AP-42 Section 12.2
Reference
Report Sect. 4
Reference 180

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

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

Conc. from 1993 used in conjunction w/flow data from 1991 and 1992.

Emission Inventory Report

Bethlehem Steel Corporation

Burns Harbor Division

BY

BRADFORD K. PEASE, PE

MARCH 30, 1994

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March 30, 1994

Mr. Pillip L. Gano
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Subject: Emissions Inventory, Burns Harbor Plant

Dear Phil:

A stack emission inventory measuring the concentration of oxygen, total combustibles, carbon monoxide, oxides of nitrogen, sulfur dioxide, total gaseous hydrocarbons, and methane was made at 44 sources throughout the plant between September 15, 1993 and December 17, 1993. The inventory included sources at the Coke Ovens, Sinter Plant, Power Station, Blast Furnaces, Steelmaking, Continuous Casters, Soaking Pits, Slabbing Mill, 110" Plate Mill, 160" Plate Mill, 80" Hot Strip Mill, and Finishing Facilities.

The tests were carried out in accordance with EPA Method 3A - Determination of Oxygen Concentration in Emissions From Stationary Sources (Instrumental Analyzer Procedure) using a Teledyne Model 980 Oxygen/Combustibles Analyzer, EPA Method 6C - Determination of Sulfur Dioxide Emissions From Stationary Sources (Instrumental Analyzer Procedure) using a Thermo Electron Model 40 Pulsed Fluorescent $S0_2$ Analyzer, EPA Method 7E - Determination of Nitrogen Oxides Emissions From Stationary Sources (Instrumental Analyzer Procedure) using a Thermo Electron Model 10A Chemiluminescent $N0/N0_x$ Analyzer, EPA Method 10 - Determination of Carbon Monoxide Emissions From Stationary Sources using a Siemens Ultramat 22 Infrared CO Analyzer, and EPA Method 25A - Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer using a JUM Engineering Model 109A Flame Ionization Non-Methane Hydrocarbon Analyzer.

An insulated heated sample line was used between the stainless steel or quartz probe in the stack and the analyzers to maintain the sample gases at least 250°F and prevent condensation. Sample dryers and filters were used ahead of the oxygen/combustibles analyzer and the carbon monoxide analyzer which read on a dry stack gas basis, and sample conditioning systems which included heated filters were used before the other analyzers which read on a total stack gas basis. Ambient air with 20.9% oxygen was used for calibrating the oxygen analyzer and certified calibrating gas containing 2.86% hydrogen, 3.51% carbon

TABLE 1. EMISSION MEASUREMENTS - BURNS HARBOR DIVISION

Test Date	Facility	Fuel Fired, Percent [1]			Average Oxygen	Average NOx		Average SO_2		Average CO		Average VOC	
		BFG	COG	NG	%	ppm	lbs/MBtu[2]	ppm	lbs/MBtu	ppm	lbs/MBtu	ppm	lb/MBtu[3]
Coke Ovens													
9/15 & 22/93	Battery No. 1	14	86	---	9.9	999	2.3176	268	0.8854	248	0.3138	2	0.0046
9/22/93	Battery No. 1	---	100	---	13.6	224	0.6351*	243	0.9811*	71	0.1110*	---	---
9/16 & 22/93	Battery No. 2	---	100	---	10.5	265	0.5752	275	0.8500	184	0.0740	15	0.0320
9/24/93	Push. Scrub. 1	---	---	---	19.7	16	0.0186**	24	0.0390**	100	0.0668**	4	0.0046**
9/28/93	Push. Scrub. 2	---	---	---	18.8	15	0.0192**	18	0.0330**	180	0.1371**	2.3	0.0029**
* Without BFG ** lb/ton coal charged													
Sinter Plant													
		Coke					lb/ton		lb/ton		lb/ton		lb/ton
11/3/93	Stack	90.2	9.8	---	17.1	82	0.6033	43	0.4505	8500	35.6773	20	0.1446
11/9/93	Dedust Baghse	---	---	---	20.8	4	0.0122	ND[4]	---	128	0.2308	3	0.009
Power Station													
11/4/93	Boiler No. 7	90.6	6	3.4	1.5	34	0.0732	92	0.2821	18000	22.3977	1	0.0021
11/11/93	Boiler No. 8	53.5	---	46.5	3.1	53	0.1046	45	0.1265	455	0.502	1	0.0019
11/5/93	Boiler No. 9	59.8	15.5	24.7	3	79	0.1593	135	0.3875	2849	3.225	1	0.002
12/1/93	Boiler No. 10	55.9	3.8	40.3	3.4	47	0.0836	38	0.1193	1707	0.313	0.3	0.0006*
11/10/93	Boiler No. 11	82.6	---	17.4	4.4	36	0.0875	72	0.2492	1118	1.5726	1	0.0024
11/10/93	Boiler No. 12	79.3	18.3	2.4	5	52	0.1283	138	0.4847	859	1.2177	1	0.0024
Average		70.3	7.3	22.4	3.4	50	0.1061	87	0.2749	4165	5.0863	0.9	0.0019
* Average, three tests													

Test Date	Facility	Fuel Fired, Percent [1]			Average Oxygen	Average NOx		Average SO_2		Average CO		Average VOC	
		BFG	COG	NG	%	ppm	lbs/MBtu[2]	ppm	lbs/MBtu	ppm	lbs/MBtu	ppm	lb/MBtu[2]
Blast Furnace Stoves													
10/27/93	Furnace C	77.2	22	0.8	2.9	43	0.0934	213	0.6585	14000	17.3686	1	0.0021
10/28/93	Furnace D	78.1	21.9	---	2.4	45	0.0956	184	0.5565	6000	7.2779	ND	---
BOF Shop													
							lb/ton				lb/ton		lb/ton
9/29 & 30, 10/1, 13, 14/93	Vessels 1 & 2	---	---	---	11.5	19	0.0539	---	---	24714	40.7847	0.5	0.0014
10/1 & 15/93	Desulfurizer 1	---	---	---	---	2.6	0.0027	ND	---	66	0.0540	ND	---
10/1 & 15/93	Desulfurizer 2	---	---	---	---	1.8	0.0017	ND	---	46	0.0387	ND	---
12/8/93	Ladle Treat Sta.	---	---	---	---	ND	---	ND	---	34	0.0103	ND	---
12/8/93	Ladle Desulf.	---	---	---	---	ND	---	ND	---	16	0.0006	---	---
Continuous Casters													
													lb/hr
9/23/93	Caster No. 1	---	---	---	---	---	---	---	---	---	---	2.7	3.1
9/23/93	Caster No. 2	---	---	---	---	---	---	---	---	---	---	7.6	15.4058
Soaking Pits													
11/17 & 18/93	Pit No. 41	32.4	67.6	---	14.1	162	0.6734	132	0.7814	19.5	0.0468	ND	---
11/17 & 18/93	Pit No. 43	---	---	100	15.5	199	0.8348	ND[4]	---	16.5	0.0397	ND	---
Slabbing Mill													
11/16/93	Scarfer Scrub.	---	---	---	20.3	107	---	ND	---	216	---	ND	---
110" Plate Mill													
11/19/93	Furnaces 1 & 2	---	---	100	12.8	96	0.2769	ND	---	5	0.008	ND	---

Test Date	Facility	Fuel Fired, Percent [1]			Average Oxygen	Average NOx		Average SO_2		Average CO		Average VOC	
		BFG	COG	NG	%	ppm	lbs/MBtu[2]	ppm	lbs/MBtu	ppm	lbs/MBtu	ppm	lb/MBtu[3]
160" Plate Mill													
11/30/93	Cont. Fce. 1*	---	---	100.0	17.6	23	0.1535	ND	---	15	0.0587	ND	---
11/30/93	Cont. Fce. 2*	---	---	100.0	14.9	65	0.2471	ND	---	12	0.0260	ND	---
12/2/93	Cont. Fce. 1**	---	---	100.0	10.8	86	0.2032	---	---	12	0.0155	ND	---
12/2/93	Cont. Fce. 2**	---	---	100.0	10.1	134	0.2982	---	---	14	0.0169	ND	---
12/9/93	In & Out 6 & 7	---	---	100.0	12.1	46	0.1230	ND	---	8	0.0119	ND	---
12/9/93	In & Out Fce. 5	---	---	100.0	16.6	33	0.1715	ND	---	6	0.0181	ND	---
12/10/93	Pusher Fce. 8	---	100.0	---	8.3	123	0.2263	440	1.1525	0.3	0.0003	0.1	0.0002
12/10/93	Hard. Fce.	---	---	100.0	11.3	44	0.1088	ND	---	27	0.0367	0.1	0.0002
12/14/93	Temp. Fce.	---	---	100.0	13.6	22	0.0698	ND	---	217	0.3871	ND	---
* Thin slabs ** Normal heating													
80" Hot Strip Mill													
12/15/93	Furnace No. 1	---	---	100.0	2.9	300	0.4297	ND	---	5	0.0036	0.6	0.0008
12/15/93	Furnace No. 2	---	---	100.0	2.4	354	0.4956	ND	---	2	0.0014	1.1	0.0015
12/15/93	Furnace No. 3	---	---	100.0	2.3	286	0.3988	ND	---	9	0.0063	0.9	0.0012
	Average	---	---	100.0	2.5	313	0.4414	ND	---	5	0.0038	0.9	0.0012
Box Anneal Furnaces													
10/20-22/93*	Fce.10,Bse 119	---	---	100.0	4.9	61	0.0964	---	---	21	0.0172	2.1	0.0033
* 50-hour cycle													
Continuous Heat Treat Line													
12/17/93	Anneal Heat	---	---	100.0	7.5	127	0.2338	ND[4]	---	340	0.3315	ND	---
12/17/93	Anneal Soak	---	---	100.0	16.4	39	0.1941	ND	---	600	1.7293	14	0.0685
12/17/93	Age Reheat	---	---	100.0	15.5	47	0.1972	ND	---	61	0.1468	22	0.0907

Test Date	Facility	Fuel Fired, Percent [1]			Average Oxygen	Average NOx		Average SO_2		Average CO		Average VOC	
		BFG	COG	NG	%	ppm	lbs/MBtu[2]	ppm	lbs/MBtu	ppm	lbs/MBtu	ppm	lb/MBtu[3]
Hot Dip Coating Line													
12/16/93	Clean. Scrub.	---	---	---	20.8	---	----	ND	---	8	0.304**	3.9	0.264**
12/16/93	Anneal Fce.	---	---	100.0	9.1	7.1	0.0146	ND	---	167	0.1848	ND	---

* wet sample, **lb/hr

(1) On a Btu basis.
(2) Reported as lbs NO_2.
(3) Reported as lbs C_3H_8.
(4) ND - none detected.

APPENDICES

A. Emission Test Data

B. Stack Gas Flow Rate Data

C. Fuel Gas Analyses and Computer Calculated Combustion Data

D. Sample Calculations of Emission Rates

Appendix A

Emission Test Data

A - 1

Burns Harbor No. 1 Coke Oven Battery - 9/15/93

Time	Opt. %	Comb. %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
									North Flue
10:35 am	13.2	0.17	—	200 (195)	—	—	—	—	Yellow Rev. 20 min, 5 after hr Green 25, 45
10:55 "	15.2	0.10	·	170-180	—	—	—	—	BFG - Off, COG - 0.53 M
11:15 "	14.1	0.18	—	210	—	—	—	—	Yellow BFG - Off, COG - 0.53 M
11:35 "	10.0	0.20	-	1548	—	—	—	—	Green BFG - 0.56 M COG - 0.52 M
11:55 "	11.2	0.18	—	200 (195)	—	(1.5) 5.9 (6.1) 6.2	(0.8) 4.1 (4.2) 4.2	(0.7 amb.) 1.8 (1.9) 2.0	BFG Yellow " COG "
12:15 "	11.8 (10.8) 11.8	0.13	—	1350	—	8.9 (9.1) 9.2	6.3 (6.3) 6.1	2.7 (2.8) 2.8	" Green " "
2:15 pm	11.2	0.12	—	1450 1510 (1480)	—	10.4	8.0	2.4	Green BFG - 0.55 M COG - 0.57 M
2:35 "	11.2	0.12	—	230	—	8.0	6.2	1.8	Yellow BFG 0.55 M COG, 0.57 M
2:55 "	9.7	0.18	—	1500 1520 (1510)	—	8.8	7.4	2.4	Green
3:15 "	11.7	0.13	—	220 230 (225)	—	7.2 (7.2) 7.2	5.2 (5.1) 5.5	2.0 (1.8) 1.7	Yellow
3:30 "	10.8	0.13	—	1500	—	8.6	6.5	2.1	Green
									South Flue
3:35 pm	9.2	0.11	—	1950	—	8.5	6.5	2.0	Green
3:55 "	9.7	0.13	—	260 280 (270)	—	5.6	4.2	1.4	Yellow
4:15 "	8.7	0.18	—	1900	—	(1.5) 8.1	(0.9) 6.2	(0.6 amb.) 1.9	BFG - 0.55 Green COG - 0.7 M
4:35 "	9.7	0.13	—	250 300 (275)	—	7.4	5.5	1.9	Yellow
4:55 "	8.1 (8.0) 7.8	0.18	—	1750 1800-1850 (1825)	—	10.7 (10.8) 10.9	8.2 (8.3) 8.3	2.5 (2.5) 2.5	Green
5:15 "	8.1 (7.8) 7.5	0.13	—	260 300 (280)	—	7.4	5.6	1.8	Yellow

Burns Harbor No. 2 Coke Oven Battery - 9/16/93

Time	Opt. %	Comb. %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
									North Flue
12:25 pm	10.7	0.20	-	280	—	—	—	—	Rev. 30 min, hr, ½ Yellow Y G
2:20 pm	9.8	0.12	80	275	—	—	—	—	0.57 M cfm COG
2:40 "	10.3	0.15	136	280	—	—	—	—	Green
3:20 "	12.4	0.11	68	280	—	—	—	—	Yellow
3:40 "	10.1	0.12	228	290	(230 x 1.13) 260	—	—	—	Green
4:15 "	10.2	0.15	0.06% 190 ppm	280 (285)	(322 x 1.13) 293	—	—	—	Yellow
4:20 pm	11.6	0.11	122	260	(248 x 1.31) 271	—	—	—	South Flue Yellow
4:50 "	9.3	0.15	224	230 260 (245)	(271)	—	—	—	Green
5:20 "	10.2	0.15	218 0.028	240 250 (245)	(260)	—	—	—	Yellow
5:50 "	10.8	0.10		230 250 (240)	(282)	—	—	—	Green
6:20 "	10.8	0.18	148	250	282	—	—	—	0.57 M cfm COG Yellow

A-2

Data Summary - No. 1 Battery, 9/15/93

North Flue	Dry	Comb.	CO	NO_x	SO_2	THC	CH_4	VOC	Notes
Green	10.7	0.15	–	1476	–	9.2	7.0	2.4	With BFG
Yellow	11.2	0.14	–	217	–	7.1	5.3	1.8	" "
Green	15.2	0.10	–	175	–	–	–	–	Without BFG
Yellow	13.7	0.18	–	205	–	–	–	–	" "
Avg.	11.0	0.15	–	847	–	8.2	6.1	2.1	With BFG
Avg.	14.5	0.14	–	190	–	–	–	–	Without BFG
South Flue									
Green	8.6	0.16	–	1894	–	9.1	7.0	2.1	With BFG
Yellow	9.1	0.12	–	275	–	6.8	5.1	1.7	" "
Avg	8.9	0.14	–	1085	–	8.0	6.1	1.9	" "
Overall									
Green	9.7	0.16	–	1685	–	9.2	7.0	2.2	With BFG
Yellow	10.2	0.14	–	246	–	7.0	5.2	1.8	" "
Avg.	9.9	0.15	–	966	–	8.1	6.1	2.0	" "

Data Summary - No. 2 Battery, 9/16/93

North Flue								
Green	10.2	0.14	182	285	268	–	–	–
Yellow	10.8	0.15	178	279	293	–	–	–
Avg.	10.5	0.14	180	282	277	–	–	–
South Flue								
Green	10.1	0.18	212	243	277	–	–	–
Yellow	10.9	0.15	163	252	271	–	–	–
Avg.	10.5	0.16	187	247	274	–	–	–
Overall								
Green	10.2	0.16	197	264	269	–	–	–
Yellow	10.9	0.15	171	266	282	–	–	–
Avg.	10.5	0.15	184	265	275	–	–	–

A-3

Burns Harbor Coke Oven Battery No. 1 - 9/22/93

Time	Oxy %	Comb. %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
									North Flue
8:20 am	—	—	—	1650	—	—	—	—	Green
8:40 "	10.7	0.1	222	230	—	—	—	—	Yellow
9:00 "	10.6	5.38	263	1550	—	—	—	—	BFG-.54 COG-.57 Mcfh
9:20 "	10.8	0.25	186	230	—	—	—	—	Green Yellow
9:40 "	10.8	0.08	234	1650	—	—	—	—	Green
10:00 "	14.5	0.08	86	170	—	—	—	—	Yellow BFG-0, COG-.55 Mcfh
10:20 "	13.3	0.07	92	230	—	—	—	—	Green
10:40 "	13.2	0.04	72	220	1.05x2 = 2.1	798/750=1.05	—	—	Yellow
11:00 "	13.3	0.05	84	210	—	221	—	—	Green
									South Flue
11:02 "	11.8	0.10	72	250	—	—	—	—	BFG-0 Green COG-.57 Mcfh
11:20 "	11.9	0.12	48	220	1.05x2	260. 274	—	—	Yellow
11:40 "	16.4?	0.08	70	280	"	260. 274	—	—	Green
12:00 noon	14.5	0.09	41	210	"	280. 295	—	—	Yellow
12:20 pm	10.8	0.07	220	2150		240 253	—	—	BFG-0.6, COG-0.6 Mcfh Green
12:40 "	9.3	0.08	312	280		260. 274	—	—	Yellow
1:00 "	8.6	0.08	242	2000	"	275 290	—	—	Green
1:20 "	7.7	0.21	0.06% → 270 ppm	285	"	280. 295	—	—	BFG-.56, COG-.58 Mcfh Yellow
1:40 "	8.3	0.08	280	1850	"	280. 295	—	—	Green

Burns Harbor Coke Oven Battery No. 2 - 9/22/93

Time	Oxy %	Comb. %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
									North Flue
4:25 pm	—	—	—	—	—	84	70	14	Yellow
4:45 "	—	—	—	—	—	94	83	11	Green
4:55 "	—	—	—	—	—	88	74	14	0.56 Mcfh COG
5:10 "	10.6	.012	—	—	—	85 (80)	68 (83)	17 (15)	Green Yellow
5:25 "	10.0	.017	—	—	—	84	71	13	Yellow
5:40 "	9.9	0.15	—	—	—	96	81	15	Green
									South Flue
5:45 pm	9.5 (10.5) 12.5-5.5	0.20 (0.16) 0.12-0.15	—	—	—	101	85	16	Green
5:55 "	10.2	0.15	—	—	—	97	81	16	Green
6:10 "	10.8	0.15	—	—	—	95 (95) 95	79 (77) 77	16 (18) 18	Yellow
6:25 "	10.8	0.15	—	—	—	95	77	18	0.56 Mcfh COG Yellow
6:40 "	10.8	0.18 0.13 (0.16)	—	—	—	98	81	17	Flue temp - 480 Green
6:50 "	10.9	0.12	—	—	—	99 (99) 10.3	80 (84) 85	19 (12) 15 13	Green

Data Summary – No. 1 Battery, 9/22/93

North Flue	Opacity	Comb	CO	NO_x	SO_2	THC	CH_4	VOC	Notes
Green	10.7	0.08	247	1617	–	–	–	–	With BFG
Yellow	10.8	0.09	204	230	–	–	–	–	" "
Green	13.3	0.06	88	220	–	–	–	–	Without BFG
Yellow	13.8	0.06	79	195	221	–	–	–	" "
Avg.	10.7	0.09	226	923	–	–	–	–	With BFG
Avg.	13.6	0.06	84	208	221	–	–	–	Without BFG
South Flue									
Green	9.2	0.08	247	2000	265	–	–	–	With BFG
Yellow	8.5	0.14	291	283	270	–	–	–	" "
Green	14.1	0.09	71	265	260	–	–	–	Without BFG
Yellow	13.2	0.11	45	215	270	–	–	–	" "
Avg.	8.9	0.11	269	1141	268	–	–	–	With BFG
Avg.	13.6	0.10	58	240	265	–	–	–	Without BFG
Overall									
Green	10.0	0.08	247	1809	265	–	–	–	With BFG
Yellow	9.7	0.12	248	257	270	–	–	–	" "
Green	13.7	0.08	80	243	260	–	–	–	Without BFG
Yellow	13.5	0.09	62	205	246	–	–	–	" "
Avg.	9.8	0.10	248	1032	268	–	–	–	With BFG
Avg.	13.6	0.09	71	224	243	–	–	–	Without BFG

Data Summary – No. 2 Battery, 9/22/93

North Flue								
Green	9.9	0.15	–	–	–	93	79	13
Yellow	10.3	0.15	–	–	–	84	70	14
Avg	10.2	0.15	–	–	–	88	75	13
South Flue								
Green	10.6	0.15	–	–	–	99	83	16
Yellow	10.8	0.16	–	–	–	95	78	17
Avg.	10.7	0.15	–	–	–	97	81	16
Overall								
Green	10.3	0.15	–	–	–	96	81	15
Yellow	10.6	0.15	–	–	–	90	74	16
Avg	10.4	0.15	–	–	–	97	78	15

A-5

Data Summary - Coke Oven Batteries

No. 1 Battery

9/15/93	Dry Comb	CO	NOx	SO2	THC	CH4	VOC	Note	
North Flue	11.0	0.15	- 847	—	8.2	6.1	2.1	With	BFG
South Flue	8.9	0.14	- 1085	—	8.0	6.1	1.9	"	"
Green Rev	9.7	0.16	- 1685	—	9.2	7.0	2.2	"	"
Yellow Rev	12.2	0.14	- 246	—	7.0	5.2	1.8	"	"
Overall	9.9	0.15	- 946	—	8.1	6.1	2.0	"	"
9/22/93									
North Flue	10.7	0.09	226	923	—	—	—	—	With BFG
South Flue	8.9	0.11	269	1141	268	—	—	—	" "
Green Rev	10.0	0.08	247	1809	265	—	—	—	" "
Yellow Rev	9.7	0.12	248	257	270	—	—	—	" "
Overall	9.8	0.10	248	1032	268	—	—	—	" "
9/22/93									
North Flue	13.6	0.06	84	208	221	—	—	—	Without BFG
South Flue	13.6	0.10	58	240	265	—	—	—	" "
Green Rev	13.7	0.08	80	243	260	—	—	—	" "
Yellow Rev	13.5	0.09	62	205	246	—	—	—	" "
Overall	13.6	0.08	71	224	243	—	—	—	" "
Avg. 9/15 9/22									
North Flue	10.9	0.12	226	885	—	8.2	6.1	2.1	With BFG
South Flue	8.9	0.12	269	1113	268	8.0	6.1	1.9	" "
Green Rev	9.9	0.12	247	1747	265	9.2	7.0	2.2	" "
Yellow Rev	9.9	0.13	248	252	270	7.0	5.2	1.8	" "
Overall	9.9	0.13	248	999	268	8.1	6.1	2.0	" "

Data Summary - Coke Oven Batteries

	O_2	Comb.	CO	NO_x	SO_2	THC	CH_4	VOC	Notes
No. 1 Battery									
Green Rev.	9.9	0.12	247	1747	265	9.2	7.0	2.2	With BFG
Yellow Rev	9.9	0.13	248	252	270	7.0	5.2	1.8	" "
Green Rev.	13.7	0.08	80	243	260	—	—	—	Without BFG
Yellow Rev.	13.5	0.09	62	205	246	—	—	—	" "
Overall	9.9	0.13	248	999	268	8.1	6.1	2.0	With BFG
Overall	13.6	0.08	71	224	243	—	—	—	Without BFG
No. 2 Battery									
Green Rev.	10.3	0.15	197	264	269	96	81	15	
Yellow Rev.	10.2	0.15	171	266	282	90	74	16	
Overall	10.5	0.15	184	265	275	93	78	15	

A-7

Bunce Harbor No. 1 Coke Oven Battery Pushing Emissions Scrubber

Time 9/24/93	Opacity %	Comb %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
9 55 am	—	—	—	52	—	—	—	—	Peak value noted
10 05 "	—	—	—	22	—	—	—	—	over 2½ minute period
10 15 "	—	—	—	32	—	—	—	—	Ave for period since
10 23 "	—	—	—	25	—	—	—	—	half of max
10 47 "	—	—	—	48	—	—	—	—	
10 53 "	—	—	—	—	—	—	—	—	Hose off
11 08 "	—	—	—	26	—	—	—	—	
11 28 "	—	—	—	24	—	—	—	—	
11 38 "	—	—	—	23	—	—	—	—	
11 48 "	19.7	0.1	—	—	—	—	—	—	
11 58 "	—	—	272	—	—	—	—	—	
12 10 pm	—	—	90	—	—	—	—	—	
12 20 "	—	—	—	36	—	—	—	—	
12 45 "	—	—	—	—	40	—	—	—	It's doubtful that the
12 55 "	—	—	—	—	—	16	4	12	peak is long enough
1 16	—	—	—	—	—	15	4	11	for a stable SO_2 reading
1 40 "	—	—	—	—	60	—		—	
1 53 "	—	—	248	—	—	—	—	—	
2 05 "	—	—	—	—	—	9	4	5	
2 20 "	—	—	214	—	—	—		—	
3 06	—	—	—	—	—	0.8	1.8	-1.0 amb	Shift change
						15	4	6	
3 17 "	—	—	—	—	—	8	4	4	
3 28 "	—	—	172	—	—	—	—	—	
3 39 "	—	—	—	—	40	—	—	—	
3 52 "	—	—	—	42	—	1.0	1.8	-0.8 amb	
4 10 "	19.6	0	—	→11 —	—	—	—	—	
4 13 "	—	—	—	27	—	—	—	—	
Avg.	19.7	0.05	199	→15 32	47	12	4	8	

A-8

Burns Harbor No. 2 Coke Oven Battery Pushing Fume Scrubber

Time 9/28/93	O_2 %	Comb. %	CO ppm	NOx ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
3:08 pm	—	—	—	22	—	—	—	—	Much less vent. in sample than at No. 1 Battery scrubber
3:25 "	—	—	—	32	—	—	—	—	
3:40 "	19.1	0	—	—	—	—	—	—	
3:55 "	—	—	272	—	—	—	—	—	
4:10 "	—	—	—	—	—	9	3	6	
4:20 "	—	—	—	33	—	1.4	2.2	-0.8	omo
4:40 "	—	—	0.06%	→22 —	—	—	—	—	
4:52 "	—	—	—	—	—	7	4	3	
5:06 "	—	—	—	46	—	—	—	—	
5:17 "	—	—	—	—	30	—	—	—	
5:28 "	—	—	276	—	—	—	—	—	
5:40 "	—	—	—	—	—	7	4	3	
6:00 "	—	—	—	23	—	—	—	—	
6:17 "	—	—	—	→13 —	40	—	—	—	
7:02 "	—	—	286	—	—	—	—	—	Changed door and coke guide machine
7:14 "	—	—	→57 —	—	—	13	7	6	
7:26 "	—	—	—	21	—	—	—	—	second machine did not connect with fume system for second pushes.
7:45 "	18.4	0	—	—	—	—	—	—	
Avg.	18.8	0	359	29	35	9	4.5	4.5	

Burns Harbor No. 1 Caster Steam Vent - 9/23/93

Time	THC ppm	CH_4 ppm	VOC ppm	Notes
11:00 am	6.0	3.2	2.8	Started/cast at 9:47 am
11:15 "	5.7	3.1	2.6	
11:30 "	2.0 / 5.6	2.2 / 3.1	-0.2 / 2.5 amb	Two fans @ 80,000 cfm
11:45 "	5.5	3.1	2.4	
12 noon	6.1	3.1	3.0	
12:15 pm	5.8 (5.5) / 5.5-5.2	3.1 (3.1) / 3.1-3.0	2.7 (2.4) / 2.4-2.2	
12:30 "	6.0	3.1	2.9	
12:45 "	5.7	3.1	2.6	
1:00 "	6.3	3.1	3.2	
1:15 "	5.8	3.2	2.6	
1:30 "	1.2 / 5.7	2.2 / 3.2	-1.0 amb / 2.5	
	3.0 → 2.8	2.6 0.25	0.4 Hose only	
	5.8	3.1	2.7	

Burns Harbor No. 2 Caster Steam Vents - 9/23/93

Time	THC ppm	CH_4 ppm	VOC ppm	Notes
3:30 pm	11.8 (12.3) / 12.8	2.8 / 2.7	9.0 / 9.9	Fan No. 4
3:40 "	9.8	2.8	7.0	Each fan @ 120,000 m^3/hr
3:50 "	11.8	2.7	9.1	
4:00 "	1.3 / ~~7.7~~	2.3 / ~~2.7~~	-1.0 amb / ~~5.0~~	Caster down at 3:55 pm.
4:10 "	~~4.4~~	~~2.7~~	~~1.7~~	
4:05 "	6.0/10.0	2.5/2.7	3.5/7.3	
4:15 pm	~~7.5~~	~~2.6~~	~~-0.1~~	Fan No. 3
6:30 pm	8.7	2.8	5.9	Caster restarted at 5:30 pm.
6:40 "	1.1 / 9.8	2.0 / 2.5	-0.9 amb / 7.3	
6:50 "	9.3	2.5	6.8	
7:00 "	8.5/9.1	2.6/2.6	5.9/6.5	
7:55 pm	16.3 (5.1) / 13.8	3.0 (3.1) / 3.1	11.3 (11.0) / 10.7	Fan No. 2
8:05 "	11.8	2.7	9.1	Put dropout bottle at inlet.
8:15 "	12.7	2.7	10.0	sample inlet due to
8:25 "	1.3 / 11.7/12.8	2.2 / 2.7/2.8	-0.9 amb / 9.0/9.8	extreme moisture in sample
8:30 pm	16.1	2.8	13.3	Fan No. 1
8:40 "	8.3	2.7	5.6	
8:50 "	1.2 / 6.8	2.1 / 2.6	-0.4 amb / 4.2	
9:00 "	6.5/9.4	2.6/2.7	-0/1.8	

	THC	CH_4	VOC
Overall	10.3	2.7	7.6

A-10

Duluth Harbor DEQ Boiler No. 3 (Center Stack) - 9/29/93

Time in Heat-min.	NO_x ppm	CO %	THC ppm	CH_4 ppm	VOC ppm	Notes
1	0	13.5+	3	1	2	NO_x heat started 1^{07} pm
2	0	2.0	2	1	1	on No. 2 Vessel
3	18	2.1	2	1	1	CO heat started 2^{25} pm
4	22	4.8	2	1	1	on No. 2 Vessel
5	24	6.2	2	1	1	VOC heat started 3^{13} pm
6	25	5.4	2	1	1	on No. 2 Vessel
7	26	5.6 (6.2)	2	1	1	
8	32	6.7 3.2 (6.8)	2	1	1	
9	43 (45) 46	10.3 6.7	1	0	1	
10	39	5.6	1	0	1	
11	50 63 (55)	5.8	1	0	1	
12	92 (76) 80 86	8.6	1	0	1	
13		6.6	1	0	1	
14	100	4.6	1	0	1	
15	130	1.5	2	2	2	
16	2	0.1	2	1	1	
17	— /43	168 ppm	4	2	2	
18	—	4.9%	2	2	0 / 1.8 0.7 1.1 (1.0 1.6 -0.6 amb)	

9/30/93	NO_x	CO	NO_x	NO_x	THC	CH_4	VOC	
1	0 (28)	0.1%	5	30	—	—	—	NO_x heat started 10^{11} am
2	43 (inst.) 5	70 ppm	6	7	2	0	2	on No. 2 Vessel
3	11	92 "	11	12	1	0	1	CO heat started 11^{40} am
4	8	0.1%	8	16	1	0	1	on No. 1 Vessel
5	6	0.9 "	11	18	1	0	1	Second NO_x heat at
6	14	2.4 "	14	18	1	0	1	12^{23} pm on No. 1 Vessel
7	18	2.7	15	22	1	0	1	Third NO_x heat at
8	20	3.4	18	20	1	0	1	12^{48} on No. 2 Vessel
9	22	4.0	20	28	1	0	1	VOC heat at 1^{11} pm
10	25	3.9	21	29	1	0	1	on No. 1 Vessel
11	33	4.1	23	33	1	0	1	ID Fan No. 3
12	39	4.3	27	35	1	0	1	11^{36} am 90, 88, 89 amp
13	38	4.1	30	42	1	0	1	2050 KW
14	50	4.4 (4.1) 3.8	50	62 (81) 100	1	0	1	325 KVar
15	64	10.5	74/22	92/26	1	0	1	11^{37} am 89 85 88 amp
16	68 18 36	5.7	58 18 6	53 18 4	1	0	1	1900 KW
17	70 19 3 /29	2.5 /29	23 19 5	12 19 —	1	0	1 / 1 0 1	325 KVar

A-11

Bunge Harbor DOF Scrubber No. 4 - 9/30/93

Time in hrs, min	NO_x ppm	NO_x ppm	CO ppm	NO_x ppm	NO_x ppm	SO_2 ppm	Notes
1	4	–	0.1	7	2 (12)	20	NO_x heat at 1.43 pm
2	8	–	112 ppm	9	2.2 4	10	on No. 2 Vessel
3	22	8	0.9	28	2	10	Second NO_x heat at
4	14	13	1.8	17	3	0	2.02 pm on No. 1 Vessel
5	21	15	2.1	19	2	10	CO heat at 3.03 pm
6	22	12	3.2	19	3	0	on No. 2 Vessel
7	25	11	3.9	20	4	10	Third NO_x heat at
8	34	11	4.4	22	4	10	3.57 pm on No. 2 Vessel
9	35	11	3.9	23	4	10	Fourth NO_x heat at
10	42	6	5.7 (5.1) 4.4	30	5	0	5.00 pm on No. 1 Vessel
11	56	20 (22)	6.7	28	5	0	Amber light on
12	54	33 22	8.2 (8.7) 9.2	34	5	0	control panel
13	66	8	8.9	38	5	10	indicating that
14	76	8	8.1	42	5	5	No. 2 vessel
15	84	9	3.1	52 (99) 105	6	10	damper not
16	90	13	216 ppm	86	10	5	closed all the
17	23	11	276 "	38	13	5	way. Visable
18	6	16 (18) 20	104 "	6	4	0	emissions from
Avg.	38	13	3.47%	30	5.3	6.4	Stack Nos. 2+3,

nothing from No. 4

SO_2 heat at 5.27 pm on No. 2 Vessel

Accuracy of SO_2 reading doubtful at these locations

ID Fan No. 4

3.03 pm 90, 87, 88 amp

2050 KW

800 KVars

Burns Harbor BOF No. 2 Scrubber - 10/1/93

Time in Heat-min	NO_x ppm	CO %	THC ppm	CH_4 ppm	VOC ppm	Notes
1	—	0.1	—	—	—	NO_x heat at 9:37 am
2	0	50 ppm	—	—	—	on No. 2 Vessel,
3	0	35 "	—	—	—	17 min blow
4	0	160 "	—	—	—	CO heat at 10:25 am
5	0	31 "	—	—	—	on No. 2 Vessel
6	0	0.04 %	—	—	—	No. 2 Zone
7	0	0.02 "	—	—	—	10:25 am PP, P6, P6 amp
8	0	0.02	—	—	—	2050 KV, 800 KVa
9	1	315 ppm	—	—	—	VOC heat at 11:15 am
10	0	266 "	—	—	—	on No. 2 Vessel
11	2	152 "	—	—	—	
12	2	188 "	—	—	—	
13	2	208 "	5	4	1	
14	1	106 "	5	5	0	
15	2	128 "	6	5	1	
16	3	156 "	5	5	0	
17	4	64 "	5	5	0	
18	5	46 "	4	4	0	
19	—	—	3	3	0	
avg	1.3	222 "	4.7	4.4	0.3	

A-13

Burns Harbor BOF Hot metal Desulfurization - 10/1/93

Time on Blow - min	NO_x ppm	NO_x ppm	NO_x ppm	CO ppm
1	0	—	0	62
2	2	2	3	45
3	3	3	2	51
4	3	3	2	42
5	2	3	2	44
6	2	3	2	45 (49)
7	2	4	2	45
8	2	3	3	43 (47)
9	2	5	1	45 (53)
10	2	2	0	33
11	2	2	0	34 (37)
12	2	2	0/1.4	33
13	2/2.0	2/2.6	0	45 (49)
14	2	2	1	37 (41)
15	2	4	1	35 (40)
16	2	4	1	45
17	2	3	0	47
18	2/2.0	2/3.0	0/6.5	45
19	—	—	—	44
20	—	—	—	60
21	—	—	—	28
22	—	—	—	9
23	—	—	—	7
24	—	—	—	7
25	—	—	—	6
26	—	—	—	7
27	—	—	—	7
28	—	—	—	7/36
29	—	—	—	6
30	—	—	—	50
31	—	—	—	36
32	—	—	—	37
33	—	—	—	62
34	—	—	—	43
35	—	—	—	32/38

Notes

NO_x

- Blow on No. 1 Desulf. at 12:27 pm for 10 min. Skim at 14 min

Second NO_x

- Blow on No. 2 Desulf. at 12:43 pm for 8 min. Skim at 14 min. No. 2 Fan - 55, 55, 55 amp, 300 KW, 806 KVars

Third NO_x

- Blow on No. 2 Desulf. at 2:17 pm for 8 min. NO_x was 2 ppm during metal pour into ladle. Skim at 13 min.

CO

- Blow on No. 2 Desulf. at 2:57 pm for 8 min. CO peak of 0.36% during metal pour. Reblow at 11 min to 19 min. Skim at 29 min to 33 min

A-14

Burns Harbor BOF No. 2 Scrubber - 10/13/93

Time in Heat-min	NO_x ppm	CO ppm	CO %	NO_x ppm	CO ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
1	8	11	156 ppm	0	0	110			First NO_x heat at 10^{13} am
2	8	86	—	40 peak 2	0	110			on Vessel No. 2
3	0	—	1.6 %	2	0	110			First CO heat at 11^{03} am
4	0	70	—	4	0	110			on Vessel No. 2
5	0	—	—	4	40	110			Second CO heat at 12^{02} pm
6	0	220	2.8	6	200	110			on Vessel No. 1
7	0	—	—	7	0	110			Second NO_x heat at 3^{33} pm
8	0	136	—	10	0	110			on Vessel No. 1
9	0	—	4.0	12	0	110			Third CO heat at 4^{52} pm
10	0	180	—	12	0	110			on Vessel No. 2
11	0	—	5.5	12	0	110			VOC heat at 4^{26} pm
12	0	166	—	17	0	110			on Vessel No. 1
13	0	—	5.4	16	28	110			
14	0	—	—	22	16	110			
15	0	110	5.4	23	14	110			
16	0	—	—	28	14	110			
17	0	126	3.2	46	13	110			
18	—	—	—	52 22	88	110			
19	—	—	—	2	12	—	—	—	
Avg.	0.5	123	3.5	14	22	110			

Burns Harbor, Nr. 3 Scrubber A-15 - 10/13/93

Time in Heat-min.	CO %	CO %	O_2 %	Cond %	THC ppm	CH_4 ppm	VOC ppm	NO_x ppm	Notes
1	4.7	—	20.9	0	1	1	0	6	First CO heat at 11:03 am
2	—	0.9	14.2	0	1	0	1	5	on Vessel Nr. 2
3	1.9	—	13.8	0	1	0	1	4	Second CO heat at 12:19 pm
4	—	—	12.0	[illegible]	1	0	1	8	on Vessel Nr. 1
5	10.5+	3.0	13.1	0.5	2	1	1	9	First O_2 heat at 1:03 pm
6	—	—	12.1	1.8	1	0	1	12	on Vessel Nr. 2
7	4.3	—	11.1	2.5	1	0	1	14	VOC heat at 2:07 pm
8	—	3.4	11.3	2.7	1	0	1	18	on Vessel Nr. 2
9	6.2	—	10.8	3.1	1	0	1	20	First NO_x heat at 2:46 pm
10	—	5.3	10.7	3.3	1	0	1	22	on Vessel Nr. 2
11	4.5	—	10.6	2.8	1	0	1	25	
12	—	5.0	10.2	3.2	1	0	1	23	
13	5.6	—	10.1	3.4	1	0	1	27	
14	—	4.2	9.9	4.0	1	0	1	32	
15	5.6	—	9.8	4.4 (46)	1	0	1	46	
16	0.08	1.9	9.7	4.7 4.3	1	1	0	84 (95)	
17	0.04	—	9.9	3.4	1	1	0	105 47	
18	—	154 ppm	11.0	1.2	—	—	—	3	
19	—	—	17.0	0	—	—	—	—	
20	—	—	20.0	0	—	—	—	—	
Avg.	4.3	3.0	11.5	2.3	1.0	0.2	0.8	23	

Bruce Harbor DOA No. 4A-16 Scrubber – 10/13/93

Time in Heat-min	THC ppm	CH_4 ppm	VOC ppm	NO_x ppm	CO %	CO ppm	Notes
1	—	—	—	2	42 ppm	—	VOC heat at 44± ppm
2	—	—	—	1	0.8%	18 ppm	on No. 2 Vessel
3	—	—	—	1	1.1	0.04%	NO_x heat at 5 0± ppm
4	—	—	—	1	2.3 (2.0)	0.04"	on No. 1 Vessel
5	—	—	—	1	2.8 3.3 (3.7)	16 ppm	CO heat at 5 40 ppm
6	—	—	—	1	4.2 4.8	142"	on No. 2 Vessel
7	1	0	1	1	4.2 (4.7)	9"	Second CO heat at 6 0 ppm
8	1	0	1	1	5.1 4.9 (5.1)	10" (13)	on No. 1 Vessel
9	1	0	1	2	6.3 8.2	16 7 (16)	
10	1	0	1	2	7.9 (8.1)	315+ 315+	
11	1	0	1	2	8.2 7.3	0.04% (329)	
12	1	0	1	15	7.8 (8.2)	258 ppm 315+	
13	1	1	0	1	8.6 8.2 (7.7)	200 200 (250)	
14	1	1	0	6	6.5 4.7 (3.1)	200 315+	
15	1	1	0	6	2.1 0.4 (0.3)	206 (260) 118 (212)	
16	1	1	0	2	0.1 300 ppm	315+ 0.2% (110)	
17	1	1	0	1	0.1	200 ppm 106"	
18	—	—	—	—	80 ppm	315+ (210) 264	
19	—	—	—	—	—	78	
avg.	1	0.5	0.5	2.7	3.7	242	

A-17

Bunker Harbor TBD & Scrubber No. 2 - 10/14/93

Time in Heat-min.	NO_x ppm	NO_x ppm	CO ppm	CO %	Notes
1	4	0	42	106 ppm	First NO_x heat at 4:28 pm
2	—	3	32	180 "	on Vessel No. 2
3	8	8	36	2.5%	Second NO_x heat at 5:28 pm
4	6	5	34	3.9	on Vessel No. 1
5	6	10	27	6.1 (5.8)	First CO heat at 5:54 pm
6	4	14	25	5.6 4.6 (4.2)	on Vessel No. 2
7	1	14	14	3.8 3.7	Second CO heat at
8	1	15	16	4.0 (2.8)	8:43 pm, 10/15/93 on
9	1	18	14	3.5 4.9 (4.9)	Vessel No. 1
10	1	24	13	4.4-5.3 3.0 (2.4)	
11	1	26 (29)	32	1.7 3.2 (3.6)	
12	1	32 37	24	4.1 8.1 (6.3)	
13	52	42	30	4.9 10.2	
14	9 (17)	66 (65)	27	9.5 (8.4)	
15	24 6	63 59 (43)	29	7.2 6.3 (5.6)	
16	3	34 20 (12)	47	4.9 3.2	
17	2 / 7.1	5 1 / 21.2	76	1.1 (2.1) 0.3	
18	—	—	49 / 32	284 ppm 204 " 198 (191)	
19	—	—	—	206 "	
20	—	—	—	45 "	
21	—	—	—	46 (Taking test) 3.2%	

A-18

Burns Harbor BOF Scrubber No. 3 – 10/14/93

Time in Heat-min	CO %	CO %	NO_x ppm	NO_x ppm	NO_x ppm	Notes
1	—	—	10 (6)	5	2	First CO heat at 11:21 am
2	8.8	0.04	34 (20)	9	2 (23)	on Vessel No. 2
3	—	—	5	36	10	Second CO heat at 11:5 am
4	3.2	2.2	10	34	10	on Vessel No. 1
5	—	—	12	24	10	First NO_x heat at 12:42 pm
6	4.5	3.2	15	27 (34)	12	on Vessel No. 1
7	—	—	16	37	15	Second NO_x heat at 1:15 pm
8	5.2	3.9	18	28	15	on Vessel No. 2
9	—	—	20	24	17	Third NO_x heat at 1:51 pm
10	5.8	4.4	23	27	19	on Vessel No. 1, re-
11	—	—	26	35	20	blow on No. 2
12	7.1	4.5	32	27 (55)	22	between minutes
13	—	—	33	54	27	4 and 5.
14	6.7	3.4	35	37 (46)	5	
15	—	—	64 (58)	2	42	
16	0.1	226 ppm	57 (57)	—	57 (60)	
17	—	—	6	—	62 (62)	
18	86 ppm	46"	—	—	16	
Avg.	4.6	2.4	23	26	26	

A-19

Burns Harbor TSD & Scrubber No. 4 - 10/14/93

Time in Heat-min	CO %	CO ppm	THC ppm	CH_4 ppm	VOC ppm	NO_x ppm	NO_x ppm	Notes
1	116	45	1	1	0	14	5	First CO heat at 11 21 am
2	— ppm	—	1	1	0	7	6	on No. 2 Vessel
3	4.1 %	154	1	1	0	12	6	Second CO heat at 11 59 am
4	—	—	1	1	0	10	5	on Vessel No. 1
5	6.2	122	1	1	0	11	7	VOC heat at 2 10 pm
6	—	—	1	1	0	13	13	on Vessel No. 1
7	7.1	204	1	1	0	14	15	First NO_x heat at 3 07 pm
8	—	—	1	1	0	17	18	on Vessel No. 2
9	7.0	142	1	1	0	19	20	Second NO_x heat at 6 38 pm
10	—	—	1	1	0	24	24	on Vessel No. 2
11	9.8	122	1	1	0	28	27	
12	—	—	1	1	0	46	30	
13	8.9	86	1	1	0	62 70 (66)	37	
14	—	—	1	1	0	62	44	
15	1.8	124	1	1	0	53 24 (58)	72 62 (67)	
16	—	—	1	1	0	2	40 5 (23)	
17	0.03	60	1	1	0	1	0	
18	—	—	—	—	—	—	—	
avg.	5.0	118	1	1	0	22	20	

A - 20

Rinna Harbor D&B Scrubber Summary

Scrubber No. 2

Vessel No. 1	NO_x ppm	CO %	THC ppm	CH_4 ppm	VOC ppm
Heat 1	14	3.5	1	1	0
Heat 2	21	3.2	—	—	—
Avg	17	3.4	1	1	0

Vessel No. 2		ppm			
Heat 1	1.3	222	4.7	4.4	0.3
Heat 2	0.5	123	—	—	—
Heat 3	7.1	22	—	—	—
Heat 4	—	32	—	—	—
Avg	3.0	100	4.7	4.4	0.3

Scrubber No. 3

Vessel No. 1		%			
Heat 1	22	2.9	1	0	1
Heat 2	23	3.0	—	—	—
Heat 3	26	2.4	—	—	—
Avg	24	2.8	1	0	1

Vessel No. 2					
Heat 1	43	4.9	1.0	1.6	0
Heat 2	29	4.3	1.0	0.2	0.8
Heat 3	26	4.6	—	—	—
Heat 4	23	—	—	—	—
Heat 5	26	—	—	—	—
Avg	29	4.6	1.0	—	0.4

Scrubber No. 4

Vessel No. 1	NO_x ppm	CO ppm	THC ppm	CH_4 ppm	VOC ppm
Heat 1	13	247	1	1	0
Heat 2	5.3	118	—	—	—
Heat 3	2.7	—	—	—	—
Avg	7	183	1	1	0
Vessel No. 2		%			
Heat 1	32	3.4	1	0	1
Heat 2	30	3.7	—	—	—
Heat 3	22	5.0	—	—	—
Heat 4	20	—	—	—	—
Avg	28	4.0	1	0	1

Overall						Stack Flow, scfm
Vessel No. 1						
Scrubber No. 2	18	3.4%	1	1	0	123,717
Scrubber No. 3	24	2.8%	1	0	1	119,726
Scrubber No. 4	7	183 ppm	1	1	0	125,588
Vessel No. 2						
Scrubber No. 2	3	100 ppm	4.7	4.4	0.3	123,717
Scrubber No. 3	29	4.6%	1.0		0.4	123,272
Scrubber No. 4	28	4.0%	1	0	1	121,246
Avg						
Near Scrubbers	26	3.7%	1		0.6	122,155
Far Scrubbers	5	142 ppm	2.9		0.2	124,653
Overall	19	24,714 "	1.6		0.5	368,963

A-22

Buffalo Harbor BD & Desulfurizer No. 1 – 10/15/93

Time in Cycle-min.	NO_x ppm	CO ppm	NO_x ppm	THC ppm	CH_4 ppm	VOC ppm	CO ppm	SO_2 ppm	Notes
1	–	146	0.5	–	–	–	160	0	Cycle in from start
2	1	44	2.0	–	–	–	90	0	ladle thru blow
3	1.5	55	0	2	2	0	52	0	to ladle out from blow
4	0.5	110	0	2	2	0	108	0	First NO_x at 3^{45} pm
5	0.5	58	0	2	2	0	60	0	3.5 ppm peak at skim
6	3.5	60	2.5	2	2	0	59	0	First CO at 4^{57} pm, blow
7	3.5	64	3.0	2	2	0	56	0	at 5^{10} pm, fin 5^{23} pm,
8	3.0	59	3.0	2	2	0	60	0	skim at 5^{20}, fin 5^{33}
9	3.5	54	3.5	2	2	0	56	0	ladle away
10	3.0	52	3.0	2	2	0	52	0	Second NO_x at 5^{39} pm,
11	3.0	55	3.0	2	2	0	54	0	blow at 5^{43}, fin 6^{06}
12	2.5	53	2.5	2	2	0	56	0	skim at 6^{12} pm
13	3.0	57	2.5	2	2	0	50	0	VOC at 6^{32} pm
14	2.5	54	3.0	2	2	0	53	0	Second CO at 7^{19} pm,
15	3.0/2.4	55	3.0	2	2	0	51	0	blow at 7^{22}, fin 7^{37}
16	3.5	56	3.5	2	2	0	52	0	skim at 7^{40}, ladle
17	4.0	59	3.5	2	2	0	54	0	away at 7^{44} pm
18	4.0	60	4.0	2	2	0	108 (114)	0	SO_2 blow at 8^{10} pm, start
19	6.0	56	4.0	2	2	0	120/55	0	blow at 8^{04}, fin 8^{21}
20	1.0/3.7	60	4.5	2	2	0	42/69	0	skim at 8^{25}
21	–	62	4.5 (5.0)	2	2	0	15	0	
22	–	68	5.5/4.5	2	2	0	45	40	
23	–	70	5.0	2	2	0	144	0	
24	–	66	6.0	2	2	0	42	0	
25	–	70	5.0	2	2	0	50/59	0	
26	–	68 (71)	6.5	2	2	0	–	0	
27	–	152/74	7.0	2	2	0	–	0	
28	–	68	6.0	2	2	0	–	0	
29	–	48/69	9.0	2	2	0	–	0	
30	–	15	0	2/2	2/2	0/0	–	0/ND	
31	–	26	0				–		
32	–	55	0	–	–	–	–	–	
33	–	84	0	–	–	–	–	–	
34	–	56	3.0	–	–	–	–	–	
35	–	94	1.0	–	–	–	–	–	
36	–	100/61	0/1.3	–	–	–	–	–	

A-23

Bunker Hill 1987 Desulfurizer No. 2 - 10/15/93

Time in Cycle min.	NO_x ppm	NO_x ppm	CO ppm	CO ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
1	0	1	–	80	2	2	0	A cycle is from start
2	0	0	~~0.04~~ 400	36	2	2	0	of reladle pour thru
3	1	0.5	~~68~~ 90	41	2	2	0	desulf. to out from hood
4	1.5	1.5	80 ppm	38	2	2	0	First NO_x at 10^{35} am, No. 1
5	0.5	1	60	76	2	2	0	desulf, No. 2 baghouse
6	0.5	1	30	39	2	2	0	End pour at 10^{38}, start
7	2	1.5	25	41	2	2	0	blow at 10^{40}, fin. at 10^{55},
8	2	1	60	42	2	2	0	out of hood at 10^{57}, skim
9	2	1	40	40	2	2	0	at 10^{58}, ladle away at 11^{02}
10	2	2	38	39	2	2	0	Zero inst. drift to 1.5
11	2	2	40	40	2	2	0	Second NO_x at 11^{57}, No. 2
12	2	2	36	41	2	2	0	desulf, No. 2 baghouse
13	2.5	2	38	42	2	2	0	Stopped pour to bring in
14	2	2.5	37	39	2	2	0	another sub, resume at 12^{5}
15	2.5	2.5	35	42	2	2	0	Start blow at 12^{05}, stop at 12^{14}
16	2.5	2.5	34	40	2	2	0	skim at 12^{17}, fin 12^{21}
17	2.5	2.5	37	41	2	2	0	First CO at 12^{42} pm, No. 2 dem
18	2.5	0	39	41	2	2	0	No. 2 baghouse
19	3	0/1.3	41/63	42	2	2	0	Second CO at 1^{33}, desulf at
20	2.5	1	41	42	2	2	0	1^{37}, fin at 1^{55} pm, out
21	3	2	43	42	2	2	0	at 2^{00}, skim at 2^{07} pm
22	1.5/1.8	2	44	39	2	2	0	fin at 2^{06}. CO remains
23	1.5	1.5	44	66	2	2	0	at ~58 ppm until most
24	1	1.5	40	34	2	2	0	ladle in place. Between
25	1.5	1.5	42	35	2	2	0	successive ladles CO remains
26	1.5	1.5/1.6	43 / 62 (53)	34	2	2	0	at about 42 ppm.
27	1.5/1.4	–	31	27	2	2	0	VOC cycle at 2^{20} pm, No.
28	–	–	–	25/42	2/2	2/2	0/0	desulf, No. 2 baghouse, pour
29	–	–	–	31				over at 2^{22}, blow at 2^{29}
30	–	–	–	64				fin at 2^{44} pm, ladle
31	–	–	–	56 (64)				out at 2^{48} pm
32	–	–	–	92 / 60 (68)				
33	–	–	–	76 / 43				
34	–	–	–	59				
35	–	–	–	58/55				

Burns Harbor BOF Desulfurizer Summary

Desulfurizer No. 1

Treatment No	NO_x ppm (H/L)	CO ppm (H/L)	THC ppm	CH_4 ppm	VOC ppm	Avg. time - min
1	2.0/2.0	67/61	2	2	0	NO_x (20) 25
2	2.4/3.7	67/57	—	—	—	CO (25) 31
3	3.2/1.3	—	—	—	—	VOC 30
Avg.	2.5/2.3 (2.5)	67/60 (64)	2	2	0	

Desulfurizer No. 2

	NO_x (H/L)	CO (H/L)	THC	CH_4	VOC	
1	2.6/3.0	36/38	2	2	0	NO_x (17) 22
2	1.4/0.5	63/42	—	—	—	CO (25) 32
3	1.8/1.4	42/55	—	—	—	VOC 28
4	1.3/1.6	—	—	—	—	
Avg.	1.8/1.6 (1.8)	47/45 (46)	2	2	0	$V_L = 5.151 \times 10^6 / 60 / 0.997$ = 86,114 or 115,357
						85,255 115,011

High flow rate = 115,011 dscfm / 0.997 = 115,357 scfm

Low flow rate = 42,529 dscfm / 0.997 = 42,657 scfm

A-25

Burns Harbor Box Anneal Furnace - 10/20/93

Time	Oxy %	Comb %	CO ppm	NO_x ppm	THC ppm	CH_4 ppm	VOC ppm		Notes
1:15 pm	7.4	0.1	152	12	17 120	13 122	4 Box 0 Stack		Furnace No. 10, Base No. 119
1:30 "	8.8	0.15	182	20	17	13	4		48-hour cycle started
1:45	8.6	0.15	45	21	56	52	4		at 100 p.m.
2:00	8.3	0.25	146	25	19 28	15 22	4 0		Sampling from center flue
2:15 "	9.3	0.28	84	24	17	15	4		east side of furnace
2:30 "	—	—	—	—	—	—	—		Fce at about 700°F for
2:45 "	8.4	0.20	51	29	20 22	17 22	3 0		four hours
3:00 "	7.8	0.15	66	26	20 9	17 7	3 2		Fce has recuperator to
3:15 "	7.6	0.12	62	28	20 9	17 8	3 1		preheat comb. air ~600°
3:30 "	6.6	0.10	52	34	23 9	19 9	4 0		
3:45 "	7.2	0.10	31	27	21 4	18 6	3 1		
4:00 "	7.6	0.13	43 27	33	20 8	17 8	3 0		
4:15 "	—	—	—	—	—	—	—		
4:30 "	6.8	0.10	~~6~~	29	19 3	16 2	3 1	Box Stack	Sampling from center
4:45 "	6.9	0.13	21	30	19 2	15 2	4 0		flue, west side of fce
5:00 "	5.9	0.10	25	33 36	19 3	15 3	4 0		Fce ~800°F, steel ~500°
5:15 "	6.2	0.10	42	32 32	21 2	16 2	5 0		
5:30 "	6.4	0.12	13 37	33	20 1	15 1	5 0		
5:45 "	5.3	0.05	11 20	32	23 1	16 0	7 1		
6:00 "	5.8	0.10	16	34	25 1	17 0	8 1		
8:15 pm	3.4	0+	22	40	92 4	16 0	76 4	Box Stack	Steel 644-672° F
8:30 "	3.2	0	7	46	103 4	19 8	84 4		Fce 1114°F at 8:00 pm
8:45 "	3.4	0	7	44	126 —	27 —	99 —		~85 ppm THC
9:00 "	3.1	0	6	45	134 5	29 1	105 4		
9:15 "	3.4	0	9	45	157 6	42 1	115 5		
9:30 "	—	—	—	—	180	55	125		
10/21/93									
7:15 am	3.3	0	26	62	1,580 4	1,320 0	260 4	Box Fce	10/21/93, West side
—	—	—	16	—	11	8	3 amb.		Fce 1424°, Steel 1100°
8:00 "	3.2	0	22	59	1,350 1,370	1,180 1,300	170 70		
—	—	—	—	—	—	—	—		
8:30 "	3.3	0	17	57	1,350	1,180	170		
—	—	—	—	—	—	—	—		
9:00 "	3.2	0	16	60	1,260	1,100	160		Fce 1420°, Steel 1083-1131
—	—	—	—	—	—	—	—		
9:30 "	3.3	0	20	58	1,100	950	150		

Burns Harbor Box Annealed Furnace - 10/21/93 (Cont.)

Time	Oxy %	Comb. %	CO ppm	NOx ppm	THC ppm	CH4 ppm	VOC ppm		Notes
					890	945	145		
10:00 am	3.4	0	22	65	—	—	—		Furnace No. 10, Base 119
					680	560	120		
10:30 "	3.4	0	21	58	—	—	—		48-hour cycle started
				76					
11:00 "	13.0	0	21	8	—	—	—		at 1:00 pm 10/20/93
					545	425	105		
11:07 "	3.5	0	19	68	—	—	—		Sampling from center
									flue, west side
					420	335	85		
11:30 am	4.4	0	19	72	—	—	—		Fce 1420, steel 1090-1140
					305	240	65		
12:00 noon	4.3	0	18	74	—	—	—		4% H_2 in atmos gas
					130	97	33		
1:15 pm	4.2	0	18	78	—	—	—		to 1000° steel temp,
					102	72	30	Box	
1:45 "	4.4	0	17	76	4	0	4	Fce	then 10% H_2 in gas
					85	65	20		
2:15 "	4.4	0	16	74	3	1	2		~1:00 am
					75	57	18		
2:45 "	4.4	0	17	74	—	—	—		At 10:50 fce at 1408°,
					70	54	16		
3:15 "	3.3	0	21	70	—	—	—		steel at 1095-1143,
			15		73	57	16		
3:45 "	3.4	0	16	72	3	3	0		hold for 4 hours
					75	58	17		
4:15 "	3.4	0	16	72	—	—	—		Fce temp dropped
					78	62	16		
4:45 "	3.8	0	16	68	—	—	—		back to 1330°
					75	60	15		
5:15 "	3.3	0	15	66	—	—	—		At 11:30 sampling
					77	63	14		
5:45 "	3.7	0	—	74	2	0	2		from center flue,
									east side
					77	62	15	Box	
8:45 pm	3.9	0	17	75	2	0	2	Fce	Fce at 1407°, steel at
					78	59	19		
9:15 "	4.1	0	21	74	—	—	—		1096 to 1141°
					76	57	19		
9:45 "	4.6	0	22	72	—	—	—		At 1:25 fce at 1354°,
10/22/93					13	12	1 amb.		steel at 1104-1145°
					42	39	3 Box		
7:30 am	6.8	0	19	74	2	0	2 Fce		At 3:30 fce at 1447°,
					40	35	5		
8:00 "	6.9	0	21	72	—	—	—		steel at 1145-1184
					37	30	7		
8:30 "	7.0	0	22	72	—	—	—		holding period on 2nd
					34	28	6		at 5:00 pm fce at 1447°
9:00 "	7.1	0	21	74	—	—	—		steel at 1171-1215°
					31	26	5		
9:30 "	7.5	0	20	72	—	—	—		Target 1300° for 10
					39	34	5		
10:00 "	7.2	0	20	68	—	—	—		At 9:45 pm, fce at 1445,
					48	42	6		
10:30 "	7.4	0	18	70	1	0	1		steel at 1221-125.
					51	45	6		
11:00 "	6.9	0	18	66	—	—	—		10/22/93
					58	51	7		
11:30 "	7.2	0	17	72	—	—	—		At 7:00 am, fce at 1443
					62	54	8		
12:00 noon	7.5	0	16	72	—	—	—		steel at 1277-1299
					61	56	5		
1:30 pm	7.6	0	19	75	—	—	—		At 10:15 am, fce at 1440°
					66	61	5		
2:00 "	8.2	0	16	72	—	—	—		steel at 129-1308°
					60	56	4		
2:30 "	7.8	0	15	72	1	0	1		At 1:15 pm, fce at 1446,
					64	61	3		
3:00 "	7.8	0	16	70	—	—	—		steel at 1302-1308
					72	65	7		
3:15 "	16.3	0+	70	10	2	1	1		Low fire at 3:01 p.m.

A-27

Burns Harbor C Blast Furnace Stoves - 10/27/93

Time	Opacity %	Smoke %	CO %	NO_x ppm	SO_2 ppm 760/790 corr.	THC ppm	CH_4 ppm	VOC ppm	Notes
9:30 am	2.2	1.3	1.3	45	—	21	20	1	Stove Nos. 1+2
9:45 "	2.7	1.0	0.9 (1.1) 1.2	42	—	21	20	1	BFG - 83 Btu
									DFG - 72.3 kscfm
10:05 "	3.1	0.3	0.3	53	—	40	36	4	COG - 3663 scfm
10:15 "	3.3	0.4	1.0	49	—	27	26	1	NG - 112 scfm
10:30 "	0.4	0.8 (0.9) 0.6-1.4	0.8	48	—	25	23	2	Stoves Nos 2+3, 10:20 am
									BFG - 75.4 kscfm
11:00 "	2.9	2.2	2.1	41	60	66 (60) 120	60 (60) 120	0 0	COG - 3771 scfm
11:15 "	2.8	1.9 (1.7) 2.8	2.1	43	200	65 1	62 2	3 -1	NG - 55/0 scfm
									Stoves Nos. 3+4, 10:45 am
11:45 "	3.1	2.3	4.4 (3.2) 2.1-2.8	34	280	58	63	0	BFG - 80.2
12:00 noon	3.0	3.0 (2.9) 1.6-4.0	1.7 (1.3) 2.6	32	—	65	76	0	COG - 3690
12:15 pm	3.1	3.3 (2.2) 1.7	2.7	33	—	—	—	—	NG - 78
									Stoves Nos. 4+1, 11:30 am
12:30 "	2.5	1.0 (1.1) 1.3	1.2 (1.1) 0.9	44	200	20	20	0	BFG - 78.7
12:45 "	2.8	1.5	0.9	46	—	19	18	1	COG - 3729
1:00 "	3.0	1.0 (0.9) 0.9	0.9 (1.0) 1.2	43	—	19	18	1	NG - 96
									Stoves Nos. 1+2, 12:30
1:15 "	3.3	0.2	0.1	54	240	35 (34) 33	37 (35) 33	0 0	BFG - 76.0/76
1:30 "	3.1	0.3 0.8 (0.6)	0.4 (0.4) 0.3	48	—	26	25	1	COG - 3649
1:45 "	3.2	0.6 0.5 (0.5)	0.6 (0.4) 0.7	50	240	30	30	0	NG - 0/135
									Stoves Nos 2+3, 1:45 pm
2:00 "	2.6	1.6	2.1 (1.5) 0.8	50	—	66	64	2	BFG - 74.2
2:15 "	2.5	1.9 (1.5)	1.0	48	240	60	60	0	COG - 3720
2:30 "	2.6	1.0 1.5 (1.3)	1.9 (1.6) 1.3	42	—	54	54	0	NG - 0/156
									Stoves Nos. 3+4, 1:50 pm
2:45 "	2.7	1.5 (1.5) 2.0-4.1	2.2	36	220	62	63	0	BFG - 86.2
3:00 "	2.7	3.4	2.8 (2.1) 2.1	34	—	62	62	0	COG - 3765 3:00
3:15 "	2.7	2.3 (2.0) 2.6-1.1	2.8 (2.1) 1.1	36	220	57	56	1	NG - 146/0
									Stoves Nos. 4+1, 2:40 pm
									BFG - ~~65~~ 74.0
Avg. Stoves 1+2	2.7	1.2	1.1	44	200	20	19	1	COG - 3683 81.4
Avg. 2+3	3.2	0.5	0.5	50	240	30	29	1	NG - 55
Avg. 3+4	2.7	2.0	1.7	45	167	67	66	1	Top Gas Analysis
Avg. 4+1	2.9	2.6	2.5	34	213	61	64	0	H_2 - 7.2%
Avg. Overall	2.9	1.6	1.4	43	205/760 790	45	44	1	CO - 19.6, [illegible]
									CO_2 - 21.4, [illegible]

Burns Harbor D Blast Furnace Stoves - 10/28/93

Time	Opy. %	Comb. %	CO %	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
12:45 pm	2.0	0.7	1.5 (1.1) 0.6	40	—	38	38	0	Stoves 2+3 at 12:35 84 12:45
1:00 "	2.6	0.4 (0.4)	0.1	56	200	39	39	0	BFG - 76.7 kscfh
1:15 "	4.4	0.3 0.2	0.1	50	—	36	37	0	COG - 4215 scfm
									NG - 0
1:30 "	1.9	0.2 (0.4)	0.2	45	—	22	22	0	Stoves 3+4 at 1:20 pm
1:45 "	2.4	0.5 0.3	0.2	42	200	22 (1 2 0 amb.)	23	0	BFG - 72.3, 87.4
2:00 "	2.1	0.3	0.2	41	—	21	21	0	COG - 3408, 3200 69.7, 71.4
									Wind off - 1:15 pm 1:25 pm
2:15 "	2.2	0.5 (0.6)	0.5	45	—	27	27	0	Stoves 4+1 at 2:05 pm
2:30 "	2.4	0.7 0.5 (0.6) 0.6	0.5 (0.8) 1.1	45	150	29	30	0	BFG - 74.7, 87.9
2:45 "	2.3	1.0 (0.8) 0.6	0.9 (1.0) 1.4-0.6	44	—	56	58	0	COG - 3572, 361
3:00 "	2.1	1.3	1.4 (1.3) 0.9-1.6	47	—	25	26	0	Stoves 1+2 at 2:55 pm
3:15 "	2.1	0.8 0.6 (0.7)	0.4 (0.3) 0.2	44	180	21	22	0	BFG - 79.7, 84.9
3:30 "	2.2	0.5	0.8 (0.8) 0.5-1.0	44	—	22	23	0	COG - 4239, 421
3:45 "	2.6	0.4	0.3	45	—	15	16	0	Stoves 2+3 at 3:40 pm
4:00 "	2.6	0.5	0.5 0.9 (0.7)	41	200	30 (1 2 0 amb.)	31	0	BFG - 84.4, 87.1
4:15 "	4.0	0.2	0.1	—	—	—	—	—	COG - 4148
4:30 "	2.5	0.7 (0.5)	0.1	43	—	19	19	0	Stoves 3+4 at 4:25 pm
4:45 "	2.8	0.2 0.2	0.1	40	170	18	18	0	BFG - 75.3, 89.
5:00 "	2.6 2.8 (2.7)	0.2	0.3	42	—	19	19	0	COG - 3508, 320
5:20 "	2.0	0.2 (0.4)	0.2 (0.3)	44	—	25	26	0	Stoves 4+1 at 5:15 pm
5:35 "	2.6	0.5 0.4	0.3 0.5	43	200	28	29	0	BFG - 70.8, 81.2
5:50 "	1.9	2.2 (1.9) 1.6	1.8 (1.7) 0.5-2.0	62	—	46	54	0	COG - 3675
6:10 "	1.9	0.9 (1.2)	1.2 (1.2) 0.9-1.6	46	—	25	26	0	Stoves 1+2 at 6:00 pm
6:25 "	2.0	1.4 1.5 (1.3)	1.6	42	170	22	24	0	BFG - 90.1
6:40 "	1.7	0.8-1.8 1.4 (1.1) 0.9	0.9	42	—	20	21	0	COG - 4162
Stoves									
Avg. 1+2	2.0	1.0	1.0	44	175	23	24	0	Top Gas Anal
Avg. 2+3	3.0	0.4	0.4	46	200	32	32	0	H_2 - 7.28
Avg. 3+4	2.4	0.3	0.2	42	185	20	20	0	CO - 20.34
Avg. 4+1	2.2	0.8	0.8	47	175	35	37	0	CO_2 - 21.0
Avg. Overall	2.4	0.6	0.6	45	184	28	28	0	N_2 - 50.4

A-29

Burns Harbor Sinter Plant Stack - 10/29/93

Time	O_2 %	Comb %	CO %	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
2:15 pm	—	—	0.7	—	ND	52	36	16	O_2/Comb and
2:25 "	—	—	0.7	—	40	49	37	12	pump failed
3:00 "	—	—	0.7	—	40	55	40	15	NO_x and filled
3:15 "	—	—	0.7	—	40	57	39	18	with condensate
avg.	—	—	0.7	—	40	53	38	15	
11/3/93									
11:15 am	17.0	0.5	0.62	82	45	70	50	20	490 tph sinter
11:30 "	17.2	0.5	0.62	81	40	69	50	19	2.7% tot coke
11:45 "	17.0	0.5	0.64	84	60	2 / 71	2 / 51	0 amb. / 20	1050 cog
12 noon	17.1	0.55	0.62	84	50	66	46	20	ign. hood
12:15 pm	17.5	0.45	0.62	85	40	66	46	20	
12:30 "	17.2	0.50	0.56	86	40	69	49	20	
12:45 "	17.5	0.50	0.56	79	40	68	48	20	
1:00 "	17.1	0.52	0.56	79	40	72	51	21	
1:15 "	17.0	0.60	0.56	82	—	68	48	20	
1:30 "	17.0	0.58	0.58	83	50	2 / 64	2 / 44	0 amb. / 20	
1:45 "	17.1	0.55	0.56* (0.84)	81	40	75	55	20*	0.84% CO $\bar{S}$
2:00 "	17.1	0.60	0.62 / 0.84*	81	—	74	56	18	dyrite
2:15 "	17.2	0.58	0.62 / 0.84*	82	40	75 (73) / 71	59 (55) / 51	16 (18) / 20	Cal-2.75% $\bar{C}$
2:30 "	17.0	0.57	0.68 / 0.86*	81	50	66	47	19	dyrite, 3.05%
2:45 "	17.0	0.53	0.70 / 0.85*	79	40	68	48	20	$\bar{S}$ dyrite
3:00 "	16.7	0.58	0.68 / 0.86*	82	40	67	45	22	
3:15 "	17.0	0.60	0.72 / 0.84*	80	40	76 (75) / 73	58 (54) / 50	18 (21) / 23	
3:30 "	17.0	0.60	0.64 / 0.86*	79	40	68	47	21	490-495 tph prod.
3:45 "	16.7	0.66	0.60 / 0.88*	80	40	74 (74) / 73	55 (53) / 50	19 (21) / 23	616 tph mix
4:00 "	16.8	0.53 / 0.58 (0.56)	0.66 / 0.84*	78	40	66	44	22	13 tph coke
4:15 "	16.9	0.58	0.62 / 0.84*	82	40	70 (71)	50 (50) / 49	20 (21) / 22	1070 cog
avg.	17.1	0.55	0.84* / 0.85*	81	43	71 / 70	49 / 49	22 / 20	
5:30 "	17.5	0.4	0.38 / 0.88*	82	160	62	40	22	Sample from dust before scrubber CO cal.-3.05. $\bar{S}$ dyrite, 2.75 $\bar{C}$ dyrite

A-30

Burns Harbor Power Station Boiler No. 7 - 11/4/93

Time	Oxy %	Cont. %	CO %	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
1:30 pm	3.1	1.2	1.6	42	60	2	1	1	2:20 pm 78,000 cfh cog
1:45 "	3.3	1.6	0.6 1.6	36	100	2	1	1	5 M cfh bfg
2:00 "	3.4	1.7	1.6	42	100	2	1	1	29,000 cfh ng
2:15 "	3.6 3.3	0.4 1.6	0.8 1.3	41	90	2	1	1	~~0.04 O_2 on pane~~
2:30 "	4.8	1.3 1.7	1.0 2.0 1.5	34	—	1	0	1	Normal mix of
2:45 "	4.7	2.2	1.4 2.6	35	100	2	1	1	fuels
3:00 "	5.5	1.1 1.6	1.5 2.2	34	100	2	1	1	
3:15 "	5.3 4.9	2.0 1.1-1.6	2.6 1.8	25 36	100	2	1	1	3:55 pm
3:30 "	4.9	0.7 1.2	0.7 1.6	36	100	1	1	1	86,000 cog
3:45 "	5.8	1.0 0.5	2.1 2.3	35	80	1	1	1	5 M bfg
4:00 "	5.8	1.4	1.3 2.2	34 42	90	1	1	1	14,000 ng
4:15 "	6.2	1.1 0.6-1.4	1.9 1.2	36	90	1	1	1	
4:30 "	2.5 2.4	1.4 1.7-2.2	1.7 1.4	22 33	85	1	1	1	4:35 pm Found leak in
4:45 "	2.6	2.5	2.7 1.9	36	100	2	1	1	oxy. analyzer system
5:00 "	1.5	1.3	2.5 3.1-1.0	22 34	100	2	1	1	corrected at 5:00 pm
5:15 "	1.6	1.5	1.4 1.6-2.3	32 21	85	1	1	1	
5:30 "	1.6	1.3	2.4 1.7	34 28	100	2	2	0 Jub.	
5:45 "	1.5	1.7 3.1	1.6 2.0	44	80	1	1	1	3,000 cog
6:00 "	1.5	2.3 1.4	2.5	22	100	2	1	1	5 M bfg
6:15 "	1.5	2.9 1.8	2.8 2.3	37	80	1	1	1	5,000 ng
6:30 "	1.5	2.7	1.8 2.2	34	—	1	1	1	
Avg	1.5	1.6	1.8% or 18,000 ppm	34	92	1.9	1	1	

A-31

Burns Harbor Power Station Boiler No. 9 - 11/5/93

Time	Opac. %	O_2 %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
10 30 am	3.6	0.	2.4%	135	120	2	1	1	10 55 am
	4.0-2.6	0.7		120		6	7	0 amb.	
10 45 "	3.7	0	120 ppm	112	140	2	1	1	300,000 cfh cog
11 00 "	3.1	0+	30 47	88	130	2	1	1	2.5 M " bfg
	2.6-3.5		800	105					
11 15 "	3.1	0	32	82	—	2	1	1	250,000 " ng
11 30 "	2.3	0+	110	78	170	1	1	1	Blast fce down
			370						
11 45 "	3.3	0+	46	100	100	2	1	1	11 25 am
			24						
12 noon	3.2	0+	66	160	80	1	1	1	150,000 cfh cog
			112-33						
12 15 pm	2.5	0+	280	54	80	1	1	1	2.5 M " bfg
			32						
12 30 "	3.6	0+	45	70	100	2	1	1	250,000 " ng
	6.0-4.0		25	78					
12 45 "	2.1	0.5	120	54	250	2	1	1	12 55 pm
		0+	24						
1 00 "	2.3	0.3	68	70	100	2	1	1	150,000 cfh cog
	2.8	0	33						
1 15 "	2.6	0.1	51	76	180	2	1	1	5.15 M " bfg
			78		100				
1 30 "	2.5	0+	70	74	160	1	1	1	50,000 " ng
			120-27			6	6	0 amb	
1 45 "	2.7	0+	142	56	140	1	1	1	1 40 pm
			500						
2 00 "	2.5	0+	45	82	100	2	1	1	100,000 cog
			26						
2 15 "	3.4	0	36	68	120	2	1	1	3.5 M bfg
			25						
2 30 "	2.6	0	38	36	90	2	1	1	200,000 ng
			0.25%						
2 45 "	2.1	0.1	74	62	110	2	1	1	2 25 pm
			26						
3 00 "	2.3	0.3	34	52	180	2	1	1	150,000 cfh cog
	3.6	0+	82						200,000 "
3 15 "	3.6	0	0.84%	44	220	2	1	1	5.1 M " bfg
			1.70 "	48					
3 30 "	1.7	5.0	3.60%	74	160	225	227	0	50,000 " ng
		4.0	2.80 "						
Avg.	3.0	1.1	0.2	2,849	79	135	12.4	11.8	3 05 pm
									200,000 cfh cog
									5.55 M " bfg
									50,000 " ng

A-32

Burns Harbor Sinter Plant Dedusting Baghouse - 11/9/93

Time	Oxy %	Comb %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
2:30 pm	20.8	0	122 (116) 140-80	4	ND	9	9	0	Baghouse
2:45 "	20.8	0	166 (155) 174	4	ND	19	15	4	operation
3:00 "	20.8	0	164 (132) 180	4	20	7	6	1	normal
3:15 "	20.8	0	186 (149) 186	4	ND	12	8	4	according to
3:30 "	20.8	0	160 (140) 120	4	ND	12	9	3	operator.
3:45 "	20.8	0	150 (139) 166-102	4	ND	11	8	3	Sinter PC
4:00 "	20.8	0	128 (119) 84-138	5	ND	10	7	3	producing
4:15 "	20.8	0	134 (162) 170	4	ND	11	7	4	500 tons
4:30 "	20.7	0	154 (119) 116-26	4	ND	7	5	2	normal
4:45 "	20.8	0	72 (102) 142	4	ND	12	9	3	operation
Avg	20.8	0	128	4	ND	11	8	3	

A-33

Burns Harbor Power Station Boiler No. 11 - 11/10/93

Time	O_2 %	Comb. %	CO %	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
11:45 am	5.3	0	0.12-0.44	36	60	1	0	1	12:55 pm COG - 0 (Momentary spikes)
12 noon	4.4	0.1	16 ppm 0.22	27 54	—	1	0	1	BFG - 4.8 M scf
12:15 pm	6.1-3.8 4.3	0+	42 ppm 38 ppm	37-64 66	80	1 2 0 amb. 1	0	1	NG - 0 - 100,000
12:30 "	5.2-3.8 3.4	0.1	17-11 46	74-17 17	80	1	0	1	
12:45 "	3.0-3.9 3.6	0.5 1.8	35	29 76	—	1	0	1	
1:00 "	5.6 5.2	0 0+	1.5 26	24 29	70	1	0	1	
1:15 "	4.6 5.2	0	21 2-16 116	25	90	1	0	1	
1:30 "	3.5 3.7	0.15 0	12-1.5% 480	21 ppm 12	80	1	0	1	
1:45 "	4.5 4.8	0+	12-0.9% 32	36 35	50	1	0	1	2:40 pm
2:00 "	6.0-3.4 4.2	1.3 0	8-22 9	37 33	50	1	0	1	COG - 0 (Momentary spikes)
2:15 "	3.5	0.1	22	29	80	1	0	1	BFG - 3.5 M "
2:30 "	4.3 5.7	0	26 8	64 37	80	1	0	1	NG - 100,000 "
2:45 "	3.8	0.1	7	33	—	1	0	1	275,000 lbs/hr
Avg.	4.4	0.2	0.28% 11 ppm	36	72	1	0	1	steam generation

Boiler No. 12

Time	O_2 %	Comb. %	CO %	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
3:15 pm	11.2	0	1.1%	61	150	1	0	1	3:40 pm 200,000 COG - 130,000 cfh
3:30 "	3.1	0+	18 ppm 82	42 65	130	1	0	1	BFG - 4.2 M (5.0 ")
3:45 "	4.3 10.5	0+	5 0.2%	58	—	1	0	1	NG - 0 "
4:00 "	7.6	0+	5 ppm 0.8%	16-55 55	180	1	0	1	300,000 lb/hr
4:15 "	8.3 2.2	0 0.2	23 ppm 15 "	52	140	1 2 0 amb. 1	0	1	steam gen.
4:30 "	3.5 4.3	0	0.18% - 8 ppm 24	76	160	1	0	1	
4:45 "	3.1 3.0	1.3	315 ± 15 - 0.1% 24	57 61	140	1	0	1	
5:00 "	4.9-2.1 2.7	0 ± 0.3 0+	66-5 0.86%	30 62	150	1	0	1	
5:15 "	3.6	0	86 ppm - 6 ppm 26	26 51	150	0.9	0.5	0.4	6:10 pm
5:30 "	4.4-3.4 3.8	0	16	58	150	1	0	1	COG - 200,000 cfh
5:45 "	7.3 8.1	0	315 2	67 55	110	1	0	1	BFG - 4.8 M scf
6:00 "	4.6	0	18	45	100	1	0	1	NG - 50,000 - 0
6:15 "	3.9	0	18	40 64	100	1	0	1	335,000 lb/hr ste
Avg.	5.0	0	244 16	24-72	138	1	0	1	
			859	52					

A-34

Brunswick Harbor Power Station Boiler No. 8 - 11/11/93

Time	Dry Comb. O2 %	CO %	CO ppm	NOx ppm	SO2 ppm	THC ppm	CH4 ppm	VOC ppm	Notes
10:30 am	9.4	0+	23	77	40	2	1	1	Air leak in O2 anal.
10:45 "	10.6 / 5.6	0+	0.02%	82	—	2	1	1	tubing 10:30 + 10:45
11:00 "	8.6 / 2.5	0.2	24 ppm 0.02%	33	—	2	1	1	12:25 pm
11:15 "	3.4	0.2 / 0	27 ppm 0.02%	37	50	1	1	1	COG - 0
11:30 "	2.7	0.1	25 ppm 0.04%	48	40	3	3	0 amb.	BFG - 3.6 M cfh
11:45 "	3.2	0+	58 ppm - 0.02% 56 " - 0.2%	80 45	60	2	1	1	NG - 150,000
12 noon	2.8	0	122 " 80	53 37	60	1	0	1	Avg:
12:15 pm	3.3 / 3.0	0+	0.36% 0.30% 25 ppm	66 68	40	1	0	1	COG - 0
12:30 "	3.3 / 3.2	0	0.20% 21 ppm 0.06%	53 58	60	2	2	0 amb	BFG - 3.0 M
12:45 "	2.9	0.1	94 ppm 42 "	54	40	1	0	1	NG - 250,000 "
1:00 "	3.2 / 2.9	0.1	15+ 16	62 26	60	1	0	1	Stm Gen - 315,000 lb
1:15 "	2.7 / 3.2	0.7 / 0+	84 25	53	40	1	0	1	1:40 pm
1:30 "	2.6	0 / 0.1	27 0.05%	42 24	40	1	0	1	COG - 0
1:45 "	3.1	0+	0.12% 0.24% 19 ppm	57	40	1	0	1	BFG - 3.0 M cfh
2:00 "	3.7	0	202 ppm 26	96 33	—	1	0	1	NG - 270,000 "
2:15 "	2.9 / 3.4	0	0.04% 36 ppm	54 70	40	1	0	1	
2:30 "	3.1 / 3.7	0	33	26	40	1	0	1	3:25 pm
2:45 "	3.4	0	57	44	40	1	1	1	COG - 0
3:00 "	2.3	0.5	0.26%	22	35	2	2	0 amb	BFG - 3.4 M cfh
3:15 "	3.2 / 3.7	0+ / 0+	0.03" 51 ppm	40 51	40	1	1	1	NG - 300,000 "
3:30 "	2.9 / 3.1	0.1 / 0	0.40% 40 ppm	52 / 455	40 / 53	1 / 45	1 / 1.1	1 / 0.5 / 1	Stm. Gen - 320,000
Avg.									

A-35

Burns Harbor Slabbing Mill Scarfer Scrubber - 11/16/93

Reading No.	Oxy O_2 %	Comb %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
1	20.2	1.1	154	100	ND	9	11	0	Each reading is a peak on a slab goes thru the scarfer. Time a slab is under the scarfer varies from about 30 sec to one minute. The oxy reading goes up to about 21.5% initially, then drops back. The combustible reading is steady for a finite time. The other reading NO_x, CO, HCs, are instantaneous peak
2	19.5	1.1	162	100+	ND	20 (4)	17 (7)	3 (0)	
3	20.2	1.2	315+	115	ND	12 (2)	13 (0)	0 (0 avg)	
4	20.4	1.0	315+	125	ND	14	14	0	
5	20.6	1.2	240	110	ND	13	13	0	
6	20.6	1.2	212	110	—	12	12	0	
7	20.0	1.4	214	100	—	17	17	0	
8	20.9	1.1	208	105	—	13	14	0	
9	20.3	1.3	222	105	—	12	14	0	
10	20.3	1.4	116	95	—	12	14	0	
Avg.	20.3	1.2	216	107	ND	13	14	0	

A-36

Burns Harbor Soaking Pits - 11/17/93

Reading No.	O_2 %	Smk %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
						2	0	3MD	
1	14.2	0	16	94	90	1	2	0	Pit 41, south
2	14.8	0	13	90	101	2	2	0	stack, fired
3	14.8	0	14	88	120	1	2	0	with mixed gas
4	14.5	0	15	92	—	1	2	0	(BFG+COG) ~ 2030
5	14.5	0	12	90	—	1	2	0	Started step
6	—	—	—	92	—	—	—	—	heating ~ 1:15 p.m.
7	—	—	—	94	—	—	—	—	pit at ~ 1600°F
8	—	—	—	100	—	—	—	—	up to 2000°F
9	—	—	—	94	—	—	—	—	by ~ 5:30 p.m.
10	—	—	—	92	—	—	—	—	when readings stopped
avg.	14.6	0	14	93	100	1	2	0	
						2	0	2MD	
1	15.1	0	12	110	ND	2	3	0	Pit 43, south
2	15.8	0	10	110	—	2	3	0	stack, fired with
3	15.8	0	10	120	—	2	3	0	natural gas.
4	—	—	—	125	—	—	—	—	Started step
5	—	—	—	125	—		—	—	heating ~ 1:15 p.m.
6	—	—	—	125	—	—	—	—	pit at ~ 2000°F
avg.	15.6	0	11	113	ND	2	3	0	at 6 p.m. when
11/18/93									started readings
1	14.5	0+	20	197	—	—	—	—	Pit 41, south stack
2	—	—	—	203	—	—	—	—	mixed gas, 2400°F
avg.	14.5	0	20	200	—	—	—	—	
1	15.5	0	22	203	—	—	—	—	Pit 43, south stack
2	—	—	—	205	—	—	—	—	nat gas, 2400°F
avg.	15.5	0	22	204	—	—	—	—	
1	13.5	0+	19	115	100	2	2	0	Pit 41, south stack
2	14.3	0+	24	120	120	2	2	0 3MD	12:40 p.m. after changing
3	13.3	0	17	130	180	2	3	0	starting temp. 1600°,
4	13.6	0+	19	135	150	1	2	0	quickly up to 1800°
5	14.3	0	20	140	100	2	3	0	Temp at to 2250°
6	—	—	—	145	—	—	—	—	at 3:10 when stopped
7	—	—	—	145	—	—	—	—	readings
8	—	—	—	150	—	—	—	—	
9	—	—	—	160	—	—	—	—	
10	—	—	—	175	—	—	—	—	
avg.	13.8	0	20	157	130	2	2	0	

Burns Harbor Soaking Pits - 11/18/93 (Continued)

Reading No.	Oxy. %	Comb. %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
						1	2	0 amb.	
1	16.2	0	19	165	ND	2	2	0	Pit 43, south stack
2	16.1	0	16	170	ND	2	2	0	3^{30} pm, pit at 2408°F
3	16.2	0	15	175	—	2	3	0	
4	—	—	—	175	—	—	—	—	
5	—	—	—	170	—	—	—	—	
avg	16.2	0	17	171	ND	2	2	0	
1	14.3	0	16	330	ND	1	2	0	Pit 43, north stack
2	15.2	0	15	330	—	2	2	0	5^{10} pm, pit at 2408°F
3	—	—	—	310	—	—	—	—	Seemed to be a
4	—	—	—	290	—	—	—	—	problem with the
5	—	—	—	285	—	—	—	—	reversal times causing
avg	14.8	0	16	309	ND	2	2	0	the imbalance.
						1	2	0 amb.	
1	13.6	0+	26	205	170	1	2	0	Pit 41, south stack
2	13.0	0+	22	205	165	2	2	0	6^{30} pm, pit at 2425°F
3	—	—	—	180	160	—	—	—	
4	—	—	—	195	—	—	—	—	
5	—	—	—	205	—	—	—	—	
avg	13.3	0	24	198	165	2	2	0	

Summary

Pit 41 - Mixed gas, 74% BFG; 26% COG by volume

Period 1	14.6	0	14	93	100	1	2	0
2	14.5	0	20	201	—	—	—	—
3	13.8	0	20	157	130	2	2	0
4	13.3	0	24	198	165	2	2	0
Avg	14.1	0	19.5	162	132	2	2	0

Pit 43 - Natural gas

1	15.6	0	11	113	ND	2	2	0
2	15.5	0	22	204	—	—	—	—
3	16.2	0	17	171	—	2	2	0
4	14.8	0	16	309	—	2	2	0
Avg	15.5	0	16.5	199	—	2	2	0

Buffalo Harbor 110" Plate Mill Furnaces - 11/19/93

Time	Oxy %	Comb %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
11:15 am	14.3	0	5	88	—	1	1	0	All zones on
11:30 "	13.8	0	4	90	ND	1	2	0 amb	both No. 1 + No. 2
11:45	12.7	0	3	102	—	1	1	0	Furnaces not on fire
12 noon	13.7	0	4	102	ND	1	1	0	Zone 1 / Zone 2
12:15 pm	13.6	0	11	97	ND	1	1	0	Zone % / Zone %
12:30 "	14.3	0	7	88	ND	1	1	0	1 34.2 / 1 36.4
12:45 "	12.7	0	9	97	ND	1	1	0	2 57.3 / 2 46.6
1:00 "	12.6	0	7	93	ND	1	1	0	3 70.4 / 3 65.7
1:15 "	13.2	0	6	100	ND	1	2	0 amb	4 29.0 / 4 36.8
1:30 "	13.8	0	4	87	ND	1	1	0	5 11.1 / 5 12.9
1:45 "	13.7	0	4	82	ND	2	1	1	6 12.0 / 6 12.0
2:00 "	11.7	0	3	102	ND	1	0	1	Above fuel flow at 2:00 pm
2:15 "	10.4	0	2	98	ND	1	1	0	
2:30 "	10.2	0	5	105	ND	1	1	0	
2:45 "	10.9	0	6	112	ND	1	1	0	
Avg.	12.8	0	5	96	ND	1	1	0	
3:00 "	19.1	0	2	13	ND	1	2	0	Top + bottom pre-
3:15 "	19.5	0	1	14	ND	1	2	0	heat zones shut
3:30 "	19.2	0	0	15	ND	1	2	0	off in anticipation
Avg.	19.3	0	1	14	ND	1	2	0	of 5:00 pm shutdown

A-39

Buffalo Harbor 160" Plate Mill Continuous Furnaces - 11/30/92

Time	Oxy %	Combustibles %	CO ppm	NOx ppm	SO2 ppm	THC ppm	CH4 ppm	VOC ppm	Notes
4:00 pm	17.7	0	22	21	–	5	5	0	Fce No. 1
4:15 "	18.0	0	17	21	ND	1 / 5	2 / 5	0 / 0 est	All zones on
4:30 "	17.5	0	17	24	ND	5	5	0	natural gas
4:45 "	17.8	0	15	24	ND	5	5	0	
5:00 "	17.7	0	14	25	ND	5	5	0	Furnace temp.
5:15 "	17.5	0	13	23	ND	4	4	0	controlling at
5:30 "	17.5	0	12	23	ND	4	5	0	2275°F. On
5:45 "	17.7	0	12	23	ND	4	5	0	some steel run
6:00 "	17.6	0	13	23	ND	2 / 5	3 / 6	0 / 0 est	at 2350°F
6:15 "	17.4	0	11	25	ND	4	5	0	
Avg.	17.6	0	15	23	ND	5	5	0	
6:30 "	14.5	0	14	63 (66)	ND	2	2	0	Fce No 2
6:45 "	14.6	0	17	69 / 71	ND	2	2	0	all zones on
7:00 "	14.6	0	13	67	ND	2	2	0	natural gas
7:15 "	14.4	0	11	71 (69)	ND	2	2	0	
7:30 "	14.2	0	11	67 / 72	ND	2	2	0	Same fce temp
7:45 "	14.3	0	12	71	ND	1 / 1	2 / 1	0 est / 0	as Fce. No. 1
8:00 "	15.9	0	8	52	ND	1	1	0	On some steel
8:15 "	16.8	0	8	50	ND	1	2	0	run cooler than
Avg.	14.9	0	12	65	ND	2	2	0	2275°.

About 7:55 pm fce started cutting back - rolling from in + out fce, then shutting down for a mill change

A-40

Burns Harbor Power Station Boiler No. 10 - 12/1/93

Time	O_2 %	Comb %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
10:30 am	2.2	1.0	19	39	10	1.4	0.5	0.9	
10:45 "	2.1 / 3.1	3.1 / 0.2	284 / 60	26	—	1.2 / 3.6	0.9 / 3.1	0.3 / 0.5 2mb	
									120,000 NG
11:15 "	2.0	0	0.2%	48	60	1.5	1.1	0.3	5,000,000 BFG
11:30 "	2.2	0.5 / 0+	310 / 160	53	—	1.2	0.5	0.7	290,000 STM
11:45 "	2.4	0+	0.1%	49	80	1.2 / 5	0.6 / 3	0.6 / 2 2mb	
12 noon	2.3	0.2	0.1%	55	90	0.9	0.5	0.4	
12:15 pm	2.0	0.2	0.4%	47	70	0.7	0.4	0.3	
12:30 "	3.4 / 1.9	0 / 0.3	0.1 " / 0.2 "	46	80	0.8	0.4	0.4	
12:45 "	2.8 / 2.0	0 / 0.3	0.8%	45	80	0.7	0.3	0.4	
1:00 "	2.4 / 2.1	0 / 0.2	0.2 " / 0.1 "	47	80	0.7	0.3	0.4	
1:15 "	2.7	0+	30 ppm / 0.5%	47	90	0.8	0.4	0.4	
1:30 "	2.7	0	0.1% / 106 ppm	47	80	0.7	0.3	0.4	
avg.	/2.4	/0.1	137 " / 40 "	/1870	/48	/79	/0.9	/0.5	/0.4
2:00 "	2.3	0.6	0.3%	69	ND	4	5	0	430,000 NG
2:15 "	2.6	2.0	0.7 "	68	ND	3	4	0	300,000 STM
2:30 "	2.6	3.7	2.0 "	59 / 57	—	33	48	0	Put more comb.
2:45 "	6.7	0	8 ppm	90	ND	0.9	0.5	0.4	air on, Econics
3:00 "	3.7	0	11 "	76	ND	0.9	0.4	0.5	window blocked,
3:15 "	2.8	0.2	28 " / 0.02%	85	ND	0.8	0.4	0.4	was cleaned
3:30 "	2.4	0.4	84 ppm / 0.1%	87	ND	0.9	0.5	0.4	
3:45 "	2.4	0.4	0.2%	86	—	0.8	0.5	0.3	One row (lower)
4:00 "	—	—	0.2 "	92	ND	0.9 / 0.9	0.3 / 0.5	0.6 / 0.4	of NG burners on
4:30 "	2.3	0.5	0.2%	80	ND	0.8	0.6	0.2	Two rows of NG
4:45 "	2.5	0.3	0.2 "	88	ND	0.9	0.7	0.2	burners on
avg.	2.3/3.0	0.5/0.8	/3025	/78	/ND	/0.9	/0.5	/0.3	
5:45 "	2.6	0	130 ppm	16	ND	0.6	0.4	0.2	5,200,000 BFG
6:00 "	4.8	0	6 " / 8	16	—	0.8	0.6	0.2	50,000 NG
6:15 "	3.0	0	25-116 / 18	16	40	0.9	0.6	0.3	290,000 STM
6:30 "	4.2	0	7 / 7	16	40	2 / 0.9	3 / 0.6	0 2mb / 0.3	
6:45 "	3.5	0+	16 / 6	14	40	1.0	0.7	0.3	
7:00 "	3.7	0	6	14	40	0.9	0.7	0.2	
7:15 "	3.6	0	6	15	40	1.0	0.7	0.3	
7:30 "	4.9 / 3.8	0	8	15	40	1.0	0.7	0.3	
7:45 "	2.1	0.5	0.1%	17	40	0.9	0.7	0.2	
avg.	/3.6	/0+	0.2 "/225	/15	/35	/0.9	/0.6	/0.3	

Burns Harbor Power Station Boiler No. 10 - 12/1/93 (continued)

Time	O_2 %	Comb %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
8:15 pm	4.6	0	7	72	40	0.8	0.6	0.2	Boiler on automatic
8:30 "	3.1	0	8	32 27	50	0.9	0.6	0.3	fuel control, fuel
8:45 "	2.4	0.1	1.0% 0.1 "	46 13	ND	1.2	0.6	0.6	fluctuated widely
Avg	3.4		16 ppm	38	36	1.0	0.6	0.4	Mostly BFG, some
			2,206						NG, spikes of COG

A-42

Burns Harbor 160" Plate Mill Continuous Furnace - 12/2/93

Time	Oxy %	Comb O_2	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
12 noon	10.3	0	13	93	ND	3	2	1	Fce No. 1
12 15 pm	10.0	0	12	92 (88)	ND	1	3	0 amb	all zones on
12 30 "	10.8	0	11	84 92	ND	3	3	0	natural gas
12 45 "	10.7	0	11	88	ND	2	2	0	Zone Flow
1 00 "	12.5	0	13	66	ND	3	3	0	Soak 20.3
1 15 "	11.6	0	14	82	ND	2	2	0	Top Heat 14.4
1 30 "	8.8	0	16	102	ND	2	2	0	Bot Heat 26.8
1 45 "	9.8	0	12	92	ND	2	2	0	Top Fce 56.6
2 00 "	10.3	0	14	86	ND	2	2	0	Bot Fce 72.3
2 15 "	10.8	0	12	84	ND	3	3	0	Tot 190.4
2 30 "	12.3	0	11	71	ND	3	3	0	MBtu/hr
2 45 "	11.3	0	12	82	ND	3	3	0	
3 00 "	10.7	0	11	86	ND	3	3	0	
avg.	10.8	0	12	86	ND	2.5	2.5	0	
3 30 "	9.8	0	12	147	ND	2	1	1	Fce No. 2
3 45 "	9.8	0	12	142	ND	1	1	0	All zones on
4 00 "	9.8	0	11	143	ND	1	1	0	natural gas
4 15 "	10.2	0	12	153	ND	1	3	0 amb	
4 30 "	9.3	0	11	143	ND	1	1	0	Zone Flow
4 45 "	9.9	0	15	133	ND	1	1	0	Soak 22.5
5 00 "	10.2 9.7 (10.0)	0	15	138	ND	1	1	0	Top Heat 19.3
5 15 "	10.4	0	16	127	ND	1	1	0	Bot Heat 42.8
5 30 "	10.0	0	14	123	ND	1	1	0	Top Fce 42.3
5 45 "	10.7	0	15	113	ND	1	1	0	Bot Fce 73.1
6 00 "	11.2	0	14	112	ND	1	1	0	Tot 200.0 MBtu/hr
6 15 "	10.3	0	15	133	ND	1	1	0	Rolling from in and out fces for ~ 25 min
6 30 "	9.7	0	14	138	ND	1	1	0	
Avg.	10.1	0	14	134	ND	1	1	0	

Fce No. 2 stack temp much higher than No. 1 (color in flue)

Heating much thicker slabs, firing harder than test 11/30/93

Burns Harbor BOF Steel Ladle Treatment Baghouse - 12/8/93

Time in Cycle, min	NO_x ppm	NO_x ppm	CO ppm	CO ppm	THC ppm	CH_4 ppm	VOC ppm	SO_2 ppm	Note
0				24					
1	0	0	44	34 Ar on	2	3	0	ND	First NO_x - West LTS
2	0	8	56	40	2	3	0	ND	(ladle treat. sta.
3	0	0	48	29 Ar off 33	2	3	0	ND	Ar stir, Al wire
4	0	0	42	31	2	3	0	ND	Second NO_x - No. 2
5	0	0	36	29	2	3	0	ND	desulf. sta.
6	0	8/0	34	32	2	3	0	ND	First CO - West LTS
7	0	—	35	33	2	3	0	ND	Ar stir, Al wire
8	0	—	37 34	29	2	3	0	ND	Second CO - West LTS
9	0	—	31	26	2/2	3/3	0/0	ND	First VOC - West LTS
10	0	—	25	27	1	3	0	amb. ND	First SO_2 - West LTS
11	0	—	24	27	—	—	—	ND	Cont. SO_2 - No. 2 desul
12	0	—	32 - Ar on 25	25	—	—	—	ND	Switch from SO_2
13	8	—	24	25	—	—	—	ND	
14	0	—	27 - Al	23	—	—	—	ND	
15	1	—	42	38 - Ar 44 on	—	—	—	ND	
16	0/0	—	39	30	—	—	—	ND	End desulf.
17	—	—	34	32 Ar on	—	—	—	ND	
18	—	—	32	38 34	—	—	—	ND	
19	—	—	31	27	—	—	—	ND	
20	—	—	29	26	—	—	—	ND	
21	—	—	29	25 Ar	—	—	—	ND	
22	—	—	39 Inc Ar	33 off 27	—	—	—	~~50~~ 27	Desulf.
23	—	—	36	17 ladle out	—	—	—	35	sta.
24	—	—	31 Ar off	29	—	—	—	21	LTS ladle out
25	—	—	25	—	—	—	—	12	
26	—	—	20 Ladle Out	—	—	—	—	12	
27	—	—	16 / 33	—	—	—	—	10	
28	—	—	8 amb.	—	—	—	—	9	
29	—	—	—	—	—	—	—	8	
30	—	—	—	—	—	—	—	8	
31	—	—	—	—	—	—	—	11	
32	—	—	—	—	—	—	—	12	
33	—	—	—	—	—	—	—	12	End desulf.
34	—	—	—	—	—	—	—	8	/15
35	—	—	—	—	—	—	—	7	

Bunge Harbor DOT Steel Ladle Treatment Baghouse (Continued)

Time in Cycle min	CO ppm	Time min	CO ppm	CO ppm	Time min	CO ppm	Notes
1	16	38	12	15	4:15 pm	20	First CO - East LTS
2	12	39	"	11	4:20	16 22	At 23 min East
3	12	41	11	16	4:25	19	finished west started
4	11	41	12	15	4:30	16	At 56 min East
5	15	42	12	11		19	start
6	15	43	25	9 11			Second CO - Sta 2
7	17	44	20				stir ladle
8	11	45	22				
9	11	46	20				
10	12	47	25 (20)				
11	16	48	15 64 Ash				
12	12	49	42 Al				
13	10	50	34				
14	8	51	21				
15	8	52	22				
16	64 Carbon Wire	53	11				
17	38	54	15				
18	30	55	12/55				
19	30	56	11 East + West				
20	29	57	19				
21	29	58	13				
22	29						
23	31/20						
24	6-2 51 (926)						
25	0.18% 128						
26	48						
27	43						
28	38						
29	31						
30	26						
31	22						
32	25						
33	26						
34	19						
35	16						
36	16						
37	14						

Summary

Ladle Treatment Station Baghouse

Cycle Nr.	NO_x ppm	CO ppm	SO_2 ppm	VOC ppm
1	ND	33	ND	ND
2	—	29	—	—
3	—	20	—	—
4	—	55	—	—
Avg.	ND	34	ND	ND

Ladle Desulfurizer Baghouse

1	ND	15	ND	—
2	—	13	—	—
3	—	19	—	—
Avg	ND	16	ND	—

A-45

Burns Harbor 160" Plate Mill Inn and Out Furnaces - 12/9/93

Time	O_2 %	Opac. %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
11:15 am	13.2	0	9	58	—	1	1	0	Fr. Nos. 6 + 7
11:30 "	13.4	0	10	60	ND	1	1	0	Nat. gas
11:45 "	13.0	0	7	53	ND	1	1	0	No. 6 - 74+163 (237) MBtu/hr
12:00 noon	11.8	0	8	47	ND	1	1	0	No. 7 - 163+165 " " (328)
12:15 pm	12.8	0	7	49	ND	1	1	0	
12:30 "	11.8	0	10	61 (56)	ND	1	1	0	
12:45 "	11.6	0	7	51 36	ND	1	1	0	
1:00 "	11.4	0	9	36	ND	1	2	0 amb.	
1:15 "	11.4	0	8	39	ND	1	1	0	
1:30 "	11.6	0	7	39	ND	1	1	0	
1:45 "	11.4	0	7	41	ND	1	1	0	
2:00 "	11.4	0	6	41	ND	1	1	0	
Avg.	12.1	0	8	46	ND	1	1	0	
2:15 "	15.7	0	5	32	ND	1	1	0	Fr. No. 5
2:30 "	16.1	0	5	35	ND	1	1	0	Nat gas
2:45 "	16.2	0	8	33	ND	1	1	0	27+19 MBtu/hr
3:00 "	17.3	0	6	36	ND	1	2	0 amb	(46)
3:15 "	16.9	0	7	41	ND	1	2	0	
3:30 "	15.9	0	7	30	ND	1	2	0	
3:45 "	16.2	0	7	33	ND	2	2	0	
4:00 "	17.2	0	6	43	ND	1	2	0	41+38 MBtu/hr
4:15 "	17.1	0	6	31	ND	1	2	0	(79)
4:30 "	16.2	0	5	30	ND	1	2	0	
4:45 "	17.3	0	4	20	ND	1	2	0	See chart for add. data
Avg.	16.6	0	6	33	ND	1.1	1.7	0	
12/10/93									
9:30 a.m.	11.3	0	0	127	310	1	1	0	Fr. No. 8
9:45 "	18.8	0	3 amb 0	134	340	1	1	0	Coke oven gas all gone
10:00 "	18.7	0	1	132	350	1	1	0	22+32+57 MBtu/hr
10:15 "	9.3	0	1	132	330	1	1	0	(111)
10:30 "	9.4	0	1	122	350	1	1	0	
10:45 "	10.7	0	1	118 123	350	1	2	0 amb	
11:00 "	10.2 9.7	0.0	0	123	330	1	1	0	
11:15 "	9.8	0	0	143 117	560	1	1	0	
11:30 "	4.0	0	0	143	640	1	1	0	31+48+76 MBtu/hr
11:45 "	4.8	0	0	155 137	680	0.4	0	0.4	(155)
12:00 noon	3.8 4.8	4.0 3.3	0	148	580 479 (525)	1	2	0 amb	
12:15 pm	3.9 (4.8)	5.2 0/0 8.3	0/0.3	152 123	520 440	0.4	0	0.4	37+67+88 MBtu/hr (192)
						0.4/0.9	0/0.8	0.4/0.1	

A-46

Bethlehem Harbor 160" Plate Mill Heat Treatment Furnaces

Time	Oxy %	Smoke %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
12/10/93									
5:00 p.m.	1.2 (1.4) 3.9-2.5	0+	182 (190) 195	61	ND	1	1	0	Hardening Fce
5:15 "	2.4	0	36	63	ND	1.6	0.6	0.4	Zone 3 1660°F
5:30 "	11.2 (9.9) 7.5	0	14 (19) 24	66 53	ND	1	1	0	All 10 zones nat. gas
5:45 "	14.8	0	12	47	ND	1	1	0	
6:00 "	13.1	0	11	38 31	ND	1	3	0 amb	Zone 4 1650°F
6:15 "	13.5	0	10	35	ND	1	1	0	
6:30 "	14.0	0	12	48	ND	1	1	0	
6:45 "	15.2	0	10	42	ND	1.1	0.6	0.5	
7:00 "	14.0 (5.9) 17.8	0	9	14	ND	1	1	0	Zone 7 1650°
7:15 "	17.2	0	9	15	ND	1	1	0	
7:30 "	17.7	0	9	22	ND	1.1	0.5	0.6	
7:45 "	5.5 (5.3) 5.0	0+	12	68	ND	1	2	0	
8:00 "	6.2	0	11	61	ND	1.0	0.6	0.4	
Avg	6.5 (6.3) 11.3	0	27	44	ND	1.0	0.9	0.1	
12/14/93									
4:00 pm	3.8 (8.9) 12.0	0.3 0	260 (188) 116	31	ND	2	2	0	Tempering Fce
4:15 "	14.0	0+	224	23	ND	5	5	0	Zone 3 950°F 1230
4:30 "	14.6	0+	315+	23	ND	8	9	0	All 14 zones nat gas
4:45 "	13.5	0	312	20	ND	1	2	0 amb	
5:00 "	13.8	0	315+	21	ND	6	7	1	Zone 6 1250°F
5:15 "	14.8	0	315+	20	ND	5	6	0	
5:30 "	14.5	0	315+	18	ND	7	8	0	
5:45 "	14.4	0	290 (290) 290	19	ND	2	3	0	
6:00 "	13.0	0	192	20	ND	3	4	0	Zone 9 1250°
6:15 "	15.2	0	190	21	ND	4	5	0	
6:30 "	14.2	0	184 (245) 306	39 44	ND	1	1	0	
6:45 "	7.4 (10.8) 15.1	0	94 (115) 136	21	ND	1	2	0 amb	
7:00 "	14.6	0	39 (33) 26	20	ND	2	3	0	Zone 12 1260°
7:15 "	10.5 (12.6) 14.7	0	315+ (95) 34	20	ND	1	2	0	
7:30 "	13.4	0	188 (136) 84	20	ND	1	1	0	
7:45 "	15.2	0	126 (116) 106	18	ND	1	1	0	
Avg.	13.6	0	217	22	ND	3.2	3.9	–	

A-47

Burns Harbor 80" Hot Strip Mill Furnace - 12/15/93

Time	Dry Comb O_2 %	O_2 %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
12:15 pm	2.5	0	5	325	ND	0.2	0	0.2	Fce No. 3, east flue
12:30 "	2.2	0	4	305	ND	1.1	0.6	0.5	All gases on mat. pc
12:45 "	2.4	0	2	305 / 293	ND	3.7 / 1.3	3.0 / 0.5	0.7 (2 mo) / 0.2	Total firing rate 335 MMBtu/hr
1:00 "	2.7	0	Power Failure	260	ND	1.1	0.5	0.6	Soak zone 2450°F
1:15 "	2.4	0		255	ND	1.1	0.4	0.7	Heating zone 2400°
1:30 "	2.3	0	–	275	ND	1.4	0.5	0.9	Preheat zone 2300°
1:45 "	2.2	0	15	270	ND	1.2	0.5	0.7	
2:00 "	2.2	0	12	275	ND	1.3	0.5	0.8	
2:15 "	2.5 / 2.8 (2.1)	0	13	285	ND	1.3	0.5	0.8	Firing rate 257
2:30 "	2.5	0	15	265	ND	2.9 / 1.1	2.7 / 0.4	0 (2 mo) / 0.7	Temps 2350, 2370, 2330, 2400
Avg.	2.4	0	9	281	ND	1.1	0.4	0.7	
3:00 "	4.2	0	19	310	ND	1.8	0.4	1.4	Fce No. 1, west flue
3:15 "	3.4	0	13	305	ND	1.5	0	1.5	All gases on mat. pc
3:30 "	3.6	0	3	315	ND	1.0	0	1.0	Firing rate 355F
3:45 "	3.6	0	3	325	ND	2.4 / 0	2.0 / 0	0.4 (2 mo) / 0	Temps 2410, 2400, 2360, 2450
4:00 "	2.1	0	2	285	ND	0.5	0	0.5	Fce No. 1, east flue
4:15 "	2.1	0	0	295	ND	0.4	0	0.4	
4:30 "	2.3	0	1	295	ND	0.4	0	0.4	Temps 2420, 2395, 2350, 2470
4:45 "	2.2	0	1	270	ND	0.1	0	0.1	
Avg.	2.9	0	5	300	ND	0.7	0.1	0.6	
5:00 "	2.7	0	0	355	ND	0.8	0	0.8	Fce No. 2, west flue
5:15 "	2.6	0	0	350	ND	3.4 / 0.6	2.7 / 0	0.7 (2 mo) / 0.6	All gases on mat. pc
5:30 "	2.4	0	0	360	ND	0.6	0	0.6	Temps 2420, 2400, 2360, 2470
5:45 "	2.6	0	0	370	ND	0.7	0	0.7	
6:00 "	2.2	0	0	350	ND	1.4	0	1.4	Fce No. 2 east flue
6:15 "	2.4	0	1	340	ND	1.4	0	1.4	Temps 2420, 2400, 2375, 2470
6:30 "	2.4	0	6	355	ND	1.5	0	1.5	
6:45 "	2.2	0	7	350	ND	1.8	0	1.8	
Avg.	2.4	0	2	354	ND	1.1	0	1.1	
7:00 "	1.9	0	9	265	ND	1.9	0	1.9	Fce No. 3, west flue
7:15 "	2.0 / 1.9	0	9	275	ND	1.8	0	1.8	Temps 2435, 2400, 2345, 2475
7:30 "	1.9	0	9	315	ND	1.8	0.1	1.7	
7:45 "	2.1	0	9	305	ND	2.0	0.2	1.8	
8:00 "	2.1	0	4	305	ND	3.4 / 1.2	3.1 / 0.6	0 (2 mo) / 0.6	Fce No. 3, east flue
8:15 "	2.1	0	6	305	ND	1.1	0.5	0.6	
Avg.	2.0	0	8	295	ND	1.6	0.2	1.4	
Avg.	2.3	0	9	286	ND	1.3	0.4	0.9	Fce No. 3 overall

A-48

Burns Harbor Hot Dip Coating Line - 12/16/93

Time	Oxy ~~Combu~~ %	CO %	CO ppm	NO_x ppm	SO_2 ppm	THC ppm	CH_4 ppm	ISC ppm	Notes
						1.0	2.7	0 amb.	
10:30 am	20.8	0	8	0	ND	7.3	3.5	3.6	Cleaning
10:45 "	20.8	0	9	0.2	Water in analyzer	7.2	3.2	4.0	Section Stack
11:00 "	20.9	0	7	0.4		7.4	3.2	4.2	Scrubber exhaust,
Avg.	20.8	0	8	0.2	ND	7.3	3.3	3.9	no fuel fired very wet sample
12 noon	9.2	0	94	4.8	–	0.9	0.7	0.2	Annealing
12:15 pm	8.9	0	94	6.4	–	0.9	0.8	0.1	Furnace Stack.
						1.0	2.2	0 amb	all 8 zones on
12:30 "	9.4	0	136	7.2	–	1.3	1.3	0	net. gas
12:45 "	8.6	0	148-106 144 68	9.0 0	–	1.3	1.5	0	93 ppm NO_x before treatment, 0 ppm
1:00 "	10.4	0	132	0	–	1.5	1.7	0	after by Rosemount
1:15 "	8.8	0	184	0	–	1.8	2.2	0	analyzers. High
1:30 "	10.5	0	228	0	–	1.9	2.2	0	NH_3 set manually
1:45 "	8.8	0	246	0	–	2.2	2.6	0	by Fuel Dept.
						0.9	2.3	0 amb	
2:00 "	7.9	0	220	0	Analyzer dried out	2.3	2.8	0	while calibrating
2:15 "	7.8	0	172	1.6	ND	0.9	1.1	0	analyzers. Back
2:30 "	8.9	0	144	6.4 4.8	ND	1.2	1.5	0	on auto ~ 2:15 pm
2:45 "	8.8	0	206	27	ND	1.5	1.7	0	
3:00 "	8.7	0	208	8.4	ND	1.9	2.5	0	
3:15 "	8.4	0	196	7.2	ND	2.0	2.5	0	
3:30 "	8.6	0	210	6.4	ND	2.0	2.6	0	
						1.0	2.5	0 amb.	
3:45 "	8.9	0	222	5.6	ND	1.8	2.5	0	
4:00 "	12.7	0	43	12.3	ND	0.8	1.5	0	
Avg.	9.1	0	167	7.1	ND	1.5	1.9	0	

A - 49

Burns Harbor Continuous Heat Treat Line - 12/17/93

Time	Dry Comb O_2 %	CO %	NO_x %	SO_2 ppm	THC ppm	CH_4 ppm	VOC ppm	Notes
9:30 am	7.6	0.1	0.04	117	ND	650	733	0	Anneal Furnace
9:45 "	7.9	0.2	0.04	123	ND	662	746	0	Preheat and
10:00 "	7.5	0.2	0.04	120	ND	681	694	0	heat sections
10:15 "	7.4	0.1	0.03+	128	ND	693	701	0	All 6 zones on
10:30 "	7.5	0.1	0.03+	122	ND	664	723	0	natural gas
10:45 "	7.5	0.2	0.03+	123	ND	683	740	0	1450°F to 11:00 am,
11:00 "	7.6	0.2	0.03+	125	ND	652	627	25	then 1350°F
11:15 "	7.7	0.2	0.04	133	ND	630	605	25	
11:30 "	7.3	0.2	0.03+	138	ND	625	643	0	
11:45 "	7.2	0.2	0.03	136	ND	685	660	25	
avg.	7.5	0.2	0.034	127	ND	663	687	-	
12:30 pm	16.4	0.3	0.06	38	ND	76	59	17	Anneal Furnace
12:45 "	16.4	0.2	0.06	38	ND	56	42	14	Soak section,
1:00 "	16.4	0.2	0.06	39	ND	68	52	16	both zones on nat
1:15 "	16.2	0.2	0.06	39	ND	74	58	16	gas, 1350°F
1:30 "	16.4	0.2	0.06	39	ND	13	9	4	
1:45 "	16.5	0.25	0.06	40	ND	55	44	11	
2:00 "	16.4	0.25	0.06	40	ND	61	48	13	
2:15 "	16.4	0.3	0.06	40	ND	64	51	13	
2:30 "	16.4	0.3	0.06	40	ND	67	52	15	
avg.	16.4	0.2	0.06	39	ND	61	47	14	
2:45 pm	15.6	0+	52	46	ND	566	512	54	Age Furnace
3:00 "	15.5	0+	47	45	ND	542	520	22	Reheat section,
3:15 "	15.5	0+	53	45	ND	554	538	16	all 4 zones on
3:30 "	15.5	0+	48	48	ND	526	512	14	nat. gas,
3:45 "	15.4	0+	94	51	ND	526	496	30	750°F
4:00 "	15.6	0+	74	46	ND	575	562	13	
4:15 "	15.5	0+	55	47	ND	524	509	15	
4:30 "	15.5	0+	68	47	ND	534	521	13	
avg.	15.5	0	61	47	ND	543	521	22	

Appendix B

Stack Gas Flow Rate Data

B-1

MOSTARDI-PLATT ASSOCIATES, INC.

PARTICULATE TEST RESULTS SUMMARY

Plant: Bethlehem Steel, Burns Harbor, Indiana **Source:** Coke Battery No. 1 Push Control System

Test Run Number	1	2	3	Average
Test Location	stack	stack	stack	
Source Condition	normal	normal	normal	
Date	01/14/92	01/15/92	01/16/92	
Time	1033-1612	0812-1328	0850-1337	
Particulate Concentration:				
@ Flue Conditions, grains/acf	0.0055	0.0040	0.0066	0.0054
@ Standard Conditions, grains/dscf	0.0064	0.0046	0.0073	0.0061
Emission Rate:				
pounds/hour	6.5791	4.9224	7.9118	6.4711
Average Gas Volumetric Flow Rate:	123,404/(1-0.0517) = 130,132 scfm			
@ Flue Conditions, acfm	138,878	143,629	140,812	141,039.33
@ Standard Conditions, dscfm	119,381	124,428	126,403	123,404
Average Gas Temperature, °F	107	107	103	105.67
Average Gas Velocity, ft/sec	39.24	40.58	39.78	39.867
Flue Gas Moisture, percent by volume	0.0509	0.0544	0.0499	0.0517
Average Flue Pressure, in. Hg	29.12	29.42	30.12	
Barometric Pressure, in. Hg	29.10	29.40	30.10	
Average %CO_2 by volume, dry basis	1.00	1.00	1.00	
Average %O_2 by volume, dry basis	19.00	19.00	19.00	
Dry Molecular Wt. of Gas, lb/lb-mole	28.92	28.92	28.92	
Gas Sample Volume, dscf	48.557	49.363	48.610	
Isokinetic Variance	1.03	0.91	0.91	

MOSTARDI-PLATT ASSOCIATES, INC.

No. 1 PECS

PARTICULATE TEST RESULTS SUMMARY

Plant: Bethlehem Steel

Source: Coke Plant, No. 1 Battery

Test Run Number	1	2	3	Average
Test Location	Stack	Stack	Stack	
Source Condition	Normal	Normal	Normal	
Date	05-13-91	05-14-91	05-15-91	
Time	1033-1643	0935-1527	0835-1427	
Particulate Concentration: @ Flue Conditions, grains/acf	0.0064	0.0052	0.0048	0.0055
@ Standard Conditions, grains/dscf	0.0074	0.0061	0.0056	0.0064
Emission Rate: pounds/hour	8.0501	6.4443	5.8879	6.7941
Average Gas Volumetric Flow Rate: @ Flue Conditions, acfm	146,876	143,427	143,229	144,511
@ Standard Conditions, dscfm	126,787	122,842	123,216	124,282
Average Gas Temperature, °F	108	109	111	109
Average Gas Velocity, ft/sec	41.46	40.49	40.43	40.79
Flue Gas Moisture, percent by volume	5.4	5.7	5.2	5.4
Average Flue Pressure, in. Hg	29.36	29.26	29.36	
Barometric Pressure, in. Hg	29.30	29.20	29.30	
Average $\%CO_2$ by volume, dry basis	1.00	1.00	1.00	
Average $\%O_2$ by volume, dry basis	19.50	19.00	19.20	
Dry Molecular Wt. of Gas, lb/lb-mole	28.940	28.920	28.928	
Gas Sample Volume, dscf	56.41	53.62	53.61	
Isokinetic Variance	1.04	1.02	1.02	

No. 1 PECS

ATEC ENVIRONMENTAL CONSULTANTS

2646 Highway Avenue, Highland, Indiana 46322 (219)972-5252

EPA METHOD 5
PARTICULATE EMISSIONS CALCULATIONS

TABLE 1

CLIENT: Bethlehem Steel Corp. JOB NO.:52-92-10-00023

SOURCE TESTED: Coke Oven #1 Push Stack DATA INPUT BY: WCJ

INPUT DATA

	1	2	3
Run Number	07/21/92	07/22/92	07/23/92
Date	0831-1546	0835-1848	0750-1652
Time Began-Ended	54	64.5	60
Sampling Time, Minutes	58.99	58.99	58.99
Stack Area, Square Feet	29.54	29.53	29.36
Barometric Pressure, Inches of mercury	0.1	0.1	0.1
Static Pressure, Inches of Water	29.55	29.54	29.37
Stack Pressure, Inches of mercury	0.84	0.84	0.84
Pitot Tube Correction factor	0.9786	0.9786	0.9786
Meter Correction Factor	0.250	0.250	0.250
Nozzle Diameter, Inches	39.966	48.567	43.467
Meter Volume, Cubic feet	71.0	68.0	75.0
Meter Temperature, Degrees F	1.78	1.66	1.63
Meter Orifice Press., Inches of Water	38.7	43.8	40.6
Volume H2O Collected, Milliliters	0.80	1.10	1.00
CO2 Concentration, Percent	20.00	19.10	19.90
O2 Concentration, Percent	0.676	0.664	0.666
Average Square Root of Velocity Head, in. H2O	100.0	105.0	111.0
Stack Temperature, Degrees F	0.0142	0.0111	0.0140
Particulate Collected, Grams			

CALCULATED DATA

Standard Meter Volume, Cubic Feet	38.551	47.083	41.346
Standard Water Volume, Cubic Feet	1.822	2.062	1.911
Moisture Fraction	0.045	0.042	0.044
Molecular Weight Of Stack Gas	28.435	28.481	28.472
Average Stack Gas Velocity, Feet/Second	39.6	39.1	39.5
Stack Gas Flow @ Stack Conditions, ACFM	140275	138310	139886
Stack Gas Flow @ Standard Conditions, DSCFM	124669	122197	121305
Isokinetic Sampling Rate, Percent	99.11	103.39	98.32
Particulate Concentration (gr/dscf)	0.0057	0.0036	0.0052
Particulate Emission Rate, Pounds/Hour	6.06	3.80	5.42
Average Emission Rate, Pounds/Hour	5.09		

Signature of Reviewer:

B-4

MOSTARDI-PLATT ASSOCIATES, INC.

No. 2 Pushing Emissions Control System

PARTICULATE TEST RESULTS SUMMARY				
Plant: Bethlehem Steel Burns Harbor, Indiana		Source: Number 2 Coke Battery Emission Control		
Test Run Number	1	2	3	Average
Test Location	Outlet	Outlet	Outlet	
Source Condition	Normal	Normal	Normal	
Date	11/25/91	11/26/91	11/27/91	
Time	1107-1542	0912-1626	0838-1414	
Particulate Concentration:				
@ Flue Conditions, grains/acf	0.0253	0.0071	0.0090	0.0138
@ Standard Conditions, grains/dscf	0.0290	0.0081	0.0105	0.0159
Emission Rate:				
pounds/hour	34.99	9.63	12.44	19.02
Average Gas Volumetric Flow Rate:	139,328/(1-0.0516)=146,908 scfm			
@ Flue Conditions, acfm	161,279	157,525	160,640	159,815
@ Standard Conditions, dscfm	140,940	139,272	137,771	139,328
Average Gas Temperature, °F	104	98	106	103
Average Gas Velocity, ft/sec	45.57	44.50	45.38	45.15
Flue Gas Moisture, percent by volume	5.05	4.96	5.46	5.16
Average Flue Pressure, in. Hg	29.41	29.41	29.09	
Barometric Pressure, in. Hg	29.47	29.47	29.15	
Average %CO_2 by volume, dry basis	1.00	1.00	1.20	
Average %O_2 by volume, dry basis	19.40	19.00	19.00	
Dry Molecular Wt. of Gas, lb/lb-mole	28.94	28.92	28.95	
Gas Sample Volume, dscf	39.119	58.910	58.799	
Isokinetic Variance	1.01	1.01	1.02	

B-5

MOSTARDI-PLATT ASSOCIATES, INC.

No. 2 Battery PECS

PARTICULATE TEST RESULTS SUMMARY

Plant: Bethlehem Steel, Burns Harbor, Indiana

Source: Coke Plant, No. 2 Battery

Test Run Number	1	2	3	Average
Test Location	stack	stack	stack	
Source Condition	normal	normal	normal	
Date	05/08/91	05/09/91	05/10/91	
Time	1512-2017	1506-2102	1428-2105	
Particulate Concentration:				
@ Flue Conditions, grains/acf	0.0045	0.0046	0.0048	0.0046
@ Standard Conditions, grains/dscf	0.0052	0.0052	0.0056	0.0053
Emission Rate: pounds/hour	4.4417	5.7940	6.5748	5.6035
Average Gas Volumetric Flow Rate:				
@ Flue Conditions, acfm	113,957	147,360	159,950	140,422
@ Standard Conditions, dscfm	99,954	128,850	137,909	122,238
Average Gas Temperature, °F	110	112	117	113
Average Gas Velocity, ft/sec	32.30	41.63	45.19	39.71
Flue Gas Moisture, percent by volume	4.3	4.3	4.8	4.5
Average Flue Pressure, in. Hg	29.62	29.59	29.61	
Barometric Pressure, in. Hg	29.56	29.53	29.55	
Average $\%CO_2$ by volume, dry basis	1.0	1.0	1.0	
Average $\%O_2$ by volume, dry basis	19.5	19.6	19.6	
Dry Molecular Wt. of Gas, lb/lb-mole	28.94	28.944	28.944	
Gas Sample Volume, dscf	37.35	50.65	54.65	
Isokinetic Variance	1.09	1.02	1.01	

B-6

MOSTARDI-PLATT ASSOCIATES, INC.

7.0 TEST RESULTS SUMMARIES

TEST RESULTS SUMMARY				
Plant: Bethlehem Steel Corporation		Source: Sinter Plant		
Test Run Number	1	2	3	Average
Test Location	scrubber stack			
Source Condition	normal			
Date	03/09/92	03/11/92	03/11/92	
Time	1317-1426	0925-1028	1110-1213	
Average Gas Volumetric Flow Rate:	464,408/(1-0.0623) = 495,263 scfm			
@ Flue Conditions, acfm	532,209	530,407	550,651	537,756
@ Standard Conditions, dscfm	458,088	457,195	477,942	464,408
Average Gas Temperature, °F	101.4	98.6	97.8	99.3
Average Gas Velocity, ft/sec	39.08	38.95	40.43	
Flue Gas Moisture, percent by volume	6.61	6.29	5.78	6.23
Average Flue Pressure, in. Hg	29.32	29.10	29.10	
Barometric Pressure, in. Hg	29.30	29.12	29.12	
Average $\%CO_2$ by volume, dry basis	4.70	3.90	4.00	4.20
Average $\%O_2$ by volume, dry basis	14.80	15.50	15.10	15.13
Dry Molecular Wt. of Gas, lb/lb-mole	29.344	29.244	29.244	
Gas Sample Volume, dscf	51.886	51.868	53.685	
Isokinetic Variance	1.02	1.01	1.00	

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B-7

Sinter Plant Dedusting Baghouse

MOSTARDI-PLATT ASSOCIATES, INC.
Environmental Consultants

7.0 PARTICULATE TEST RESULTS SUMMARY TABLE

Plant: Bethlehem Steel Burns Harbor, Indiana	Source: Sinter Plant De-dusting			
Test Run Number	1	2	3	Average
Test Location	Stack			
Source Condition	Normal			
Date	09/15/93	09/15/93	09/15/93	09/15/93
Time	1247-1431	1506-1645	1721-1924	1247-1924
Particulate Concentration:				
@ Flue Conditions, grains/acf	0.0149	0.0037	0.0081	0.0089
@ Standard Conditions, grains/dscf	0.0181	0.0044	0.0095	0.0107
Emission Rate:				
pounds/hour	30.3	7.6	16.5	18.1
Average Gas Volumetric Flow Rate:	199,497/(1-0.0307) = 205,816 scfm			
@ Flue Conditions, acfm	237,899	237,960	238,251	238,037
@ Standard Conditions, dscfm	195,750	200,411	202,330	199,497
Average Gas Temperature, °F	143	138	128	136
Average Gas Velocity, ft/sec	38.17	38.18	38.23	38.19
Flue Gas Moisture, percent by volume	3.77	2.31	3.14	3.07
Average Flue Pressure, in. Hg	29.22	29.22	29.22	29.22
Barometric Pressure, in. Hg	29.20	29.20	29.20	29.20
Average %CO_2 by volume, dry basis	0.30	0.20	0.10	0.20
Average %O_2 by volume, dry basis	20.40	20.80	20.80	20.66
Dry Molecular Wt. of Gas, lb/lb-mole	28.86	28.86	28.85	28.86
Gas Sample Volume, dscf	72.638	70.667	77.639	73.648
Isokinetic Variance	1.03	0.97	1.06	1.03
% Opacity	0.0	0.0	0.0	0.0

B-8

MOSTARDI-PLATT ASSOCIATES, INC.

Sinter Plant Dedusting Baghouse

PARTICULATE TEST RESULTS SUMMARY

Plant: Bethlehem Steel Corporation

Source: Sinter Plant- Dedusting Baghouse

Test Run Number	1	2	3	Average
Test Location	Stack			
Source Condition	Data on file at plant			
Date	07/02/91	07/02/91	07/02/91	07/02/91
Time	0840-1017	1042-1220	1304-1441	0840-1441
Particulate Concentration:				
@ Flue Conditions, grains/acf	0.0122	0.0112	0.0179	0.0138
@ Standard Conditions, grains/dscf	0.0155	0.0145	0.0230	0.0177
Emission Rate: pounds/hour	24.57	22.81	36.02	27.80
Average Gas Volumetric Flow Rate:				
@ Flue Conditions, acfm	234,242	236,591	234,320	235,051
@ Standard Conditions, dscfm	184,526	184,062	182,668	183,752
Average Gas Temperature, °F	177	183	181	180
Average Gas Velocity, ft/sec	37.59	37.96	37.60	
Flue Gas Moisture, percent by volume	2.53	2.93	3.00	2.82
Average Flue Pressure, in. Hg	29.18	29.18	29.18	
Barometric Pressure, in. Hg	29.16	29.16	29.16	
Average $\%CO_2$ by volume, dry basis	0.20	0.10	0.10	
Average $\%O_2$ by volume, dry basis	20.80	21.00	20.20	
Dry Molecular Wt. of Gas, lb/lb-mole	28.864	28.856	28.824	
Gas Sample Volume, dscf	70.809	72.788	70.971	
Isokinetic Variance	1.00	1.03	1.01	

B-9

Flowrates Measured by W. Howard

BOF Scrubber Stack

Date	ID Fan	Vessel Blowing	KW³	Flow ACFM	Flow SCFM
9/30/93	3	1	1950	128,366	119,786
9/30/93	3	2	1950	132,190	123,272
9/30/93	4	2	1950	131,576	121,846
9/30/93	4	1	1950	135,617	125,588
10/1/93	2	2	1950	132587	123,717
Avg.				132,154	122,987
Total (3 Scrubbers)				396,462	368,963
Total Dry (Less 4.3% moisture)				379,414	353,098

B-10

MOSTARDI-PLATT ASSOCIATES, INC.

BOF Scrubbers

PARTICULATE TEST RESULTS SUMMARY

Plant: Bethlehem Steel, Burns Harbor, IN

Source: No. 1 BOF Stack 2

Test Run Number	1	2	3	Average
Test Location	stack	stack	stack	
Source Condition	normal	normal	normal	
Date	04/17/91	04/17/91	04/17/91	
Time	1120-1241	1324-1515	1618-1733	
Particulate Concentration:				
@ Flue Conditions, grains/acf	0.0034	0.0019	0.0028	0.0027
@ Standard Conditions, grains/dscf	0.0040	0.0022	0.0033	0.0032
Emission Rate: pounds/hour	3.41	1.93	2.76	2.70
Average Gas Volumetric Flow Rate:				
@ Flue Conditions, acfm	116,951	119,030	116,346	117,442
@ Standard Conditions, dscfm scfm	98,741	100,587	98,706	99,345 102,523
Average Gas Temperature, °F	131	131	129	130
Average Gas Velocity, ft/sec	32.41	32.99	32.25	32.55
Flue Gas Moisture, percent by volume	3.2	3.1	2.9	3.1
Average Flue Pressure, in. Hg	29.18	29.18	29.18	
Barometric Pressure, in. Hg	29.20	29.20	29.20	
Average $\%CO_2$ by volume, dry basis	10.6	7.0	7.3	
Average $\%O_2$ by volume, dry basis	13.0	15.0	15.0	
Dry Moleculer Wt. of Gas, lb/lb-mole	30.22	29.72	29.77	
Gas Sample Volume, dscf	61.304	68.461	58.590	
Isokinetic Variance	0.99	0.96	0.90	

B-11

MOSTARDI-PLATT ASSOCIATES, INC.

BOF Scrubbers

PARTICULATE TEST RESULTS SUMMARY

Plant: Bethlehem Steel, Burns Harbor, IN

Source: No. 1 BOF Stack 3

Test Run Number	1	2	3	Average
Test Location	stack	stack	stack	
Source Condition	normal	normal	normal	
Date	04/18/91	04/18/91	04/18/91	
Time	0935-1036	1201-1259	1352-1448	
Particulate Concentration:				
@ Flue Conditions, grains/acf	0.0041	0.0042	0.0043	0.0042
@ Standard Conditions, grains/dscf	0.0050	0.0052	0.0053	0.0052
Emission Rate: pounds/hour	4.17	4.26	4.41	4.28
Average Gas Volumetric Flow Rate:				
@ Flue Conditions, acfm	118,207	117,588	118,385	118,060
@ Standard Conditions, dscfm scfm	97,418	95,667	96,154	96,413 101,701
Average Gas Temperature, °F	133	142	142	139
Average Gas Velocity, ft/sec	32.76	32.59	32.81	32.72
Flue Gas Moisture, percent by volume	5.3	5.1	5.2	5.2
Average Flue Pressure, in. Hg	29.23	29.23	29.23	
Barometric Pressure, in. Hg	29.25	29.25	29.25	
Average $\%CO_2$ by volume, dry basis	8.0	10.2	10.2	
Average $\%O_2$ by volume, dry basis	13.8	13.5	13.5	
Dry Molecular Wt. of Gas, lb/lb-mole	29.83	30.17	30.17	
Gas Sample Volume, dscf	48.556	45.938	45.876	
Isokinetic Variance	0.99	1.04	1.04	

B-12

BOF Scrubbers

MOSTARDI-PLATT ASSOCIATES, INC.

PARTICULATE TEST RESULTS SUMMARY

Plant: Bethlehem Steel, Burns Harbor, IN

Source: No. 1 BOF Stack 4

Test Run Number	1	2	3	Average
Test Location	stack	stack	stack	
Source Condition	normal	normal	normal	
Date	04/19/91	04/19/91	04/19/91	
Time	0908-1046	1203-1350	1443-1624	
Particulate Concentration:				
@ Flue Conditions, grains/acf	0.0052	0.0019	0.0037	0.0036
@ Standard Conditions, grains/dscf	0.0061	0.0023	0.0044	0.0043
Emission Rate:				
pounds/hour	5.25	1.99	3.76	3.67
Average Gas Volumetric Flow Rate:				
@ Flue Conditions, acfm	117,828	119,978	118,711	118,839
@ Standard Conditions, ~~dscfm~~ scfm	100,117	101,785	100,303	100,735 105,422
Average Gas Temperature, °F	124	124	125	124
Average Gas Velocity, ft/sec	32.66	33.25	32.90	32.94
Flue Gas Moisture, percent by volume	4.3	4.4	4.7	4.5
Average Flue Pressure, in. Hg	29.38	29.38	29.38	
Barometric Pressure, in. Hg	29.40	29.40	29.40	
Average $\%CO_2$ by volume, dry basis	7.4	7.2	7.1	
Average $\%O_2$ by volume, dry basis	14.2	14.5	14.5	
Dry Molecular Wt. of Gas, lb/lb-mole	29.75	29.73	29.72	
Gas Sample Volume, dscf	68.337	85.052	54.21	
Isokinetic Variance	1.02	0.95	0.92	

THE ALMEGA CORPORATION

B-13

BOF
HMD Baghouse

SUMMARY OF EMISSION TEST DATA

TABLE: 1

PLANT: Bethlehem Steel Corporation

LOCATION: BOF Hot Metal Desulfurization Baghouse

OPERATORS: M. R. Jackson, B. W. Jackson and H. Caine

TEST DATE: November 11 and 13, 1986

REPETITION #:	1	2	3
TEST DATE:	11/11	11/11-11/13	11/13
TEST TIME:	8:10A-1:22P	1:58P-8:40A	9:08A-2:23P
STACK GAS			
Temperature, average °F	91.9	92.9	89.0
Velocity average fps	30.9	43.5	40.9
Volume flow x 10^6 dscfh	4.138	5.832	5.484
acfm	72,699	102,415	96,318
Orsat, average % CO_2	0.0	0.0	0.0
O_2	20.9	20.9	20.9
Moisture %	0.4	0.3	0.3
PARTICULATE SAMPLE			
Time, mins.	178	176	224
Volume scf db	118.175	158.051	187.901
Particulates collected, mg.	3.9	14.7	13.5
Isokinetic Ratio %	107.6	103.2	102.6
PARTICULATE			
Concentration grains/dscf	0.0005	0.0030	0.0011
x 10^{-6} lbs/dscf	0.0728	0.2051	0.1584
Emissions lbs/hr	0.301	1.196	0.869
VISUAL EMISSIONS			
Opacity Average %	0	0	0
Maximum %	0	0	0
VOLUME FLOW RATE			
High flow rate acfm			121,175
scfh db x 10^6			6.900682
Low flow rate acfm			44,808
scfh db x 10^6			2.551728

B-14

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

105 South Meridian Street
P.O. Box 6015
Indianapolis 46206-6015
Telephone 317/232-8603

ENVIRONMENTAL SERVICES
DEC 02 '91
FILE

November 27, 1991

Certified Mail P 741 218 970

Bethlehem Steel Corporation
Burns Harbor Plant
Box 248
Chesterton, IN 46304

Attention: J. P. Sapia, Superintendent
Environmental Control

Re: Registered Construction
and Operation Status
ID No. 127-00001

Dear Sir:

Your application has been reviewed. Based on the data submitted and the provisions in Sections 1 and 2 of 326 IAC 2-1, it has been determined that the following, to be located at the Burns Harbor Plant is classified as registered: the BOF Ladle Treatment Station baghouse modification. The modification will be: 1) the replacement of the spark arrestor with a multiple-cyclone separator, 2) replacement of four existing fans on the top of the baghouse with one fan at ground level with 45000 SCFM which is the same as the combined existing fans air flow and 3) the addition of a fifth pulse jet module.

Any change or modification which may increase the potential emissions to 25 tons of particulate matter per year or more from the equipment covered in this letter must be approved by the Office of Air Management before such change may occur.

Sincerely,

Paul Dubenetzky
Acting Assistant Commissioner
Office of Air Management

p.s. This is a re-issue of the same registration letter orignally signed by Tim Method on February 6, 1991, but was not received by Mr. Sapia.

RWO

cc: Porter County Health Department
Air Compliance Section
Enforcement Section - DD
Data Management Section

JB-15

MOSTARDI-PLATT ASSOCIATES, INC.

BOF
SLD Baghouse

PARTICULATE TEST RESULTS SUMMARY

Plant: Bethlehem Steel Burns Harbor

Source: SLD Baghouse

Test Run Number	1	2	Average
Test Location	Stack	Stack	
Source Condition	Desulfurizing		
Date	07-20-90	07-20-90	07-20-90
Time	0915-1059	1128-1337	0915-1337
Particulate Concentration: @ Flue Conditions, grains/acf	0.0011	0.0008	0.0010
@ Standard Conditions, grains/dscf	0.0012	0.0009	0.0011
Emission Rate: pounds/hour	0.20	0.16	0.18
Average Gas Volumetric Flow Rate: @ Flue Conditions, acfm	22,059	23,957	23,008
@ Standard Conditions, dscfm	19,602	20,793	20,198
Average Gas Temperature, °F	106	120	113
Average Gas Velocity, ft/sec	29.26	31.77	30.52
Flue Gas Moisture, percent by volume	2.4	2.4	2.4
Average Flue Pressure, in. Hg	29.19	29.19	
Barometric Pressure, in. Hg	29.20	29.20	
Average $\%CO_2$ by volume, dry basis	0.0	0.0	
Average $\%O_2$ by volume, dry basis	20.8	20.8	
Dry Molecular Wt. of Gas, lb/lb-mole	28.83	28.83	
Gas Sample Volume, dscf	64.075	84.656	
Isokinetic Variance	1.01	1.00	

MOSTARDI-PLATT ASSOCIATES, INC.
Environmental Consultants

7.0 PARTICULATE TEST RESULTS SUMMARY

Plant: Bethlehem Steel Corporation	Source: Burns Harbor Plant			
Test Run Number	1	2	3	Average
Test Location	HDCL Scrubber Stack			
Source Condition	Full Production			
Date	11/11/93	12/07/93	12/07/93	
Time	1051-1258	0910-1120	1150-1323	
Particulate Concentration:				
@ Flue Conditions, grains/acf	0.0014	0.0031	0.0012	0.0019
@ Standard Conditions, grains/dscf	0.0016	0.0038	0.0014	0.0023
Emission Rate:				
pounds/hour	0.141	0.252	0.097	0.163
Average Gas Volumetric Flow Rate:	8,558/(1-0.0928) = 9,433 scfm			
@ Flue Conditions, acfm	12,098	9,422	9,723	10,414
@ Standard Conditions, dscfm	10,009	7,663	8,003	8,558
Average Gas Temperature, °F	109	114	112	112
Average Gas Velocity, ft/sec	76.38	59.49	61.39	65.75
Flue Gas Moisture, percent by volume*	8.59	9.96	9.29	9.28
Average Flue Pressure, in. Hg	29.19	29.40	29.40	
Barometric Pressure, in. Hg	29.24	29.45	29.45	
Average $\%CO_2$ by volume, dry basis	0.10	0.10	0.10	
Average $\%O_2$ by volume, dry basis	20.85	20.80	20.80	
Dry Molecular Wt. of Gas, lb/lb-mole	28.850	28.848	28.848	
Gas Sample Volume, dscf	126.346	88.477	86.058	
Isokinetic Variance	0.94	0.95	0.93	

* Theoretical maximum H_2O in supersaturated gas stream.

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Appendix C

Fuel Gas Analyses and Computer Calculated Combustion Data

C-1

INPUT CONDITIONS :

FUEL: BURNS HARBOR BLAST FURNACE GAS, 1993	
PCT STOICHIOMETRIC AIR	100.0 %
PRE-HEAT AIR TEMPERATURE	60. DEG F
RELATIVE HUMIDITY - COMBUSTION AIR	.0 %
EXIT FLUE TEMPERATURE	1800. DEG F

FUEL ANALYSIS		VOL %	COMBUSTION PRODUCTS WET %	DRY %
HYDROGEN	H2	6.59	.00	.00
OXYGEN	O2	.02	.00	.00
NITROGEN	N2	50.51	67.24	70.33
C-MONOXIDE	CO	20.60	.00	.00
C-DIOXIDE	CO2	21.43	27.96	29.25
METHANE	CH4	.00	.00	.00
ACETYLENE	C2H2	.00	.00	.00
ETHLYENE	C2H4	.00	.00	.00
ETHANE	C2H6	.00	.00	.00
PROPYLENE	C3H6	.00	.00	.00
PROPANE	C3H8	.00	.00	.00
BUTANE	C4H10	.00	.00	.00
PENTANE	C5H12	.00	.00	.00
BENZENE	C6H6	.00	.00	.00
HEXANE	C6H14	.00	.00	.00
H2-SULFIDE	H2S	.00	.00	.00
S-DIOXIDE	SO2	.00	.00	.00
AMMONIA	NH3	.00	.00	.00
WATER	H2O	.02	4.40	.00
ARGON	AR	.00	.40	.42
SO2, PPM(VOL)		- -	.0	.0
TOTALS		99.17 %	100.00 %	100.00 %

CALCULATED FUEL PROPERTIES:

FUEL HEATING VALUE, BTU/FT3 FUEL	GROSS =	87.7	NET =	84.5
STOICHIOMETRIC AIR (DRY), FT3/FT3 FUEL				.648
FUEL SPECIFIC GRAVITY				1.0225
WOBBE INDEX	GROSS =	86.8	NET =	83.5
CARI INDEX				.641

CALCULATED COMBUSTION PROPERTIES :

ACTUAL AIR	.648	FT3/FT3 FUEL
COMBUSTION PRODUCTS (WET)	1.504	FT3/FT3 FUEL
(DRY)	1.438	FT3/FT3 FUEL
WATER-GAS EQUILIBRIUM CONSTANT	******	
FLUE HEAT LOSS	60.5	BTU/FT3 FUEL
AVAILABLE HEAT	23.9	BTU/FT3 FUEL
PCT AVAILABLE HEAT (HHV)	27.3	%
(LHV)	28.3	%

Burns Harbor Blast Furnace Gas, 1993 C-2

PERCENT O2	STOICH AIR
.00000	100.00
.10000	101.06
.20000	102.14
.30000	103.22
.40000	104.32
.50000	105.42
.60000	106.54
.70000	107.67
.80000	108.81
.90000	109.96
1.00000	111.12
1.10000	112.29
1.20000	113.48
1.30000	114.68
1.40000	115.89
1.50000	117.11
1.60000	118.35
1.70000	119.59
1.80000	120.85
1.90000	122.13
2.00000	123.42
2.10000	124.72
2.20000	126.03
2.30000	127.36
2.40000	128.70
2.50000	130.06
2.60000	131.44
2.70000	132.82
2.80000	134.23
2.90000	135.65
3.00000	137.08
3.10000	138.53
3.20000	140.00
3.30000	141.48
3.40000	142.98
3.50000	144.50
3.60000	146.04
3.70000	147.59
3.80000	149.16
3.90000	150.75
4.00000	152.36
4.10000	153.98
4.20000	155.63
4.30000	157.30
4.40000	158.99
4.50000	160.69
4.60000	162.42
4.70000	164.17
4.80000	165.94
4.90000	167.73
5.00000	169.55
5.10000	171.39
5.20000	173.25
5.30000	175.14
5.40000	177.05
5.50000	178.98
5.60000	180.94
5.70000	182.93
5.80000	184.94
5.90000	186.98
6.00000	189.04
6.10000	191.14
6.20000	193.26
6.30000	195.41
6.40000	197.59
6.50000	199.80
6.60000	202.04
6.70000	204.32
6.80000	206.62
6.90000	208.96
7.00000	211.33
7.10000	213.74
7.20000	216.18
7.30000	218.65
7.40000	221.17
7.50000	223.72
7.60000	226.31
7.70000	228.93
7.80000	231.60
7.90000	234.31
8.00000	237.06
8.10000	239.85
8.20000	242.69
8.30000	245.57
8.40000	248.50
8.50000	251.47
8.60000	254.50
8.70000	257.57
8.80000	260.69
8.90000	263.87
9.00000	267.09
9.10000	270.38
9.20000	273.72
9.30000	277.11
9.40000	280.57
9.50000	284.08
9.60000	287.66
9.70000	291.30
9.80000	295.00
9.90000	298.77
10.00000	302.62
10.10000	306.53
10.20000	310.51
10.30000	314.57
10.40000	318.71
10.50000	322.93
10.60000	327.22
10.70000	331.61
10.80000	336.07
10.90000	340.63
11.00000	345.28

Burns Harbor Blast Furnace Gas (Cont.) C-3

11.10000	350.02
11.20000	354.86
11.30000	359.80
11.40000	364.84
11.50000	369.99
11.60000	375.25
11.70000	380.63
11.80000	386.12
11.90000	391.73
12.00000	397.47
12.10000	403.34
12.20000	409.34
12.30000	415.48
12.40000	421.77
12.50000	428.20
12.60000	434.79
12.70000	441.54
12.80000	448.45
12.90000	455.54
13.00000	462.80
13.10000	470.25
13.20000	477.89
13.30000	485.73
13.40000	493.77
13.50000	502.04
13.60000	510.53
13.70000	519.25
13.80000	528.21
13.90000	537.44
14.00000	546.92
14.10000	556.69
14.20000	566.74
14.30000	577.09
14.40000	587.76
14.50000	598.77
14.60000	610.11
14.70000	621.83
14.80000	633.92
14.90000	646.41
15.00000	659.32
15.10000	672.68
15.20000	686.50
15.30000	700.80
15.40000	715.63
15.50000	730.99
15.60000	746.93
15.70000	763.48
15.80000	780.67
15.90000	798.55
16.00000	817.14
16.10000	836.50
16.20000	856.68
16.30000	877.72
16.40000	899.69
16.50000	922.65
16.60000	946.66
16.70000	971.80
16.80000	998.15
16.90000	1025.81
17.00000	1054.86
17.10000	1085.43
17.20000	1117.62
17.30000	1151.58
17.40000	1187.45
17.50000	1225.40
17.60000	1265.62
17.70000	1308.31
17.80000	1353.71
17.90000	1402.09
18.00000	1453.75
18.10000	1509.04
18.20000	1568.34
18.30000	1632.12
18.40000	1700.91
18.50000	1775.31
18.60000	1856.04
18.70000	1943.94
18.80000	2040.03
18.90000	2145.49
19.00000	2261.76
19.10000	2390.61
19.20000	2534.18
19.30000	2695.15
19.40000	2876.89
19.50000	3083.70
19.60000	3321.15
19.70000	3596.59
19.80000	3919.94
19.90000	4304.87
20.00000	4770.84

C - 4

INPUT CONDITIONS :

FUEL: BURNS HARBOR COKE OVEN GAS, 1993

PCT STOICHIOMETRIC AIR	100.0 %
PRE-HEAT AIR TEMPERATURE	60. DEG F
RELATIVE HUMIDITY - COMBUSTION AIR	.0 %
EXIT FLUE TEMPERATURE	1800. DEG F

FUEL ANALYSIS		VOL %	COMBUSTION PRODUCTS WET %	DRY %
HYDROGEN	H2	52.30	.00	.00
OXYGEN	O2	.46	.00	.00
NITROGEN	N2	10.55	69.42	88.62
C-MONOXIDE	CO	4.65	.00	.00
C-DIOXIDE	CO2	1.58	8.03	10.26
METHANE	CH4	25.48	.00	.00
ACETYLENE	C2H2	.08	.00	.00
ETHLYENE	C2H4	2.16	.00	.00
ETHANE	C2H6	.70	.00	.00
PROPYLENE	C3H6	.11	.00	.00
PROPANE	C3H8	.07	.00	.00
BUTANE	C4H10	.03	.00	.00
PENTANE	C5H12	.00	.00	.00
BENZENE	C6H6	.56	.00	.00
HEXANE	C6H14	.00	.00	.00
H2-SULFIDE	H2S	.39	.00	.00
S-DIOXIDE	SO2	.00	.08	.10
AMMONIA	NH3	.00	.00	.00
WATER	H2O	.00	21.67	.00
ARGON	AR	.00	.80	1.02
SO2, PPM(VOL)		- -	750.6	958.3
TOTALS		99.12 %	100.00 %	100.00 %

CALCULATED FUEL PROPERTIES:

FUEL HEATING VALUE, BTU/FT3 FUEL	GROSS = 520.6	NET = 464.3
STOICHIOMETRIC AIR (DRY), FT3/FT3 FUEL		4.484
FUEL SPECIFIC GRAVITY		.4065
WOBBE INDEX	GROSS = 816.5	NET = 728.2
CARI INDEX		7.032

CALCULATED COMBUSTION PROPERTIES :

ACTUAL AIR	4.484	FT3/FT3 FUEL
COMBUSTION PRODUCTS (WET)	5.196	FT3/FT3 FUEL
(DRY)	4.070	FT3/FT3 FUEL
WATER-GAS EQUILIBRIUM CONSTANT	******	
FLUE HEAT LOSS	195.6	BTU/FT3 FUEL
AVAILABLE HEAT	268.7	BTU/FT3 FUEL
PCT AVAILABLE HEAT (HHV)	51.6	%
(LHV)	57.9	%

Burns Harbor Coke Oven Gas, 1993 C-5

PERCENT O2	STOICH AIR
.00000	100.00
.10000	100.44
.20000	100.87
.30000	101.32
.40000	101.77
.50000	102.22
.60000	102.68
.70000	103.14
.80000	103.60
.90000	104.07
1.00000	104.55
1.10000	105.03
1.20000	105.52
1.30000	106.01
1.40000	106.50
1.50000	107.00
1.60000	107.51
1.70000	108.02
1.80000	108.53
1.90000	109.05
2.00000	109.58
2.10000	110.11
2.20000	110.65
2.30000	111.19
2.40000	111.74
2.50000	112.30
2.60000	112.86
2.70000	113.43
2.80000	114.00
2.90000	114.58
3.00000	115.17
3.10000	115.76
3.20000	116.36
3.30000	116.97
3.40000	117.59
3.50000	118.21
3.60000	118.83
3.70000	119.47
3.80000	120.11
3.90000	120.76
4.00000	121.42
4.10000	122.09
4.20000	122.76
4.30000	123.44
4.40000	124.13
4.50000	124.83
4.60000	125.54
4.70000	126.25
4.80000	126.98
4.90000	127.71
5.00000	128.45
5.10000	129.21
5.20000	129.97
5.30000	130.74
5.40000	131.52
5.50000	132.31
5.60000	133.12
5.70000	133.93
5.80000	134.75
5.90000	135.58
6.00000	136.43
6.10000	137.29
6.20000	138.15
6.30000	139.03
6.40000	139.93
6.50000	140.83
6.60000	141.75
6.70000	142.68
6.80000	143.62
6.90000	144.58
7.00000	145.55
7.10000	146.53
7.20000	147.53
7.30000	148.54
7.40000	149.57
7.50000	150.62
7.60000	151.67
7.70000	152.75
7.80000	153.84
7.90000	154.95
8.00000	156.07
8.10000	157.22
8.20000	158.38
8.30000	159.56
8.40000	160.75
8.50000	161.97
8.60000	163.21
8.70000	164.47
8.80000	165.74
8.90000	167.04
9.00000	168.36
9.10000	169.71
9.20000	171.07
9.30000	172.46
9.40000	173.87
9.50000	175.31
9.60000	176.78
9.70000	178.26
9.80000	179.78
9.90000	181.32
10.00000	182.90
10.10000	184.50
10.20000	186.13
10.30000	187.79
10.40000	189.48
10.50000	191.20
10.60000	192.96
10.70000	194.76
10.80000	196.58
10.90000	198.45
11.00000	200.35

Burns Harbor Coke Oven Gas (Cont.) C-6

11.10000	202.29
11.20000	204.27
11.30000	206.29
11.40000	208.35
11.50000	210.46
11.60000	212.61
11.70000	214.81
11.80000	217.06
11.90000	219.36
12.00000	221.70
12.10000	224.10
12.20000	226.56
12.30000	229.07
12.40000	231.64
12.50000	234.28
12.60000	236.97
12.70000	239.73
12.80000	242.56
12.90000	245.46
13.00000	248.43
13.10000	251.48
13.20000	254.60
13.30000	257.81
13.40000	261.10
13.50000	264.48
13.60000	267.96
13.70000	271.53
13.80000	275.19
13.90000	278.97
14.00000	282.85
14.10000	286.84
14.20000	290.95
14.30000	295.19
14.40000	299.56
14.50000	304.06
14.60000	308.70
14.70000	313.49
14.80000	318.44
14.90000	323.55
15.00000	328.83
15.10000	334.30
15.20000	339.95
15.30000	345.80
15.40000	351.87
15.50000	358.16
15.60000	364.68
15.70000	371.45
15.80000	378.48
15.90000	385.79
16.00000	393.40
16.10000	401.32
16.20000	409.58
16.30000	418.19
16.40000	427.17
16.50000	436.57
16.60000	446.39
16.70000	456.68
16.80000	467.46
16.90000	478.77
17.00000	490.66
17.10000	503.16
17.20000	516.33
17.30000	530.23
17.40000	544.90
17.50000	560.43
17.60000	576.88
17.70000	594.35
17.80000	612.93
17.90000	632.72
18.00000	653.86
18.10000	676.47
18.20000	700.74
18.30000	726.83
18.40000	754.97
18.50000	785.41
18.60000	818.44
18.70000	854.41
18.80000	893.72
18.90000	936.86
19.00000	984.43
19.10000	1037.15
19.20000	1095.88
19.30000	1161.74
19.40000	1236.10
19.50000	1320.71
19.60000	1417.86
19.70000	1530.55
19.80000	1662.84
19.90000	1820.32
20.00000	2010.96

C-7

INPUT CONDITIONS :

FUEL: BURNS HARBOR NATURAL GAS, 1993

PCT STOICHIOMETRIC AIR	100.0 %
PRE-HEAT AIR TEMPERATURE	60. DEG F
RELATIVE HUMIDITY - COMBUSTION AIR	.0 %
EXIT FLUE TEMPERATURE	1800. DEG F

FUEL ANALYSIS		VOL %	COMBUSTION PRODUCTS WET %	DRY %
HYDROGEN	H2	.00	.00	.00
OXYGEN	O2	.00	.00	.00
NITROGEN	N2	1.04	70.72	87.05
C-MONOXIDE	CO	.00	.00	.00
C-DIOXIDE	CO2	.91	9.68	11.92
METHANE	CH4	94.14	.00	.00
ACETYLENE	C2H2	.00	.00	.00
ETHLYENE	C2H4	.00	.00	.00
ETHANE	C2H6	3.04	.00	.00
PROPYLENE	C3H6	.00	.00	.00
PROPANE	C3H8	.53	.00	.00
BUTANE	C4H10	.00	.00	.00
PENTANE	C5H12	.00	.00	.00
BENZENE	C6H6	.00	.00	.00
HEXANE	C6H14	.00	.00	.00
H2-SULFIDE	H2S	.00	.00	.00
S-DIOXIDE	SO2	.00	.00	.00
AMMONIA	NH3	.00	.00	.00
WATER	H2O	.00	18.75	.00
ARGON	AR	.00	.84	1.04
SO2, PPM(VOL)		- -	.0	.0
TOTALS		99.66 %	100.00 %	100.00 %

CALCULATED FUEL PROPERTIES:

FUEL HEATING VALUE, BTU/FT3 FUEL	GROSS =1021.8	NET = 922.0
STOICHIOMETRIC AIR (DRY), FT3/FT3 FUEL		9.621
FUEL SPECIFIC GRAVITY		.5860
WOBBE INDEX	GROSS =1334.9	NET =1204.5
CARI INDEX		12.569

CALCULATED COMBUSTION PROPERTIES :

ACTUAL AIR	9.621	FT3/FT3 FUEL
COMBUSTION PRODUCTS (WET)	10.639	FT3/FT3 FUEL
(DRY)	8.643	FT3/FT3 FUEL
WATER-GAS EQUILIBRIUM CONSTANT	******	
FLUE HEAT LOSS	401.3	BTU/FT3 FUEL
AVAILABLE HEAT	520.7	BTU/FT3 FUEL
PCT AVAILABLE HEAT (HHV)	51.0	%
(LHV)	56.5	%

Burns Harbor Natural Gas, 1993 C-8

PERCENT O2	STOICH AIR
.00000	100.00
.10000	100.43
.20000	100.87
.30000	101.31
.40000	101.75
.50000	102.20
.60000	102.65
.70000	103.11
.80000	103.57
.90000	104.03
1.00000	104.50
1.10000	104.98
1.20000	105.46
1.30000	105.94
1.40000	106.43
1.50000	106.93
1.60000	107.43
1.70000	107.93
1.80000	108.44
1.90000	108.96
2.00000	109.48
2.10000	110.01
2.20000	110.54
2.30000	111.08
2.40000	111.62
2.50000	112.17
2.60000	112.73
2.70000	113.29
2.80000	113.86
2.90000	114.43
3.00000	115.01
3.10000	115.60
3.20000	116.20
3.30000	116.80
3.40000	117.40
3.50000	118.02
3.60000	118.64
3.70000	119.27
3.80000	119.90
3.90000	120.55
4.00000	121.20
4.10000	121.86
4.20000	122.53
4.30000	123.20
4.40000	123.88
4.50000	124.57
4.60000	125.27
4.70000	125.98
4.80000	126.70
4.90000	127.43
5.00000	128.16
5.10000	128.91
5.20000	129.66
5.30000	130.42
5.40000	131.20
5.50000	131.98
5.60000	132.77
5.70000	133.58
5.80000	134.39
5.90000	135.22
6.00000	136.05
6.10000	136.90
6.20000	137.76
6.30000	138.63
6.40000	139.51
6.50000	140.41
6.60000	141.32
6.70000	142.24
6.80000	143.17
6.90000	144.12
7.00000	145.08
7.10000	146.05
7.20000	147.04
7.30000	148.04
7.40000	149.06
7.50000	150.09
7.60000	151.14
7.70000	152.21
7.80000	153.29
7.90000	154.38
8.00000	155.50
8.10000	156.63
8.20000	157.78
8.30000	158.94
8.40000	160.13
8.50000	161.33
8.60000	162.56
8.70000	163.80
8.80000	165.07
8.90000	166.35
9.00000	167.66
9.10000	168.99
9.20000	170.34
9.30000	171.71
9.40000	173.11
9.50000	174.53
9.60000	175.98
9.70000	177.46
9.80000	178.96
9.90000	180.48
10.00000	182.04
10.10000	183.62
10.20000	185.24
10.30000	186.88
10.40000	188.56
10.50000	190.26
10.60000	192.00
10.70000	193.78
10.80000	195.59
10.90000	197.43
11.00000	199.31
11.10000	201.23

Burns Harbor Natural Gas (Cont.) C-9

11.20000	203.19
11.30000	205.19
11.40000	207.24
11.50000	209.32
11.60000	211.45
11.70000	213.63
11.80000	215.85
11.90000	218.12
12.00000	220.45
12.10000	222.82
12.20000	225.25
12.30000	227.74
12.40000	230.29
12.50000	232.89
12.60000	235.56
12.70000	238.29
12.80000	241.09
12.90000	243.96
13.00000	246.90
13.10000	249.91
13.20000	253.01
13.30000	256.18
13.40000	259.44
13.50000	262.79
13.60000	266.22
13.70000	269.76
13.80000	273.39
13.90000	277.12
14.00000	280.96
14.10000	284.91
14.20000	288.98
14.30000	293.18
14.40000	297.50
14.50000	301.95
14.60000	306.55
14.70000	311.29
14.80000	316.19
14.90000	321.24
15.00000	326.47
15.10000	331.88
15.20000	337.47
15.30000	343.27
15.40000	349.27
15.50000	355.49
15.60000	361.95
15.70000	368.65
15.80000	375.61
15.90000	382.84
16.00000	390.37
16.10000	398.21
16.20000	406.38
16.30000	414.90
16.40000	423.80
16.50000	433.09
16.60000	442.82
16.70000	453.00
16.80000	463.67
16.90000	474.86
17.00000	486.63
17.10000	499.00
17.20000	512.04
17.30000	525.79
17.40000	540.31
17.50000	555.68
17.60000	571.96
17.70000	589.25
17.80000	607.63
17.90000	627.22
18.00000	648.14
18.10000	670.53
18.20000	694.54
18.30000	720.36
18.40000	748.22
18.50000	778.34
18.60000	811.03
18.70000	846.62
18.80000	885.53
18.90000	928.23
19.00000	975.31
19.10000	1027.48
19.20000	1085.61
19.30000	1150.79
19.40000	1224.38
19.50000	1308.11
19.60000	1404.26
19.70000	1515.79
19.80000	1646.71
19.90000	1802.57
20.00000	1991.25

Appendix D

Sample Calculations of Emission Rates

D-1

Sample Calculations, Burns Harbor Emission Inventory

Coke Oven Battery No. 1

Fuel fired - 580,000 cfh COG × 520.6 Btu/cf = 301.9 M Btu/hr or 86.0%
560,000 cfh BFG × 87.7 Btu/cf = 49.1 M Btu/hr or 14.0%
Total 351.0 M Btu/hr or 100.0%
COG - 86.0% × 1,000,000 Btu/520.6 Btu/cf = 1,651.9 cf/M Btu
BFG - 14.0% × 1,000,000 Btu/87.7 Btu/cf = 1,596.4 cf/M Btu

Prod. of comb. - 1,651.9 cf COG/M Btu × 5.196[1] cf/cf COG = 8,583.3 cf/M Btu
1,596.4 cf BFG/M Btu × 1.504[1] cf/cf BFG = 2,401.0 cf/M Btu
Total 10,984.3 cf/M Btu

Prod. of comb. dry - 1,651.9 cf COG/M Btu × 4.070[1] cf/cf COG = 6,723.2 cf/M Btu
1,596.4 cf BFG/M Btu × 1.438[1] cf/cf BFG = 2,295.6 cf/M Btu
Total 9,018.8 cf/M Btu

Excess air - 1,651.9 cf COG/M Btu × 81.3%[1] cf air × 4.484[1] cf air/cf COG = 6,022.0 cf/M Btu
(9.9% O_2) 1,596.4 cf BFG/M Btu × 198.8%[1] cf air × 0.648[1] cf air/cf BFG = 2,056.5 cf/M Btu
Total 8,078.5 cf/M Btu

Total stack gas - 10,984.3 cf comb. prod. + 8,078.5 cf ex. air = 19,062.8 cf/M Btu
Dry stack gas - 9,018.8 cf dry comb. prod. + 8,078.5 cf ex. air = 17,097.3 cf/M Btu
NO_x emission rate - 0.000999 cf NO/cf stack gas × 19,062.8 × 0.1217[2] lb NO_2/cf = 2.3176 lb/M Btu
SO_2 emission rate - 0.000268 cf SO_2/cf stack gas × 19,062.8 × 0.1733[2] lb SO_2/cf = 0.8854 lb/M Btu
CO emission rate - 0.000248 cf CO/cf dry stack gas × 17,097.3 × 0.0740[2] lb CO/cf = 0.3138 lb/M Btu
VOC emission rate - 0.000002 cf VOC/cf stack gas × 19,062.8 × 0.1196[2] lb C_3H_8/cf = 0.0046 lb/M Btu

Coke Oven Battery No. 1 Pushing Emission Control System

NO_x emission rate - 0.000032/2 cf NO_x × 130,132[3] cfm × 2.5 min × 0.1219/34 tons = 0.0186 lb/ton coke
SO_2 emission rate - 0.000047/2 cf SO_2 × 130,132[3] cfm × 2.5 min × 0.1733/34 tons = 0.0390 lb/ton
CO emission rate - 0.000199/2 cf CO × 123,404[3] dcfm × 2.5 min × 0.0740/34 tons = 0.0668 lb/ton
VOC emission rate - 0.000008/2 cf VOC × 130,132[3] cfm × 2.5 min × 0.1196/34 tons = 0.0046 lb/ton

Sinter Plant Scrubber Stack

Fuel fired - 13 tph coke × 83% C × 2,000 lbs/ton × 14,093 Btu/lb C = 304.1 M Btu/hr
1,060 cfm COG × 60 min × 520.6 Btu/cf COG = 33.1 M Btu/hr
Total - 304.1 + 33.1 = 337.2 M Btu/hr, 90.2% coke, 9.8% COG

NO_x emission rate - 0.000082 cf NO_x × 495,000[3] scfm × 60 min × 0.1219/491.25 tph = 0.6033 lb/ton
SO_2 emission rate - 0.000043 cf SO_2 × 495,000[3] scfm × 60 min × 0.1733/491.25 tph = 0.4505 lb/ton
CO emission rate - 0.0085 cf CO × 464,400[3] dcfm × 60 min × 0.0740/491.25 tph = 35.6773 lb/ton
VOC emission rate - 0.00002 cf VOC × 495,000[3] scfm × 60 min × 0.1196/491.25 tph = 0.1446 lb/ton

Notes

(1) Calculated by HRL combustion computer program, Appendix C
(2) Physical properties from "Fuel Flue Gases," American Gas Association
(3) Stack gas flow rates supplied by Burns Harbor Environmental Services Appendix B

Sample Calculations, Burns Harbor Emission Inventory (Cont.)

Sinter Plant Dedusting Baghouse

NO_x emission rate - 0.000004 cf NO_x × 205,816 scfm × 60 × 0.1217/491.25 = 0.0122 lb/ton
CO emission rate - 0.000128 cf CO × 199,497 dscfm × 60 × 0.0740/491.25 = 0.2308 lb/ton
VOC emission rate - 0.000003 cf VOC × 205,816 scfm × 60 × 0.1196/491.25 = 0.0090 lb/ton

Power Station Boiler No. 7

Fuel fired - 55,667 scfh COG × 520.6 Btu/cf = 29.0 M Btu/hr or 6.0%
5,000,000 scfh BFG × 87.7 Btu/cf = 438.5 M Btu/hr or 90.6%
16,000 scfh NG × 1021.8 Btu/cf = 16.3 M Btu/hr or 3.4%
Total 483.8 M Btu/hr or 100.0%

COG - 6.0% × 1,000,000/520.6 = 115.25 cf/M Btu
BFG - 90.6% × 1,000,000/87.7 = 10,330.67 cf/M Btu
NG - 3.4% × 1,000,000/1021.8 = 33.27 cf/M Btu

Prod. of comb. - 115.25 cf COG × 5.196 cf/cf COG = 598.84 cf/M Btu
10,330.67 cf BFG × 1.504 cf/cf BFG = 15,537.33 cf/M Btu
33.27 cf NG × 10.639 cf/cf NG = 353.96 cf/M Btu
Total 16,490.13 cf/M Btu

Prod. of comb. dry - 115.25 cf COG × 4.070 cf/cf COG = 469.07 cf/M Btu
10,330.67 cf BFG × 1.438 cf/cf BFG = 14,855.50 cf/M Btu
33.27 cf NG × 8.643 cf/cf NG = 287.55 cf/M Btu
Total 15,612.12 cf/M Btu

Excess comb. air - 115.25 cf COG × 7.0% ex. air × 4.484 cf air/cf COG = 36.17 cf/M Btu
(1.5% O_2) 10,330.67 cf BFG × 17.1% ex. air × 0.648 cf air/cf BFG = 1,144.72 cf/M Btu
33.27 cf NG × 6.9% ex. air × 9.621 cf air/cf BFG = 22.09 cf/M Btu
Total 1,202.98 cf/M Btu

Total stack gas - 16,490.13 cf comb. prod. + 1,202.98 cf air = 17,693.11 cf/M Btu
Dry stack gas - 15,612.12 cf dry comb. prod. + 1,202.98 cf air = 16,815.10 cf/M Btu
NO_x emission rate - 0.000034 cf NO_x × 17,693.11 cf × 0.1217 lb NO_2/cf = 0.0732 lb/M Btu
SO_2 emission rate - 0.000092 cf SO_2 × 17,693.11 cf × 0.1733 lb SO_2/cf = 0.2821 lb/M Btu
CO emission rate - 0.0180 cf CO × 16,815.10 dcf × 0.0740 lb CO/cf = 22.3977 lb/M Btu
VOC emission rate - 0.000001 cf VOC × 17,693.11 cf × 0.1196 lb C_3H_8/cf = 0.0021 lb/M Btu

Blast Furnace C Stoves

Fuel fired - 3,711 scfm COG × 60 × 520.6 Btu/cf = 115.9 M Btu/hr or 22.00%
77,250 scfm BFG × 60 × 87.7 Btu/cf = 406.5 M Btu/hr or 77.15%
73 scfm NG × 60 × 1021.8 Btu/cf = 4.5 M Btu/hr or 0.85%
Total 526.9 M Btu/hr or 100.00%

Sample Calculations, Burns Harbor Emission Inventory (Cont.)

Blast Furnace C Stoves (Cont.)

Fuel fired - COG - 22.00% x 1,000,000/520.6 = 422.6 cf/M Btu
BFG - 77.15% x 1,000,000/87.7 = 8,797.0 cf/M Btu
NG - 0.85% x 1,000,000/1021.8 = 8.3 cf/M Btu

Prod. of comb. - 422.6 cf COG x 5.196 cf/cf COG = 2,195.8 cf/M Btu
8,797.0 cf BFG x 1.504 cf/cf BFG = 13,230.7 cf/M Btu
8.3 cf NG x 10.639 cf/cf NG = 88.3 cf/M Btu
Total 15,514.8 cf/M Btu

Prod. of comb. dry - 422.6 cf COG x 4.070 cf/cf COG = 1,720.0 cf/M Btu
8,797.0 cf BFG x 1.438 cf/cf BFG = 12,650.1 cf/M Btu
8.3 cf NG x 8.643 cf/cf NG = 71.7 cf/M Btu
Total 14,441.8 cf/M Btu

Excess comb. air - 422.6 cf COG x 14.6% ex. air x 4.484 cf air = 276.7 cf/M Btu
(2.9% O_2) 8,797.6 cf BFG x 35.7% ex air x 0.648 cf air = 2,035.1 cf/M Btu
8.3 cf NG x 14.4% ex. air x 9.621 cf air = 11.5 cf/M Btu
Total 2,323.3 cf/M Btu

Total stack gas - 15,514.8 cf comb. prod. + 2,323.3 cf ex. air = 17,838.1 cf/M Btu
Dry stack gas - 14,441.8 dcf comb. prod. + 2,323.3 cf ex. air = 16,765.1 cf/M Btu
NO_x emission rate - 0.000043 cf NO_x x 17,838.1 cf x 0.1217 lb NO_2/cf = 0.0934 lb/M Btu
SO_2 emission rate - 0.000213 cf SO_2 x 17,838.1 cf x 0.1733 lb SO_2/cf = 0.6585 lb/M Btu
CO emission rate - 0.0140 cf CO x 16,765.1 dcf x 0.0740 lb CO/cf = 17.3686 lb/M Btu
VOC emission rate - 0.000001 cf VOC x 17,838.1 cf x 0.1196 lb C_3H_8/cf = 0.00213 lb/M Btu

B07 Shop Vessels 1+2 (Scrubbers 2, 3, + 4)

NO_x emission rate - 0.000019 cf NO_x x 368,963 scfm x 18 min x 0.1217/285 tons
= 0.0539 lb/ton

CO emission rate - 0.024,714 cf CO x 353,098 dscfm x 18 min x 0.0740/285 tons
= 40.785 lb/ton

VOC emission rate - 0.0000005 cf VOC x 368,963 scfm x 18 min x 0.1196/285 tons
= 0.0014 lb/ton

B07 Hot Metal Desulfurizer No. 1

NO_x emission rate - 0.0000025 cf NO_x x 115,357 cfm x 20 min x 0.1217 = 0.7019 lb
0.0000023 cf NO_x x 42,657 cfm x 5 min x 0.1217 = 0.0597 lb
Total - (0.7019 + 0.0597)/285 tons/hr = 0.0027 lb/ton

CO emission rate - 0.000367 cf CO x 115,011 dcfm x 25 min x 0.0740 = 14.256 lb
0.000060 cf CO x 42,529 dcfm x 6 min x 0.0740 = 1.133 lb
Total - (14.256 + 1.133)/285 tons/hr = 0.0540 lb/ton

Sample Calculations, Burns Harbor Emission Inventory (Cont.)

BOF Ladle Treatment Station

CO emission rate - 0.000034 cf CO x 45,000 scfm x 26 min x 0.0740/285 = 0.0103 lb/ton

Continuous Caster No. 1

VOC emission rate - 0.0000027 x 80,000 cfm x 60 min x 2 fans x 0.1196 lb/cf = 3.100 lb/hr

Soaking Pit No. 41

Fuel fired - Mixed gas, 200 Btu/cf; COG = 0.26 cf x 520.6 Btu/cf = 135 Btu or 67.6%
BFG = 0.74 cf x 87.7 Btu/cf = 65 Btu or 32.4%

COG - 67.6% x 1,000,000/520.6 = 1,300 cf/M Btu
BFG - 32.4% x 1,000,000/87.7 = 3,700 cf/M Btu

Prod. of comb. - 1,300 cf COG x 5.196 cf/cf COG = 6,754.8 cf/M Btu
3,700 cf BFG x 1.504 cf/cf BFG = 5,564.8 cf/M Btu
Total 12,319.6 cf/M Btu

Prod. of comb dry - 1,300 cf COG x 4.070 cf/cf COG = 5,291.0 cf/M Btu
3,700 cf BFG x 1.438 cf/cf BFG = 5,320.6 cf/M Btu
Total 10,611.6 cf/M Btu

Excess comb air - 1,300 cf COG x 186.2% ex. air x 4.484 cf air = 10,888.9 cf/M Btu
(14.1% O_2) 3,700 cf BFG x 456.7% ex. air x 0.648 cf air = 10,949.8 cf/M Btu
Total 21,838.7 cf/M Btu

Total stack gas - 12,319.6 cf comb. prod. + 21,838.7 cf air = 34,158.3 cf/M Btu
Dry stack gas - 10,611.6 dcf comb. prod. + 21,838.7 cf air = 32,450.3 cf/M Btu
NO_x emission rate - 0.000162 cf NO_x x 34,158.3 cf x 0.1217 lb NO_2/cf = 0.6734 lb/M Btu
SO_2 emission rate - 0.000132 cf SO_2 x 34,158.3 cf x 0.1733 lb SO_2/cf = 0.7814 lb/M Btu
CO emission rate - 0.0000195 cf CO x 32,450.3 dcf x 0.0740 lb CO/cf = 0.0468 lb/M Btu

110" Plate Mill Furnace Nos. 1 + 2

Fuel fired - 100% NG x 1,010,000/1021.8 Btu/cf = 978.7 cf/M Btu
Prod. of comb. - 978.7 cf NG x 10.639 cf/cf NG = 10,412.4 cf/M Btu
Prod. of comb dry - 978.7 cf NG x 8.643 cf/cf NG = 8,458.9 cf/M Btu
Excess air (12.8% O_2) - 978.7 cf NG x 141.1% ex air x 9.621 cf air = 13,286.1 cf/M Btu
Total stack gas - 10,412.4 cf comb. prod. + 13,286.1 cf air = 23,698.5 cf/M Btu
Dry stack gas - 8,458.9 dcf comb. prod. + 13,286.1 cf air = 21,745.0 cf/M Btu
NO_x emission rate - 0.000096 cf NO_x x 23,698.5 cf x 0.1217 lb NO_2/cf = 0.2769 lb/M Btu
CO emission rate - 0.000005 cf CO x 21,745.0 dcf x 0.0740 lb CO/cf = 0.0080 lb/M Btu

Sample Calculations, Burns Harbor Emission Inventory (Cont.)

160" Plate Mill Continuous Furnace No. 1

Natural gas fired - 978.7 cf/MMBtu, Comb. prod. - 10,412.4 cf/MMBtu, 8,458.9 dcf/MMBtu
Excess air (10.8% O_2) - 978.7 cf NG X 95.6% X 9.621 cf air = 9,001.8 cf/MMBtu
Total stack gas - 10,412.4 cf + 9,001.8 cf air = 19,414.2 cf; 8,458.9 dcf + 9,001.8 = 17,460.7 cf
NO_x emission rate - 0.000086 cf NO_x X 19,414.2 cf X 0.1217 lb NO_2/cf = 0.2032 lb/MMBtu
CO emission rate - 0.000012 cf CO X 17,460.7 cf X 0.0740 lb CO/cf = 0.0155 lb/MMBtu

160" Plate Mill Pusher Furnace No. 8

Fuel fired - 100% COG X 1,000,000/520.6 Btu/cf = 1,920.9 cf/MMBtu
Prod of comb - 1,920.9 cf COG X 5.196 cf/cf COG = 9,981.0 cf/MMBtu
Prod of comb dry - 1,920.9 cf COG X 4.090 cf/cf COG = 7,818.1 cf/MMBtu
Excess air (8.3% O_2) - 1,920.9 cf COG X 59.6% ex air X 4.484 cf air = 5,133.5 cf/MMBtu
Total stack gas - 9,981 cf + 5,133.5 cf air = 15,114.5 cf; 7,818.1 dcf + 5,133.5 = 12,951.6 cf
NO_x emission rate - 0.000123 cf NO_x X 15,114.5 cf X 0.1217 lb NO_2/cf = 0.2263 lb/MMBtu
SO_2 emission rate - 0.000440 cf SO_2 X 15,114.5 cf X 0.1733 lb SO_2/cf = 1.1525 lb/MMBtu
CO emission rate - 0.0000003 cf CO X 12,951.6 dcf X 0.0740 lb CO/cf = 0.0003 lb/MMBtu
VOC emission rate - 0.0000001 cf VOC X 15,114.5 cf X 0.1196 lb C_3H_8/cf = 0.0002 lb/MMBtu

80" HT Strip Mill Furnace No. 1

Natural gas fired - 978.7 cf/MMBtu, Comb. prod - 10,412.4 cf/MMBtu, 8,458.9 dcf/MMBtu
Excess air (2.9% O_2) - 978.7 cf NG X 14.4% ex air X 9.621 cf air = 1,355.9 cf/MMBtu
Total stack gas - 10,412.4 cf + 1,355.9 cf air = 11,768.3 cf; 8,458.9 dcf + 1,355.9 = 9,814.8 cf
NO_x emission rate - 0.000300 cf NO_x X 11,768.3 cf X 0.1217 lb NO_2/cf = 0.4297 lb/MMBtu
CO emission rate - 0.000005 cf CO X 9,814.8 dcf X 0.0740 lb CO/cf = 0.0036 lb/MMBtu
VOC emission rate - 0.0000006 cf VOC X 11,768.3 cf X 0.1196 lb C_3H_8/cf = 0.0008 lb/MMBtu

Box Anneal Furnace No. 10, Base 119

Natural gas fired - 978.7 cf/MMBtu, Comb. prod - 10,412.4 cf/MMBtu, 8,458.9 dcf/MMBtu
Excess air (4.9% O_2) - 978.7 cf NG X 27.4% ex air X 9.621 cf air = 2,580.0 cf/MMBtu
Total stack gas - 10,412.4 cf + 2,580.0 cf air = 12,992.4 cf, 8,458.9 dcf + 2580.0 = 11,038.9 cf
NO_x emission rate - 0.000061 cf NO_x X 12,992.4 cf X 0.1217 lb NO_2/cf = 0.0964 lb/MMBtu
CO emission rate - 0.000021 cf CO X 11,038.9 dcf X 0.0740 lb CO/cf = 0.0172 lb/MMBtu
VOC emission rate - 0.0000021 cf VOC X 12,992.4 cf X 0.1196 lb C_3H_8/cf = 0.0033 lb/MMBtu

Sample Calculations, Burns Harbor Emission Inventory (Cont.)

Continuous Heat Treat Line Anneal Furnace Heating Zones

Natural gas fired - 978.7 cf/MMBtu, Comb. prod. - 10,412.4 cf/MMBtu, 8,458.9 dcf/MMBtu
Excess air ($7.5\% O_2$) - 978.7 cf NG x 50.1% ex air x 9.621 cf air = 4,717.5 cf/MMBtu
Total stack gas - 10,412.4 cf + 4,717.5 cf air = 15,129.9 cf, 8,458.9 + 4,717.5 = 13,176.4 dcf
NO_x emission rate - 0.000127 cf NO_x x 15,129.9 cf x 0.1217 lb NO_2/cf = 0.2338 lb/MMBtu
CO emission rate - 0.000340 cf CO x 13,176.4 dcf x 0.0740 lb CO/cf = 0.3315 lb/MMBtu

Hot Dip Coating Line Scrubber Stack

CO emission rate - 0.000008 cf CO x 8,558 dscfm x 60 min x 0.0740 lb/cf = 0.304 lb/hr
VOC emission rate - 0.0000839 cf VOC x 9,433 scfm x 60 min x 0.1196 lb/cf = 0.264 lb/hr