6.0 Emission Calculations

Emission estimates are shown in this section. The emission estimates include:

- TANKS 4.0 Output
- MathCad-Grainloading Output
- Grainloading Spreadsheets
- Criteria/Toxics/HAPs Inventory
- Combustion Spreadsheets
- Fuel Oil Throughputs
- Process Weight Documents
- Fugitives

Summary of Maximum Criteria Emission Estimates													
Source	PM, lb/hr	PM, ton/yr	PM-10, lb/hr	PM-10, ton/yr	SO_2, lb/hr	SO_2, ton/yr	CO, lb/hr	CO, ton/yr	NOx, lb/hr	NOx, ton/yr	VOC, lb/hr	VOC, ton/yr	Comments
Fluidized Bed Dryer[2]	1.55	6.79	0.71	3.11	0.004	0.02	0.57	2.50	1.10	4.818	4.0E-02	1.8E-01	
#4 Bigelow Boiler	14.00	61.32	13.16	32.74	172.46	413.76	11.45	50.15	30.55	133.809	7.5E-01	3.28	Throughputs and annual hours of operation vary with different sulfur concentrations and fuels. See boiler throughput spreadsheet.
#3 Cleaver Brooks	0.32	1.42	0.32	1.423	0.03	0.11	3.59	15.73	6.08	26.630	2.4E-01	1.0E+00	8,760 hr/yr - NG & Propane
Dryer Stage A	0.059	0.26	0.059	0.258	0.005	0.02	0.650	2.85	0.780	3.416	4.3E-02	1.9E-01	
Dryer Stage B	0.024	0.11	0.024	0.105	0.002	0.01	0.260	1.14	0.310	1.358	1.7E-02	7.4E-02	
Dryer Stage C	0.024	0.11	0.024	0.105	0.002	0.01	0.260	1.14	0.310	1.358	1.7E-02	7.4E-02	
Secondary Dryer (1st vent)	0.002	0.17	0.002	0.169	0.0002	0.001	0.02	0.10	0.03	0.118	1.5E-03	6.6E-03	
Secondary Dryer (2nd vent)	0.002	0.17	0.002	0.17	0.0002	0.001	0.02	0.10	0.03	0.118	1.5E-03	6.6E-03	
Silo Storage A[3]	6.40E-02	0.28	6.40E-02	0.28									
Silo Storage B	6.40E-02	0.28	6.40E-02	0.28									
Silo Storage C	6.40E-02	0.28	6.40E-02	0.28									
Silo Storage D	6.40E-02	0.28	6.40E-02	0.28									
Silo Storage E	6.40E-02	0.28	6.40E-02	0.28									
Silo Storage F	6.40E-02	0.28	6.40E-02	0.28									
Silo Storage G	6.40E-02	0.28	6.40E-02	0.28									
Silo Storage H	6.40E-02	0.28	6.40E-02	0.28									
Silo Storage I	6.40E-02	0.28	6.40E-02	0.28									
Silo Storage J	6.40E-02	0.28	6.40E-02	0.28									
Dehydration Lines Total[4]	14.47	50.0	6.37	22.0									6,912 hr/yr per flaker Emissions divided equally between 17 dehydration lines.
Flaker #4	8.51E-01	2.94	3.75E-01	1.29									
Flaker #3	8.51E-01	2.94	3.75E-01	1.29									
Flaker #2	8.51E-01	2.94	3.75E-01	1.29									
Flaker #1	8.51E-01	2.94	3.75E-01	1.29									
Flaker #8	8.51E-01	2.94	3.75E-01	1.29									
Flaker #7	8.51E-01	2.94	3.75E-01	1.29									
Flaker #6	8.51E-01	2.94	3.75E-01	1.29									
Flaker #5	8.51E-01	2.94	3.75E-01	1.29									
Flaker #10	8.51E-01	2.94	3.75E-01	1.29									
Flaker #9	8.51E-01	2.94	3.75E-01	1.29									
Flaker #12	8.51E-01	2.94	3.75E-01	1.29									
Flaker #11	8.51E-01	2.94	3.75E-01	1.29									
Dryer Stage A	8.51E-01	2.94	3.75E-01	1.29									
Dryer Stage B	8.51E-01	2.94	3.75E-01	1.29									
Dryer Stage C	8.51E-01	2.94	3.75E-01	1.29									
Secondary Dryer (1st vent)	8.51E-01	2.94	3.75E-01	1.29									
Secondary Dryer (2nd vent)	8.51E-01	2.94	3.75E-01	1.29									
Space Heater South	6.11E-02	0.18	6.1E-02	1.8E-01	4.8E-03	1.5E-02	6.7E-01	2.0E+00	8.0E-01	2.4E+00	4.0E-02	1.2E-01	6,048 hours/yr
Space Heater North	6.11E-02	0.18	6.1E-02	1.8E-01	4.8E-03	1.5E-02	6.7E-01	2.0E+00	8.0E-01	2.4E+00	4.0E-02	1.2E-01	6,048 hours/yr
Space Heater East	1.14E-01	0.34	1.1E-01	3.4E-01	9.0E-03	2.7E-02	1.3E+00	3.8E+00	1.5E+00	4.5E+00	8.0E-02	2.4E-01	6,048 hours/yr
Miscellaneous Space Heaters	2.00E-02	0.06	2.0E-02	6.0E-02	1.0E-03	3.0E-03	1.7E-01	5.1E-01	2.0E-01	6.0E-01	1.0E-02	3.0E-02	6,048 hours/yr
Storage Tanks												6.0E-02	
Fugitives		13.00		2.50									
TOTAL	**31.35**	**136.92**	**21.57**	**66.16**	**172.52**	**413.99**	**19.61**	**82.10**	**42.49**	**181.62**	**1.27**	**5.41**	

[1] See following tables for emission calculations for each source and different fuel types.

[2] PM & PM-10 includes both combustion and process emissions.

[3] Silo emissions based on previously accepted emissions by DEQ.

[4] Emissions divided among 17 stacks. Emissions based on previously approved mass balance for PM, and a PM-10/PM ratio of 0.44, based on cereal dryer emissions, AP-42 p. B.1-42.

BOILER # 4 THROUGHPUTS WITH RESPECT TO CHANGING SULFER CONCENTRATIONS

Coal			
Average % Sulfur in Fuel	Annual Hours, hr/yr	Hourly Fuel Consumption, lb/hr*	Annual Fuel Consumption, ton/yr
0.50%	8,760	10796	47,286
*5.4 ton/hr = Capacity of Boiler #4			

Residual oil # 6			
% Sulfur in Fuel	Annual Hours, hr/yr	Hourly Fuel Consumption, gal/hr	Annual Fuel Consumption, gal/yr
0.50%	8,760	650	5,694,000
0.75%	6,480	650	4,212,314
1.00%	4,860	650	3,159,236
1.25%	3,888	650	2,527,389
1.50%	3,240	650	2,106,157
1.69%	2,875	650	1,868,750

Residual oil # 5			
% Sulfur in Fuel	Annual Hours, hr/yr	Hourly Fuel Consumption, gal/hr	Annual Fuel Consumption, gal/yr
0.50%	8,760	650	5,694,000
0.75%	6,480	650	4,212,314
1.00%	4,860	650	3,159,236
1.25%	3,888	650	2,527,389
1.50%	3,240	650	2,106,157
1.69%	2,875	650	1,868,750

Residual oil # 4			
% Sulfur in Fuel	Annual Hours, hr/yr	Hourly Fuel Consumption, gal/hr	Annual Fuel Consumption, gal/yr
0.50%	8,760	650	5,694,000
0.75%	6,783	650	4,408,889
1.00%	5,087	650	3,306,667
1.25%	4,070	650	2,645,333
1.50%	3,391	650	2,204,444
1.69%	2,907	650	1,889,524

Diesel # 2			
% Sulfur in Fuel	Annual Hours, hr/yr	Hourly Fuel Consumption, gal/hr	Annual Fuel Consumption, gal/yr
0.50%	8,760	650	5,694,000

#4 Boiler Micronized Coal - Sulfur = 0.5%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.1-3, 1.1-4, 1.1-5 1.1-6 and 1.1-14 9/98)

	Pollutant					
	SO_2	NO_X[a]	CO	PM	PM10	TOC
Emission Factor, lb/ton	35 S	12	0.5	10 A	2.3 A	0.0092
% S in fuel: 0.5						
% Ash in fuel: 9.43						
Maximum ton/hr 5.40						
Maximum hrs/yr 8,760						
Maximum ton/yr 47,286						
Emissions, lb/hr No control	94.47	64.776	2.699	509.0	117.1	0.05
Emissions, ton/yr No control	413.76	283.72	11.82	2229.6	512.8	0.2
Emissions, lb/hr Baghouse Control		25.91		14.0	1.0	
Emissions, ton/yr Baghouse Control		113.49		61.3	4.5	

[a] For the control of NOx emissions, it should be noted that the manufacturer of the coal pulverization system that Idaho Supreme will use has stated that the NOx emissions will be 60% to 70% lower than a conventional pulverized-coal boiler. The theory behind this claim is that the superheated steam used to pulverize the coal aids in driving off the NOx precursors (volatile fuelbound nitrogen) before entering the boiler combustion chamber.

#4 Boiler #6 Residual Oil - Sulfur = 1.69%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	157 S		47	5	9.19S + 3.22 + 1.5	1.04
% S in fuel: 1.69						
Maximum gal/hr 650						
Maximum hrs/yr 2,875						
Maximum gal/yr 1,868,750						
Emissions, lb/hr No control	172.46		30.55	3.25	13.2	0.7
Emissions, ton/yr No control	247.92		43.92	4.67	18.9	1.0

S = weight % sulfur in fuel

Density lb/gal 8.4234 Based on source test

Total sulfur combustion rate, lb/hr	92.53
Total sulfur combustion rate, lb/yr	266,027

#4 Boiler #6 Residual Oil, Sulfur = 1.50%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	157 S		47	5	9.19S + 3.22 + 1.5	1.04
% S in fuel: 1.5						
Maximum gal/hr 650						
Maximum hrs/yr 3,240						
Maximum gal/yr 2,106,157						
Emissions, lb/hr No control	153.1		30.55	3.25	12.0	0.7
Emissions, ton/yr No control	248		49.49	5.27	19.5	1.1

S = weight % sulfur in fuel

#4 Boiler #6 Residual Oil, Sulfur = 1.25%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	157 S		47	5	9.19S + 3.22 + 1.5	1.04
% S in fuel: 1.25						
Maximum gal/hr 650						
Maximum hrs/yr 3,888						
Maximum gal/yr 2,527,389						
Emissions, lb/hr No control	127.5625		30.55	3.25	10.5	0.7
Emissions, ton/yr No control	248		59.39	6.32	20.5	1.3

#4 Boiler #6 Residual Oil, Sulfur = 1.0%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	157 S		47	5	9.19S + 3.22 + 1.5	1.04
% S in fuel: 1.00						
Maximum gal/hr 650						
Maximum hrs/yr 4,860						
Maximum gal/yr 3,159,236						
Emissions, lb/hr No control	102.05		30.55	3.25	9.0	0.7
Emissions, ton/yr No control	248		74.24	7.90	22.0	1.6

S = weight % sulfur in fuel

#4 Boiler #6 Residual Oil, Sulfur = 0.75%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	157 S		47	5	9.19S + 3.22 + 1.5	1.04
% S in fuel: 0.75						
Maximum gal/hr 650						
Maximum hrs/yr 6,480						
Maximum gal/yr 4,212,314						
Emissions, lb/hr No control	76.5375		30.55	3.25	7.5	0.7
Emissions, ton/yr No control	248		98.99	10.53	24.5	2.2

S = weight % sulfur in fuel

#4 Boiler #6 Residual Oil, Sulfur = 0.5%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	157 S		47	5	9.19S + 3.22 + 1.5	1.04
% S in fuel: 0.50						
Maximum gal/hr 650						
Maximum hrs/yr 8,760						
Maximum gal/yr 5,694,000						
Emissions, lb/hr No control	51.025		30.55	3.25	6.1	0.7
Emissions, ton/yr No control	223.49		133.81	14.24	26.5	3.0

S = weight % sulfur in fuel

#4 Boiler #2 Diesel

#4 Boiler #2 Diesel, Sulfur = 0.5%
Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	157 S		24	5	3.3	0.252
% S in fuel: 0.5						
Maximum gal/hr 650						
Maximum hrs/yr 8,760						
Maximum gal/yr 5,694,000						
Emissions, lb/hr No control	51.03		15.6	3.25	2.145	0.2
Emissions, ton/yr No control	223.49		68.33	14.24	9.4	0.7

S = weight % sulfur in fuel

#4 Boiler #4 Residual, Sulfur = 1.69%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	150 S		47	5	8.5	1.04
% S in fuel: 1.69						
Maximum gal/hr 650						
Maximum hrs/yr 2,907						
Maximum gal/yr 1,889,524						
Emissions, lb/hr No control	164.78		30.55	3.25	5.525	0.7
Emissions, ton/yr No control	239.5		44.404	4.72	8.0	1.0

#4 Boiler #4 Residual, Sulfur = 1.5%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	150 S		47	5	8.5	1.04
% S in fuel: 1.5						
Maximum gal/hr 650						
Maximum hrs/yr 3,391						
Maximum gal/yr 2,204,444						
Emissions, lb/hr No control	146.25		30.55	3.25	5.525	0.7
Emissions, ton/yr No control	248		51.804	5.51	9.4	1.1

S = weight % sulfur in fuel

#4 Boiler #4 Residual, Sulfur = 1.25%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Table 1.3-1, 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	150 S		47	5	8.5	1.04
% S in fuel: 1.25						
Maximum gal/hr 650						
Maximum hrs/yr 4,070						
Maximum gal/yr 2,645,333						
Emissions, lb/hr No control	121.88		30.55	3.25	5.525	0.7
Emissions, ton/yr No control	248		62.17	6.61	11.2	1.4

S = weight % sulfur in fuel

#4 Boiler #4 Residual, Sulfur = 1.0%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	150 S		47	5	8.5	1.04
% S in fuel: 1.0						
Maximum gal/hr 650						
Maximum hrs/yr 5,087						
Maximum gal/yr 3,306,667						
Emissions, lb/hr No control	97.5		30.55	3.25	5.525	0.7
Emissions, ton/yr No control	248		77.71	8.27	14.1	1.7

S = weight % sulfur in fuel

#4 Boiler #4 Residual, Sulfur = 0.75%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	150 S		47	5	8.5	1.04
% S in fuel: 0.75						
Maximum gal/hr 650						
Maximum hrs/yr 6,783						
Maximum gal/yr 4,408,889						
Emissions, lb/hr No control	73.125		30.55	3.25	5.525	0.7
Emissions, ton/yr No control	248		103.61	11.02	18.7	2.3

S = weight % sulfur in fuel

#4 Boiler #4 Residual, Sulfur = 0.5%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	150 S		47	5	8.5	1.04
% S in fuel:						
0.5						
Maximum gal/hr						
650						
Maximum hrs/yr						
8,760						
Maximum gal/yr 5,694,000						
Emissions, lb/hr No control	48.75		30.55	3.25	5.525	0.7
Emissions, ton/yr No control	213.525		133.81	14.24	24.2	3.0

S = weight % sulfur in fuel

#4 Boiler #5 Residual, Sulfur = 1.69%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	157 S		47	5	11.5	1.04
% S in fuel: 1.69						
Maximum gal/hr 650						
Maximum hrs/yr 2,875						
Maximum gal/yr 1,868,750						
Emissions, lb/hr No control	172.465		30.55	3.25	7.475	0.7
Emissions, ton/yr No control	247.918		43.916	4.67	10.7	1.0

S = weight % sulfur in fuel

#4 Boiler #5 Residual, Sulfur = 1.5%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	157 S		47	5	11.5	1.04
% S in fuel: 1.5						
Maximum gal/hr 650						
Maximum hrs/yr 3,240						
Maximum gal/yr 2,106,157						
Emissions, lb/hr No control	153.1		30.55	3.25	7.475	0.7
Emissions, ton/yr No control	248		49.495	5.27	12.1	1.1

S = weight % sulfur in fuel

#4 Boiler #5 Residual, Sulfur = 1.25%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	157 S		47	5	11.5	1.04
% S in fuel: 1.25						
Maximum gal/hr 650						
Maximum hrs/yr 3,888						
Maximum gal/yr 2,527,389						
Emissions, lb/hr No control	127.563		30.55	3.25	7.475	0.7
Emissions, ton/yr No control	248		59.394	6.32	14.5	1.3

S = weight % sulfur in fuel

#4 Boiler #5 Residual, Sulfur = 1.0%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	157 S		47	5	11.5	1.04
% S in fuel: 1.0						
Maximum gal/hr 650						
Maximum hrs/yr 4,860						
Maximum gal/yr 3,159,236						
Emissions, lb/hr No control	102.05		30.55	3.25	7.475	0.7
Emissions, ton/yr No control	248		74.242	7.90	18.2	1.6

S = weight % sulfur in fuel

#4 Boiler #5 Residual, Sulfur = 0.75%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	157 S		47	5	11.5	1.04
% S in fuel: 0.75						
Maximum gal/hr 650						
Maximum hrs/yr 6,480						
Maximum gal/yr 4,212,314						
Emissions, lb/hr No control	76.538		30.55	3.25	7.475	0.7
Emissions, ton/yr No control	248		98.989	10.53	24.2	2.2

S = weight % sulfur in fuel

#4 Boiler #5 Residual, Sulfur = 0.5%

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.3-1, 1.3-2, and 1.3-3 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	TOC
Emission Factor, lb/1000 gal	157 S		47	5	11.5	1.04
% S in fuel: 0.5						
Maximum gal/hr 650						
Maximum hrs/yr 8,760						
Maximum gal/yr 5,694,000						
Emissions, lb/hr No control	51.025		30.55	3.25	7.475	0.7
Emissions, ton/yr No control	223.49		133.81	14.24	32.7	3.0

S = weight % sulfur in fuel

#4 Boiler Natural Gas

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Tables 1.4-1 (low NOx) and 1.4-2, 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	VOC
Emission Factor, lb/10^6 scf	0.6		140	84	7.6	5.5
Maximum MMscf/hr 0.136319						
Maximum hrs/yr 8,760						
Emissions, lb/hr No control	0.08		19.08	11.45	1.04	0.75
Emissions, ton/yr No control	0.358		83.59	50.15	4.54	3.3

#4 Boiler Propane

Criteria Pollutant Estimates, >100 MMBTU/hr (AP-42, Table 1.5-1, 10/96)

	Pollutant					
	SO_2		NO_X	CO	PM	VOC
Emission Factor, lb/1,000 gal	0.1 S		19	3.2	0.6	0.5
S = 0.002						
Maximum gal/hr 1,050.00						
Maximum hrs/yr 8,760						
Emissions, lb/hr No control	2.10E-04		19.95	3.36	0.63	0.53
Emissions, ton/yr No control	9.20E-04		87.38	14.72	2.76	2.3

S = sulfur fuel content in grains/100 ft^3. At approximately 15 ppm or 1.1×10^{-5} weight fraction, S =

(1.1×10^{-5})(4.2 lb/gal)(78 gal/hr)(7,000 grain/lb)(100)/(60 min/hr)/(26,000 ft^3/min)

= 0.002 grains/100 ft^3

Note that the density is 4.2 lb/gal, and the exhaust flow rate is 26,000 ft^3/min.

#3 Boiler Natural Gas

Criteria Pollutant Estimates, <100 MMBTU/hr (AP-42, Tables 1.4-1 and 1.4-2, 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	VOC
Emission Factor, lb/10^6 scf	0.6		100	84	7.6	5.5
Maximum MMscf/hr 0.042745862						
Maximum hrs/yr 8,760						
Emissions, lb/hr No control	0.03		4.27	3.59	0.32	0.24
Emissions, ton/yr No control	0.112		18.72	15.73	1.42	1.0

#3 Boiler Propane

Criteria Pollutant Estimates (AP-42, Tables 1.5-1, 10/96)

	Pollutant					
	SO_2		NO_X	CO	PM	VOC
Emission Factor, lb/1,000 gal	0.1 S		19	3.2	0.6	0.5
S = 0.002						
Maximum gal/hr 320						
Maximum hrs/yr 8,760						
Emissions, lb/hr No control	6.40E-05		6.08	1.02	0.19	0.16
Emissions, ton/yr No control	0.00028		26.63	4.49	0.84	0.7

S = sulfur fuel content in grains/100 ft^3. At approximately 15 ppm or 1.1×10^{-5} weight fraction, S =

(1.1×10^{-5})(4.2 lb/gal)(78 gal/hr)(7,000 grain/lb)(100)/(60 min/hr)/(26,000 ft^3/min)

= 0.002 grains/100 ft^3

Note that the density is 4.2 lb/gal, and the exhaust flow rate is 26,000 ft^3/min.

Space Heater South

Criteria Pollutant Estimates, <100 MMBTU/hr (AP-42, Tables 1.4-1 and 1.4-2, 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	VOC
Emission Factor, lb/10^6 scf	0.6		100	84	7.6	5.5
Maximum MMscf/hr						
0.008033106						
Maximum hrs/yr						
6,048						
Emissions, lb/hr No control	0.005		0.80	0.67	0.06	0.04
Emissions, ton/yr No control	0.015		2.43	2.04	0.18	0.1

Propane								
	SO_2				**NO_X**	**CO**	**PM**	**VOC**
Emission Factor, lb/1,000 gal	0.1	S			14	1.9	0.4	0.5
lb/hr	2.77E-09				**0.63**	**0.0859**	**0.018**	**0.023**
42 gph								

Note: S = sulfur fuel content in grains/100 ft^3. At approximately 15 ppm or 1.1 x 10^{-5} weight fraction.

S = 6.60E-07 grains / 100 ft^3

Note that the density is 4.2 lb/gal, and the exhaust flow rate is 70,000 ft^3/min.

Space Heater North

Criteria Pollutant Estimates, <100 MMBTU/hr (AP-42, Tables 1.4-1 and 1.4-2, 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	VOC
Emission Factor, lb/10^6 scf	0.6		100	84	7.6	5.5
Maximum MMscf/hr						
0.008033106						
Maximum hrs/yr						
6,048						
Emissions, lb/hr No control	0.00		0.80	0.67	0.06	0.04
Emissions, ton/yr No control	0.015		2.43	2.04	0.18	0.1

Propane								
	SO_2				NO_X	CO	PM	VOC
Emission Factor, lb/1,000 gal	0.1	S			14	1.9	0.4	0.5
lb/hr	1.60E-06				**0.63**	**0.0859**	**0.018**	**0.023**
42 gph								

Note: S = sulfur fuel content in grains/100 ft^3. At approximately 15 ppm or 1.1×10^{-5} weight fraction.

S = 3.80E-04 grains / 100 ft^3

Note that the density is 4.2 lb/gal, and the exhaust flow rate is 70,000 ft^3/min.

Space Heater East

Criteria Pollutant Estimates, <100 MMBTU/hr (AP-42, Tables 1.4-1 and 1.4-2, 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	VOC
Emission Factor, lb/10^6 scf	0.6		100	84	7.6	5.5
Maximum MMscf/hr						
0.014995131						
Maximum hrs/yr						
6,048						
Emissions, lb/hr No control	0.009		1.50	1.26	0.11	0.08
Emissions, ton/yr No control	0.027		4.53	3.81	0.34	0.25

Propane								
	SO_2				**NO_X**	**CO**	**PM**	**VOC**
Emission Factor, lb/1,000 gal	0.1	S			14	1.9	0.4	0.5
lb/hr	5.69E-06				**0.63**	**0.0859**	**0.018**	**0.023**
79 gph								

Note: S = sulfur fuel content in grains/100 ft^3. At approximately 15 ppm or 1.1 x 10^{-5} weight fraction.

S = 7.20E-04 grains / 100 ft^3

Note that the density is 4.2 lb/gal, and the exhaust flow rate is 70,000 ft^3/min.

Miscellaneous Space Heaters
Criteria Pollutant Estimates, <100 MMBTU/hr (AP-42, Tables 1.4-1 and 1.4-2, 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	VOC
Emission Factor, lb/10^6 scf	0.6		100	84	7.6	5.5
Maximum MMscf/hr						
0.002005842						
Maximum hrs/yr						
6,048						
Emissions, lb/hr No control	0.001		0.20	0.17	0.02	0.01
Emissions, ton/yr No control	0.004		0.61	0.51	0.05	0.03

Propane								
	SO_2				NO_X	CO	PM	VOC
Emission Factor, lb/1,000 gal	0.1	S			14	1.9	0.4	0.5
lb/hr	5.69E-06				**0.63**	**0.0859**	**0.018**	**0.023**
79 gph								

Note: S = sulfur fuel content in grains/100 ft^3. At approximately 15 ppm or 1.1×10^{-5} weight fraction.

S = 7.20E-04 grains / 100 ft^3

Note that the density is 4.2 lb/gal, and the exhaust flow rate is 70,000 ft^3/min.

National Dryer Stage A

Criteria Pollutant Estimates, <100 MMBTU/hr (AP-42, Tables 1.4-1 and 1.4-2, 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	VOC
Emission Factor, lb/10^6 scf	0.6		100	84	7.6	5.5
Maximum MMscf/hr						
0.00779						
Maximum hrs/yr						
8,760						
Emissions, lb/hr No control	0.005		0.78	0.65	0.06	0.04
Emissions, ton/yr No control	0.02		3.41	2.87	0.26	0.19

Propane								
	SO_2				**NO_X**	**CO**	**PM**	**VOC**
Emission Factor, lb/1,000 gal	0.1	S			14	1.9	0.4	0.5
lb/hr	1.54E-05				**0.63**	**0.0859**	**0.018**	**0.023**
45.2 gph								

Note: S = sulfur fuel content in grains/100 ft^3. At approximately 15 ppm or 1.1 x 10^{-5} weight fraction.

S = 3.40E-03 grains / 100 ft^3

Note that the density is 4.2 lb/gal, and the exhaust flow rate is 8,500 ft^3/min.

National Dryer Stage B

Criteria Pollutant Estimates, <100 MMBTU/hr (AP-42, Tables 1.4-1 and 1.4-2, 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	VOC
Emission Factor, lb/10^6 scf	0.6		100	84	7.6	5.5
Maximum MMscf/hr						
0.003116						
Maximum hrs/yr						
8,760						
Emissions, lb/hr No control	0.002		0.31	0.26	0.02	0.02
Emissions, ton/yr No control	0.008		1.36	1.15	0.10	0.08

Propane								
	SO_2				**NO_X**	**CO**	**PM**	**VOC**
Emission Factor, lb/1,000 gal	0.1	S			14	1.9	0.4	0.5
lb/hr	2.70E-06				**0.252**	**0.0342**	**0.0072**	**0.009**
18 gph								

Note: S = sulfur fuel content in grains/100 ft^3. At approximately 15 ppm or 1.1 x 10^{-5} weight fraction.

S = 1.50E-03 grains / 100 ft^3

Note that the density is 4.2 lb/gal, and the exhaust flow rate is 7,500 ft^3/min.

National Dryer Stage C

Criteria Pollutant Estimates, <100 MMBTU/hr (AP-42, Tables 1.4-1 and 1.4-2, 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	VOC
Emission Factor, lb/10^6 scf	0.6		100	84	7.6	5.5
Maximum MMscf/hr						
0.003116						
Maximum hrs/yr						
8,760						
Emissions, lb/hr No control	0.002		0.31	0.26	0.02	0.02
Emissions, ton/yr No control	0.008		1.36	1.15	0.10	0.08

Propane								
	SO_2				**NO_X**	**CO**	**PM**	**VOC**
Emission Factor, lb/1,000 gal	0.1	S			14	1.9	0.4	0.5
lb/hr	2.52E-06				**0.252**	**0.0342**	**0.0072**	**0.009**
18 gph								

Note: S = sulfur fuel content in grains/100 ft^3. At approximately 15 ppm or 1.1 x 10^{-5} weight fraction.

S = 1.40E-03 grains / 100 ft^3

Note that the density is 4.2 lb/gal, and the exhaust flow rate is 8,500 ft^3/min.

Secondary Dryer - 1st Vent

Criteria Pollutant Estimates, <100 MMBTU/hr (AP-42, Tables 1.4-1 and 1.4-2, 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	VOC
Emission Factor, lb/10^6 scf	0.6		100	84	7.6	5.5
Maximum MMscf/hr						
0.000536						
Maximum hrs/yr						
8,760						
Emissions, lb/hr No control	0.0002		0.03	0.02	0.002	0.001
Emissions, ton/yr No control	0.0007		0.12	0.10	0.01	0.01

Propane								
	SO_2				NO_X	CO	PM	VOC
Emission Factor, lb/1,000 gal	0.1	S			14	1.9	0.4	0.5
lb/hr	1.09E-08				**0.0215**	**0.00295**	**0.00062**	**0.0008**
1.55 gph								

Note: S = sulfur fuel content in grains/100 ft^3. At approximately 15 ppm or 1.1×10^{-5} weight fraction.

S = 1.40E-04 grains / 100 ft^3

Note that the density is 4.2 lb/gal, and the exhaust flow rate is 7,000 ft^3/min.

Secondary Dryer - 2nd Vent

Criteria Pollutant Estimates, <100 MMBTU/hr (AP-42, Tables 1.4-1 and 1.4-2, 9/98)

	Pollutant					
	SO_2		NO_X	CO	PM	VOC
Emission Factor, lb/10^6 scf	0.6		100	84	7.6	5.5
Maximum MMscf/hr						
0.000536						
Maximum hrs/yr						
8,760						
Emissions, lb/hr No control	0.0002		0.03	0.02	0.002	0.001
Emissions, ton/yr No control	7E-04		0.12	0.10	0.01	0.01

Propane								
	SO_2				NO_X	CO	PM	VOC
Emission Factor, lb/1,000 gal	0.1	S			14	1.9	0.4	0.5
lb/hr	1.09E-08				**0.0215**	**0.00295**	**0.00062**	**0.0008**
1.55 gph								

Note: S = sulfur fuel content in grains/100 ft^3. At approximately 15 ppm or 1.1×10^{-5} weight fraction.

S = 1.40E-04 grains / 100 ft^3

Note that the density is 4.2 lb/gal, and the exhaust flow rate is 7,000 ft^3/min.

Fluidized Bed Dryer
Criteria Pollutant Estimates, <100 MMBTU/hr (AP-42, Tables 1.4-1 and 1.4-2, 9/98)

	Pollutant					
	SO_2	PM-10	NO_X	CO	PM	VOC
Emission Factor, lb/10^6 scf	0.6		100	84	7.6	5.5
Maximum MMscf/hr 0.006815969						
Maximum hrs/yr 8,760						
Emissions, lb/hr No control	0.0041	0.05	0.68	0.57	0.052	0.037
Emissions, ton/yr No control	0.018	0.227	2.99	2.51	0.227	0.164

Process Emission Factors*			
Emission	Emission Factor	Emission Rate, lb/hr	Emission Rate, TPY
PM	1.5 lb / ton of processed material	1.5	6.56
PM-10	0.66 lb / ton of processed material	0.66	2.88

*In AP-42, Appendix B.1-43, particulate emissions factors for Cereal Drying are given. The proposed process most closely resembles Cereal Drying. The general emission factor for particulate matter (PM) is 1.5 pounds per ton of material dried. This is derived from the AP-42 uncontrolled PM-10 emission factor of 0.20 kg/Mg; with PM-10 at 44% of PM, and converting to lb/hr, the PM emission factor is 1.5 lb/ton.

Propane								
	SO_2				**NO_X**	**CO**	**PM**	**VOC**
Emission Factor, lb/1,000 gal	0.1	S			14	1.9	0.4	0.5
lb/hr	1.50E-05				**1.1**	**0.15**	**0.031**	**0.04**
78 gph								

Note: S = sulfur fuel content in grains/100 ft^3. At approximately 15 ppm or 1.1×10^{-5} weight fraction.

S = 0.00192 grains / 100 ft^3

Note that the density is 4.2 lb/gal, and the exhaust flow rate is 26,000 ft^3/min.