CD-)	45.6	997.7	0.4	0.5	96.2	840.5	0.4	4.5
Octa (OCD-)	93.6	3931.5	0.5	1.9	36.8	760.2	0.4	1.7
Total (PCD-)	259.1	6477.9	1.6	2.7	297.5	5868.5	3.6	11.2

ND = not detected, < 0.05 ng/g

Sample Description

A- Fly ash collected from the walls of the duct leading from the heat exchanger to the low temp stack

B- Fly ash collected from the bottom of the duct leading from the heat exchanger to the low temp stack

C- Composite of bottom ash collected from regions 1, 2, 3, 4, 5, 7, 8 in Figure 4

D- Bottom ash collected from region 6 in Figure 4.

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7. Author(s) Al Jenkins, Cindy Castronovo, Gloria Lindner, Peter Ouchida, and Dean C. Simeroth			6.	
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16. Abstract (Limit: 200 words) An evaluation test program was conducted to evaluate the emissions from a hospital refuse incinerator. The refuse incinerator/heat recovery system exhaust gas passed through a fabric filter baghouse before the gas was vented to the atmosphere. The evaluation tests were conducted as a part of the Air Resources Board's program to assess emissions from stationary sources. The incinerator was operated at an average burn rate of approximately 980 pounds of hospital refuse per hour during the entire test period. Daily average oxygen and carbon dioxide concentrations ranged from 13.2 percent (%) and 5.5%, respectively to 13.9 and 6.8%. The carbon monoxide concentrations were less than 50 parts per million by volume, (PPMV), during the entire test period. Analysis for selected trace metals was conducted and emission rates determined. The baghouse removal efficiency for trace metals exceeded 99 percent and the baghouse removal efficiency for total particulate matter averaged 93 percent. The baghouse did not have a significant effect on the emissions of hydrochloric acid. Mass emission rates for chlorinated organic compounds were determined. Stack gas samples were analyzed for polychlorinated dibenzodioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), and polychlorinated biphenyls (PCBs). The data indicate that hospital incinerators are a potential source of PCDD and PCDF emissions to the atmosphere.				
17. Document Analysis a. Descriptors Organic Waste Destruction Products of Incomplete Combustion (PICs) Principal Organic Compounds (POCs) Destruction and Removal Efficiencies (DREs) b. Identifiers/Open-Ended Terms Tedlar Bag Sampling Resin Cartridge Sampling Gas Chromatography c. COSATI Field/Group				
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SUMMARY

An evaluation test program was conducted from October 28 through October 31, 1986, by Air Resources Board (ARB) staff to evaluate the emissions from a hospital refuse incinerator located at the Cedars Sinai Medical Center in Los Angeles, CA. The refuse incinerator/heat recovery system exhaust gas passes through a fabric filter baghouse before the gas is vented to the atmosphere. A schematic of the system including sampling points is shown in Figure S-1.

The evaluation tests were conducted as a part of the Air Resources Board's program to assess emissions from stationary sources.

The incinerator was operated at an average burn rate of approximately 980 pounds of hospital refuse per hour during the entire test period. Daily average emissions of gaseous pollutants, particulate matter and hydrochloric acid as determined from test data are shown in Table S-1. Oxygen and carbon dioxide concentrations indicated the incinerator was operated at steady state conditions. Daily average oxygen and carbon dioxide concentrations ranged from 13.2 percent(%) and 5.5%, respectively to 13.9% and 6.8%. The carbon monoxide concentrations were less than 50 parts per million by volume, (PPMV), during the entire test period.

Analysis for selected trace metals was conducted and emission concentrations and mass rates are presented in Section V of the report. The baghouse removal efficiency for trace metals exceeded 99 percent and the baghouse removal efficiency for total particulate matter exceeded 98 percent. However, the baghouse did not have a significant effect on the emissions

TABLE 4
STACK CONDITIONS FOR INCINERATOR
AT CEDARS SINAI MEDICAL CENTER

Date	Location	Stack Gas Velocity, Ft/Sec.	Stack Gas Flow DSCFM	Moisture Content, % by Vol.	Temperature, of
10-29-86	Baghouse Outlet	42.9	2711	9.3	332
	Baghouse Inlet	48.7	2793	12.2	389
	Boiler Outlet	44.4	2401	13.1	435
10-30-86	Baghouse Outlet	43.1	2699	10.0	332
	Baghouse Inlet	47.1	2710	11.4	393
	Boiler Outlet	46.7	2550	12.4	433
10-31-86	Baghouse Outlet	43.0	2720	8.6	332
	Baghouse Inlet	47.6	2789	9.0	397
	Boiler Outlet	44.6	2435	10.1	453

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TABLE 5

DAILY AVERAGE CONCENTRATIONS OF OXYGEN, CARBON DIOXIDE,
CARBON MONOXIDE, OXIDES OF NITROGEN, SULFUR DIOXIDE,
TOTAL HYDROCARBONS, PARTICULATE MATTER AND HYDROCHLORIC ACID
IN THE BAGHOUSE OUTLET STACK GAS AT CEDARS SINAI MEDICAL CENTER

Date	O ₂ ^{a/} Percent	CO ₂ ^{a/} Percent	CO ^{a/} PPMV	NO _x ^{b/} PPMV	SO ₂ ^{b/} PPMV	HC ^{bc/} PPMV	PM ^{de/} gr/DSCF	HCL ^{d/} PPMV
10-29-86	13.3	6.6	<50	270	50	7	0.001	f/
10-30-86	13.9	5.5	<50	220	25	3	0.001	521
10-31-86	13.2	6.8	<50	160	35	3	0.002	403

- a/ The O₂, CO₂ and CO values were used to determine the molecular weight of the stack gas and mass emission rates.
b/ NO_x, SO₂ and HC data corrected to 3 percent O₂.
c/ Total hydrocarbon data reported as propane.
d/ Reported at actual flue gas oxygen concentration.
e/ Includes front half of Method 5 catch only.
f/ Test results for 10-29-86 baghouse outlet deemed invalid.

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TABLE 6

MASS EMISSION RATES OF PARTICULATE MATTER AND HYDROCHLORIC ACID, LBS/HR
AT CEDARS SINAI MEDICAL CENTER

DATE	Baghouse Inlet		Baghouse Outlet	
	PM	HCL	PM	HCL ^{a/}
10-29-86	1.73	12.86	0.03	0.59
10-30-86	1.27	9.18	0.02	7.98
10-31-86	0.69	6.30	0.05	6.23

a/ HCL data for 10-29-86 baghouse outlet deemed invalid.

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TABLE 12

MASS EMISSION RATES FOR 2,3,7,8-SUBSTITUTED PCDD AND PCDF
IN GAS SAMPLES FROM INLET AND OUTLET OF BAGHOUSE
AT CEDARS-SINAI MEDICAL CENTER INCINERATOR

Sampling date	10-29-86		10-30-86		10-31-86 a/	
Sampling location	INLET	OUTLET	INLET	OUTLET	INLET	OUTLET
	(ng/sec)		(ng/sec)		(ng/sec)	
DIOXINS						
2,3,7,8-TCDD	0.20	0.32	0.48	0.51	0.34	<0.02
1,2,3,7,8-PeCDD	0.67	1.64	2.49	1.93	1.43	<0.57
1,2,3,4,7,8-HxCDD	2.91	1.69	2.19	2.93	2.40	<0.96
1,2,3,6,7,8-HxCDD	2.68	2.77	3.99	3.44	4.52	<1.61
1,2,3,7,8,9-HxCDD	2.33	1.90	2.81	2.91	3.05	1.07
1,2,3,4,6,7,8-HpCDD	36.4	28.4	44.6	30.8	52.6	13.6
OCDD	70.8	50.1	90.2	33.8	131	13.5
FURANS						
2,3,7,8-TCDF	1.28	1.96	2.78	2.79	2.12	0.63
1,2,3,7,8-PeCDF	5.93	6.98	11.2	10.1	8.76	2.50
2,3,4,7,8-PeCDF	6.40	7.03	11.0	10.0	11.0	2.15
1,2,3,4,7,8-HxCDF	11.2	11.2	17.3	15.1	17.5	3.98
1,2,3,6,7,8-HxCDF	10.7	11.9	16.7	15.3	16.6	4.94
1,2,3,7,8,9-HxCDF	<0.55	1.32	<1.12	0.87	<1.28	<0.06
2,3,4,6,7,8-HxCDF	15.1	16.0	24.2	18.2	29.9	6.33
1,2,3,4,6,7,8-HpCDF	77.4	78.5	102	77.1	133	21.9
1,2,3,4,7,8,9-HpCDF	13.4	10.7	14.9	11.1	23.3	3.69
OCDF	76.7	62.8	102	48.4	187	11.4

The mass emission rates shown for 10/29 and 10/30 do not include the contribution of the resin PCDD/PCDF spike mix.

a/ Outlet sample train leakage. Data invalid.

See text, page 19.

<0.55 = Not detected at detection limit of 0.55 ng/sec.

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TABLE 18

MASS EMISSION RATES OF ARSENIC, CADMIUM,
CHROMIUM, IRON, MANGANESE, NICKEL AND LEAD
IN THE STACK GAS AT CEDARS SINAI MEDICAL CENTER

MASS EMISSION RATES, POUNDS/HOUR

RUN NO.	As	Cd	Cr	Fe	Mn	Ni	Pb
HCL/M5-1D	1.43E-4	3.33E-3	1.78E-4	2.55E-3	2.14E-4	<5.31E-5	2.84E-2
HCL/M5-2D	9.05E-5	1.77E-3	0.50E-4	3.56E-3	2.14E-4	<5.43E-5	2.05E-2
HCL/M5-3D	7.22E-5	1.42E-3	0.63E-4	2.02E-3	1.61E-4	<5.47E-5	1.49E-2
HCL/M5-1S	<2.0E-8	<2.58E-6	1.59E-6	<1.19E-5	<2.58E-6	<1.49E-5	<4.97E-5
HCL/M5-2S	<2.0E-8	<2.60E-6	1.20E-6	<1.20E-5	<2.60E-6	<1.05E-5	<5.00E-5
HCL/M5-3S	<1.8E-8	<2.40E-6	0.37E-6	<1.11E-5	<2.40E-6	<1.38E-5	<4.61E-5

a/

The values denoted with the less than symbol (<) are presented to show lower detection limits. The values shown reflect differences in sampling volumes.

C-86-077

REPORT DOCUMENTATION PAGE		1. REPORT NO. ARB/ML-90-029	2.	3. PB 90-259946
4. Title and Subtitle ARB Evaluation Test Conducted on a Hospital Waste Incinerator At Los Angeles Co. - USC Medical Center Los Angeles, California			5. Report Date Date of Approval January 1990	
7. Author(s) James E. McCormack 916-323-2289			8. Performing Organization Report No.	
9. Performing Organization Name and Address Engineering Evaluation Branch Monitoring and Laboratory Division Air Resources Board P.O. Box 2815 Sacramento, CA 95812			10. Project/Task/Work Unit No. C-87-122	
			11. Contract/(C) or Grant/(G) No. (C) (G)	
12. Sponsoring Organization Name and Address Air Resources Board State of California P. O. Box 2815 Sacramento, CA 95812 2990 916-323-2289			13. Type of Report & Period Covered Test Report 3/7/88 - 3/11/88	
14.				
15. Supplementary Notes				
16. Abstract (Limit: 200 words) A series of emission tests were conducted on a small hospital waste incinerator. The small hospital waste incinerator burns less than 100 pounds per hour of infectious hospital waste and burns a total of no more than 300 pounds per day. Hospital waste incinerators previously tested by the ARB were rated at 600 to 1000 pounds per hour. The small incinerator is manually charged and cleaned. The objectives of the incinerator emission test were to characterize criteria and select non-criteria air pollutants released to the atmosphere. The criteria air pollutants were carbon monoxide, total hydrocarbons, sulfur dioxide, oxides of nitrogen. In addition, CO ₂ , PM, and O ₂ were measured. Some of the select non-criteria air pollutants included dioxins, furans, PCBs, semi-volatile organics, volatile organics, hydrogen chloride, hexavalent chromium, and mercury.				
17. Document Analysis a. Descriptors Evaluation test on a small hospital refuse incinerator test report. b. Identifiers/Open-Ended Terms Carbon Dioxide, Carbon Monoxide, Total Hydrocarbons, Sulfur Dioxide, Nitric Oxides, Dioxins, Furans, Polychlorinated Biphenols, Semi-volatile Organics, Hydrogen Chloride, Hexavalent Chromium and Mercury. Incinerator Air Pollution c. COSATI Field/Group				
18. Availability Statement Release Unlimited. Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161		19. Security Class (This Report) UNCLASSIFIED		21. No. of Pages 122
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Table II
Charging Log

<u>date</u>	<u>time</u>	<u>charge</u> <u>pounds</u>
03/08/88	0740	30
03/08/88	0805	31
03/08/88	0835	30
03/08/88	0907	25
03/08/88	0928	28
03/08/88	0950	30
03/08/88	1010	28
03/08/88	1030	23
03/08/88	1055	28
03/08/88	1110	20
03/08/88	1130	22
03/08/88	1150	18
03/08/88	1210	20
03/08/88	1230	25
03/08/88	1250	25
03/08/88	1310	15
03/08/88	1330	12
03/08/88	1349	18
03/08/88	1410	16
03/08/88	1426	12
03/08/88	1447	18
03/08/88	1510	20
03/08/88	1553	18
03/08/88	1550	15
03/08/88	1630	12
03/08/88	1650	15
03/09/88	0708	25
03/09/88	0728	25
03/09/88	0750	25
03/09/88	0835	20
03/09/88	1015	25
03/09/88	1200	25
03/09/88	1330	25
03/10/88	0520	35
03/10/88	0550	35
03/10/88	0830	35
03/10/88	0950	57
03/10/88	1038	55
03/10/88	1230	49
03/10/88	1345	48
03/10/88	1440	35
03/10/88	1617	25
03/11/88	0540	55
03/11/88	0843	61
03/11/88	0942	52
03/11/88	1136	37
03/11/88	1215	73

Table VI
Concentrations of Gaseous Criteria Pollutants During Sampling Times

Run Number	Sampling		Time		CONCENTRATIONS					
	Date		Start	End	NOX	SO2	THC	O ₂	CO ₂	CO
					PPM	PPM	PPM	%	%	PPM
RT-1	03/08/88		0849	1049	87	>463	>474	6.2	9.8	>492
RT-2	03/08/88		0900	1100	77	>463	>474	4.9	9.3	>492
M5-1	03/08/88		1145	1245	80	32	< 1	4.7	10	>492
HCL-1	03/08/88		1200	1300	69	32	>474	5.2	10	>492
RT-3	03/08/88		1352	1552	83	< 1	35	5.2	9.5	>492
YMO-1	03/08/88		1430	1450	75	28	>474	4.7	10	>492
YMO-2	03/08/88		1510	1528	102	32	27	4.3	10	>492
YMO-3	03/08/88		1550	1608	80	56	>474	5.0	10	>492
YMO-4	03/08/88		1630	1648	91	32	< 1	7.6	9.5	>492
HCL-2	03/09/88		0730	0830	58	28	>474	7.7	8	>492
DT-2	03/09/88		1126	1416	47	18	< 1	10	7.2	>492
DT-1	03/09/88		1130	1530	47	18	< 2.5	9.6	7.2	>492
M5-3	03/10/88		0715	0815	57	14	< 1	10	6.8	39
HG-1	03/10/88		0952	1150	49	< 1	9	11	6.8	>492
DT-3	03/10/88		1015	1415	44	10	< 1	11	6.3	>492
DT-4	03/10/88		1030	1430	44	10	< 1	11	6.3	>492
HG-2	03/10/88		1443	1643	30	< 1	11	12	5.0	>492
HCL-4	03/11/88		0758	0858	48	9	< 1	7.4	6.3	30
M5-4	03/11/88		0815	0915	42	8	< 1	11	6.3	30
HG-3	03/11/88		0948	1148	56	< 1	14	10	6.8	>492

> Means the values were off scale of the monitors.

< Means the values were below detection of the monitors.

Table VII

Stack Gas Flowrate and Moisture Content

<u>Run Number</u>	<u>Date</u>	<u>Stack Flow Flow Rate</u> dscfm	<u>Moisture Content</u> %	
--*	03/07/88	281	--	
--*	03/07/88	--	13	
M5-1	03/08/88	234	17	
--*	03/09/88		18	
--*	03/09/88	358		
M5-3	03/10/88	334	24	
M5-4	03/11/88	346	26	

* - unnumbered method 2 and method 4 runs

Table X
PCDD/PCDF Stack Mass Emission Rates
(ng/sec)

RUN #	DT-1S	DT-2S*	DT-3S	DT-4S
DIOXINS				
2,3,7,8-TCDD	0.506	0.073	0.065	0.176
Total TCDD	3.083	0.364	0.923	0.968
1,2,3,7,8-PeCDD	1.872	0.342	0.300	0.794
Total PeCDD	14.092	2.782	5.540	7.195
1,2,3,4,7,8-HxCDD	2.642	0.556	0.946	1.737
1,2,3,6,7,8-HxCDD	3.303	0.920	3.232	3.474
1,2,3,7,8,9-HxCDD	2.202	0.449	1.800	2.407
Total HxCDD	26.422	5.136	25.391	27.292
1,2,3,4,6,7,8-HpCDD	30.826	4.066	46.165	39.698
Total HpCDD	57.248	8.347	87.713	76.915
Total OCDD	21.578	5.565	50.781	57.066
Total PCDD	122.4	22.2	170.3	169.436
FURANS				
2,3,7,8-TCDF	2.422	0.471	0.785	1.389
Total TCDF	35.229	7.063	9.233	19.105
1,2,3,7,8-PeCDF	5.064	1.070	1.246	2.481
2,3,4,7,8-PeCDF	8.147	1.327	1.593	3.474
Total PeCDF	74.862	17.978	32.315	42.179
1,2,3,4,7,8-HxCDF	12.771	3.424	5.078	8.932
1,2,3,6,7,8-HxCDF	17.395	4.494	9.233	15.383
1,2,3,7,8,9-HxCDF	1.387	0.385	0.808	1.141
2,3,4,6,7,8-HxCDF	12.330	3.210	13.388	20.593
Total HxCDF	112.3	32.1	76.2	106.688
1,2,3,4,6,7,8-HpCDF	46.2	17.5	53.1	66.990
1,2,3,4,7,8,9-HpCDF	13.7	5.8	13.4	18.608
Total HpCDF	107.9	44.9	120.0	156.311
Total OCDF	116.7	113.4	122.3	198.490
Total PCDF	447.0	215.5	360.1	522.773

NOTES

- < - Indicates below minimum detection limit (MDL).
- * - Maximum possible emission rate.
- ** - Total includes MDLs for homologues below the detection limit.
- + - Failed post test leak check.

Table XVI

Concentrations and Mass Emission Rates of Hydrogen Chloride

RUN NUMBER	IMPINGER CATCH mg	***** RESULTS *****			
		gr/DSCF	PPMV	lbs/hr	mg/sec
HC1-1	3881	2.41	3620	5.60	706
HC1-2	3164	1.23	1848	3.52	443
HCL-4	1185	0.49	730	1.42	180
BLANK	< 15				

Table XVII

Concentrations and Mass Emissions of Total Particulate

RUN NUMBER	MASS CATCH mg	CONCENTRATION gr/dscf	MASS EMISSIONS lbs/hr
MS-1	660.3	0.37	0.7
MS-3	182.0	0.07	0.1
MS-4	154.1	0.06	0.1
BLANK	6.3		

Table XVIII

Concentrations and Mass Emissions of Selected Trace Metals

	HCL-1 (1)			HCL-2 (1)			HCL-4 (1)			BLANK
	TOTAL CATCH	MASS CONC.	MASS ENS.	TOTAL CATCH	MASS CONC.	MASS ENS.	TOTAL CATCH	MASS CONC.	MASS ENS.	TOTAL CATCH
	ug	gr/decf	lbs/hr	ug	gr/decf	lbs/hr	ug	gr/decf	lbs/hr	ug
ARSENIC	0.84	3.21E-07	1.21E-06	1.11	4.31E-07	1.23E-06	0.57	2.33E-07	0.84E-07	0.80
CADMIUM	154.6	9.80E-06	2.23E-04	76.8	2.88E-05	8.93E-06	32.4	1.33E-05	3.80E-06	2
CHROMIUM	7.1	4.40E-06	1.02E-05	6.2	2.41E-06	6.00E-06	<5	2.09E-06	6.00E-06	<8
IRON	836	3.84E-04	9.17E-04	286	9.84E-05	2.84E-04	161	6.61E-05	1.84E-04	75
MANGANESE	11	6.82E-06	1.59E-06	8.7	2.21E-06	6.33E-06	4.5	1.84E-06	5.40E-06	<2.8
NICKEL	< 7.5	<4.68E-06	<1.00E-05	<7.5	<2.91E-06	<8.33E-06	<7.5	<3.07E-06	<9.91E-06	<7.5
LEAD	5035	3.12E-03	7.20E-03	2050	7.80E-04	2.20E-03	1115	4.50E-04	1.34E-03	280

(1) filters from the hydrochloric acid sampling train were analyzed for trace metals.

**Particle Size Distributions
Mass Versus Aerodynamic Diameter**

Aerodynamic Diameter	Percent of Total Mass		
	PS-1	PS-2	PS-3
0.5	0.08	0.05	0.06
1.0	0.39	0.20	0.80
1.5	1.21	0.51	3.26
2.0	1.84	0.57	5.57
2.5	2.12	0.65	4.68
3.0	2.23	0.83	3.16
3.5	2.20	0.72	3.06
4.0	2.43	0.87	2.23
4.5	2.38	0.67	2.50
5.0	2.50	0.98	1.68
5.5	2.54	0.89	0.75
6.0	2.75	0.53	1.73
6.5	2.30	0.50	1.85
7.0	2.60	0.69	1.86
7.5	2.29	1.01	2.17
8.0	2.47	1.31	1.94
8.5	1.58	0.64	0.92
9.0	2.10	1.48	0.78
9.5	1.79	1.03	0.41
10.0	1.99	0.15	0.00
10.5	1.34	0.62	0.89
11.0	1.98	0.62	1.38
11.5	0.87	0.97	0.37
12.0	1.54	1.12	1.53
12.5	0.81	1.10	0.00
13.0	1.24	1.61	1.14
13.5	1.07	0.50	1.69
14.0	0.81	0.15	1.07
14.5	0.64	0.20	1.36
15.0	0.96	1.16	0.74
15.5	0.90	0.91	0.00
16.0	0.68	0.26	0.00
16.5	0.72	0.62	1.03
17.0	1.04	0.46	0.00
17.5	1.07	1.24	1.68
18.0	1.72	1.75	0.00
18.5	1.48	0.81	0.00
19.0	1.05	1.79	1.07
19.5	1.29	0.00	2.41
20.0	0.32	0.00	0.00
20.5	0.48	0.00	0.00
21.0	0.14	1.25	0.00
21.5	0.99	2.02	0.00
22.0	0.69	1.19	0.00
22.5	0.00	1.34	0.00
23.0	0.37	1.22	1.57
23.5	0.45	1.55	0.00
24.0	0.36	2.16	0.00
24.5	0.39	0.71	3.50
>25.0	34.81	58.39	39.16

Table XXI

Concentrations and Mass Emission Rates of Mercury

RUN NUMBER	FILTER CATCH mg	***** RESULTS *****			
		gr/dscf	PPMV	lbs/hr	mg/sec
HG-1	56.29	1.02E-02	2.80E+00	3.14E-02	3.96E+00
HG-3	1.52	3.01E-04	8.22E-02	8.87E-04	1.12E-01
HG-4	1.50	2.83E-04	7.74E-02	4.19E-04	5.28E-02
blank	<0.01				

REPORT DOCUMENTATION PAGE		1. REPORT NO. ARD/ML-90-030		2. PB90-258872	
4. Title and Subtitle Evaluation Test of the Kaiser Permanente Hospital Waste Incinerator in San Diego				3. Report Date/Date of Approval March 1990	
7. Author(s) James E. McCormack				6. Performing Organization Rept. No.	
9. Performing Organization Name and Address Engineering Evaluation Branch Monitoring and Laboratory Division Air Resources Board P.O. Box 2815 Sacramento, CA 95812				10. Project/Task/Work Unit No. C-88-013	
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15. Supplementary Notes				14.	
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17. Document Analysis a. Descriptors Evaluation test on a hospital refuse incinerator test report. b. Identifiers/Open-Ended Terms Carbon Dioxide, Carbon Monoxide, Total Hydrocarbons, Sulfur Dioxide, Nitric Oxides, Dioxins, Furans, Polychlorinated Biphenols, Semi-volatile Organics, Hydrogen Chloride, Hexavalent Chromium and Mercury. Incinerator Air Pollution c. COSATI Field/Group					
18. Availability Statement Release Unlimited. Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161		19. Security Class (This Report) UNCLASSIFIED		21. No. of Pages 177	
		20. Security Class (This Page) UNCLASSIFIED		22. Price	

Table II
Charging Log

<u>Day of Week</u>	<u>Date</u>	<u>Time</u>	<u>Hourly Charge Amount (pounds)</u>
Monday	4/25/88	0700-0800	476
Monday	4/25/88	0800-0900	613
Monday	4/25/88	0900-1000	703
Monday	4/25/88	1000-1100	615
Monday	4/25/88	1100-1200	656
Monday	4/25/88	1200-1300	651
Monday	4/25/88	1300-1400	519
Monday	4/25/88	1400-1515	312
Monday		Average	568
Tuesday	4/26/88	0700-0800	628
Tuesday	4/26/88	0800-0900	647
Tuesday	4/26/88	0900-1000	651
Tuesday	4/26/88	1000-1100	652
Tuesday	4/26/88	1100-1200	594
Tuesday	4/26/88	1200-1300	665
Tuesday	4/26/88	1300-1400	616
Tuesday	4/26/88	1400-1515	594
Tuesday		Average	631
Wednesday	4/27/88	0700-0800	661
Wednesday	4/27/88	0800-0900	646
Wednesday	4/27/88	0900-1000	634
Wednesday	4/27/88	1000-1100	579
Wednesday	4/27/88	1100-1200	624
Wednesday	4/27/88	1200-1300	609
Wednesday	4/27/88	1300-1400	391
Wednesday	4/27/88	1400-1500	632
Wednesday	4/27/88	1500-1600	259
Wednesday		Average	559
Thursday	4/28/88	0700-0800	607
Thursday	4/28/88	0800-0900	597
Thursday	4/28/88	0900-1000	481
Thursday	4/28/88	1000-1100	570
Thursday	4/28/88	1100-1200	444
Thursday	4/28/88	1200-1300	470
Thursday	4/28/88	1300-1400	586
Thursday	4/28/88	1400-1500	601
Thursday	4/28/88	1500-1530	283
Thursday		Average	515

Table II (Continued)

Charging Log

<u>Day of Week</u>	<u>Date</u>	<u>Time</u>	<u>Hourly Charge Amount (pounds)</u>
Friday	4/29/88	0700-0800	622
Friday	4/29/88	0800-0900	611
Friday	4/29/88	0900-1000	637
Friday	4/29/88	1000-1100	635
Friday	4/29/88	1100-1200	562
Friday	4/29/88	1200-1300	297
Friday	4/29/88	1300-1400	445
Friday	4/29/88	1400-1500	473
Friday	4/29/88	1500-1530	<u>64</u>
		Average	483

Table VI

Stack Gas Flowrate and Moisture Content

location	sample	date	flow rate dscfm	moisture %
scrubber inlet	M2/M4	04/25/88	2312	6.9
scrubber inlet	M2/M4	04/26/88	2300	7.8
scrubber inlet	M5-1I	04/27/88	2387	7.3
scrubber inlet	M5-2I	04/29/88	2398	6.4
scrubber inlet	M5-3I	04/29/88	2299	7.3
scrubber stack	M2/M4	04/25/88	2301	6.2
scrubber stack	M2/M4	04/26/88	2290	6.9
scrubber stack	M5-1S	04/27/88	2304	8.3
scrubber stack	M5-2S	04/27/88	2344	8.8
scrubber stack	M5-3S	04/29/88	2300	9.3

NOTE

M2 - ARB Method 2 (Moisture Determination Method)

M4 - ARB Method 4 (Velocity Determination Method)

Table VII

Concentration and Mass Emissions of Dioxins and Furans at Scrubber Inlet

	ng/sample			ng/dscm			ng/dscm (corr. to 125 CO ₂)			mg/yr		
	DT-11	DT-21	DT-31	DT-11	DT-21	DT-31	DT-11	DT-21	DT-31	DT-11	DT-21	DT-31
DIOXINS												
2,3,7,8-TCDD	< 1.6	< 0.60	< 2.0	< 0.31	< 0.13	< 0.37	< 0.67	< 0.29	< 0.80	< 3.37E-01	< 1.90E-01	< 4.32E-01
Total TCDD	< 1.6	< 2.0	23	< 0.31	< 0.51	4.22	< 0.67	< 1.12	9.21	< 3.37E-01	< 5.97E-01	4.97E-00
1,2,3,7,8-PeCDD	6.6	< 2.0	12	1.26	< 0.39	2.20	2.76	< 0.06	4.01	1.39E+00	< 4.59E-01	2.59E+00
Total PeCDD	22	27	170	4.21	5.32	31.21	9.10	11.61	69.00	4.64E+00	6.29E+00	3.07E+01
1,2,3,4,7,8-HxCDD	< 11	5.4	15	< 2.11	1.06	2.75	< 4.50	2.32	6.01	< 3.32E+00	1.24E+00	3.24E+00
1,2,3,6,7,8-HxCDD	< 18	12	32	< 3.45	2.37	5.07	< 7.52	5.16	12.82	< 7.79E+00	2.79E+00	6.92E+00
1,2,3,7,8,9-HxCDD	< 8.5	0.0	21	< 1.63	1.56	3.86	< 3.55	3.44	8.41	< 1.79E+00	1.04E+00	4.54E+00
Total HxCDD	53	97	280	10.15	19.12	53.24	22.14	41.72	116.15	1.12E+01	2.23E+01	6.27E+01
1,2,3,4,6,7,8-HpCDD	210	100	400	40.20	35.40	88.12	87.71	77.41	182.25	4.43E+01	4.13E+01	1.04E+02
Total HpCDD	440	390	1000	84.23	76.87	183.50	183.8	167.72	400.5	9.27E+01	8.92E+01	2.16E+02
1,2,3,4,6,7,8-HxCDD	620	750	2100	116.60	147.83	385.51	259.95	322.55	841.11	1.31E+02	1.72E+02	4.84E+02
Total OCDD												
Total PCDD	1136.6	1266.6	3563.6	217.6	249.7	657.8	474.7	544.7	1435.1	2.40E+02	2.91E+02	7.79E+02
FURANS												
2,3,7,8-TCDF	< 0.4	2.0	25.0	< 1.23	0.51	4.59	< 2.67	1.12	10.01	< 1.35E+00	5.97E-01	5.40E+00
Total TCDF	92	77	300	17.61	15.16	69.76	38.42	33.11	152.20	1.94E+01	1.77E+01	8.21E+01
1,2,3,7,8-PeCDF	24	14	64	4.50	2.76	11.75	10.02	6.02	25.63	5.06E+00	3.21E+00	1.30E+01
2,3,4,7,8-PeCDF	36	19	92	6.89	3.75	16.89	15.04	8.17	36.85	7.59E+00	4.30E+00	1.90E+01
Total PeCDF	290	270	640	55.51	53.22	154.20	121.1	110.12	336.44	6.11E+01	6.20E+01	1.02E+02
1,2,3,4,7,8-HxCDF	71	37	140	13.50	7.28	25.70	29.65	15.91	56.07	1.50E+01	8.48E+00	3.03E+01
1,2,3,6,7,8-HxCDF	52	34	130	9.95	6.70	23.86	21.72	14.62	52.07	1.10E+01	7.81E+00	2.01E+01
1,2,3,7,8,9-HxCDF	< 40	25	91	< 7.66	4.83	16.71	< 16.71	10.75	36.45	< 8.43E+00	5.74E+00	1.97E+01
2,3,4,6,7,8-HxCDF	140	93	300	26.00	10.33	55.07	50.47	40.00	120.16	2.92E+01	2.14E+01	6.40E+01
Total HxCDF	636	420	1000	120.6	82.70	183.56	263.1	190.6	400.5	1.33E+02	7.35E+01	2.10E+02
1,2,3,4,6,7,8-HpCDF	370	320	600	70.83	63.00	161.55	154.5	137.6	352.5	2.80E+01	2.10E+01	5.19E+01
1,2,3,4,7,8,9-HpCDF	100	94	240	19.14	10.53	44.66	41.0	40.4	90.1	2.11E+01	1.74E+01	4.11E+01
Total HpCDF	900	760	1900	172.20	149.80	340.79	375.9	326.0	761.0	1.90E+02	2.30E+02	6.00E+02
Total OCDF	1100	1000	2000	210.6	187.1	514.01	459.4	439.1	1121.5	2.32E+02	2.30E+02	6.00E+02
Total PCDF	3012.6	2527	6920	576.6	480.1	1270.3	1256.0	1006.8	2771.7	6.33E+02	5.80E+02	1.50E+03

NOTES
 < Indicates below limit of detection (MDL)
 * Total includes MDLs for homologues below the detection limit
 dscm - dry standard cubic meter at 68 F and one atmosphere

Table IX

Concentration and Mass Emissions of Dioxins and Furans at Stock

	ng/sample			ng/dec			ng/dec corrected to 12.5 CO ₂			ng/sec		
	DT-15	DT-23	DT-35	DT-15	DT-23	DT-35	DT-15	DT-23	DT-35	DT-15	DT-23	DT-35
DIOXINS												
2,3,7,8-TCDD	0.50	< 0.40	< 0.63	0.07	< 0.06	< 0.14	0.15	< 0.12	< 0.32	0.073	< 0.004	< 0.147
Total TCDD	4.6	< 2.5	20	0.62	< 0.36	4.50	1.35	< 0.70	10.02	0.075	0.401	4.004
1,2,3,7,8-PeCDD	< 11	< 5.6	< 3.7	< 1.48	< 0.00	< 0.85	< 3.23	< 1.74	< 1.05	< 1.014	< 0.000	< 0.003
Total PeCDD	5.6	6.4	32	< 1.48	4.41	7.35	3.23	0.02	10.04	0.022	1.020	< 0.070
1,2,3,4,7,8-HxCDD	11	14	< 2.0	0.75	0.90	< 0.07	1.04	1.90	< 1.45	1.014	2.244	1.213
1,2,3,6,7,8-HxCDD	6.0	7.0	< 1.0	0.83	1.00	< 1.10	2.03	4.34	< 0.00	1.013	1.122	< 0.420
1,2,3,7,8,9-HxCDD	94	130	32	12.05	10.40	7.35	27.01	40.34	10.04	13.705	20.036	20.044
Total HxCDD	140	180	58	18.85	22.75	13.32	41.12	49.05	20.07	44.025	60.007	13.525
1,2,3,4,6,7,8-HpCDD	300	350	250	40.30	40.77	27.06	80.1	100.00	60.1	70.245	80.100	50.200
Total HpCDD	540	600	250	72.00	85.33	57.43	150.50	180.17	125.20	130.4	170.5	100.0
Total OCDD	949.0	1113.5	454	127.0	180.4	104.5	270.0	345.5	227.5	340.3	400.0	200.1
FURANS												
2,3,7,8-TCDF	4.6	4.0	7.0	0.62	0.70	1.01	1.35	1.52	3.51	0.075	0.705	1.032
Total TCDF	100	130	200	13.46	10.40	50.72	20.37	40.34	130.30	2.405	20.030	00.020
1,2,3,7,8-PeCDF	17	21	17	2.20	2.00	3.00	4.00	0.52	0.52	3.220	5.120	3.004
2,3,4,7,8-PeCDF	22	32	20	2.00	4.55	4.50	0.46	0.93	10.02	42.000	57.700	55.000
Total PeCDF	290	360	240	30.04	51.20	55.13	0.52	111.70	120.20	0.751	0.057	5.130
1,2,3,4,7,8-HxCDF	46	62	22	6.10	0.02	5.05	13.51	10.24	11.03	5.577	0.174	4.004
1,2,3,4,7,8-HxCDF	30	51	20	5.12	7.25	4.50	9.10	15.82	0.01	4.540	5.200	2.700
1,2,3,6,7,8-HxCDF	31	35	12	4.17	4.00	2.70	32.31	10.24	0.01	10.143	20.030	0.704
1,2,3,7,8,9-HxCDF	110	130	42	14.01	10.40	0.05	120.2	100.2	110.3	41.1	57.7	51.3
Total HxCDF	440	600	220	50.2	65.35	50.03	82.2	100.2	00.1	41.1	57.7	20.0
1,2,3,4,6,7,8-HpCDF	200	300	120	37.00	51.20	27.06	22.0	20.2	11.5	11.3	134.0	50.0
1,2,3,4,7,8,9-HpCDF	77	94	23	10.30	13.57	5.20	103.0	200.0	120.3	90.0	170.3	72.3
Total HpCDF	660	840	240	80.04	119.46	71.21	201.4	341.3	155.4	130.0	170.3	72.3
Total OCDF	800	1100	310	110.0	150.4	101.7	000.0	040.2	030.5	340.3	400.0	200.1
Total PCDF	2300	3030	1270	320.4	430.0	201.7	000.0	040.2	030.5	340.3	400.0	200.1

NOTES:
 < - Indicates below limit of detection (MDL)
 & - Total includes MDL for homologues below the detection limit

Table XV

Concentrations and Mass Emission Rates of Hydrogen Chloride

RUN NUMBER	IMPINGER CATCH mg	***** gr/DSCF	RESULTS PPMV	***** lbs/hr	Concentration
					Corrected to 12 % CO ₂ gr /dscf
HC1-1I	285.9	0.17	263	2.64	0.38
HC1-2I*	311.6	0.19	286	3.33	0.43
HC1-3I					
HC1-1S	52.4	0.03	48	0.53	0.07
HC1-2S	54.1	0.03	47	0.55	0.07
HC1-3S	40.7	0.02	33	0.42	0.05
BLANK	< 0.06				

NOTE:

* Impinger and probe samples were compromised.

Table XVI

Concentrations and Mass Emissions of Total Particulate Matter

RUN NUMBER	MASS CATCH mg	RESULTS		CONCENTRATION CORRECTED TO 12 % CO ₂ gr/dscf
		gr/dscf	lbs/hr	
M5-2I	221.2	0.12	2.4	0.27
M5-3I	116.6	0.05	1.0	0.11
M5-4I	189.3	0.11	2.1	0.25
M5-1S	161.7	0.09	1.7	0.20
M5-2S	160.3	0.09	1.9	0.20
M5-3S	37.3	0.02	0.4	0.05

Table XVII
Concentrations and Mass Emissions of Trace Metals

RUN NUMBER	ARSENIC			CADMIUM			TOTAL CHROMIUM			IRON		
	TOTAL CONC.	MASS CONC.	EMISSIONS	TOTAL CONC.	MASS CONC.	EMISSIONS	TOTAL CONC.	MASS CONC.	EMISSIONS	TOTAL CONC.	MASS CONC.	EMISSIONS
	ug	g/dmcl	lbs/hr	ug	g/dmcl	lbs/hr	ug	g/dmcl	lbs/hr	ug	g/dmcl	lbs/hr
MS-21	4.26	2.27E-06	4.63E-05	273	1.45E-04	2.97E-03	10.1	5.37E-06	1.10E-04	368.5	1.95E-04	3.00E-03
MS-31	1.19	4.69E-07	1.01E-05	69.5	2.40E-05	5.11E-04	11	4.52E-06	9.39E-05	259.2	1.07E-04	2.10E-03
MS-41	0.91	5.10E-07	1.01E-05	56.1	3.20E-05	6.42E-04	10.7	6.00E-06	1.10E-04	209	1.51E-04	2.97E-03
MS-15	4.97	2.60E-06	5.29E-05	239.5	1.20E-04	2.54E-03	12.9	6.90E-06	1.37E-04	178	9.49E-05	1.07E-03
MS-25	5.02	2.69E-06	5.00E-05	236	1.36E-04	2.73E-03	11.7	6.73E-06	1.36E-04	309.5	2.30E-04	4.02E-03
MS-35	0.04	3.73E-07	7.34E-06	43.3	2.52E-05	4.97E-04	5.6	3.20E-06	6.43E-05	106.6	8.37E-05	1.22E-03
RUN NUMBER	MANGANESE			NICKEL			LEAD					
	TOTAL CONC.	MASS CONC.	EMISSIONS	TOTAL CONC.	MASS CONC.	EMISSIONS	TOTAL CONC.	MASS CONC.	EMISSIONS			
	ug	g/dmcl	lbs/hr	ug	g/dmcl	lbs/hr	ug	g/dmcl	lbs/hr			
MS-21	22	1.32E-05	2.03E-04	< 7.5	< 4.49E-06	< 6.92E-05	3140	1.00E-03	2.90E-02			
MS-31	18.4	1.10E-05	1.96E-04	< 7.5	< 4.49E-06	< 6.92E-05	1330	7.90E-04	1.42E-02			
MS-41	14.3	8.11E-06	1.41E-04	< 7.5	< 4.25E-06	< 7.38E-05	1300	7.83E-04	1.36E-02			
MS-15	15.3	9.11E-06	1.55E-04	< 7.5	< 4.47E-06	< 7.50E-05	2785	1.66E-03	2.02E-02			
MS-25	16	9.04E-06	1.63E-04	10.7	6.04E-06	1.09E-04	2675	1.51E-03	2.73E-02			
MS-35	6.1	3.24E-06	6.31E-05	< 7.5	< 3.99E-06	< 7.76E-05	925	4.92E-04	9.57E-03			

< below the detection limit of the analytical method

TEST REPORT
FOR
SWEDISH AMERICAN HOSPITAL
CONSUMAT INCINERATOR

DECEMBER 17, 1986

B-5021-16AP

Beling Consultants

DISCUSSION

A sampling program to determine the level of particulate and carbon monoxide emission was performed on December 17, 1986 on the hospital's new Consumat Incinerator. The incinerator is a Model C75P with serial number of 4806. It is rated as a type 7 with a capacity of 175 pounds/hour.

The unit was charged at 175 lbs/hr for tests #1 and #3. Test #2, the rate was 172 lbs/hr.

The unit was loaded one time for these tests.

Pre-test orsats were done with all the burners operating and with the bottom burners off.

The unit was operated during this series with the bottom burners off.

BTU usage was recorded for all tests. The carbon monoxide was measured by indicator tube and infrared analysis.

There were not any mechanical problems with the unit during the tests.

PARTICULATE FIELD DATA

-ANT: SWEDISH AMERICAN HOSPITAL
 SOURCE: CONSUMAT INCINERATOR
 PROCESS WEIGHT RATE: 175 LBS/HR
 SAMPLE LOCATION: STACK
 OPERATOR: LT-RS
 DAY/DATE: WED.-12/17/66

IMP. BOX NO. = 1
 PITOT CP = 0.83
 EST. TM (DEG.F) = 60.00
 STATIC DUCT PRES. (IN.HG) = 29.34
 C-FACTOR = 0.98
 NOZZLE DIA. (IN.) = 0.507
 AMBIENT TEMP. (DEG.F) = 37.0
 FILTER WT. (MG) = 625.58

BAR. PRES. (IN.HG) = 29.35
 METER DELTA HA (IN.H2O) = 1.80
 EST. % MOISTURE = 6.
 PS/P = 1.000
 EST. TS (DEG.F) = 550.00
 REF. DELTA PRES. (IN.H2O) = 0.05
 STACK X-SEC. AREA (SQ.FT) = 2.46
 PARTIC. WT. (UNCURR. MG) = 158.32
 ACETONE BLANK (MG) = 2.00
 WATER BLANK (MG) = 0.00
 LEAK TESTS: BEFORE = .00
 AFTER = .02

MIN./POINT = 5

TEST NO. 1

PUMP VACUUM (I.HG)	POINT NO.	CLOCK TIME	STACK TEMP. (DEG.F)	DRY GAS METER (CU.FT.)	PITOT DELTA P (IN.H2O)	DRIFICE DELTA H (IN.H2O)	DRY GAS TEMP. (DEG.F) INLET OUTLET	
0.50	1	0.0	530.0	290.02	0.0400	1.35	76.0	58.0
0.50	2	5.0	538.0	293.40	0.0450	1.50	76.0	58.0
0.50	3	10.0	536.0	296.90	0.0300	1.70	74.0	60.0
0.50	4	15.0	533.0	300.60	0.0400	1.35	74.0	58.0
0.50	5	20.0	536.0	304.15	0.0400	1.35	72.0	58.0
0.50	6	25.0	528.0	307.35	0.0300	1.02	70.0	57.0
0.50	7	30.0	540.0	310.20	0.0400	1.35	62.0	56.0
0.50	8	35.0	547.0	313.80	0.0450	1.50	67.0	57.0
0.50	9	40.0	580.0	317.40	0.0450	1.50	70.0	56.0
0.50	10	45.0	618.0	321.00	0.0500	1.70	68.0	56.0
0.50	11	50.0	611.0	324.70	0.0400	1.35	68.0	57.0
0.50	12	55.0	605.0	328.00	0.0400	1.35	68.0	57.0
		60		331.37				
OTAL VERAGE			6702.0 558.5	41.35	0.5050 0.0421	17.02 1.42	845.0 70.4	688.0 57.3

PARTICULATE FIELD DATA

ANT: _____
 SOURCE: SWEDISH AMERICAN HOSPITAL
 PROCESS WEIGHT RATE: 172 LBS/HR
 SAMPLE LOCATION: STACK
 OPERATOR: LT-RS
 DAY/DATE: WED-12/17/86

IMP. BOX NO. = 2
 PITOT CP = 0.83
 EST. TM (DEG.F) = 60.00
 STATIC DUCT PRES. (IN.HG) = 29.37
 C-FACTOR = 0.98
 NOZZLE DIA. (IN.) = 0.507
 AMBIENT TEMP. (DEG.F) = 38.0
 FILTER WT. (MG) = 628.05
 MIN. POINT = 5
 BAR. PRES. (IN.HG) = 29.38
 METER DELTA HA (IN.H2O) = 1.80
 EST. % MOISTURE = 6.
 PS/P = 1.000
 EST. TS (DEG.F) = 600.00
 REF. DELTA PRES. (IN.H2O) = 0.05
 STACK X-SEC. AREA (SQ.FT) = 2.46
 PARTIC. WT. (UNCORR. MG) = 38.84
 ACETONE BLANK (MG) = 1.93
 WATER BLANK (MG) = 0.00
 LEAK TESTS BEFORE = .01
 AFTER = .01

TEST NO. 2

PUMP VACUUM (I.HG)	POINT NO.	CLOCK TIME	STACK TEMP. (DEG.F)	DRY GAS METER (CU.FT.)	PITOT DELTA P (IN.H2O)	ORIFICE DELTA H (IN.H2O)	DRY GAS TEMP. (DEG.F) INLET OUTLET	
0.50	1	0.0	570.0	407.10	0.0450	1.45	72.0	56.0
0.50	2	5.0	608.0	410.60	0.0500	1.60	70.0	56.0
0.50	3	10.0	600.0	414.25	0.0600	1.95	74.0	57.0
0.50	4	15.0	597.0	418.19	0.0450	1.45	76.0	56.0
0.50	5	20.0	594.0	421.65	0.0500	1.60	74.0	56.0
0.50	6	25.0	583.0	425.40	0.0450	1.45	74.0	56.0
0.50	7	30.0	621.0	428.60	0.0400	1.30	60.0	52.0
0.50	8	35.0	619.0	432.05	0.0400	1.30	62.0	52.0
0.50	9	40.0	612.0	435.45	0.0400	1.30	64.0	52.0
0.50	10	45.0	613.0	438.80	0.0450	1.45	65.0	52.0
0.50	11	50.0	614.0	442.20	0.0400	1.30	66.0	52.0
0.50	12	55.0	613.0	445.50	0.0300	1.15	68.0	52.0
		60		448.55				
TOTAL			7244.0	41.45	0.5300	17.30	825.0	649.0
VERAGE			603.7		0.0442	1.44	68.8	54.1

PARTICULATE FIELD DATA

LANT: SWEDISH AMERICAN HOSPITAL
 SOURCE: CONSUMAT INCINERATOR
 PROCESS WEIGHT RATE: 175 LBS/HR
 SAMPLE LOCATION: STACK
 OPERATOR: LT-RS
 DAY/DATE: WED. 12/17/86

IMP. BOX NO. = 3
 PITOT CP = 0.83
 EST. TM (DEG.F) = 60.00
 STATIC DUCT PRES. (IN.HG) = 29.38
 C-FACTOR = 0.98
 NOZZLE DIA. (IN.) = 0.507
 AMBIENT TEMP. (DEG.F) = 40.0
 FILTER WT. (MG) = 824.03

SAR. PRES. (IN.HG) = 29.40
 METER DELTA HA (IN.H2O) = 1.80
 EST. % MOISTURE = 6.
 PS/P = 1.000
 EST. TS (DEG.F) = 600.00
 REF. DELTA PRES. (IN.H2O) = 0.06
 STACK X-SEC. AREA (SQ.FT) = 2.46
 PARTIC. WT. (UNCORR. MG) = 97.25
 ACETONE BLANK (MG) = 2.32
 WATER BLANK (MG) = 0.00
 LEAK TESTS: BEFORE = .00
 AFTER = .02

MIN./POINT = 5

TEST NO. 3

PUMP /ACUUM (V.HG)	POINT NO.	CLOCK TIME	STACK TEMP. (DEG.F)	DRY GAS METER (CU.FT.)	PITOT DELTA P (IN.H2O)	ORIPICE DELTA H (IN.H2O)	DRY GAS TEMP. (DEG.F)	
							INLET	OUTLET
0.50	1	0.0	615.0	450.10	0.0500	1.60	42.0	40.0
0.50	2	5.0	700.0	453.95	0.0500	1.52	52.0	42.0
0.50	3	10.0	683.0	457.20	0.0550	1.70	54.0	42.0
0.50	4	15.0	672.0	461.10	0.0500	1.52	60.0	44.0
0.50	5	20.0	663.0	464.40	0.0500	1.52	60.0	44.0
0.50	6	25.0	659.0	467.48	0.0400	1.25	60.0	46.0
0.50	7	30.0	634.0	470.72	0.0500	1.52	56.0	46.0
0.50	8	35.0	644.0	474.30	0.0600	1.80	62.0	47.0
0.50	9	40.0	634.0	478.10	0.0600	1.80	62.0	47.0
0.50	10	45.0	625.0	481.90	0.0500	1.60	62.0	47.0
0.50	11	50.0	582.0	485.45	0.0400	1.35	64.0	48.0
0.50	12	55.0	583.0	488.67	0.0350	1.12	60.0	50.0
		60		491.69				
TAL ERAGE			7694.0 641.2	41.59	0.5900 0.0492	18.30 1.53	694.0 57.8	543.0 45.3

BEILING CONSULTANTS INC

PROJECT: SWEDISH AMERICAN HOSPITAL
STACK LOCATION: STACK

TEST NO: 1
DATE: 12/17/86
TIME: 9:51 AM-10:55 AM

TEST DATA:

SAMPLE TIME (MINUTES)	60
AVERAGE STACK TEMPERATURE (DEG.F)	558.50
AVERAGE METER TEMPERATURE (DEG.F)	63.87
BAROMETRIC PRESSURE (IN.HG), PBAR	29.35
STACK PRESSURE (IN.HG), PS	29.34
STACK CROSS-SEC. AREA (SQ.FT), A	2.46
NOZZLE CROSS-SEC. AREA (SQ.FT), AN	0.0014019
PITOT COEFFICIENT, CP	0.83
AVERAGE SORT(DELTA P)	0.20
AVERAGE DELTA H (IN.H2O)	1.41
METERED GAS VOLUME (CU.FT.), VM	41.35
MOISTURE COLLECTED (ML), VLC	55.00

PARTICULATE SUMMARY:

PARTICULATE PRIOR TO FILTER (MG)	129.19
PARTICULATE ON FILTER (MG)	9.13
PARTICULATE ORGANIC CONDENSIBLES (MG)	0.00
PARTICULATE INORGANIC CONDENSIBLES (MG)	0.00
UNCORRECTED PARTICULATE TOTAL (MG)	138.32
CORRECTION FOR BLANKS (MG)	2.00
CORRECTED PARTICULATE TOTAL (MG)	136.32

CALCULATED DATA:

AVERAGE FLUE GAS TEMPERATURE (DEG.R), TS	1018.50
AVERAGE METER TEMPERATURE (DEG.R), TM	523.87
METERED GAS VOLUME (SCF), VMSTD	41.17
VOLUME OF WATER VAPOR (CU.FT.), VWSTD	2.60
MOISTURE CONTENT (%), BWD	5.95
DRY MOLECULAR WT. OF GAS (LB/LB-MOLE), MD	29.25
WET MOLECULAR WT. OF GAS (LB/LB-MOLE), MS	28.58
STACK GAS VELOCITY (FPS), VS	16.00
VOLUMETRIC FLOW RATE (CFM), QS	68029.
CONCENTRATION (GR./SCF), CMS	0.0509
PARTICULATE MASS RATE (LB/HR), PMRS	0.51
ISOKINETIC VARIATION (%), I	106.22

BELING CONSULTANTS INC

PROJECT: SWEDISH AMERICAN HOSPITAL
STACK LOCATION: STACK

TEST NO: 2
DATE: 12/17/86
TIME: 11:55 AM - 1:00 PM

TEST DATA:

SAMPLE TIME (MINUTES)	60
AVERAGE STACK TEMPERATURE (DEG.F)	603.66
AVERAGE METER TEMPERATURE (DEG.F)	61.41
BAROMETRIC PRESSURE (IN.HG), PS	29.38
STACK PRESSURE (IN.HG), PS	29.37
STACK CROSS-SEC. AREA (SQ.FT), A	2.46
NOZZLE CROSS-SEC. AREA (SQ.FT), AN	0.0014019
PITOT COEFFICIENT, CP	0.83
AVERAGE SQR(Delta P)	0.20
AVERAGE Delta H (IN.H2O)	1.44
METERED GAS VOLUME (CU.FT.), VM	41.45
MOISTURE COLLECTED (ML), VLC	34.00
PARTICULATE SUMMARY:	
PARTICULATE PRIOR TO FILTER (MG)	27.97
PARTICULATE ON FILTER (MG)	8.87
PARTICULATE ORGANIC CONDENSIBLES (MG)	0.00
PARTICULATE INORGANIC CONDENSIBLES (MG)	0.00
UNCORRECTED PARTICULATE TOTAL (MG)	36.84
CORRECTION FOR BLANKS (MG)	1.93
CORRECTED PARTICULATE TOTAL (MG)	34.91

CALCULATED DATA:

AVERAGE FLUE GAS TEMPERATURE (DEG.R), TS	1063.66
AVERAGE METER TEMPERATURE (DEG.R), TM	521.41
METERED GAS VOLUME (SCF), VMSTD	41.51
VOLUME OF WATER VAPOR (CU.FT.), VMSTD	2.55
MOISTURE CONTENT (%), BWD	5.80
DRY MOLECULAR WT. OF GAS (LB/LB-MOLE), MD	29.25
WET MOLECULAR WT. OF GAS (LB/LB-MOLE), MS	28.60
STACK GAS VELOCITY (FPS), VS	16.72
VOLUMETRIC FLOW RATE (CFH), QS	68237.
CONCENTRATION (GR./SCF), C _S	0.0129
PARTICULATE MASS RATE (LG/HR), PMRS	0.13
ISOKINETIC VARIATION (%), I	106.77

BEILING CONSULTANTS INC

PROJECT: SWEDISH AMERICAN HOSPITAL
STACK LOCATION: STACK

TEST NO: 3
DATE: 12/17/86
TIME: 1:45 PM-2:48 PM

TEST DATA:

SAMPLE TIME (MINUTES)	60
AVERAGE STACK TEMPERATURE (DEG.F)	641.16
AVERAGE METER TEMPERATURE (DEG.F)	51.54
BAROMETRIC PRESSURE (IN.HG), PS	29.40
STACK PRESSURE (IN.HG), PS	29.38
STACK CROSS-SEC. AREA (SQ.FT), A	2.46
NOZZLE CROSS-SEC. AREA (SQ.FT), AN	0.0014019
PITOT COEFFICIENT, CP	0.83
AVERAGE SQRT(DELTA P)	0.22
AVERAGE DELTA H (IN.H2O)	1.52
METERED GAS VOLUME (CU.FT.), VM	41.59
MOISTURE COLLECTED (ML), VLC	57.50
PARTICULATE SUMMARY:	
PARTICULATE PRIOR TO FILTER (MG)	71.26
PARTICULATE ON FILTER (MG)	25.99
PARTICULATE ORGANIC CONDENSIBLES (MG)	0.00
PARTICULATE INORGANIC CONDENSIBLES (MG)	0.00
UNCORRECTED PARTICULATE TOTAL (MG)	97.25
CORRECTION FOR BLANKS (MG)	2.32
CORRECTED PARTICULATE TOTAL (MG)	94.93

CALCULATED DATA:

AVERAGE FLUE GAS TEMPERATURE (DEG.R), TS	1101.16
AVERAGE METER TEMPERATURE (DEG.R), TM	511.54
METERED GAS VOLUME (SCF), VMSTD	42.49
VOLUME OF WATER VAPOR (CU.FT.), VMSTD	2.72
MOISTURE CONTENT (%), BWO	6.02
DRY MOLECULAR WT. OF GAS (LB/LB-MOLE), MD	29.30
WET MOLECULAR WT. OF GAS (LB/LB-MOLE), MS	28.62
STACK GAS VELOCITY (FPS), VS	17.95
VOLUMETRIC FLOW RATE (CFM), QS	70602.
CONCENTRATION (GR./SCF), CWS	0.0344
PARTICULATE MASS RATE (LG/HR), PMRS	0.35
ISO KINETIC VARIATION (%), I	105.63

SWEDISH AMERICAN HOSPITAL

CARBON MONOXIDE TEST DATA

Test No.	Infrared Tests Absorbance	Time COST	CO ₂ %	O ₂ %	N ₂ %	Infrared CO PPM	Indicator Tube CO PPM	Excess Air Ratio	CO Corrected to 50% Excess Air, PPM
1A:	0.004	9:51 am	3.5	17.4	79.1	5.0	5.0	4.78	0.0
1B	0.004	-----	3.5	17.4	79.1	5.0	5.0	4.78	0.0
1C	0.004	10:51 am				5.0	5.0	4.78	0.0
2A	0.000	11:55 am	3.6	17.0	79.4	0.0	0.0	---	19.0
2B	0.000	-----	3.6	17.0	17.9	0.0	0.0	---	19.0
2C	0.000	1:00 pm				0.0	0.0	---	19.0

Average carbon monoxide concentration 10.0 PPM.



COMPUTATION SHEET

Beling Consultants

PROFESSIONAL ENGINEERS

MOBILE, IL PEORIA, IL ROCKFORD, IL JOLIET, IL
BURLINGTON, IA BETTENDORF, IA AURORA, CO

BY L. Thomsen	DATE 12/18/86	PROJECT	JOB NO.
CHE'D BY	DATE	HCI Testing	SHEET NO. OF SHEETS

The samples were collected in dilute sodium hydroxide solution in a Method Five sampling train. The sample length was thirty minutes with the sampling rate at approximately 0.5 CFM. The analysis was done by titration for total chlorides. The unit was charged at one half of its hourly capacity.

$$175/2 = 87\frac{1}{2} \text{ #/hr}$$

HCl EMISSION DATA

Run No.	4	5
Date	12/17/86	12/17/86
mg/HCl	119	147
T _m - Average Gas Meter Temperature, °F	50.6	51.3
P _b - Barometric Pressure, "Hg abs.	29.38	29.38
V _m - Volume of dry gas sampled @ meter conditions, ft ³	15.87	19.4
ppm: HCl	172	174

$$\text{ppm HCl} = \frac{1.32 \times \text{mg HCl} \times (T_m + 460)}{V_m \times P_b}$$

TEST 4

$$\text{ppm HCl} = \frac{1.32 \times 119 \text{ mg} \times 510.6}{15.87 \times 29.38} = 172 \text{ ppm}$$

TEST 5

$$\text{ppm HCl} = \frac{1.32 \times 147 \text{ mg} \times 511.3}{19.4 \times 29.38} = 174 \text{ ppm}$$



COMPUTATION SHEET

Beling Consultants

PROFESSIONAL ENGINEERS

MOBILE, IL PEORIA, IL ROCKFORD, IL JOLIET, IL
BURLINGTON, IA BETTENDORF, IA AURORA, CO

by L. Thomsen	DATE 12/18/86	PROJECT	JOB NO.
CHE'D BY	DATE	Incinerator	SHEET NO. OF SHEETS

Test 4

$$\begin{aligned} M_{HCl} &= 5.76 \times 10^{-6} (172)(1057.24) \\ &= 1.05 \text{ lbs/hr} \end{aligned}$$

Test 5

$$\begin{aligned} M_{HCl} &= 5.76 \times 10^{-6} (174)(1131.27) \\ &= 1.13 \text{ lbs/hr} \end{aligned}$$

ARB/ML-88-026

Evaluation Retest on a Hospital Refuse Incinerator
At Sutter General Hospital, Sacramento, CA

April, 1988

CALIFORNIA AIR RESOURCES BOARD
MONITORING AND LABORATORY DIVISION
1309 T STREET, SACRAMENTO, CA 95814

Al Jenkins
Peter Ouchida
George Lew

This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement of recommendation for use.

Revised 3/89

II. PROCESS DESCRIPTION

Sutter General Hospital operates a multichambered waste heat recovery incinerator located at 2801 L Street, Sacramento, CA. The incinerator, Model/No. 67-SA and heat recovery system, Model HR-1000-2-SK-9, are manufactured by Thermtec of Tualatin, Oregon. This system consists of a dual chambered hospital refuse burning incinerator which passes its exhaust gases through a waste heat boiler for steam generation. The incinerator is equipped to burn natural gas, which is used during start-up and to maintain the necessary temperature. A schematic of the incinerator/heat recovery system is shown in Figure 1.

The average refuse feed rate to the incinerator during the test period was reported as follows:

DATE	TIME	NUMBER OF <u>a</u> / INFECTIOUS BOXES (pounds)	NUMBER OF <u>b</u> / CARTS (pounds)	PROCESS WEIGHT RATE, LB/HR
7-29-87	1300-1800	13 (264)	36 (2700)	593
7-30-87	0900-1400	14 (284)	29 (2175)	492
7-31-87	0900-1900 ^c /	37 (751)	49 (3675)	443
8-3-87	1300-2300	34 (690)	40 (3000)	369

a/ Infectious boxes weigh 20.3 pounds each

b/ Typical cart trash weight is 75 pounds

c/ On July 31, 1987 the refuse loading ram to the bottom chamber was inoperative from approximately 1000 to 1500 HOURS. During this period the bottom chamber was in a burndown configuration with an increased natural gas consumption in the upper chamber to satisfy boiler heating requirements.

TABLE 4

DAILY AVERAGE STACK CONDITIONS FOR INCINERATOR
AT SUTTER GENERAL HOSPITAL

Date	Stack Gas Velocity (Ft/Sec)	Stack Gas Flow Rate (DSCFH)	Moisture Content, (% By Volume)	Stack Gas Temperature (°F)
7-29-87	10.9	2687	13.2	326
7-30-87	13.4	3145	13.2	369
7-31-87	13.0	2833	15.5	409
8-3-87	11.9	2894	10.9	357

C-87-090

TABLE 5
DAILY AVERAGE CONCENTRATIONS OF SELECTED GASEOUS AIR
POLLUTANTS FROM THE SUTTER GENERAL INCINERATOR

DATE	d/ PM	a/ O ₂	a/ CO ₂	a/ CO	b/ NOX	b/ SO ₂	bc/ HC	c/ HCL
		GR/DSCF	PERCENT	PERCENT	PPMV	PPMV	PPMV	PPMV
7-29-87	-	15.6	4.0	(50	130	50	(3	-
7-30-87	-	12.1	5.5	(50	90	13	(2	315
	f/					e/		g/
7-31-87	0.024	12.5	5.2	(50	80	11	(2	224
	h/							
8-3-87	0.050	13.9	4.8	(50	100	22	12	-

a/ THE O₂, CO₂ AND CO VALUES WERE USED TO DETERMINE THE MOLECULAR WEIGHT OF THE STACK GAS.

b/ NOX, SO₂ AND HC VALUES ARE CORRECTED TO 3 PERCENT O₂.

c/ TOTAL HYDROCARBON DATA REPORTED AS PROPANE.

d/ REPORTED AT ACTUAL FLEE GAS O₂ CONCENTRATIONS.

e/ SO₂ ANALYZER INOPERATIVE DURING PART OF TEST PERIOD.

f/ AVERAGE OF FOUR TEST RUNS (0.027 , 0.021 , 0.023 AND 0.024 GR/DSCF)

g/ AVERAGE OF TWO TEST RUNS (285 AND 159 PPMV)

h/ AVERAGE OF TWO TEST RUNS (0.043 AND 0.057 GR/DSCF)

SYMBOL () INDICATES BELOW DETECTABLE LIMIT.

C-87-100

TABLE 6

PARTICULATE MATTER AND HYDROCHLORIC ACID
CONCENTRATIONS AND MASS EMISSION RATES

DATE RUN	NO.	PM		HCl	
		GR/DSCF	LB/HR	PPM	LB/HR
7-30-87	HC1-1S	-	-	315	5.79
7-31-87	HC1-2S	-	-	282	4.46
	HC1-3S	-	-	159	2.59
	M5-1S	0.027	0.74	-	-
	M5-2S	0.021	0.50	-	-
	M5-3S	0.023	0.55	-	-
	M5-4S	0.024	0.53	-	-
8-3-87	M5-5S	0.043	1.09	-	-
	M5-6S	0.057	1.38	-	-

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TABLE 9

PCDD/PCDF MASS EMISSION RATES IN STACK GAS
(ng/sec)

RUN # Sampling date	DT-1S 7-29-87	DT-2S 7-30-87	DT-3S 7-30-87
DIOXINS			
2,3,7,8-TCDD	0.24	< 0.11	0.140
Total TCDD	25.4	21.0	33.3
1,2,3,7,8-PeCDD	4.03	2.39	3.8
Total PeCDD	138	103	106
1,2,3,4,7,8-HxCDD	10.9	8.96	10.1
1,2,3,6,7,8-HxCDD	21.5	18.7	21.5
1,2,3,7,8,9-HxCDD	13.4	10.5	12.5
Total HxCDD	291	236	242
1,2,3,4,6,7,8-HpCDD	157	13.8	169
Total HpCDD	349	334	355
Total OCDD	237	265	269
Total PCDD	1041	959 **	1005
FURANS			
2,3,7,8-TCDF	6.51	4.86	6.05
Total TCDF	329	253	256
1,2,3,7,8-PeCDF	30.0	25.2	30.6
2,3,4,7,8-PeCDF	36.4	29.7	37.0
Total PeCDF	407	342	333
1,2,3,4,7,8-HxCDF	50.0	43.6	49.6
1,2,3,6,7,8-HxCDF	53.2	41.1	43.8
1,2,3,7,8,9-HxCDF	14.5	13.9	17.5
2,3,4,6,7,8-HxCDF	115	104	103
Total HxCDF	463	374	431
1,2,3,4,6,7,8-HpCDF	233	244	236
1,2,3,4,7,8,9-HpCDF	45.5	51.1	56.2
Total HpCDF	437	462	477
Total OCDF	381	404	396
Total PCDF	2016	1834	1893

NOTES

< indicates below limit of detection (MDL)

** - Total includes MDLs for homologues below the detection limit

C-87-090

TABLE 16

MASS EMISSION RATES OF TRACE METALS IN STACK GAS

MASS EMISSION RATES, POUNDS/HOUR^{a/}

RUN NO.	As.	Cd	Cr	Fe	Mn	Ni	Pb
M5-1S	0.45E-5	5.90E-4	9.84E-5	2.99E-3	1.14E-4	< 6.71E-5	7.65E-3
M5-2S	ND	1.86E-4	4.22E-5	3.12E-3	2.55E-5	< 6.09E-5	2.01E-3
M5-3S	ND	1.95E-4	5.20E-5	0.37E-3	1.67E-5	< 6.96E-5	2.97E-3
M5-4S	ND	2.07E-4	< 4.87E-5	0.70E-3	0.31E-4	< 7.30E-5	2.34E-3
M5-5S	ND	6.68E-4	7.30E-5	1.52E-3	0.80E-4	< 9.13E-5	6.31E-3
M5-6S	0.11E-5	6.85E-4	1.16E-4	1.06E-2	2.55E-4	< 7.94E-5	1.23E-2

^{a/} Symbol (<) indicates below limit of detection.

ND Not Determined

C-87-090

ARB/SS-87-01

Evaluation Test On A Hospital
Refuse Incinerator At Saint Agnes
Medical Center, Fresno, CA

January 1987

CALIFORNIA AIR RESOURCES BOARD

STATIONARY SOURCE DIVISION
1102 Q STREET, SACRAMENTO, CA 95814

Alfred C. Jenkins

This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Revised 3/90

II. PROCESS DESCRIPTION

The Saint Agnes Medical Center operates a multichambered waste heat recovery incinerator located at 1303 E. Herndon Avenue, Fresno, CA. The incinerator, Model 1000 - TE incinerator/heat recovery system, is manufactured by Environmental Control Products, Inc. This system consists of a dual chambered, natural gas fired, hospital refuse burning incinerator which passes its exhaust gases through a waste heat boiler for steam generation. A schematic of the incinerator/heat recovery system is shown in Figure 1. The average refuse feed rate to the incinerator during the test period was 783 lb/hr. The refuse is fed to the first or lower chamber with a ram.

The refuse composition was considered to be typical for hospital incinerators i.e., moisture 10 percent, plastic 30 percent, paper 65 percent and other 5 percent. The heating value was estimated at 10,000 BTU per pound. The operating temperature of the lower chamber is between 1500 and 1600°F and the second chamber between 1800 and 2000°F. The lower chamber is initially fired with natural gas until the refuse-laden chamber comes up to operating temperature, then the natural gas firing is discontinued. The upper or second chamber is fired with natural gas at a rate required to maintain second chamber operating temperatures.

TABLE 4

CONCENTRATIONS OF OXYGEN, CARBON DIOXIDE, CARBON MONOXIDE,
SULFUR DIOXIDE, OXIDES OF NITROGEN, TOTAL HYDROCARBONS,
PARTICULATE MATTER, AND HYDROCHLORIC ACID
IN THE STACK GAS AT SAINT AGNES

CONCENTRATIONS										
Date	Test	Time	PM gr/DSCF	O ₂ ^{a/} Percent	CO ₂ ^{a/} Percent	CO ^{b/} ppmv	NO _x ^{bc/} ppmv	SO ₂ ^{c/} ppmv	HCCd/ ppmv	HCL ^{e/} ppmv
8-12-86	DT-1S	1000-1600	-	13.6	5.5	<50	-	22	2	-
	RT-1S	1000-1200	-	12.3	7.2	<50	-	11	2	-
	HCL-1S	1015-1215	-	12.3	7.2	<50	-	11	2	764
	1-M5	1515-1630	0.08	14.1	4.6	<50	-	27	3	-
8-13-86	DT-2S	0900-1500	-	16.1	3.6	<50	-	18	4	-
	RT-2S	0900-1100	-	15.1	4.3	<50	-	14	3	-
	HCL-2S	0915-1115	-	15.1	4.3	<50	-	14	3	926
	2-M5	1330-1430	0.08	17.1	2.6	<50	-	24	5	-
8-14-86	3-M5	0930-1030	0.09	16.3	3.8	<50	155	20	1	-

a/ The O₂, CO₂ and CO values were used to determine the molecular weight of the stack gas and mass emission rates.

b/ NO_x analyzer inoperative on 8-12 and -8-13-86.

c/ NO_x, SO₂, HC and HCL data corrected to 3 percent O₂.

d/ Total hydrocarbon data reported as propane.

TABLE 5
STACK CONDITIONS FOR INCINERATOR
AT SAINT AGNES MEDICAL CENTER

Date	Run No.	Stack Gas Velocity (Ft/Sec)	Stack Gas Flow Rate (DSCFM)	Moisture Content (% by Vol.)	Stack Gas Temperature (°F)
8-12-86	DT-1S	36.1	2913	8.8	235
	RT-1S	36.0	2905	8.8	235
	HCL-1S	36.0	2905	8.8	235
	1-M5	35.3	2800	8.8	248
8-13-86	DT-2S	34.2	2751	9.7	230
	RT-2S	34.2	2751	9.7	230
	HCL-2S	34.2	2751	9.7	230
	2-M5	33.9	2650	9.7	250
8-14-86	3-M5	32.4	2472	12.5	245

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TABLE 10

SUMMARY OF 2,3,7,8-SUBSTITUTED DIOXIN/FURAN TEST RESULTS

RUN # Sampling date	C-86-059-DT-1S 8-12-86		C-86-059-DT-2S 8-13-86	
	MASS EMISSIONS RATE (ng/sec)	CONC. (ng/M ³)	MASS EMISSIONS RATE (ng/sec)	CONC. (ng/M ³)
DIOXINS				
2,3,7,8-TCDD	ND	ND	0.53	0.41
Total TCDD	52.9	38.5	4.32	3.33
1,2,3,7,8-PeCDD	2.60	1.89	1.59	1.23
Total PeCDD	32.4	23.5	23.7	18.2
1,2,3,4,7,8-HxCDD	3.91	2.84	3.44	2.65
1,2,3,6,7,8-HxCDD	6.90	5.02	3.51	2.70
1,2,3,7,8,9-HxCDD	5.27	3.83	2.46	1.89
Total 2,3,7,8-isomer	16.1	11.7	9.41	7.24
Total HxCDD	74.8	54.4	50.2	38.7
1,2,3,4,6,7,8-HpCDD	79.3	57.7	48.3	37.2
Total HpCDD	189	137	111	85.5
Total OCDD	270	196	188	145
Total PCDD	618	450	377	290
FURANS				
2,3,7,8-TCDF	2.29	1.66	2.77	2.14
Total TCDF	89.2	64.9	102	78.7
1,2,3,7,8-PeCDF	13.4	9.71	12.8	9.86
2,3,4,7,8-PeCDF	13.5	9.85	11.8	9.07
Total 2,3,7,8-isomer	26.9	19.6	24.6	18.9
Total PeCDF	187	136	169	130
1,2,3,4,7,8-HxCDF	21.9	16.0	19.6	15.1
1,2,3,6,7,8-HxCDF	21.9	15.9	18.1	13.9
1,2,3,7,8,9-HxCDF	ND	ND	ND	ND
2,3,4,6,7,8-HxCDF	43.9	32.0	34.8	26.8
Total 2,3,7,8-isomer	87.8	63.8	72.6	55.9
Total HxCDF	278	202	220	170
1,2,3,4,6,7,8-HpCDF	160	116	96.6	74.4
1,2,3,4,7,8,9-HpCDF	22.7	16.5	17.0	13.1
Total 2,3,7,8-isomer	183	133	114	87.5
Total HpCDF	319	232	207	160
Total OCDF	207	150	215	166
Total PCDF	1080	785	914	704

The mass emission rates and concentrations shown above do not include the contribution of the dioxin spike mix.

TABLE 11

MASS EMISSION RATES OF HYDROCHLORIC ACID

DATE	Emissions LB/HR
8-12-86	6.05
8-13-86	4.69

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TABLE 13

MASS EMISSION RATES OF ARSENIC, CADMIUM
CHROMIUM, IRON, MANGANESE, NICKEL AND LEAD
IN STACK GAS

MASS EMISSION RATES, POUNDS/HOUR, ($\times 10^{-6}$)

RUN NO.	AS	Cd	Cr	Fe	Mn	Ni	Pb
PT-1S	84	1601	200	3979	154	108	21893
PT-2S	29	1174	113	1557	62	62	12129
PT-3S	28	971	238	3290	108	110	16884

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