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.

AP-42 Section 11.23
Reference
Report Sect. 4
Reference 56

CLIFFS MINING

October 31, 1995

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NOV - 3 1995
MPCA, AQD
COMP/ENF SECTION

Mr. Stuart Arkley
Performance Test Coordinator
Compliance Determination Unit
Compliance and Enforcement Section
Air Quality Division
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul MN 55155

RE: LTV Steel Mining Company (LTVSMC)
Air Emission Permit No. 48A-95 I/O-1
F3 Furnace
Hoyt Lakes Mn 55750

Dear Mr. Arkley:

As per our telephone conversation, please find enclosed a copy of the test information from LTVSMC's Title V Permit Application Appendix that should satisfy Point No. 2 in your October 16, 1995, letter. This information should constitute a formal test report. Included are the Stack Test Results, Process Description and Operating Summary, the Report Nomenclature and Calculations, Field Data Sheets, Instrument Strip Charts, Laboratory Data, Process Operating Data, Calibration Data, Calibration Gas Certification, Chain of Custody Forms, Project Participants, and Source Test Plan.

If you have any further questions, please call me at 218-225-4219.

Very truly yours,

LTV STEEL MINING COMPANY

Dennis F. Koschak
Area Manager - Technical Services

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enc.
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CC: R. W. von Bitter
R. H. Hario
J. R. Stanhope
C. B. Hoffman
P. D. Brick
M. L. Harmon

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Reviewed 12/5/95

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Table 2

PARTICULATE TEST RESULTS SUMMARY

LTV Steel Mining Company

Furnace F3 Bottom Gas Stack

TEST DATE START TIME END TIME	RUN 1 8/3/94 1155 1257	RUN 2 8/3/94 1322 1424	RUN 3 8/3/94 1447 1549	AVG
Feed Rate, ton/hr	56.93	56.05	55.04	56.01
Pellet Production Rate, ton/hr	52.92	52.10	51.16	52.06
Rotoclone Pressure Drop, in. H20	3.42	3.50	3.62	3.51
Temperature, F	158	156	158	157
Moisture Content % Vol.	5.83	6.46	6.94	6.41
Airflow Rate				
ACFM	11889	11956	11787	11877
SCFM	9614	9704	9531	9616
DSCFM	9053	9077	8870	9000
Source Gas Composition %v/v (dry)				
Carbon Dioxide	0.00	0.00	0.00	0.00
Oxygen	20.90	20.90	20.90	20.90
Nitrogen	79.10	79.10	79.10	79.10
Particulate Concentration, gr/DSCF (wet and dry catch)	0.0149	0.0209	0.0151	0.0170
Particulate Emission Rate lb/hr	1.160	1.623	1.147	1.310
Particulate Emission Rate lb/ton Raw Materials Processed	0.0204	0.0290	0.0208	0.023
Particulate Emission Rate lb/ton Pellets Produced	0.0219	0.0312	0.0224	0.025

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TABLE 6
TOTAL HYDROCARBONS TEST RESULTS
FURNACE F3 BOTTOM GAS STACK
Fuel: Natural Gas
Test - 1 Test Date: 8/3/94

Averaging Period	*RUN 1* THC, PPM C3, (wet)*	*RUN 2* THC, PPM C3, (wet)*	*RUN 3* THC, PPM C3, (wet)*
1	16	35	50
2	14	20	60
3	10	4	45
4	12	3	40
5	30	5	30
6	65	7	40
7	48	8	50
8	65	8	40
9	60	40	20
10	55	45	6
11	60	45	1
12	55	48	2
13	55	70	2
14	70	60	2
15	75	70	3
16	80	58	2
17	70	75	3
18	75	55	3
19	65	65	3
20	35	75	3
21	55	85	2
22	65	90	2
23	65	86	2
24	55	70	2
25	40	50	2
26	45	20	2
27	55	30	2
28	65	40	2
29	70	52	2
30	50	62	1

Upscale Calibration Gas Concentration, ppm:			25.2	
Bias Readings	Start Zero	0	0	0
	Start Upscale	25	24	24
	End Zero	0	0	0
	End Upscale	24	24	23

RESULTS:	*RUN 1*	*RUN 2*	*RUN 3*	*AVG*
Average Concentration, PPM, (wet)	53	46	14	38
Maximum Avg. Concentration, PPM, (wet)	80	90	60	77
Minimum Avg. Concentration, PPM, (wet)	10	3	1	5
Bias Adjusted Avg. Conc., PPM, (wet)	54	48	15	39
Source Volumetric Flowrate, SCFM	9,614	9,704	9,531	9,616
Emission Rate, lb/hr C3, (wet)*	3.576	3.220	0.992	2.596
MMBtu/hr	31.45	30.96	30.41	30.94
Emission Rate, lb/MMBtu	1.1E-01	1.0E-01	3.3E-02	8.3E-02

* C3 is concentration expressed as propane (C_3H_8)

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Table 7

PARTICULATE TEST RESULTS SUMMARY

LTV Steel Mining Company

Furnace F3 Top Gas Stack

TEST DATE START TIME END TIME	RUN 1 8/4/94 13:45 14:48	RUN 2 8/4/94 16:08 17:38	RUN 3 8/4/94 18:33 19:35	AVG
Feed Rate, ton/hr	55.43	54.96	55.05	55.15
Pellet Production Rate, ton/hr	51.46	51.02	51.11	51.19
Heat Recuperation Pressure Drop, in. H2O	2.36	2.50	2.44	2.43
Dust Collector Pressure Drop, in. H20	3.30	3.00	3.16	3.15
Temperature, F	142	148	150	147
Moisture Content % Vol.	14.45	14.31	15.09	14.62
Airflow Rate				
ACFM	65403	64761	64974	65046
SCFM	54860	53752	53778	54130
DSCFM	46934	46059	45663	46219
Source Gas Composition %v/v (dry)				
Carbon Dioxide	1.80	2.00	2.00	1.93
Oxygen	16.60	16.30	16.20	16.37
Nitrogen	81.60	81.70	81.80	81.70
Particulate Concentration, gr/DSCF (wet and dry catch)	0.0150	0.0169	0.0311	0.0210
Particulate Emission Rate lb/hr	6.048	6.688	12.161	8.299
Particulate Emission Rate lb/ton Raw Materials Processed	0.1091	0.1217	0.2209	0.151
Particulate Emission Rate lb/ton Pellets Produced	0.1175	0.1311	0.2380	0.162

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TABLE 8
NOx TEST RESULTS
FURNACE F3 TOP GAS STACK
Fuel: Natural Gas
Test - 1 Test Date: 8/4/94

Averaging Period	*RUN 1* NOx, PPM	*RUN 2* NOx, PPM	*RUN 3* NOx, PPM
1	35	36	35
2	36	36	35
3	36	36	35
4	35	36	35
5	35	35	35
6	36	35	35
7	36	36	35
8	35	36	35
9	34	37	35
10	34	38	35
11	34	37	35
12	34	35	35
13	34	35	35
14	34	35	35
15	34	35	34
16	34	35	34
17	34	35	35
18	34	35	35
19	34	35	35
20	34	36	35
21	35	35	35
22	35	35	34
23	35	35	
24	35	35	
25	35	35	
26	36	36	
27	37	36	
28	37	36	
29	37	36	
30	37		

Upscale Calibration Gas Concentration, ppm:			52.0	
Bias Readings	Start Zero	0	2	3
	Start Upscale	52	52	53
	End Zero	2	3	0
	End Upscale	52	53	50

RESULTS:	*RUN 1*	*RUN 2*	*RUN 3*	*AVG*
Average Concentration, PPM (dry)	35	36	35	35
Maximum Avg. Concentration, PPM (dry)	37	38	35	37
Minimum Avg. Concentration, PPM (dry)	34	35	34	34
Bias Adjusted Avg. Conc., PPM (dry)	35	34	35	35
Source Volumetric Flowrate, DSCFM	46,934	46,059	45,663	46,219
Emission Rate, lb/hr	11.669	11.367	11.352	11.463
MMBtu/hr	28.67	28.42	28.47	28.52
Emission Rate, lb/MMBtu	4.1E-01	4.0E-01	4.0E-01	4.0E-01

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TABLE 9
SO2 TEST RESULTS
FURNACE F3 TOP GAS STACK
Fuel: Natural Gas
Test - 1 Test Date: 8/4/94

Averaging Period	*RUN 1* SOx, PPM	*RUN 2* SOx, PPM	*RUN 3* SOx, PPM
1	35	35	35
2	35	37.5	35
3	35	40	35
4	35	40	35
5	32.5	40	35
6	32.5	37.5	35
7	35	35	35
8	35	35	35
9	35	35	35
10	35	35	35
11	35	35	35
12	32.5	35	35
13	32.5	35	35
14	32.5	37.5	35
15	35	40	32.5
16	35	40	32.5
17	35	42.5	32.5
18	35	25	32.5
19	35	25	32.5
20	35	27.5	32.5
21	35	30	32.5
22	35	35	30
23	35	35	30
24	35	35	30
25	35	35	32.5
26	35	35	32.5
27	35	35	32.5
28	35	35	30
29	35	35	30
30	35	35	30
31	35	35	30
32	35	35	30
33	35	35	30
34	35	35	
35	35	35	
36	35	35	
37	35	35	
38	35	35	
39	35	35	
40	35	35	
41	35	35	
42	35	35	
43	35	35	
44	35	35	
45	35	35	

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TABLE 9
SO2 TEST RESULTS
FURNACE F3 TOP GAS STACK
Fuel: Natural Gas
Test - 1 Test Date: 8/4/94

Upscale Calibration Gas Concentration, ppm:			10	
Bias Readings	Start Zero	0	0	0
	Start Upscale	10	10	10
	End Zero	0	0	0
	End Upscale	10	10	10

RESULTS:	*RUN 1*	*RUN 2*	*RUN 3*	*AVG*
Average Concentration, PPM (dry)	35	35	33	34
Maximum Avg. Concentration, PPM (dry)	35	43	35	38
Minimum Avg. Concentration, PPM (dry)	33	25	30	29
Bias Adjusted Avg. Conc., PPM (dry)	35	35	33	34
Source Volumetric Flowrate, DSCFM	46,934	46,059	45,663	46,219
Emission Rate, lb/hr	16.257	16.158	14.977	15.797
MMBtu/hr	28.67	28.42	28.47	28.52
Emission Rate, lb/MMBtu	5.7E-01	5.7E-01	5.3E-01	5.5E-01

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TABLE 10
CO TEST RESULTS
FURNACE F3 TOP GAS STACK
Fuel: Natural Gas
Test - 1 Test Date: 8/4/94

Averaging Period	*RUN 1* CO, PPM	*RUN 2* CO, PPM	*RUN 3* CO, PPM
1	21	23	23
2	22	24	22
3	22	24	22
4	21	22	22
5	21	25	22
6	21	22	22
7	22	22	22
8	22	22	22
9	22	22	22
10	21	22	22
11	21	22	23
12	21	23	22
13	21	22	22
14	21	22	22
15	21	22	22
16	21	22	22
17	21	24	22
18	21	22	22
19	21	22	22
20	21	23	22
21	21	23	22
22	22	23	22
23	22	22	
24	22	22	
25	22	22	
26	22	22	
27	23	22	
28	23	22	
29	23	22	
30	23		

Upscale Calibration Gas Concentration, ppm:			29.8	
Bias Readings	Start Zero	0	0	0
	Start Upscale	29	29	29
	End Zero	0	0	0
	End Upscale	29	29	30

RESULTS:	*RUN 1*	*RUN 2*	*RUN 3*	*AVG*
Average Concentration, PPM (dry)	22	22	22	22
Maximum Avg. Concentration, PPM (dry)	23	25	23	24
Minimum Avg. Concentration, PPM (dry)	21	22	22	22
Bias Adjusted Avg. Conc., PPM (dry)	22	23	22	23
Source Volumetric Flowrate, DSCFM	46,934	46,059	45,663	46,219
Emission Rate, lb/hr	4.544	4.641	4.445	4.543
MMBtu/hr	28.67	28.42	28.47	28.52
Emission Rate, lb/MMBtu	1.6E-01	1.6E-01	1.6E-01	1.6E-01

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TABLE 11
TOTAL HYDROCARBONS TEST RESULTS
FURNACE F3 TOP GAS STACK

Fuel: Natural Gas
Test - 1 Test Date: 8/4/94

Averaging Period	*RUN 1* THC, PPM C3, (wet)*	*RUN 2* THC, PPM C3, (wet)*	*RUN 3* THC, PPM C3, (wet)*
1	4	1	1
2	4	2	0
3	4	2	0
4	3	2	0
5	3	1	0
6	4	1	1
7	4	1	1
8	3	1	2
9	2	1	1
10	2	1	1
11	2	1	1
12	2	1	1
13	2	1	1
14	2	2	0
15	2	2	0
16	2	2	0
17	2	2	0
18	2	1	0
19	2	1	0
20	2	2	0
21	2	2	1
22	4	2	2
23	3	2	1
24	2	2	1
25	2	2	0
26	2	2	0
27	2	2	1
28	2	2	1
29	2	1	1
30	2	1	1
31	2	1	1
32	2	1	0
33	2	1	1
34	2	1	
35	1	1	
36		1	
37		1	
38		1	
39		2	
40		2	
41		2	
42		2	
43		2	

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TABLE 11
TOTAL HYDROCARBONS TEST RESULTS
FURNACE F3 TOP GAS STACK

Fuel: Natural Gas
Test - 1 Test Date: 8/4/94

Upscale Calibration Gas Concentration, ppm:		25.2		
Bias Readings	Start Zero	0	0	0
	Start Upscale	24	24	24
	End Zero	0	0	0
	End Upscale	24	24	24

RESULTS:	*RUN 1*	*RUN 2*	*RUN 3*	*AVG*
Average Concentration, PPM, (wet)	2	1	1	2
Maximum Avg. Concentration, PPM, (wet)	4	2	2	3
Minimum Avg. Concentration, PPM, (wet)	1	1	0	1
Bias Adjusted Avg. Conc., PPM, (wet)	3	2	1	2
Source Volumetric Flowrate, SCFM	54,860	53,752	53,778	54,130
Emission Rate, lb/hr C3, (wet)*	0.960	0.577	0.247	0.595
MMBtu/hr	28.67	28.42	28.47	28.52
Emission Rate, lb/MMBtu	3.4E-02	2.0E-02	8.7E-03	2.1E-02

* C3 is concentration expressed as propane (C_3H_8)

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Source category: Taconite Ore Processing
Plant name : LTV Steel Mining Co.
Process : Indurating furnace

Filename: TAC4-56.WQ1
Location: Hoyt Lakes, MN
Test date: 8/3/94

Date: 10/11/96
Ref. No.: 4-56
Process rate basis: Production

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Rat.
Natural gas-fired vertical shaft furnace bottom gas stack	rotoclone	filt. + cond. PM	1	EPA 5	NS	NS	9,053	NS	0.015	1.16	59.3	0.010	0.020	
		filt. + cond. PM	2		NS	NS	9,077	NS	0.021	1.63	58.4	0.014	0.028	
		filt. + cond. PM	3		NS	NS	8,870	NS	0.015	1.15	57.3	0.010	0.020	
									PPM		Average	0.011	0.022	C
		THC	1	EPA 25A	NA	NA	9,614	NA	57.3	3.78	59.3	0.032	0.064	
		THC	2		NA	NA	9,704	NA	51.3	3.42	58.4	0.029	0.059	
		THC	3		NA	NA	9,531	NA	16.1	1.05	57.3	0.0092	0.018	
												0.023	0.047	
Natural gas-fired vertical shaft furnace top gas stack	heat recup./ wet scrubber	filt. + cond. PM	1	EPA 5	NS	NS	46,934	NS	0.015	6.03	57.6	0.052	0.10	
		filt. + cond. PM	2		NS	NS	46,059	NS	0.017	6.67	57.1	0.058	0.12	
		filt. + cond. PM	3		NS	NS	45,663	NS	0.031	12.17	57.2	0.11	0.21	
									PPM		Average	0.072	0.14	C
		NOx	1	EPA 7E	NA	NA	46,934	NA	35	11.28	57.6	0.098	0.20	
		NOx	2		NA	NA	46,059	NA	36	11.38	57.1	0.10	0.20	
		NOx	3		NA	NA	45,663	NA	35	10.97	57.2	0.096	0.19	
												0.098	0.20	C
		SO2	1	EPA 7E	NA	NA	46,934	NA	35	16.40	57.6	0.14	0.28	
		SO2	2		NA	NA	46,059	NA	35	16.09	57.1	0.14	0.28	
		SO2	3		NA	NA	45,663	NA	33	15.04	57.2	0.13	0.26	
												0.14	0.28	C
		CO	1	EPA 7E	NA	NA	46,934	NA	22	4.51	57.6	0.039	0.078	
		CO	2		NA	NA	46,059	NA	22	4.43	57.1	0.039	0.077	
		CO	3		NA	NA	45,663	NA	22	4.39	57.2	0.038	0.077	
												0.039	0.077	C
		THC	1	EPA 25A	NA	NA	46,934	NA	3.5	1.13	57.6	0.0098	0.020	
		THC	2		NA	NA	46,059	NA	2.3	0.74	57.1	0.0065	0.013	
		THC	3		NA	NA	45,663	NA	1.2	0.37	57.2	0.0032	0.0064	
												0.0065	0.013	C
		CO2	1	Orsat	NA	NA	46,934	NA	1.8	11,598	57.6	100	200	
		CO2	2		NA	NA	46,059	NA	2.0	12,646	57.1	110	220	
		CO2	3		NA	NA	45,663	NA	2.0	12,537	57.2	110	220	
											Average	107	210	C

Basis for rating: Incomplete documentation.
Problems noted:
Other notes: Additional information provided in Attachment 4 of Reference 53.