

Attachment 4
Emission Calculations
U14; E14 Bin, E38 Spout
Georgia-Pacific Gypsum LLC
Camden, NJ

Throughput Summary - BOP180001	
E14 Total Operating Hours (hrs) ²	8,760
E14 Total Throughput (tons/hr) ²	25
E38 Total Operating Hours (hrs) ²	1,000
E38 Total Throughput (tons) ²	25
Exhaust temperature for E14	100
Exhaust temperature for E38	190
Grain Loading (grains/dscf) ⁶	0.02
CD6 Fan Capacity (acfm) ²	2,000
CD6 Fan Capacity (dscfm)	1,893
E38 Booster Fan Capacity (acfm) ³	1,000
E38 Booster Fan Capacity (dscfm)	815

Throughput Summary - Proposed Modification	
E14 Total Operating Hours (hrs) ¹	8,760
E14 Total Throughput (tons/hr) ⁵	75
E38 Total Operating Hours (hrs) ¹	8,760
E38 Total Throughput (tons) ⁵	75
Exhaust temperature	190
Exhaust temperature for E38	190
Grain Loading (grains/dscf) ⁶	0.02
CD6 Fan Capacity (acfm) ⁴	2,400
CD6 Fan Capacity (dscfm)	1,957
E38 Booster Fan Capacity (acfm) ³	1,000
E38 Booster Fan Capacity (dscfm)	815

Emissions - BOP180001				
Pollutant	E14 Hourly Emissions (lb/hr) ³	E38 Hourly Emissions (lb/hr) ³	-	Annual Emissions (tpy)
PM ₁₀	0.001	0.100	-	0.054
PM _{2.5}	0.001	0.100	-	0.054
TSP	0.001	0.100	-	0.054
<i>uncontrolled emission rate</i>				16.2

Emissions - Proposed Modification				
Pollutant	E14 Hourly Emissions (lb/hr)	E38 Baghouse Hourly Emissions (lb/hr)	E38 Fugitive Emissions (lb/hr) (Drop Pt & Truck Storage)	Annual Emissions (tpy) ⁷
PM ₁₀	0.335	0.14	0.02	1.56
PM _{2.5}	0.335	0.14	0.004	1.48
TSP	0.335	0.14	0.04	1.65
<i>uncontrolled emission rate</i>				146.9

Notes:

1) Total operating hours based on operating schedule of 24 hrs/day 7 days/week for 12 months.

Reference (drop point from front-end loader into feeder):

Particulate emissions from the hopper are estimated based on AP-42 13.2.4-3, Equation (1) for drop loading of aggregate.

Equation (1):

$$E = k(0.0032) \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (pound [lb]/ton)}$$

Where:

E = Emission factor (lb/ton)

k = aerodynamic particle size multiplier

PM, k = 0.74

PM₁₀, k = 0.35

PM_{2.5}, k = 0.053

U = mean wind speed (mph)

U = 9.54 mph (average wind speed for Philadelphia using EPA TANKS meteorological data)

M = material moisture content (% 2.0%)

Gypsum Drop Point from filling open-top truck. Future operation at 75 tons/hr processing rate

Assume that 10% of the processing rate is not controlled by vacuum pick-up and directed to baghouse, or 7.5 tons/hr

Emission Calculations	Emission Factor ¹	E38-uncontrolled	
		Potential Emissions (lb/hr)	Potential Emissions (tpy)
TSP	0.0055 lb/ton	0.04	0.18
PM ₁₀	0.0026 lb/ton	0.02	0.09
PM _{2.5}	0.00039 lb/ton	0.003	0.01

¹ Reference AP-42, Section 13.2.4-3, Equation No. 1 for drop loading of aggregate

Attachment 4
Emission Calculations
U31; E71 Spout
Georgia-Pacific Gypsum LLC
Camden, NJ

<i>Throughput Summary - BOP180001</i>	
E106 Total Operating Hours (hrs) ²	8,760
E71 Total Operating Hours (hrs) ²	1,000
E71 Total Throughput (tons/hr) ²	50
Exhaust temperature for E71	190
Grain Loading (grains/dscf) ⁴	0.02
CD24 Fan Capacity (acfm) ²	8,000
CD24 Fan Capacity (dscfm)	6,523
E71 Booster Fan Capacity (acfm) ³	1,000
E71 Booster Fan Capacity (dscfm)	815

<i>Throughput Summary - Proposed Modification</i>	
E106 Total Operating Hours (hrs) ²	8,760
E71 Total Operating Hours (hrs) ¹	8,760
E71 Total Throughput (tons/hr) ²	50
Exhaust temperature for E71	190
Grain Loading (grains/dscf) ⁴	0.02
CD24 Fan Capacity (acfm) ²	8,000
CD24 Fan Capacity (dscfm)	6,523
E71 Booster Fan Capacity (acfm) ³	1,000
E71 Booster Fan Capacity (dscfm)	815

<i>Emissions - BOP180001</i>	OS1	OS2	OS3	OS4	OS5	OS6	OS7	OS8	OS9	OS10	OS11				
Pollutant	E31 Hourly Emissions (lb/hr) ³	E32 Hourly Emissions (lb/hr) ³	E33 Hourly Emissions (lb/hr) ³	E34 Hourly Emissions (lb/hr) ³	E35 Hourly Emissions (lb/hr) ³	E36 Hourly Emissions (lb/hr) ³	E37 Hourly Emissions (lb/hr) ³	E71 Hourly Emissions (lb/hr) ³	E57 Hourly Emissions (lb/hr) ³	E58 Hourly Emissions (lb/hr) ³	E106 Hourly Emissions (lb/hr) ³	E71 Annual Emissions (tpy)	E106 Annual Emissions (tpy)	U31 Annual Emissions (tpy)	U31 Emission Rate (lb/hr)
PM ₁₀	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.10	< 0.05	< 0.05	0.13	0.05	0.57	0.62	1.09
PM _{2.5}	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.10	< 0.05	< 0.05	0.13	0.05	0.57	0.62	1.09
TSP	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.10	< 0.05	< 0.05	0.22	0.05	0.96	1.01	1.09
<i>uncontrolled emission rate</i>															55.9

<i>Emissions - Proposed Modification</i>	OS1	OS2	OS3	OS4	OS5	OS6	OS7	OS8	OS9	OS10	OS11				
Pollutant	E31 Hourly Emissions (lb/hr) ³	E32 Hourly Emissions (lb/hr) ³	E33 Hourly Emissions (lb/hr) ³	E34 Hourly Emissions (lb/hr) ³	E35 Hourly Emissions (lb/hr) ³	E36 Hourly Emissions (lb/hr) ³	E37 Hourly Emissions (lb/hr) ³	E71 Hourly Emissions (lb/hr) ³	E57 Hourly Emissions (lb/hr) ³	E58 Hourly Emissions (lb/hr) ³	E106 Hourly Emissions (lb/hr) ³	E71 Annual Emissions (tpy)	E106 Annual Emissions (tpy)	U31 Annual Emissions (tpy)	U31 Emission Rate (lb/hr)
PM ₁₀	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.14	< 0.05	< 0.05	0.13	0.61	0.57	4.90	1.12
PM _{2.5}	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.14	< 0.05	< 0.05	0.13	0.61	0.57	4.90	1.12
TSP	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.14	< 0.05	< 0.05	0.22	0.61	0.96	4.90	1.12
<i>uncontrolled emission rate</i>															489.8

Notes:

- Total operating hours based on operating schedule of 24 hrs/day 7 days/week for 12 months.
- Based on BOP180001.
- Truck loading performed with separate fan rated at 1,000 acfm at 190 °F that discharges dust back to bin vent. Spout is double-walled, meaning that material flows through inner portion while [?] captures fugitive dust from truck loading.
- N.J.A.C. 7:27-6.2(a)4 & Table 2 to Subpart 000 of Part 60 - Stack Emission Limits for Affected Facilities with Capture Systems.

Methodology:

- Emissions are calculated using the following formulas:

Annual Emissions (tpy) = Hourly Emissions Rate × Operating Hours × k

where, **k = constant, 1 ton / 2000 lb**

$$dscfm = \frac{acfm \times (x+k)}{(y+k)} (100 - \% \text{ moisture})$$

where, **x = standard temperature, 70°F**
y = actual temperature °F
k = constant, 450 °F

$$\text{uncontrolled emissions rate} = \frac{dscfm \times 60 \frac{\text{mins}}{\text{hour}} \times 0.02 \frac{\text{grains}}{\text{dscf}} \times t}{k} / (100\% - 99\%)$$

where, **t = operating hours**
k = conversion from grains to pounds, 7000 grains/lb
assume. baahouse efficiency is assume to be 99%

$$\text{Hourly Emissions Rate} = \frac{dscfm \times 60 \frac{\text{mins}}{\text{hour}} \times 0.02 \frac{\text{grains}}{\text{dscf}}}{k}$$

where, **k = constant, 7000 grains/lb**

Attachment 4
Emission Calculations
U31; E71 Spout
Georgia-Pacific Gypsum LLC

~~Camden, NJ~~

<i>Emissions - Currently Permitted (BOP200001)</i>	<i>OS1</i>	<i>OS2</i>	<i>OS3</i>	<i>OS4</i>	<i>OS5</i>	<i>OS6</i>
Pollutant	E43 (Bag Packer) (lb/hr) ⁽³⁾	E44 (Bulk Plaster Blender and Weigher) (lb/hr) ⁽³⁾	E45 (#1 Rock Bin Transfer - 11 Belt) (lb/hr) ⁽³⁾	E46 (#2 Rock Bin Transfer - 11 Belt) (lb/hr) ⁽³⁾	E47 (Rock Transfer - 10 Belt to 11 Belt) (lb/hr) ⁽³⁾	E102 (Bag Packer 2) (lb/hr) ⁽³⁾
TSP	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

(3) Based on TVOP BOP200001.

<i>Technical Summary - Proposed Addition of OS7</i>	
Emission Unit No.	U36
Control Device No.	CD26
Emission Point No.	PT36
Maximum Annual Operation (hr/yr):	8,760
Actual exhaust flow rate (acfm):	5000
Actual exhaust temperature (°F):	110
Standard temperature (°F):	70
Outlet grain loading PM ₅ ⁽¹⁾ (gr/dscf):	0.02
Outlet grain loading PM ⁽⁴⁾ (gr/dscf):	0.014

(1) Source: 7:27-6.2.

(4) Source: NSPS Subpart OOO, for facilities constructed/modified/reconstructed after April 22, 2008.

<i>Emissions - Proposed Addition of OS7</i>	<i>OS1</i>	<i>OS2</i>	<i>OS3</i>	<i>OS4</i>	<i>OS5</i>	<i>OS6</i>	<i>OS7</i>	<i>OS0</i>
Pollutant	E43 (Bag Packer) (lb/hr) ⁽⁵⁾	E44 (Bulk Plaster Blender and Weigher) (lb/hr) ⁽⁵⁾	E45 (#1 Rock Bin Transfer - 11 Belt) (lb/hr) ⁽⁵⁾	E46 (#2 Rock Bin Transfer - 11 Belt) (lb/hr) ⁽⁵⁾	E47 (Rock Transfer - 10 Belt to 11 Belt) (lb/hr) ⁽⁵⁾	E102 (Bag Packer 2) (lb/hr) ⁽⁵⁾	Bulk Bagger (lb/hr) ⁽⁶⁾	Annual Emissions (ton/yr) ⁽⁷⁾
TSP	7.00E-04	2.80E-03	1.96E-02	1.96E-02	1.96E-02	7.00E-04	0.49	2.17

(5) Calculated using emission factors from AP-42, Table 11.19.2-2. Detailed calculations were included with BOP190004, submitted in July 2019.

(6) Requested limit determined via calculation using the NSPS outlet grain loading.

(7) Annual limit associated with previously calculated lb/hr emission rate for OS7.

Methodology:

- Emissions are calculated using the following formulas:

$$\text{Annual Emissions (tpy)} = \text{Hourly Emissions Rate} \times \text{Operating Hours} \times k$$

where, $k = \text{constant, } 1 \text{ ton} / 2000 \text{ lb}$

$$dscfm = \frac{acfm \times (x+k)}{(y+k)} (100 - \% \text{ moisture})$$

where, $x = \text{standard temperature, } 70^{\circ}\text{F}$

$y = \text{actual temperature } ^{\circ}\text{F}$

$k = \text{constant, } 459.67^{\circ}\text{R}$

$$\text{uncontrolled emissions rate} = \frac{dscfm \times 60 \frac{\text{mins}}{\text{hour}} \times 0.02 \frac{\text{grains}}{\text{dscf}} \times t}{k} / (100\% - 99\%)$$

where, $t = \text{operating hours}$

$k = \text{conversion from grains to pounds, } 7000 \text{ grains/lb}$

assume, $\text{baghouse efficiency is assume to be } 99\%$

$$\text{Hourly Emissions Rate} = \frac{dscfm \times 60 \frac{\text{mins}}{\text{hour}} \times 0.02 \frac{\text{grains}}{\text{dscf}}}{k}$$

where, $k = \text{constant, } 7000 \text{ grains/lb}$