20.11.41 NMAC
"AUTHORITY-TO-CONSTRUCT"
AIR QUALITY PERMIT REVISION #359-M2-RV1
APPLICATION

Albuquerque, New Mexico

PREPARED FOR
CORESLAB STRUCTURES (ALBUQUERQUE), INC.

APRIL 2019
REVISED JUNE 6, 2019

Prepared by

Montrose Air Quality Services, LLC

MONTROSE
AIR QUALITY SERVICES

Introduction

With this 20.11.41 NMAC Permit #359-M2-RV1 revision application, Coreslab Structures (Albuquerque), Inc. (Coreslab) is submitting a significant revision application to include additional sources to their Albuquerque Facility operations. These additional sources include; dry outdoor abrasive blasting, additional storage silo, and 300-gallon gasoline storage tank.

Coreslab has retained Montrose Air Quality Services, LLC (Montrose) to assist with the permit application. The location of Coreslab Albuquerque Facility is 2800 2nd Street SW.

The permitted operating time for the facility's concrete production is 12 hours per day (7 AM to 7 PM) at 250 cubic yards per day.

For proposed abrasive blasting operations, Coreslab will take site-specific conditions on daily abrasive use and hours of operation. For the months of November through February the daily usage will be limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 6 PM. For the months of March through October the daily usage will be limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 7 PM. For modeling, the hourly blocks vary starting from 7 AM then shifting on 2-hour intervals for 5 separate model runs as summarized on Table 1.

TABLE 1: Abrasive Blasting Model Scenario Time Segments

Model Scenario	Time Segments 5-Hour Blocks March - October	Time Segments 5-Hour Blocks November - February
1	7 AM to 12 PM	7 AM to 12 PM
2	9 AM to 2 PM	9 AM to 2 PM
3	11 AM to 4 PM	11 AM to 4 PM
4	1 PM to 6 PM	1 PM to 6 PM
5	2 PM to 7 PM	1 PM to 6 PM

No change in existing permitted sources is proposed with this permit revision. No startup/shutdown emission rates are expected to be greater than what is proposed for normal operations of the new sources. All new controls will be operating and functioning correctly prior to the start of production.

The preliminary operational plan defining the measures to be taken to mitigate source emissions during malfunction, startup, or shutdown are as follows:

STARTUP AND SHUTDOWN PROCEDURES

Water Truck

Startup

Check water supply, inspect nozzles and open all associated valves before startup.

Shutdown

Inspect nozzles and close all associated valves after shutdown.

Baghouses

Startup

Visual inspection of: product lines, vent lines and all fittings, including dust shroud, baghouse blower before startup.

Shutdown

Check that all pressurized systems are off.

OPERATIONS PLAN

Water Truck Operation

A water truck to be operated, as needed, at plant site disturbed areas, storage piles, and haul truck traffic areas to prevent excess visible emissions. These activities include; unpaved haul roads, storage piles and active disturbed areas. Water spray application rate will be determined based on the occurrence of visible dust and may vary depending on existing road conditions, traffic, wind, temperature, and precipitation.

Baghouse Operation

The baghouses will be operated at all times when pertinent equipment is operating. A visual inspection of the dust collector exits during mixers (Units 9 and 10) operation will be done once per day to make sure no excess visible emissions occur to verify the baghouse is operating correctly. A visual inspection of silo baghouses (Unit 11, 12, 13, 25) exits will be done once per silo loading to make sure no excess visible emissions occur to verify the baghouse is operating correctly. If excessive visible emissions are observed from dust collector/baghouse exit, the equipment will immediately shutdown to prevent loss of product until repairs can be made.

MAINTENANCE PLAN

Water Truck Maintenance

A safety check and equipment check will be conducted daily. Normal vehicle maintenance will be performed regularly or as needed.

Processing Plant Water Spray Dust Suppression Maintenance

Visual inspections will be made monthly to verify proper functioning of control equipment. When emissions are suspected to approach compliance values, equipment will be checked for problems and repaired.

If you have any questions regarding this permit application please call Paul Wade of Montrose Air Quality Services, LLC at (505) 830-9680 x6 or Greg Krause of Coreslab Services at (505) 967-8137.

The contents of this application packet include:

20.11.41 NMAC Permit Fee Review
20.11.41 NMAC Permit Checklist
20.11.41 NMAC Permit Application Forms

Attachment A:	Figure A-1: Coreslab Structure's Albuquerque Facility Site Layout
Attachment B:	Emission Calculations
Attachment C:	Emission Calculations Support Documents
Attachment D:	Figure D-1: Aerial Map Showing Site Location
Attachment E:	Facility Process Description
Attachment F:	Regulatory Applicability Determinations
Attachment G:	Dispersion Modeling Summary and Report
Attachment H:	Public Notice Documents

Attachment A
Facility Process Plot Plan

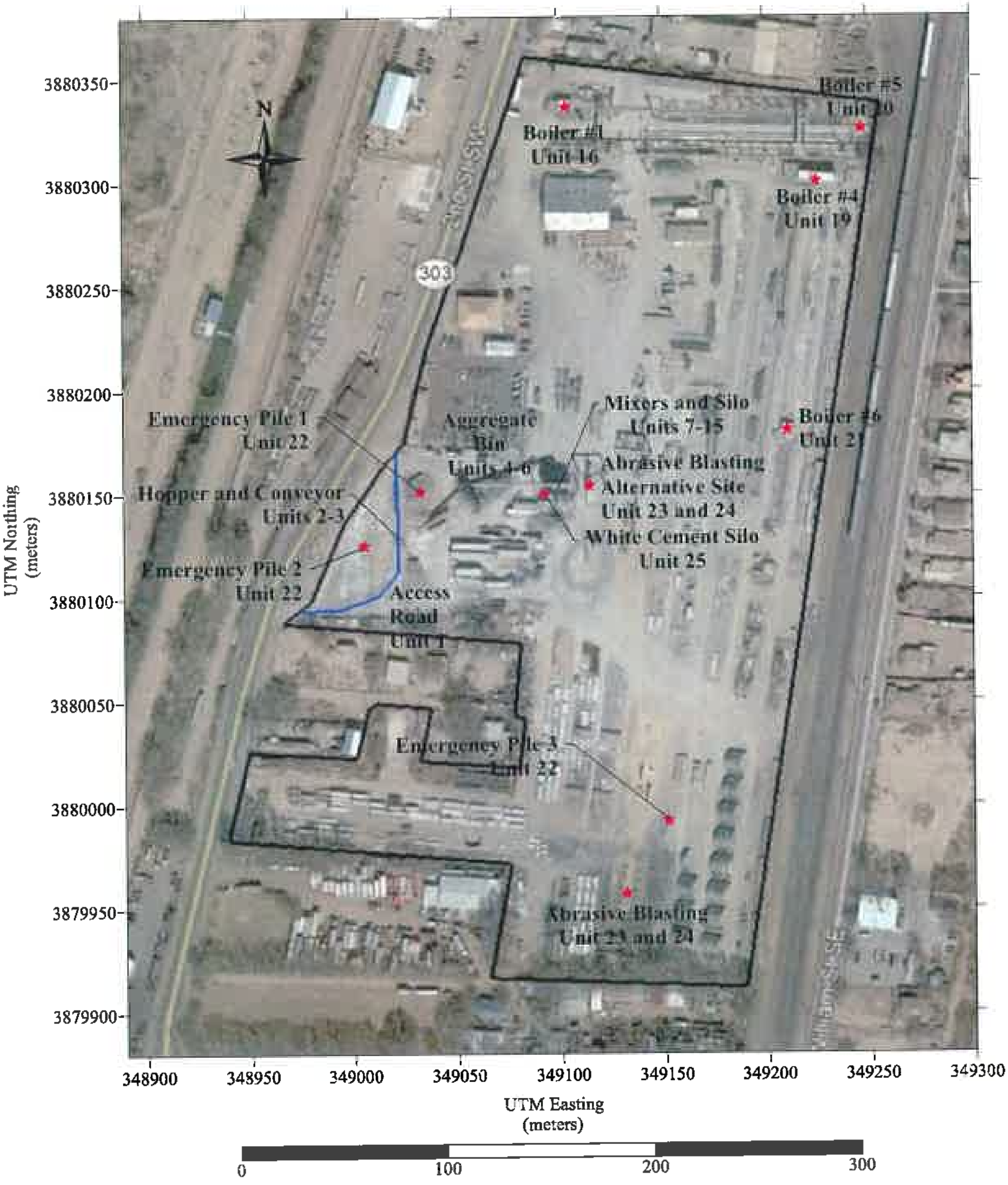

Figure A-1: Coreslab Structure's Albuquerque Facility Site Layout

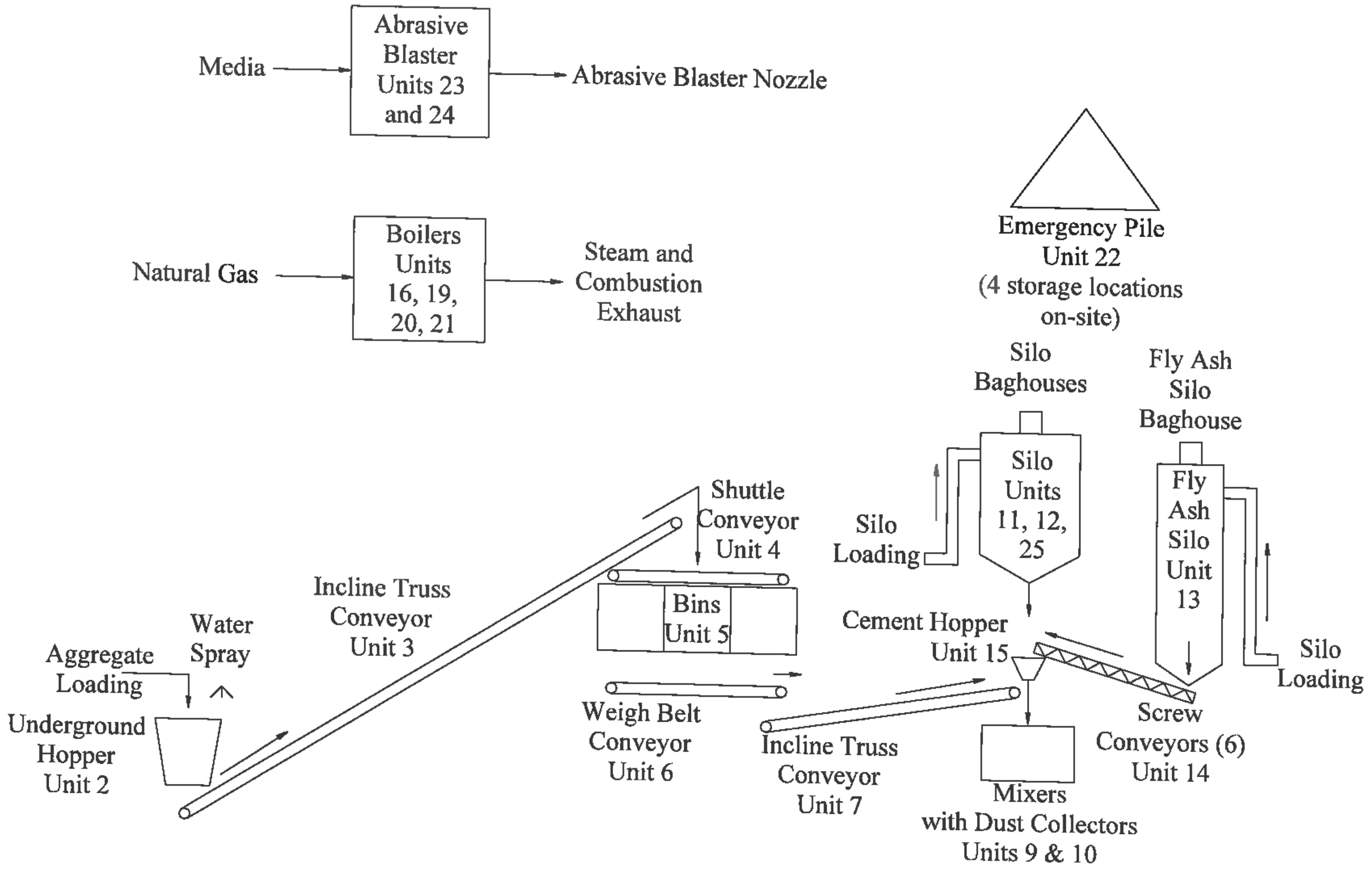

Figure A-2: Coreslab Process Flow Diagram

Attachment B
Emissions Calculations

Pre-Control Particulate Emission Rates

MATERIAL HANDLING ($PM_{2.5}$, PM_{10}, AND TSP)

To estimate pre-control particulate emission rates for abrasive blasting, emission factor for PM was obtained from EPA AP-42 Section 11.12 adjusted to Grit or Similar abrasive by multiplying Table 13.2.6-1 emission rate of 55 lbs/1000 lbs of abrasive (for windspeeds of 10 MPH) by 24% (AP-42 Section 13.2.6.3). This is equal to a Total PM emission rate of 13.2 lbs/1000 pounds of abrasive. To determine emission factors for TSP, PM_{10} and $PM_{2.5}$, particulate size distribution testing found in Advanced Technology Institute document "Residual Risk from Abrasive Blasting Emissions: Particle Size and Metal Speciation", dated December 2005, Table 2: "Size Distribution of Airborne Particles from Dry Abrasive Blasting, Single Particle Optical Scanning (SPOS) Method" was used. In Table 2, of abrasive that is proposed for the site, the highest percentage for PM_{30} (TSP), PM_{10} and $PM_{2.5}$ is found in coal slag abrasive at PM_{30} – 36.62%, PM_{10} – 8.87%, and $PM_{2.5}$ – 0.63%.

Table 2: Size Distribution of Airborne Particles from Dry Abrasive Blasting
Single Particle Optical Scanning (SPOS) Method

Particle Size Micron	Cumulative Mass % (all particles less than the size indicated)					
	Barshot %	Coal Slag %	Copper Slag %	Garnet %	Steel Grit %	Sp. Sand %
1.01	0.16	0.19	0.22	0.16	0.33	0.17
2.46	0.37	0.63	0.54	0.37	0.92	0.57
3.93	0.56	1.28	0.86	0.56	1.56	1.13
6.99	1.16	3.89	2.42	1.16	4.56	3.06
10.07	2.11	8.87	7.27	2.11	9.92	6.19
15.29	4.09	18.74	21.47	4.09	17.62	12.00
19.86	6.02	25.59	30.62	6.02	23.15	16.30
24.47	8.46	31.13	36.18	8.46	28.82	20.67
30.16	12.54	36.62	40.98	12.54	35.94	26.89
400	100.00	100.00	100.00	100.00	100.00	100.00

Normalizing this to Total PM (PM_{400}), the ratio of TSP/ PM_{400} is 0.3662 the ratio of PM_{10}/ PM_{400} is 0.0877, and for $PM_{2.5}$/ PM_{400} is 0.0063. The emission rates for abrasive blasting are as follows:

Pollutant	Particle Size Distribution %	Ratio to PM400	Emission Factor (lbs/1000 lbs of abrasives)
PM400	100.0		13.2
PM30	36.62	0.3662	4.833840
PM10	8.87	0.0887	1.170840
PM2.5	0.63	0.0063	0.083160

Pre-control particulate emissions rates for the proposed additional silo loading was obtained from EPA's Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Fifth

Edition, Section 11.12 (06/06), Table 11.12-2 "Cement Unloading to Elevated Storage Silo". To determine missing PM$_{2.5}$ emission factors the ratio of 0.995/0.050 from TSP/PM$_{2.5}$ uncontrolled emission equations found in AP-42 Section 11.12 (06/06), Table 11.12-3 "Cement Unloading to Elevated Storage Silo" was used.

Abrasive Blasting Emission Factors:

Process Unit	TSP Emission Factor (lbs/1000 lbs of Abrasive)	PM$_{10}$ Emission Factor (lbs/1000 lbs of Abrasive)	PM$_{2.5}$ Emission Factor (lbs/1000 lbs of Abrasive)
Uncontrolled Abrasive Blasting	4.833840	1.170840	0.083160

AP-42 Section 11.12 Table 11.12-2 Uncontrolled Emission Factors:

Process Unit	TSP Emission Factor (lbs/ton)	PM$_{10}$ Emission Factor (lbs/ton)	PM$_{2.5}$ Emission Factor (lbs/ton)
Mineral Filler Silo Loading	0.73	0.46	0.036

The following equation was used to calculate the hourly emission rate for each process unit:

Emission Rate = Process Rate * Emission Factor

The following equation was used to calculate the annual emission rate for each process unit:

$$\text{Emission Rate} = \frac{\text{Emission Rate} * 3756 \text{ (permit limit hr/year)}}{2000 \text{ lbs/ton}}$$

Table B-1 Pre-Controlled Additional Particulate Emission Rates

Unit #	Process Unit Description	Process Rate	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM$_{10}$ Emission Rate (lbs/hr)	PM$_{10}$ Emission Rate (tons/yr)	PM$_{2.5}$ Emission Rate (lbs/hr)	PM$_{2.5}$ Emission Rate (tons/yr)
23/ 24	Abrasive Blasting	2459 lbs/hr 9,236,004 lbs/yr	11.89	22.32	2.88	5.41	0.20	0.38
25	Silica Fume Silo	25 ton/hr 14,976 tons/yr	18.25	5.47	11.50	3.44	0.90	0.27

Controlled Particulate Emission Rates

No controls or emission reductions for abrasive blasting (Units 23 and/or 24) with the exception of limiting annual abrasive blasting usage.

Particulate emission control for silica fume silo loading is a baghouse with a control efficiency of at least 99%. Additionally, the loading of silica fume is restricted to annual production limits.

CONTROLLED MATERIAL HANDLING ($PM_{2.5}$, PM_{10}, AND TSP)

Abrasive Blasting Emission Factors:

Process Unit	TSP Emission Factor (lbs/1000 lbs of Abrasive)	PM_{10} Emission Factor (lbs/1000 lbs of Abrasive)	$PM_{2.5}$ Emission Factor (lbs/1000 lbs of Abrasive)
Uncontrolled Abrasive Blasting	4.833840	1.170840	0.083160

AP-42 Section 11.12 Table 11.12-2 Controlled Emission Factors:

Process Unit	TSP Emission Factor (lbs/ton)	PM_{10} Emission Factor (lbs/ton)	$PM_{2.5}$ Emission Factor (lbs/ton)
Mineral Filler Silo Loading	0.0073	0.0046	0.00036

The following equation was used to calculate the hourly emission rate for each process unit:

$$\text{Emission Rate (lbs/hour)} = \text{Process Rate} * \text{Emission Factor}$$

The following equation was used to calculate the annual emission rate for each process unit:

$$\text{Emission Rate (tons/year)} = \frac{\text{Hourly Emission Factor} * \text{Annual Throughput}}{2000 \text{ lbs/ton}}$$

Table B-2 Controlled Additional Particulate Emission Rates

Unit #	Process Unit Description	Process Rate	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
23/ 24	Abrasive Blasting	2459 lbs/hr 3,848,335 lbs/yr	11.89	9.30	2.88	2.25	0.20	0.16
25	Silica Fume Silo	25 ton/hr 14,976 tons/yr	0.18	0.055	0.12	0.034	0.0090	0.0027

To calculate existing source $PM_{2.5}$ emission rates, a $PM_{2.5}/PM_{10}$ ratio was used. The following ratios were used:

Operation Type	PM10 Factor	PM2.5 Factor	PM2.5/PM10 Ratio	Basis
Cement/Fly Ash Mixers, Cement/Fly Ash Silos, and Cement Hopper	0.13	0.03	0.23077	AP-42 Table 11.12-4 "Controlled Central Mixer" k factor
Aggregate Handling	0.35	0.053	0.15143	AP-42 Table 13.2.4, k factor
Haul Road	1.5	0.15	0.10	AP-42 Table 13.2.2-2, k factor

300-Gallon Gasoline Storage Tank (Unit 26)

EPA's TANK 4.0.9d emission rate program was used to determine VOC emission rates from the above ground 300-gallon gasoline storage tank (Unit 26). The annual gasoline throughput of 4,500 gallons per year. The following is the output report for the 300-gallon gasoline storage tank. Hourly VOC emission rate is 0.032 lbs/hr and 0.14 tons/year.

TANKS 4.0.9d

Emissions Report - Detail Format

Tank Identification and Physical Characteristics

Identification	
User Identification:	Coreslab
City:	Albuquerque
State:	New Mexico
Company:	Coreslab
Type of Tank:	Horizontal Tank
Description:	Coreslab 300 Gallon Gasoline Storage Tank
Tank Dimensions	
Shell Length (ft):	6.00
Diameter (ft):	3.00
Volume (gallons):	300.00
Turnovers:	15.00
Net Throughput(gal/yr):	4,500.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N
Paint Characteristics	
Shell Color/Shade:	Aluminum/Diffuse
Shell Condition	Good
Breather Vent Settings	
Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meteorological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Coreslab - Horizontal Tank
Albuquerque, New Mexico

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 10)	All	65.98	53.54	78.42	58.75	5.8155	4.5676	7.3220	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Coreslab - Horizontal Tank
Albuquerque, New Mexico

Annual Emission Calculations	
Standing Losses (lb):	238.5522
Vapor Space Volume (cu ft):	27.0137
Vapor Density (lb/cu ft):	0.0680
Vapor Space Expansion Factor:	0.5199
Vented Vapor Saturation Factor:	0.6838
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	27.0137
Tank Diameter (ft):	3.0000
Effective Diameter (ft):	4.7885
Vapor Space Outage (ft):	1.5000
Tank Shell Length (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0680
Vapor Molecular Weight (lb/lb-mole):	66.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.8155
Daily Avg. Liquid Surface Temp. (deg. R):	525.6478
Daily Average Ambient Temp. (deg. F):	56.1542
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	518.4242
Tank Paint Solar Absorptance (Shell):	0.6000
Daily Total Solar Insulation Factor (Btu/sqft day):	1,765.3167
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.5199
Daily Vapor Temperature Range (deg. R):	49.7633
Daily Vapor Pressure Range (psia):	2.7544
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.8155
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	4.5676
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	7.3220
Daily Avg. Liquid Surface Temp. (deg R):	525.6478
Daily Min. Liquid Surface Temp. (deg R):	513.2069
Daily Max. Liquid Surface Temp. (deg R):	538.0886
Daily Ambient Temp. Range (deg. R):	27.9250
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.6838
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	5.8155
Vapor Space Outage (ft):	1.5000
Working Losses (lb):	41.1236
Vapor Molecular Weight (lb/lb-mole):	66.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.8155
Annual Net Throughput (gal/yr.):	4,500.0000
Annual Turnovers:	15.0000
Turnover Factor:	1.0000
Tank Diameter (ft):	3.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	279.6758

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Coreslab - Horizontal Tank
Albuquerque, New Mexico

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 10)	41.12	238.55	279.68

Table B-3 Summary of Allowable NOx, CO, SO2, and PM Emission Rates

		Allowable Emission Totals													
		CO		NOx		SO_2		VOC		TSP		PM_{10}		$PM_{2.5}$	
Unit #	Description	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
1	Haul road									0.46	0.58	0.09	0.12	0.009	0.012
2	Sand/Gravel Hopper									0.26	0.32	0.12	0.15	0.018	0.023
3	Incline Truss Conveyor Belt 1									0.07	0.08	0.03	0.04	0.0045	0.0061
4	Shuttle Conveyor									0.07	0.08	0.03	0.04	0.0045	0.0061
5	Storage Bins (6)									0.26	0.32	0.12	0.15	0.018	0.023
6	Weight Belt Conveyor									0.13	0.17	0.06	0.08	0.0091	0.0121
7	Incline Truss Conveyor Belt 2									0.13	0.17	0.06	0.08	0.0091	0.0121
9	Mixer #1 with Baghouse									0.02	0.03	0.01	0.01	0.0023	0.0023
10	Mixer #2 with Baghouse									0.02	0.03	0.01	0.01	0.0023	0.0023
11	100 Ton Cement Silo with Baghouse									0.01	0.02	0.01	0.01	0.0023	0.0023
12	100 Ton Cement Silo with Baghouse									0.01	0.02	0.01	0.01	0.0023	0.0023
13	100 Ton Fly Ash Silo with Baghouse									0.01	0.02	0.01	0.01	0.0023	0.0023
15	Cement Hopper									0.06	0.07	0.03	0.04	0.0069	0.0092
16	Boiler #1	0.04	0.09	0.05	0.11	0.0003	0.001	0.003	0.007	0.004	0.01	0.004	0.01	0.004	0.01
17	Boiler #2	0.04	0.09	0.05	0.11	0.0003	0.001	0.003	0.007	0.004	0.01	0.004	0.01	0.004	0.01
18	Boiler #3	0.04	0.09	0.05	0.11	0.0003	0.001	0.003	0.007	0.004	0.01	0.004	0.01	0.004	0.01
19	Boiler #4	0.59	1.29	0.7	1.53	0.002	0.005	0.02	0.08	0.05	0.1	0.05	0.1	0.05	0.1
20	Boiler #5	0.29	0.64	0.35	0.77	0.002	0.005	0.02	0.04	0.03	0.02	0.03	0.02	0.03	0.02
21	Boiler #6	0.04	0.09	0.05	0.11	0.0003	0.0007	0.003	0.007	0.004	0.01	0.004	0.01	0.004	0.01

Table B-3 Summary of Allowable NOx, CO, SO2, and PM Emission Rates

		Allowable Emission Totals													
		CO		NOx		SO_2		VOC		TSP		PM_{10}		$PM_{2.5}$	
Unit #	Description	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
22	Aggregate Handling									0.09	0.11	0.04	0.05	0.0061	0.0076
23	Aggregate Blaster #1									11.89	9.30	2.88	2.25	0.20	0.16
24	Aggregate Blaster #2														
25	Silica Fume Silo with Baghouse									0.18	0.055	0.12	0.034	0.0090	0.0027
26	300-Gallon Gasoline Storage Tank							0.032	0.14						
	Total	**1.04**	**2.29**	**1.25**	**2.74**	**0.0052**	**0.014**	**0.084**	**0.29**	**13.76**	**11.52**	**3.71**	**3.23**	**0.40**	**0.42**

Attachment C
Emission Calculations Supporting Documents

11.12 CONCRETE BATCHING

11.12-1 Process Description [1-5]

Concrete is composed essentially of water, cement, sand (fine aggregate) and coarse aggregate. Coarse aggregate may consist of gravel, crushed stone or iron blast furnace slag. Some specialty aggregate products could be either heavyweight aggregate (of barite, magnetite, limonite, ilmenite, iron or steel) or lightweight aggregate (with sintered clay, shale, slate, diatomaceous shale, perlite, vermiculite, slag pumice, cinders, or sintered fly ash). Supplementary cementitious materials, also called mineral admixtures or pozzolan minerals may be added to make the concrete mixtures more economical, reduce permeability, increase strength, or influence other concrete properties. Typical examples are natural pozzolans, fly ash, ground granulated blast-furnace slag, and silica fume, which can be used individually with portland or blended cement or in different combinations. Chemical admixtures are usually liquid ingredients that are added to concrete to entrain air, reduce the water required to reach a required slump, retard or accelerate the setting rate, to make the concrete more flowable or other more specialized functions.

Approximately 75 percent of the U.S. concrete manufactured is produced at plants that store, convey, measure and discharge these constituents into trucks for transport to a job site. At most of these plants, sand, aggregate, cement and water are all gravity fed from the weight hopper into the mixer trucks. The concrete is mixed on the way to the site where the concrete is to be poured. At some of these plants, the concrete may also be manufactured in a central mix drum and transferred to a transport truck. Most of the remaining concrete manufactured are products cast in a factory setting. Precast products range from concrete bricks and paving stones to bridge girders, structural components, and panels for cladding. Concrete masonry, another type of manufactured concrete, may be best known for its conventional 8 x 8 x 16-inch block. In a few cases concrete is dry batched or prepared at a building construction site. Figure 11.12-1 is a generalized process diagram for concrete batching.

The raw materials can be delivered to a plant by rail, truck or barge. The cement is transferred to elevated storage silos pneumatically or by bucket elevator. The sand and coarse aggregate are transferred to elevated bins by front end loader, clam shell crane, belt conveyor, or bucket elevator. From these elevated bins, the constituents are fed by gravity or screw conveyor to weigh hoppers, which combine the proper amounts of each material.

11.12-2 Emissions and Controls [6-8]

Particulate matter, consisting primarily of cement and pozzolan dust but including some aggregate and sand dust emissions, is the primary pollutant of concern. In addition, there are emissions of metals that are associated with this particulate matter. All but one of the emission points are fugitive in nature. The only point sources are the transfer of cement and pozzolan material to silos, and these are usually vented to a fabric filter or "sock". Fugitive sources include the transfer of sand and aggregate, truck loading, mixer loading, vehicle traffic, and wind erosion from sand and aggregate storage piles. The amount of fugitive emissions generated during the transfer of sand and aggregate depends primarily on the surface moisture content of these materials. The extent of fugitive emission control varies widely from plant to plant. Particulate emission factors for concrete batching are give in Tables 11.12-1 and 11.12-2.

TABLE 11.12-2 (ENGLISH UNITS)
EMISSION FACTORS FOR CONCRETE BATCHING [a]

Source (SCC)	Uncontrolled				Controlled			
	Total PM	Emission Factor Rating	Total PM_{10}	Emission Factor Rating	Total PM	Emission Factor Rating	Total PM_{10}	Emission Factor Rating
Aggregate transfer [b] (3-05-011-04,-21,23)	0.0069	D	0.0033	D	ND		ND	
Sand transfer [b] (3-05-011-05,22,24)	0.0021	D	0.00099	D	ND		ND	
Cement unloading to elevated storage silo (pneumatic)[c] (3-05-011-07)	0.72	E	0.46	E	0.00099	D	0.00034	D
Cement supplement unloading to elevated storage silo (pneumatic)[d] (3-05-011-17)	3.14	E	1.10	E	0.0089	D	0.0049	E
Weigh hopper loading [e] (3-05-011-08)	0.0051	D	0.0024	D	ND		ND	
Mixer loading (central mix)[f] (3-05-011-09)	0.544 or Eqn. 11.12-1	B	0.134 or Eqn. 11.12-1	B	0.0173 or Eqn. 11.12-1	B	0.0048 or Eqn. 11.12-1	B
Truck loading (truck mix)[g] (3-05-011-10)	0.995	B	0.278	B	0.0568 or Eqn. 11.12-1	B	0.0160 or Eqn. 11.12-1	B
Vehicle traffic (paved roads)	See AP-42 Section 13.2.1							
Vehicle traffic (unpaved roads)	See AP-42 Section 13.2.2							
Wind erosion from aggregate and sand storage piles	See AP-42 Section 13.2.5							

ND = No data

[a] All emission factors are in lb of pollutant per ton of material loaded unless noted otherwise. Loaded material includes course aggregate, sand, cement, cement supplement and the surface moisture associated with these materials. The average material composition of concrete batches presented in references 9 and 10 was 1865 lbs course aggregate, 1428 lbs sand, 491 lbs cement and 73 lbs cement supplement. Approximately 20 gallons of water was added to this solid material to produce 4024 lbs (one cubic yard) of concrete.

[b] Reference 9 and 10. Emission factors are based upon an equation from AP-42, Section 13.2.2, with k_{PM-10} =.35, k_{PM} = .74, U = 10mph, $M_{aggregate}$ =1.77%, and M_{sand} = 4.17%. These moisture contents of the materials ($M_{aggregate}$ and M_{sand}) are the averages of the values obtained from Reference 9 and Reference 10.

[c] The uncontrolled PM & PM-10 emission factors were developed from Reference 9. The controlled emission factor for PM was developed from References 9, 10, 11, and 12. The controlled emission factor for PM-10 was developed from References 9 and 10.

[d] The controlled PM emission factor was developed from Reference 10 and Reference 12, whereas the controlled PM-10 emission factor was developed from only Reference 10.

[e] Emission factors were developed by using the Aggregate and Sand Transfer Emission Factors in conjunction with the ratio of aggregate and sand used in an average yard^3 of concrete. The unit for these emission factors is lb of pollutant per ton of aggregate and sand.

[f] References 9, 10, and 14. The emission factor units are lb of pollutant per ton of cement and cement supplement. The general factor is the arithmetic mean of all test data.

[g] Reference 9, 10, and 14. The emission factor units are lb of pollutant per ton of cement and cement supplement. The general factor is the arithmetic mean of all test data.

The particulate matter emissions from truck mix and central mix loading operations are calculated in accordance with the values in Tables 11.12-1 or 11.12-2 or by Equation 11.12-1[14] when site specific data are available.

$$E = k\,(0.0032)\left[\frac{U^a}{M^b}\right] + c \qquad \text{Equation 11.12-1}$$

E = Emission factor in lbs./ton of cement and cement supplement
k = Particle size multiplier (dimensionless)
U = Wind speed, miles per hour (mph)
M = Minimum moisture (% by weight) of cement and cement supplement
a, b = Exponents
c = Constant

The parameters for Equation 11.12-1 are summarized in Tables 11.12-3 and 11.12-4.

Table 11.12-3. Equation Parameters for Truck Mix Operations

Condition	Parameter Category	k	a	b	c
Controlled[1]	Total PM	0.8	1.75	0.3	0.013
	PM_{10}	0.32	1.75	0.3	0.0052
	$PM_{10-2.5}$	0.288	1.75	0.3	0.00468
	$PM_{2.5}$	0.048	1.75	0.3	0.00078
Uncontrolled[1]	Total PM	0.995			
	PM_{10}	0.278			
	$PM_{10-2.5}$	0.228			
	$PM_{2.5}$	0.050			

Table 11.12-4. Equation Parameters for Central Mix Operations

Condition	Parameter Category	k	a	b	c
Controlled[1]	Total PM	0.19	0.95	0.9	0.0010
	PM_{10}	0.13	0.45	0.9	0.0010
	$PM_{10-2.5}$	0.12	0.45	0.9	0.0009
	$PM_{2.5}$	0.03	0.45	0.9	0.0002
Uncontrolled[1]	Total PM	5.90	0.6	1.3	0.120
	PM_{10}	1.92	0.4	1.3	0.040
	$PM_{10-2.5}$	1.71	0.4	1.3	0.036
	$PM_{2.5}$	0.38	0.4	1.3	0

1. Emission factors expressed in lbs/tons of cement and cement supplement

To convert from units of lbs/ton to units of kilograms per mega gram, the emissions calculated by Equation 11.12-1 should be divided by 2.0.

Particulate emission factors per yard of concrete for an average batch formulation at a typical facility are given in Tables 11.12-4 and 11.12-5. For truck mix loading and central mix loading, the

★ PAUL WADE

HAZARD IDENTIFICATIONS

Abrasive Blasting Nozzles cannot be returned for credit or replacement after being placed into service. Damage to abrasive blasting nozzle liner or jacket may occur during shipping. If you receive a damaged abrasive blasting nozzle, contact your distributor immediately for replacement.

NOTICE

- Abrasive Blasting Nozzles cannot be returned for credit or replacement after being placed into service. Inspect abrasive blasting nozzle for damage before use. If damage is found, contact Marco.
- Do not use abrasive blasting nozzle as a hammer or drop on hard surface. Doing so may crack liner. Failure to comply with the above notice could pose a hazard to personnel or property.
- Inspect abrasive blasting nozzle washer for wear or damage. Replace washer if worn, soft, or distorted. Failure to comply with the above notice could pose a hazard to personnel or property.
- Point the abrasive blasting nozzle only at the surface being abrasive blasted. Never point the abrasive blasting nozzle or abrasive stream at yourself or others. Failure to comply with the above notice could pose a hazard to personnel or property.

⚠ WARNING

- Before using this equipment, read, understand and follow all instructions in the Operator's Manuals provided with this equipment. If the user and/or assistants cannot read or understand the warnings and instructions, the employer of the user and/or assistants must provide adequate and necessary training to ensure proper operation and compliance with all safety procedures pertaining to this equipment. If Operator's Manuals have been lost, please visit www.marco.us, or contact Marco at 563.324.2519 for replacements.

NOTICE

When it comes to air & abrasive mixtures, more is not necessarily better. Optimum abrasive blasting efficiency takes place when a lean air & abrasive mixture is used. To correctly set the abrasive metering valve, begin with the valve fully closed and slowly increase the amount of abrasive entering the airstream. As you increase the abrasive flow, watch for a "blue flame" at the exit of the abrasive blasting nozzle. Faster cutting, reduced abrasive consumption and lower clean up costs, are benefits of the "blue flame".

NOTICE

Replace abrasive blasting nozzle if liner or jacket is cracked or damaged. Replace abrasive blasting nozzle if original orifice size has worn 1/16" or more. Determine abrasive blasting nozzle wear by inserting a drill bit 1/16" larger than original size of abrasive blasting nozzle orifice. If the drill bit passes through abrasive blasting nozzle, replacement is needed.

Dry

"Blue Flame"

Air & Abrasive Consumption Chart*

Nozzle Orifice	Pressure at the Nozzle (PSI)								Air (in cfm), Abrasive & Compressor Requirements
	50	60	70	80	90	100	125	140	
No. 2 (1/8")	11 67 2.5	13 77 3	15 88 3.5	17 101 4	18 112 4.5	20 123 5	25 152 5.5	28 170 6.2	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 3 (3/16")	26 150 6	30 171 7	33 196 8	38 216 9	41 238 10	45 264 10	55 319 12	62 357 13	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 4 (1/4")	47 268 11	54 312 12	61 354 14	68 408 16	74 448 17	81 494 18	98 608 22	110 681 25	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 5 (5/16")	77 468 18	89 534 20	101 604 23	113 672 26	126 740 28	137 812 31	165 982 37	188 1100 41	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 6 (3/8")	108 668 24	126 764 28	143 864 32	161 960 36	173 1052 39	196 1152 44	237 1393 52	265 1560 58	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 7 (7/16")	147 896 33	170 1032 38	194 1176 44	217 1312 49	240 1448 54	254 1584 57	314 1931 69	352 2163 77	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 8 (1/2")	195 1160 44	224 1336 50	252 1512 56	280 1680 63	309 1856 69	338 2024 75	409 2459 90	456 2754 101	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 10 (5/8")	308 1875 68.5	356 2140 79.5	404 2422 90	452 2690 100.5	504 2973 112	546 3250 122	663 3932 146	742 4405 165	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 12 (3/4")	432 2672 96	504 3056 112	572 3456 127	644 3840 143	692 4208 154	784 4608 174.5	948 5570 209	1062 6238 230	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower

*Abrasive consumption is based on abrasive with a bulk density of 100 lbs per Cubic Foot

13.2.6 Abrasive Blasting

13.2.6.1 General[1-2]

Abrasive blasting is the use of abrasive material to clean or texturize a material such as metal or masonry. Sand is the most widely used blasting abrasive. Other abrasive materials include coal slag, smelter slags, mineral abrasives, metallic abrasives, and synthetic abrasives. Industries that use abrasive blasting include the shipbuilding industry, automotive industry, and other industries that involve surface preparation and painting. The majority of shipyards no longer use sand for abrasive blasting because of concerns about silicosis, a condition caused by respiratory exposure to crystalline silica. In 1991, about 4.5 million tons of abrasives, including 2.5 million tons of sand, 1 million tons of coal slag, 500 thousand tons of smelter slag, and 500 thousand tons of other abrasives were used for domestic abrasive blasting operations.

13.2.6.2 Process Description[1-9]

Abrasive blasting systems typically include three essential components: an abrasive container (i. e., blasting pot); a propelling device; and a blasting nozzle or nozzles. The exact equipment used depends to a large extent on the specific application and type(s) of abrasive.

Three basic methods can be used to project the abrasive towards the surface being cleaned: air pressure; centrifugal wheels; or water pressure. Air blast (or dry) systems use compressed air to propel the abrasive using either a suction-type or pressure-type process. Centrifugal wheel systems use a rotating impeller to mechanically propel the abrasive by a combination of centrifugal and inertial forces. Finally, the water (or wet) blast method uses either air pressure or water pressure to propel an abrasive slurry towards the cleaned surface.

Abrasive materials used in blasting can generally be classified as sand, slag, metallic shot or grit, synthetic, or other. The cost and properties associated with the abrasive material dictate its application. The following discusses the general classes of commonly used abrasives.

Silica sand is commonly used for abrasive blasting where reclaiming is not feasible, such as in unconfined abrasive blasting operations. Sand has a rather high breakdown rate, which can result in substantial dust generation. Worker exposure to free crystalline silica is of concern when silica sand is used for abrasive blasting.

Coal and smelter slags are commonly used for abrasive blasting at shipyards. Black Beauty™, which consists of crushed slag from coal-fired utility boilers, is a commonly used slag. Slags have the advantage of low silica content, but have been documented to release other contaminants, including hazardous air pollutants (HAP), into the air.

Metallic abrasives include cast iron shot, cast iron grit, and steel shot. Cast iron shot is hard and brittle and is produced by spraying molten cast iron into a water bath. Cast iron grit is produced by crushing oversized and irregular particles formed during the manufacture of cast iron shot. Steel shot is produced by blowing molten steel. Steel shot is not as hard as cast iron shot, but is much more durable. These materials typically are reclaimed and reused.

Synthetic abrasives, such as silicon carbide and aluminum oxide, are becoming popular substitutes for sand. These abrasives are more durable and create less dust than sand. These materials typically are reclaimed and reused.

Other abrasives include mineral abrasives (such as garnet, olivine, and staurolite), cut plastic, glass beads, crushed glass, and nutshells. As with metallic and synthetic abrasives, these other abrasives are generally used in operations where the material is reclaimed. Mineral abrasives are reported to create significantly less dust than sand and slag abrasives.

The type of abrasive used in a particular application is usually specific to the blasting method. Dry blasting is usually done with sand, metallic grit or shot, aluminum oxide (alumina), or silicon carbide. Wet blasters are operated with either sand, glass beads, or other materials that remain suspended in water.

13.2.6.3 Emissions And Controls[1,3,5-11]

Emissions —

Particulate matter (PM) and particulate HAP are the major concerns relative to abrasive blasting. Table 13.2.6-1 presents total PM emission factors for abrasive blasting as a function of wind speed. Higher wind speeds increase emissions by enhanced ventilation of the process and by retardation of coarse particle deposition.

Table 13.2.6-1 also presents fine particulate emission factors for abrasive blasting. Emission factors are presented for PM-10 and PM-2.5, which denote particles equal to or smaller than 10 and 2.5 microns in aerodynamic diameter, respectively. Emissions of PM of these size fractions are not significantly wind-speed dependent. Table 13.2.6-1 also presents an emission factor for controlled emissions from an enclosed abrasive blasting operation controlled by a fabric filter; the blasting media was 30/40 mesh garnet.

Limited data from Reference 3 give a comparison of total PM emissions from abrasive blasting using various media. The study indicates that, on the basis of tons of abrasive used, total PM emissions from abrasive blasting using grit are about 24 percent of total PM emissions from abrasive blasting with sand. The study also indicates that total PM emissions from abrasive blasting using shot are about 10 percent of total PM emissions from abrasive blasting with sand.

Hazardous air pollutants, typically particulate metals, are emitted from some abrasive blasting operations. These emissions are dependent on both the abrasive material and the targeted surface.

Controls —

A number of different methods have been used to control the emissions from abrasive blasting. Theses methods include: blast enclosures; vacuum blasters; drapes; water curtains; wet blasting; and reclaim systems. Wet blasting controls include not only traditional wet blasting processes but also high pressure water blasting, high pressure water and abrasive blasting, and air and water abrasive blasting. For wet blasting, control efficiencies between 50 and 93 percent have been reported. Fabric filters are used to control emissions from enclosed abrasive blasting operations.

Table 13.2.6-1. PARTICULATE EMISSION FACTORS FOR ABRASIVE BLASTING[a]

EMISSION FACTOR RATING: E

Source	Particle size	Emission factor, lb/1,000 lb abrasive
Sand blasting of mild steel panels[b] (SCC 3-09-002-02)	Total PM	
	5 mph wind speed	27
	10 mph wind speed	55
	15 mph wind speed	91
	PM-10[c]	13
	PM-2.5[c]	1.3
Abrasive blasting of unspecified metal parts, controlled with a fabric filter[d] (SCC 3-09-002-04)	Total PM	0.69

[a] One lb/1,000 lb is equal to 1 kg/Mg. Factors represent uncontrolled emissions, unless noted. SCC = Source Classification Code.

[b] Reference 10.

[c] Emissions of PM-10 and PM-2.5 are not significantly wind-speed dependent.

[d] Reference 11. Abrasive blasting with garnet blast media.

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Residual Risk from Abrasive Blasting Emissions: Particle Size and Metal Speciation

Final Report

Prepared for:
Advanced Technology Institute
5300 International Boulevard
North Charleston, SC 29418

Reference No.:
Support Services Agreement No. 2006-317

Prepared by:
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December 2005

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INTRODUCTION

Recently, there is a shift in regulatory emphasis from "emissions-based regulations" to "public health risk-based regulations" by the state and federal regulations. This is evidenced by the increased scrutiny of the health risks associated with air pollutant emissions resulting from shipyard operations. Based on the preliminary assessments, it appears that welding and blasting operations are driving the public health risks in the shipbuilding sector due to anticipated metal emissions and their associated toxicity. Welding emissions are relatively well studied compared to blasting emissions. Only recently, UNO studies published emission factors for TPM (total particulate matter) under a grant from EPA Region VI and the Office of Naval Research (ONR). However, due to limited resources and funding, particle size and metal speciation of blasting emissions could not be studied as part of the earlier UNO study. For health risk assessments, emission data (or emission factors) for inhalable particulate matter (typically PM_{10}, particulate matter less than 10 micron in size) and its chemical speciation is desired. Incorrect PM_{10} fraction and chemical speciation (e.g., metal fraction) can lead to incorrect calculated health risk that will be different from the true health risks. Health risk assessment process is illustrated in the following figure, Figure 1.

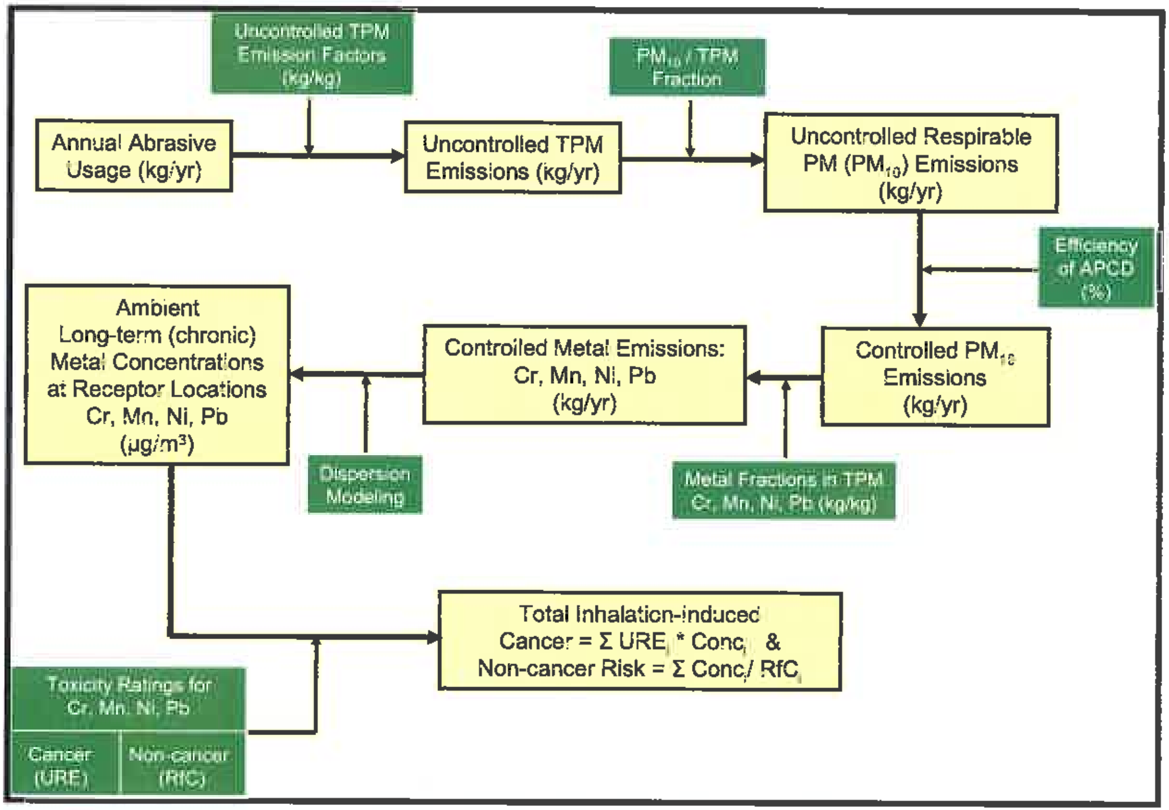


Figure 1a: Residual Risk Analysis for Dry Abrasive Blasting Process

Problem Statement

From Figure 1, it may be noted that PM_{10} fraction which is being considered as the inhalable/respirable fraction in residual risk assessment is an important input. EPA recognizes that only the PM_{10} fraction is of concern in residual risk analysis; higher PM10 fraction leads to higher potential public health risk

Similarly, it may be noted from Figure 1 that the metal fraction contained in the particulate matter emitted from dry abrasive blasting is another important input in calculating residual risk from dry abrasive blasting. These metals may include both, carcinogenic and non-carcinogenic metals. Chromium (Cr), lead (Pb), manganese (Mn), and nickel (Ni) are considered important in blasting emissions due to possible contamination or presence of these metals in abrasives and the base plate. Again, higher metal fraction within air emissions results in increased public health risks.

As it can be seen from Figure 1, respirable fraction (PM_{10} fraction of TPM) and the metal fraction have a multiplying effect on the calculated residual risk. There is a concern that the compiled literature data for PM_{10} and metal fractions to be applied in the health risk assessment are high and are not applicable to the shipbuilding industry as most of it came from different sources not relevant to the shipbuilding and ship repair industry sector. There is no reliable data on PM_{10} and metal fractions of airborne particulates resulting from dry abrasive blasting as this process was not studied well in the past. In order to estimate the true public health risk resulting from the blasting operations, more realistic data is required on (1) PM_{10} fraction of TPM emissions and (2) metal fractions of PM_{10} or TPM.

Scope of Work

Main objective of this project was to generate additional data on (1) PM_{10}/TPM fraction and (2) metal fractions of TPM for total chromium, manganese, nickel and lead. Filters with airborne particulate matter (PM) collected on them were available from earlier study titled, "Environmentally-friendly Abrasives" project for use in this project.

In the original proposal, Scanning Electron Microscope (SEM) was proposed for PM_{10}/TPM determination. SEM involves a two dimensional scanning/imaging which gives the area of a particle. Considering that all the particles are spheroids, volumes of the individual particles are calculated to finally arrive at mass fractions. Whereas, Interferometer technique involves scanning of particles at various heights to arrive at true volume of various sized particles which results in more accurate mass-based particle size distribution. As the Interferometer was available to the investigator for use in this project, Interferometer in combination with Micro Sieves was used to determine the particle size. Additionally, Single Particle Optical Sizing (SPOS) method was also used to determine the particle size.

For metal fraction determination, X-Ray Fluorescence (XRF) Spectrometer was utilized. The project results will help eliminate errors in the residual risk assessment due to data-quality problems.

Brief Description of UNO's Environmentally-Friendly Abrasives Project

Because the "airborne PM collected on filters" came from UNO's study titled, Environmentally-friendly Abrasives, it was felt appropriate to include this section that describes the earlier study, its goals, the equipment used, and the research methodology adopted.

Goals

The main purpose of the UNO study was to rank six commonly used abrasives namely, barshot (hematite), coal slag, copper slag, garnet, steel grit/shot, and specialty sand based on (1) productivity (ft^2/hr), (2) abrasive consumption (lb/ft^2), (3) used-abrasive generation potential (lb/ft^2), and (4) particulate emission factors (lb/lb and/or lb/ft^2). The portion of the study that dealt with particulate emission factors is relevant to the current study which is described further in this section.

Influencing Parameters

Atmospheric particulate emissions from dry abrasive blasting are influenced by (a) blast pressure, (b) abrasive feed rate, (c) properties of abrasive (type, size, shape, and hardness), (d) number of reuses of the abrasive, (e) nozzle size, (f) angle between blast nozzle and base plate, (g) stand-off distance, (h) ventilation conditions / exhaust fan capacity in case of indoor blasting, (i) wind speed in case of outdoors, and (j) the expertise of the worker, (k) initial surface contamination (rust, paint, others), and (l) desired surface finish. UNO study involved varying, (1) abrasives (six abrasives were tested), (2) blast pressure (80, 100, 120 PSI), (3) abrasive feed rate (Schmidt feed valve #6 set at 3, 4, 5 turns). All other conditions were kept unchanged from experiment to experiment. Average exhaust fan capacity used was 3000 cfm. Emission factors reported were "uncontrolled emission factors for total particulate matter" as these emissions were measured before the particulate collection device.

Mild steel plates were used with two initial surface conditions, rusted and painted, were used. However, only the samples collected from the testing of painted panels were utilized in this current study. Plates were painted with a 1:1 volume mixture of Rust Oleum© Safety Yellow paint and thinner. Painting was carried out with spray gun and hand rollers with an average transfer efficiency of 50% and the average paint thickness was 0.73 mils.

Emissions Test Facility Design

Dry abrasive blasting operations were simulated within the UNO's Emissions Test Facility (ETF) of size 3.7 x 3 x 2.5 m (12 x 10 x 8 feet) in order to measure particulates emitted during blasting operations. Figure 1b shows ETF utilized for the Environmentally-friendly Abrasives project which provided filter samples for this current study. A 600 lbs (273 kg) capacity Abec© blast pot was used as the abrasive supply unit. For all blasting operations, a standard Bazooka #6 nozzle was used. A Schmidt feed valve fitted below the hopper of the blast pot was used to regulate the abrasive flow rate during the blasting experiments. Sullair Model 375H© and Ingersoll Rand© compressors capable of providing a maximum of 150 PSI fitted with appropriate pressure gauges and moisture traps were used to provide the compressed air. Mild steel plates, each of dimensions 2.5 x 1.5 m (8 x 5 feet) were mounted on steel carts for ease of movement in and out of the chamber. Both rusted and painted panels were tested using six abrasives namely, barshot (hematite), coal slag, copper slag, garnet, steel grit/shot, and specialty sand. However, it should be noted that only the samples collected from the painted panels were utilized in this study as those samples from rusted panels were not available.

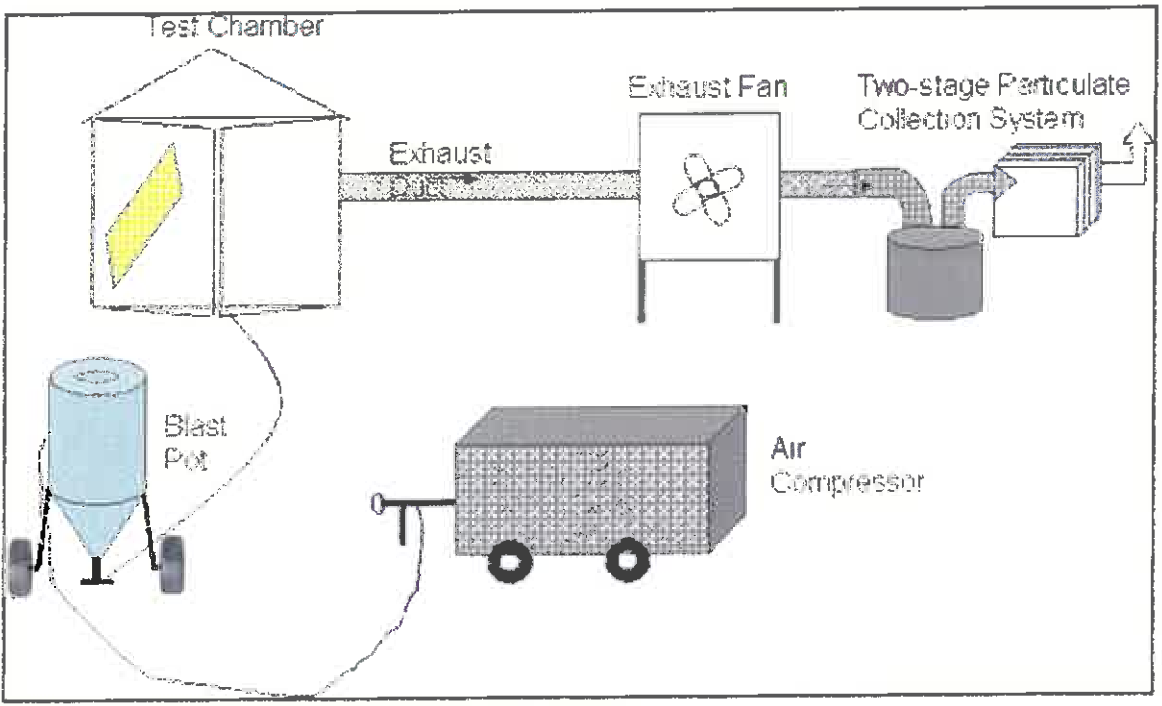


Figure 1b: UNO's Emissions Test Facility (ETF)

Exhaust Duct and Two-Stage Particle Collection System

A variable speed fan with 60 rpm was used to vent the particulates from the test chamber through an exhaust duct. The exhaust duct was designed to comply with the EPA guidelines for source monitoring. A straight, smooth circular duct of diameter 0.31 m (12 inches) was used. Sampling port was positioned at a downstream distance of 8 diameters from the air intake (flow disturbance) and 2 diameters upstream of the variable speed fan (flow disturbance) to minimize the flow turbulence. A two-stage particulate collection system was designed and installed downstream of the exhaust fan to collect the particles and prevent nuisance to the ambient environment. The first stage collected the coarse particles by changing the direction of the gas flow. The second stage collected fine particles by using a fabric filter. Since the sampling was carried out at upstream side of the particulate collection systems, the measured emission factors represent "uncontrolled total particulate emission factors."

Stack Sampling Equipment

Stack sampling and velocity measurements were carried out as per EPA Source Test Methods 1 through 5 for total particulate matter. Figure 1c shows the stack monitoring in progress. An S-type pitot tube was used for taking velocity and flow measurements within the duct. A sampling train in accordance with EPA Method 4 was used for determining moisture content and evaluating the volumetric gas flow rate. EPA Method 5 sampling train consisting of a sampling nozzle, S-type pitot tube, temperature probe, dry gas meter, PM sampling filter holder, glass impingers, hot and cold bath was used in the study. The glass impingers were connected in series inside an ice bath to condense the water vapor. The first two impingers were filled with 100 ml of distilled water to allow the moisture to condense. The third impinger was left dry for further condensation. The fourth impinger contained known quantity of silica gel (adsorbent) to remove water vapor as the gas passed through it before entering the dry gas meter inlet.

Figure 1c: PM Emissions Monitoring in Progress Using Stack Testing Equipment

Stack Test Procedure

As per EPA Source Test Method 1, a total of eight traverse points were chosen for velocity and flow measurements in the circular exhaust duct used in this study. The traverse points were measured and marked on the sampling probe to ensure accuracy and ease of traverse. For ensuring isokinetic flow conditions inside the duct, a nozzle with inner diameter of 4.57 mm (0.018 inches) was used for particulate sampling during all the runs. Pilot tests were conducted to determine the nozzle diameter to obtain isokinetic sampling conditions. For carrying out the blasting operations, three persons were trained by professionals on the operating procedures and safety issues. A pre-weighed, known amount of medium grade abrasive was loaded into the blast pot through a sieve to remove any foreign material that may interfere with the smooth flow of the abrasive. The air flow was regulated at the compressor to provide required nozzle pressures (80, 100 and 120 PSI) and the Schmidt valve was opened to the required number of turns (3, 4, and 5 turns).

Leak checks were performed before and after sampling to ensure accuracy of flow rate and velocity measurements. Conditioned, pre-weighed Whatman No. 10 filter papers were used to collect the particulate emissions. While blasting was in progress inside the chamber, sampling was carried out at the sampling port by traversing the sampling probe unit through the duct. The necessary parameters for flow and velocity measurements namely velocity head, stack temperature, vacuum, DGM flow readings, hot and cold bath temperatures were recorded at the eight traverse points. The sampling time was two minutes at each traverse point and hence the total sampling time for each experiment was sixteen minutes. Blasting time varied from run to run and it was measured using a stopwatch. Blasting was carried out until all the material in blast pot was consumed. A near-white (SP 10) surface finish was achieved in all the runs and the personnel were trained to visually examine and ensure this finish. Once blasting was complete, the filter was conditioned in the dessicator and the final weight was recorded. The sampling probe was rinsed thoroughly with acetone thrice according to EPA method 5 to collect the particles on the probe walls. The wash off liquid was collected in a pre-weighed beaker and was later evaporated in a dessicator. The blasted area was measured using a measuring tape with appropriate approximations for non-quadrilateral geometries. Due care was taken to ensure isokinetic flow conditions for each sampling run.

After conditioning and weighting, filters with PM on them were stored in zip lock bags for future examination of particle size and metal analysis as the funding was not adequate at that time. These samples were used in the current study to evaluate particle size and the metal analysis.

METHODOLOGY

In order to reach the goals of the project, the following tasks were undertaken to analyze the PM_{10}/TPM fraction and the metal speciation. The methodology used for these tasks are briefly discussed in the following section.

Determination of Particles Size Using Interferometry

MicroXAM MP8, a vertical scanning interferometer (VSI) was used in this experiment which provides high (angstrom to nanometer-scale) vertical resolution, and a lateral resolution of 500 X 500 nanometer (with a Nikon 50X Mirau objective). Figure 2a is a photograph of the MicroXAM MP8 used and Figure 2b illustrates the white light VSI principle.

Saved samples from previous research project were utilized to analyze particle size using Interferometer. Because of the wide particle size (submicron to 400 micron), samples had to be separated into a narrow size range prior to using Interferometer. For separating the particles into narrow size ranges, micro sieves were used. Micro sieves employed in this exercise confirmed to the ASTM standard ASTM E 161 – 00.

Fig 2a. MicroXAM MP8 Interferometer Positioned on an Anti-Vibration Air Table
Source: A. Luttge *et al.*

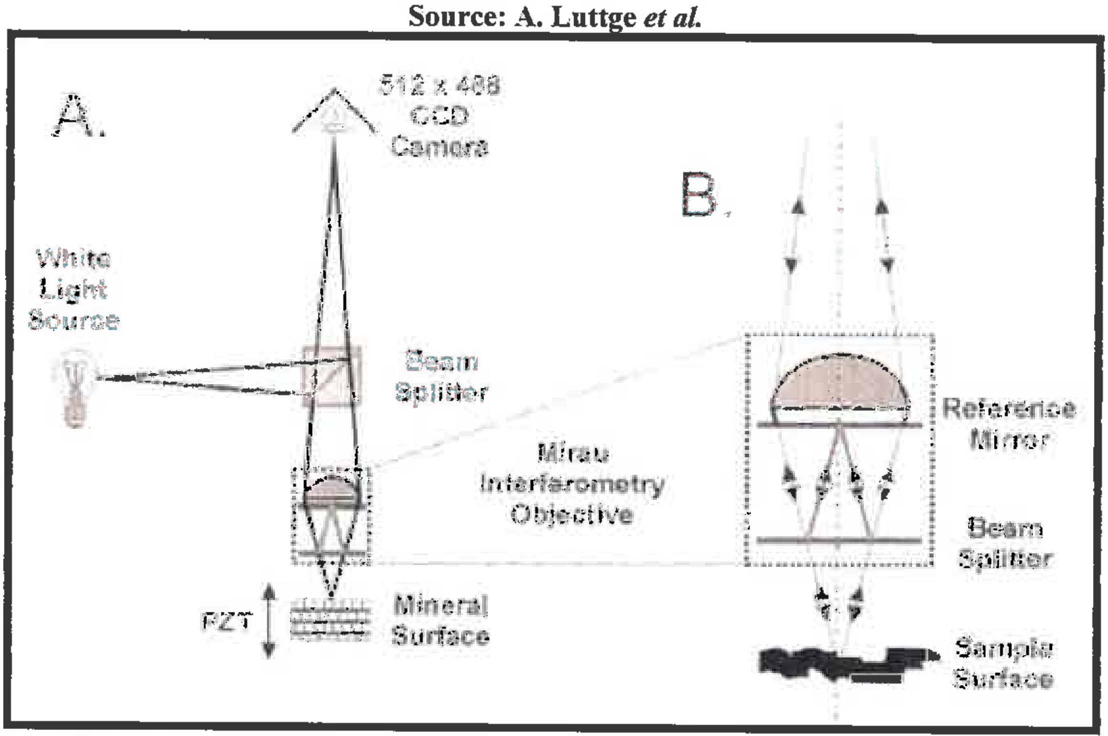


Fig 2b. Sketch of a Double-Beam Mirau Interferometer with CCD Camera
Source: A. Luttge *et al.*

The measured particles were imaged at randomly from the field of particles on the glass surface. Only the discrete particles, those that were not touching one another were chosen for measurement. This potential bias or error source would be common to all optical techniques.

The length, width, height, and volume of 100 particles were measured in each sample. Airborne particle samples from all six abrasives, viz. coal slag, specialty sand, garnet, copper slag, barshot (hematite), and steel grit were analyzed. The length, width, and height are given in microns. For irregularly shaped particles, the length and width are somewhat arbitrarily chosen. For the most part, longest dimensions of the particles were measured since these are the dimensions that didn't allow the particles to pass through the sieve. The height measurement is very arbitrary since any number of heights could be chosen from the array of pixels in the interferometry height map of each particle. Most representative height of the surface of the particle was measured, i.e. a plateau produced by many pixels of the same height. The volume of each particle is given in cubic nanometers. This was measured using the volume analysis tool provided as part of the ADE-Phase Shift software package that works in combination with the MicroXAM interferometer. Each particle was isolated using a data masking tool and if the resulting image subset had any bad pixels, they were filled using nearest neighbor approximations. Each image was also "flattened" before the volume analysis tool was employed. A horizontal plane representing the glass slide was chosen and the volume analysis tool provided the volume of each particle by calculating the volume of the pixels that rose above the plane of the glass. The error associated with this volume measurement, both, in terms of repeatability and bad or missing pixels was not considered to be higher than 10%. The volume measured in this way is much more precise and accurate than the length, width, and height measurements since it maps the height of each pixel for the entire 2D area of the particle. Therefore this volume measurement should be considered the primary number assigned to each particle. The particles were sorted in the spreadsheet according to the shortest length or width dimension.

Information obtained from the micro sieve analysis and the Interferometry were combined to obtain the particle size distribution from sub micron to 30 micron. Particles between 30 and 400 micron were lumped to one category, though there were a few particles that were larger than 400 micron. Size of these large particles (which were very few) could not be determined. However, their mass was included in calculation so there is no error in determining the mass percentages of various size fractions.

Determination of Particle Size Using Single Particle Optical Sizing (SPOC)

Single Particle Optical Sizing (SPOC) method involves the following procedure. Particles flow into illuminated view volume one at a time as illustrated in the Figure 2c. Detector picks up the decrease in light transmission due to particle obstruction. Decrease in light transmission corresponds to particle size/volume which is measured using a calibration curve. Each pass through the view volume produces a pulse which is counted.

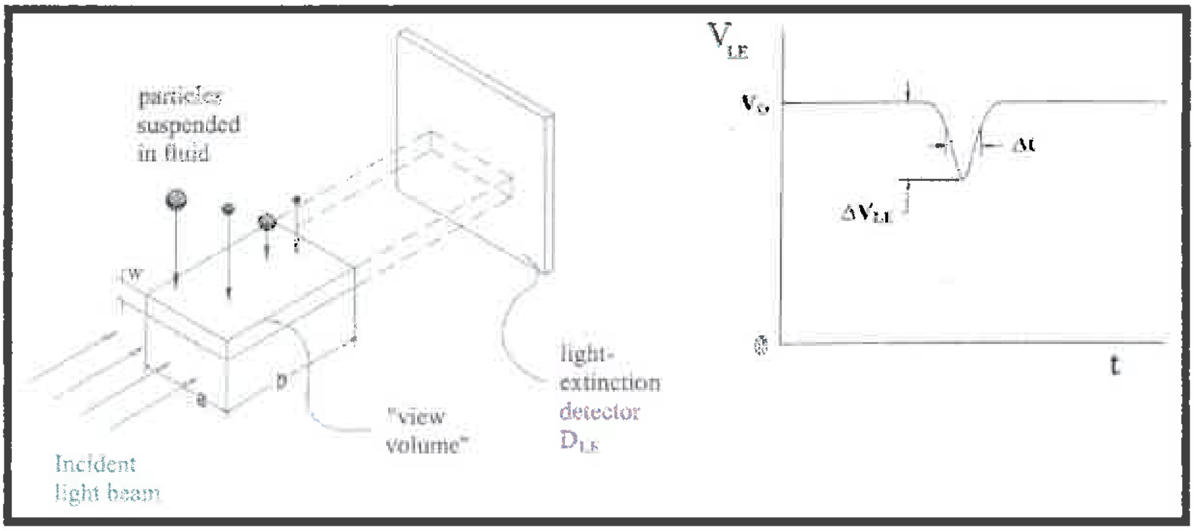


Fig 2c. Principle of SPOC Measurement Method

Sample preparation method involved taking each sample into particle free container then adding Triton-X, a non-ionic surfactant. To this sample, about 20 ml of distilled water was added. Particles were allowed to disperse uniformly by manual shaking and with the aid of sonic bath for five minutes. Sample was shook vigorously before an aliquot was injected into the Accusizer. Measurements were made with two thresholds; one set at 0.5 micron and one at 2 micron and the data was combined to obtain consolidated particle size distribution.

Determination of Metal Fraction of Airborne TPM Using XRF Spectrometry

This task involved analysis of filters containing particulate emissions from abrasive blasting to determine metal content (Cr, Mn, Ni, and Pb) using XRF Spectrometer. Metals analyzed in this study are elemental metals and not their compounds. Also, the chromium reported is total chromium not hexavalent chromium. XRF method, measurement principle, advantages are briefly described in the following section.

XRF Spectrometry method is used to identify elements in a substance and quantify the amount of those elements present to ultimately determine the elemental composition of a material. An element is identified by its characteristic X-ray emission wavelength (λ) or energy (E). The amount of an element present is quantified by measuring the intensity (I) of its characteristic emission. XRF Spectrometry identifies and quantifies elements over a wide dynamic concentration range, from PPM levels up to virtually 100% by weight.

In XRF Spectrometry, the primary interference is from other specific elements in a substance that can influence (matrix effects) the analysis of the element(s) of interest. However, these interferences are well known and documented; and, instrumentation advancements and mathematical corrections in the system's software easily and quickly correct for them. In certain cases, the geometry of the sample can affect XRF analysis, but this is easily compensated for by selecting the optimum sampling area, grinding or polishing the sample, or by pressing a pellet or making glass beads.

Quantitative elemental analysis for XRF Spectrometry is typically performed using Empirical Methods (calibration curves using standards similar in property to the unknown) or Fundamental Parameters (FP). FP is frequently preferred because it allows elemental analysis to be performed without standards or calibration curves. The capabilities of modern computers allow the use of this no-standard mathematical analysis, FP, accompanied by stored libraries of known materials, to determine not only the elemental composition of an unknown material quickly and easily, but even to identify the unknown material itself. XRF analytical procedure is illustrated in Figure 2d below.

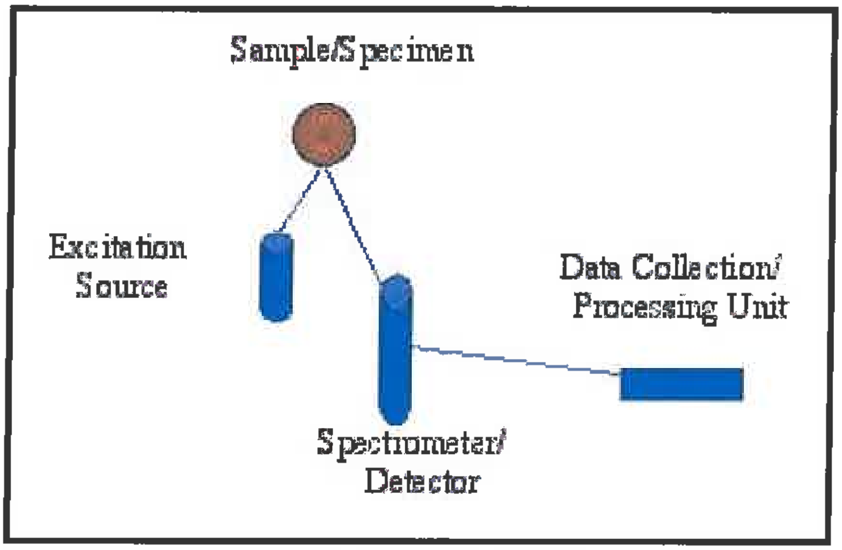


Fig 2d. XRF Spectrometry for Metal Analysis

RESULTS

Final, processed results are organized into various tables and figures for convenient use which are briefly discussed in this section. In lieu of long explanation of results, care was taken to prepare these tables and figures efficiently so that they are self-explanatory to the reader. Necessary particle size data and metal concentration data for six abrasives can be extracted from the results presented in this section for ready use in the residual risk analysis.

Particle Size Using Interferometry

Table 1 includes the particle size data obtained using the combination of micro sieving and Interferometer. Table 1 includes average particle size distribution (PSD) of airborne particulate matter (PM) emitted from dry abrasive blasting using six different abrasives. These six abrasives are garnet (GA), coal slag (CO), copper slag (CU), garnet (GA), steel grit (SG), and specialty sand (SS).

Table 1: Size Distribution of Airborne Particles from Dry Abrasive Blasting

Particle Size, Micron	Cumulative Mass % (all particles less than the size indicated)					
	Barshot	Coal Slag	Copper Slag	Garnet	Steel Grit	Specialty Sand
10	1.52	0.73	0.03	0.36	0.00	0.20
15	2.29	0.92	0.10	0.49	0.00	0.27
20	3.57	1.16	0.29	0.93	0.00	0.39
25	4.39	1.45	0.61	1.61	0.00	0.62
30	5.03	1.62	1.15	2.20	0.91	0.65
400	100.00	100.00	100.00	100.00	100.00	100.00

Figures 3 through 8 illustrate the size distribution of airborne particles for each of the six abrasives studied. Airborne particles were collected on filter media in a previous study that involved blasting on painted panels using Bazooka blast nozzle number 6 in an enclosed test chamber. Blasting pressure used ranged from 80 to 120 psi at the tip of the nozzle. All abrasives used in the study were of medium grade. Specialty sand refers to sand that is washed and graded to reduce the dust emissions and improve its abrasive properties.

Fig 3. PSD of Airborne PM - Barshot Blasting

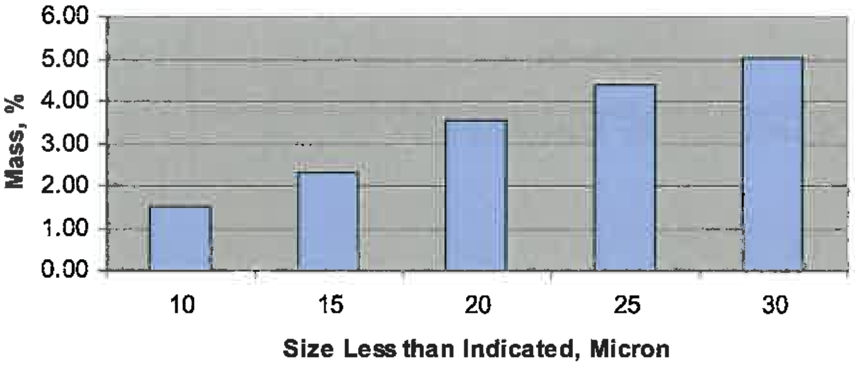


Fig 4. PSD of Airborne PM - Coal Slag Blasting

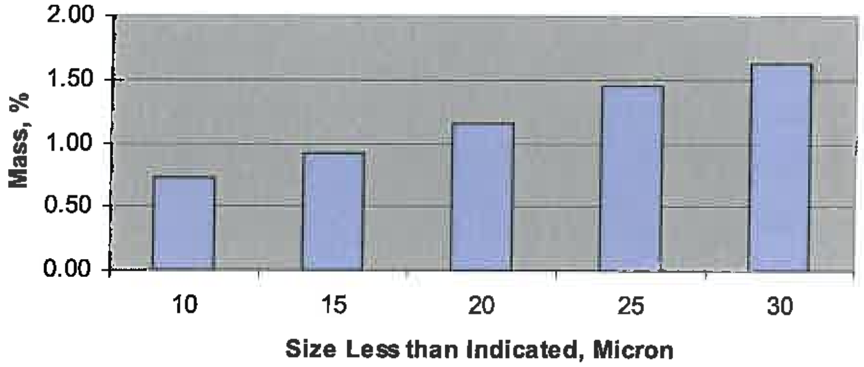


Fig 5. PSD of Airborne PM - Copper Slag Blasting

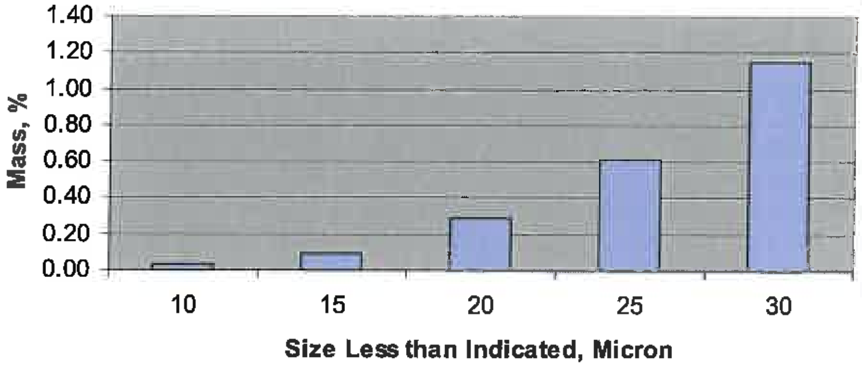


Fig 6. PSD of Airborne PM - Garnet Blasting

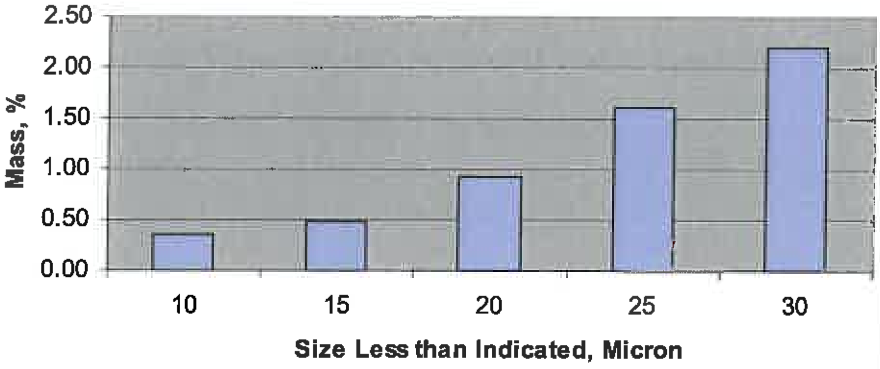


Fig 7. PSD of Airborne PM - Steel Grit

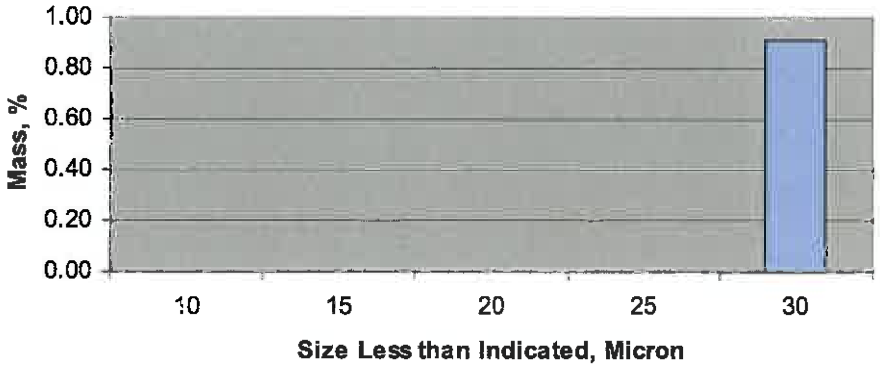
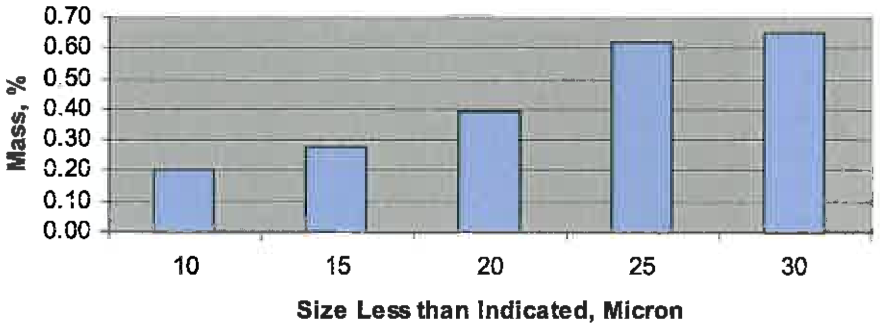


Fig 8. PSD of Airborne PM - Specialty Sand Blasting



Particle Size Using Single Particle Optical Scanning (SPOS)

Table 2 presents the particle size data of airborne particles emitted from dry abrasive blasting using six different abrasives. Figures 9 through 14 illustrate the PSD trends.

Table 2: Size Distribution of Airborne Particles from Dry Abrasive Blasting
Single Particle Optical Scanning (SPOS) Method

Particle Size, Micron	Cumulative Mass % (all particles less than the size indicated)					
	Barshot	Coal Slag	Copper Slag	Garnet	Steel Grit	Sp. Sand
1.01	0.16	0.19	0.22	0.16	0.33	0.17
2.46	0.37	0.63	0.54	0.37	0.92	0.57
3.93	0.56	1.28	0.85	0.56	1.56	1.13
6.99	1.16	3.89	2.42	1.16	4.56	3.06
10.07	2.11	8.87	7.27	2.11	9.92	6.19
15.29	4.09	18.74	21.47	4.09	17.62	12.00
19.86	6.02	25.59	30.62	6.02	23.15	16.30
24.47	8.46	31.13	36.18	8.46	28.82	20.67
30.16	12.54	36.62	40.98	12.54	35.94	26.89
400	100.00	100.00	100.00	100.00	100.00	100.00

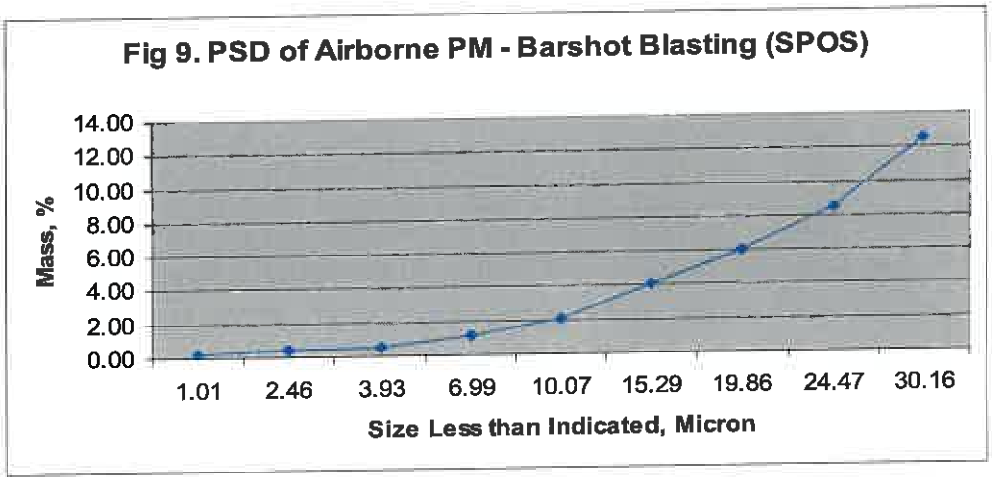


Fig 9. PSD of Airborne PM - Barshot Blasting (SPOS)

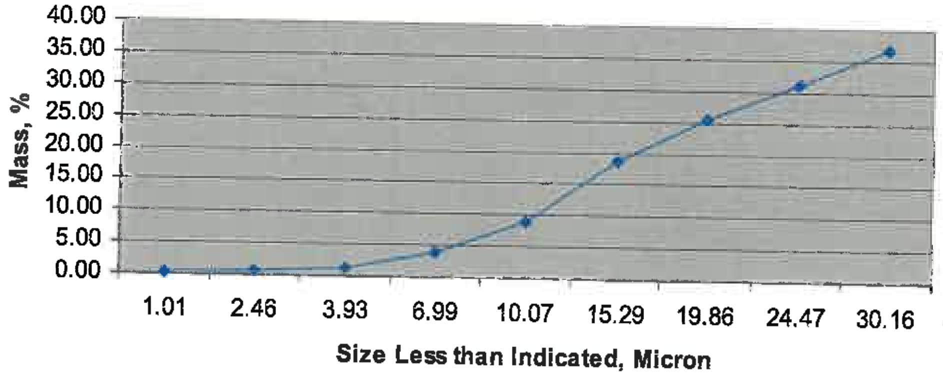


Fig 10. PSD of Airborne PM - Coal Slag Blasting (SPOS)

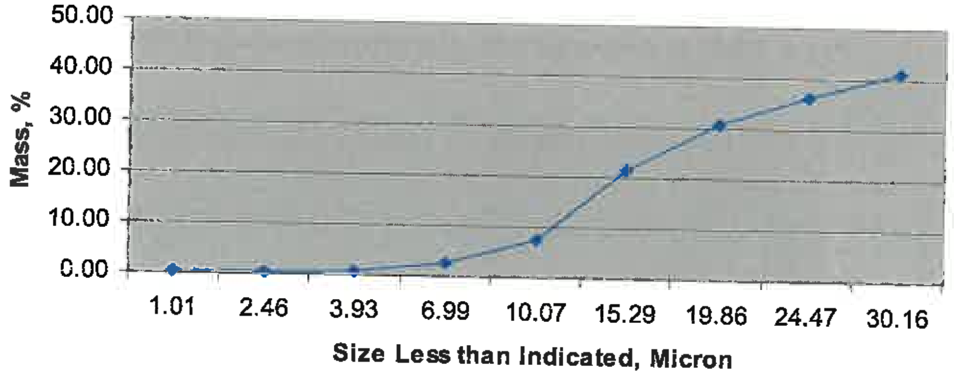


Fig 11. PSD of Airborne PM - Copper Slag (SPOS)

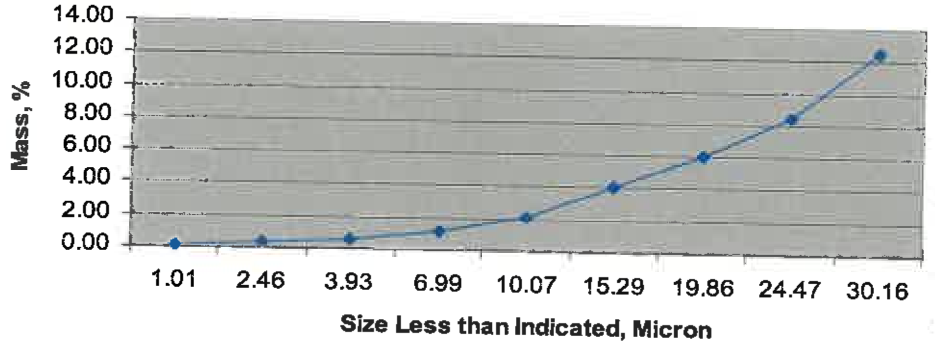


Fig 12. PSD of Airborne PM - Garnet Blasting (SPOS)

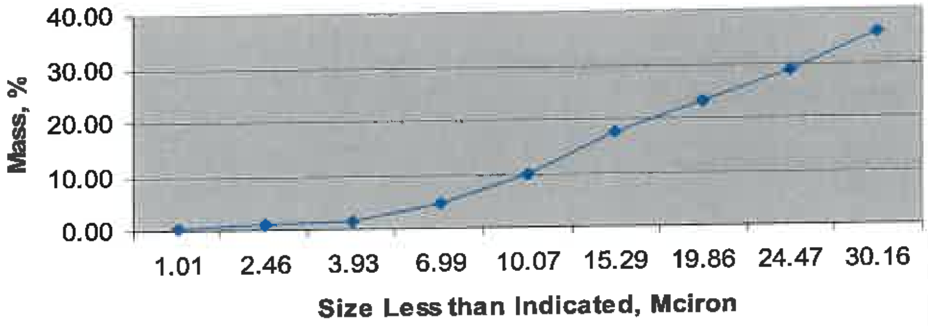


Fig 13. PSD of Airborne PM - Steel Grit Blasting (SPOS)

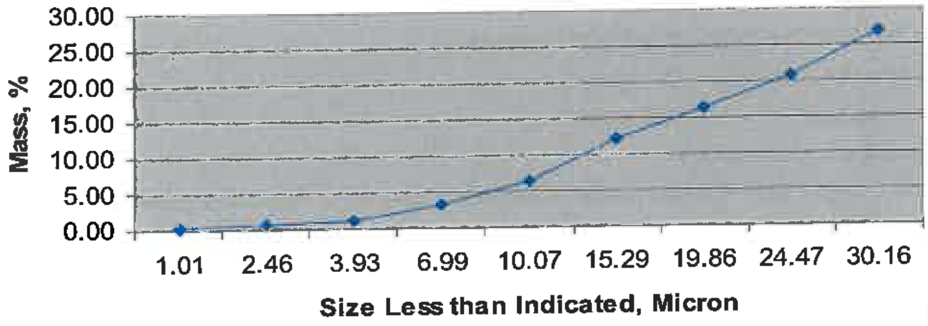


Fig 14. PSD of Airborne PM - Specialty Sand Blasting (SPOS)

Metal Fraction of Airborne TPM Using XRF Spectroscopy

Original scope included analysis of only four metals, Cr, Mn, Ni, and Pb. However, all metals that were possible to be analyzed using XRF were analyzed and included in the results. Table 3 includes the summary of metals analyzed, EPA's classification - if it is carcinogen or non-carcinogen, respective toxicity values, and the specific health effects. It is important to note that the toxicity values given in Table 3 are for various metal compounds. Whereas, the results presented in Table 4 and 5 represent the elemental metals. In case of chromium the results presented are total chromium, not hexavalent chromium. Due care should be taken when calculating various input data for the risk assessment of emissions from dry abrasive blasting. Cancer toxicity values are indicated by the unit risk estimate (URE) and the non-cancer toxicity values are indicated by the reference concentrations (RfC) values. URE and RfC are defined as follows:

SAFETY DATA SHEET

Product Name: Black Diamond, Black Magnum
Product Description: coal slag particles

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION, AND OF THE COMPANY/UNDERTAKING

1.1 Identification of the substance or preparation

Product Names: Black Diamond

1.2 Other means of identification

1.3 Use of the substance / preparation – Abrasive blasting media

1.4 Supplier

Company Name: AGSCO Corporation
Address: 160 West Hintz Road
Wheeling Illinois 60090

Emergency number: 847-520-4455
Information number: 847-520-4455
Date prepared: January 2015

2. HAZARDS IDENTIFICATION

Classification in accordance with 29 CFR 1910.1200

Acute Toxicity (Oral), Category 4 (20% unknown)
Skin Corrosion / Irritation, Category 3
Eye Damage / Irritation, Category 2A
Carcinogenicity, Category 2
Specific Target Organ Toxicity - Single Exposure, Category 2 (respiratory system)
Specific Target Organ Toxicity - Single Exposure, Category 2 (digestive system and/or systemic toxicity)
Specific Target Organ Toxicity - Repeated Exposure, Category 2 (respiratory system, lungs)

GHS LABEL ELEMENTS

Symbol(s)

NFPA Label

Signal Word

WARNING

Hazard Statement(s)

Harmful if swallowed. Can cause skin irritation.
May cause damage to respiratory system, lungs through prolonged or repeated exposure.

Precautionary Statement(s)

Prevention

Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/clothing and eye/face protection. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required.

Response

IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.

IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. Rinse mouth.

Storage

Store locked up. Store in a secure, controlled area.

Disposal

Dispose in accordance with all applicable regulations.

3. COMPOSITION / INFORMATION ON INGREDIENTS

CAS	Component	Percent %
7631-86-9	Amorphous Silicon Dioxide	48-50
1344-28-1	Aluminum oxide	18-22
1309-37-1	Iron oxide (Fe_2O_3)	18-22
1305-78-8	Calcium Oxide	5-7
12136-45-7	Potassium Oxide	1-2
13463-67-7	Titanium Oxide	0-1
1309-48-4	Magnesium Oxide	0-1
1313-59-3	Sodium Oxide	0-1
14808-60-7	Quartz	0-0.1
14464-46-1	Cristobalite	0-0.1
7440-41-7	Beryllium	0-0.0005

Others

Evidence may exist to indicate that components present in this material in concentrations of less than one percent (or in the case of carcinogens, less than 0.1 percent) could be released in concentrations which would exceed an established OSHA permissible exposure limit or ACGIH Threshold Limit Value, or could present a health risk to employees in those concentrations.

Employee exposure monitoring should be performed to determine exposure levels.

4. FIRST AID MEASURES

Description of Necessary Measures

Inhalation

If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

Skin	If adverse effects occur, wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed.
Eyes	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Do not rub eyes. Continue rinsing. Then get immediate medical attention.
Ingestion	If a large amount is swallowed, get immediate medical attention. Rinse mouth.

Most Important Symptoms/Effects

Acute	Respiratory tract irritation, skin irritation, eye irritation.
Delayed	Respiratory system damage, lung damage.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Use extinguishing agents appropriate for surrounding fire.

Unsuitable Extinguishing Media

None known.

Specific Hazards Arising from the Chemical

Negligible fire hazard.

Hazardous Combustion Products

None known.

Fire Fighting Measures

Use extinguishing agents appropriate for surrounding fire. Stay upwind and keep out of low areas. Avoid inhalation of material or combustion by-products.

Special Protective Equipment and Precautions for Firefighters

Wear full protective firefighting gear including self-contained breathing apparatus (SCBA) for protection against possible exposure.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

Wear personal protective clothing and equipment, see Section 8. Avoid release to the environment.

Methods and Materials for Containment and Cleaning Up

Collect spilled material in appropriate container for disposal. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). If sweeping of a contaminated area is necessary, use a dust suppressant agent. Move containers away from spill to a safe area. Wet down area with water.

7. HANDLING AND STORAGE

Precautions for Safe Handling

Wash thoroughly after handling. Do not breathe dust. Do not eat, drink or smoke when using this product. Wear protective gloves/clothing and eye/face protection. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required.

Conditions for Safe Storage, including any Incompatibilities

Store and handle in accordance with all current regulations and standards. Protect from physical damage.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Component Exposure Limits

Iron oxide (Fe_2O_3) (1309-37-1)

ACGIH: 5 mg/m3 TWA (respirable fraction)
NIOSH: 5 mg/m3 TWA (as Fe, dust and fume)
2500 mg/m3 IDLH (as Fe, dust and fume)
OSHA (US): 10 mg/m3 TWA (fume); 15 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable fraction)
Mexico: 5 mg/m3 TWA LMPE-PPT
10 mg/m3 STEL [LMPE-CT] (as Fe)

Silicon Dioxide (7631-86-9)

NIOSH: 6 mg/m3 TWA
3000 mg/m3 IDLH
OSHA (US): 20 mppcf TWA; (80)/(% SiO_2) mg/m3 TWA

Calcium oxide (1305-78-8)

ACGIH: 2 mg/m3 TWA
NIOSH: 2 mg/m3 TWA
25 mg/m3 IDLH
OSHA (US): 5 mg/m3 TWA
Mexico: 2 mg/m3 TWA LMPE-PPT

Aluminum oxide (1344-28-1)

OSHA (US): 15 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable
Mexico: 10 mg/m3 TWA LMPE-PPT

Appropriate Engineering Controls

Provide local exhaust or process enclosure ventilation system. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment).

Individual Protection Measures, such as Personal Protective Equipment

Eyes/Face Protection

Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Skin Protection

Wear appropriate chemical resistant clothing.

Glove Recommendations

Wear appropriate chemical resistant gloves.

Respiratory Protection

Where dust or vapor concentration exceeds or is likely to exceed applicable exposure limits, a NIOSH approved respirator is required.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Coarse Solid	**Appearance:**	black shiny solid
Color:	Black	**Physical Form:**	Solid
Odor:	No characteristic odor	**Odor Threshold:**	Not available
pH:	Not available	**Melting Point:**	Not available
Boiling Point:	Not applicable	**Flash Point:**	Non-flammable; non-explosive
Decomposition:	Not available	**Evaporation Rate:**	Not available
OSHA Flammability Class:	Non - Flammable	**LEL:**	Not available
UEL:	Not available	**Vapor Pressure:**	Not applicable
Vapor Density (air = 1):	Not applicable	**Density:**	Not available
Specific Gravity (water = 1):	Not available	**Water Solubility:**	Marginal
Log KOW:	Not available	**Coeff. Water/Oil Dist:**	Not available
Viscosity:	Not available		

Other Property Information

No additional information is available.

10. STABILITY AND REACTIVITY

Reactivity

No reactivity hazard is expected.

Chemical Stability

Stable at normal temperatures and pressure.

Possibility of Hazardous Reactions

Will not polymerize.

Conditions to Avoid

Avoid accumulation of airborne dusts.

Incompatible Materials

None

Hazardous Decomposition

Combustion: miscellaneous decomposition products.

11. TOXICOLOGICAL INFORMATION

Acute and Chronic Toxicity

Component Analysis - LD50/LC50

The components of this material have been reviewed in various sources and the following endpoints are published:

Iron oxide (Fe_2O_3) (1309-37-1)

Oral LD50 Rat >10000 mg/kg

Silicon Dioxide (7631-86-9)

Oral LD50 Rat >5000 mg/kg; Dermal LD50 Rabbit >2000 mg/kg

Calcium oxide (1305-78-8)

Oral LD50 Rat 500 mg/kg

Aluminum oxide (1344-28-1)

Oral LD50 Rat >5000 mg/kg

Information on Likely Routes of Exposure

Inhalation

Throat irritation, difficulty breathing.

Ingestion

Diarrhea, stomach pain, difficulty breathing

Skin Contact

Skin irritant

Eye Contact

Eye irritant

Immediate Effects

Eye and Skin Irritant, Shortness of Breath

Delayed Effects

Respiratory system damage

Medical Conditions Aggravated by Exposure

Respiratory disorders, eye disorders, skin disorders

Irritation/Corrosivity Data

Respiratory tract irritant, skin irritant, eye irritant.

Local Effects

Calcium oxide (1305-78-8)

Corrosive: inhalation, skin, eye, ingestion

Respiratory Sensitization

No data available.

Dermal Sensitization:

No data available.

Carcinogenicity

Available data characterizes components of this product as possible carcinogen hazards.

Component Carcinogenicity

Iron oxide (Fe2O3) (1309-37-1)

ACGIH:	A4 - Not Classifiable as a Human Carcinogen
IARC:	Supplement 7 [1987]; Monograph 1 [1972] (Group 3 (not classifiable))
DFG:	Category 3B (could be carcinogenic for man, with the exception of non-bioavailable ferrous oxides)

Silicon Dioxide (7631-86-9)

IARC:	Monograph 68 [1997]; Supplement 7 [1987] (Group 3 (not classifiable))

Aluminum oxide (1344-28-1)

DFG:	Category 2 (considered to be carcinogenic for man, fiber dust)

Mutagenic Data

No data available.

Reproductive Effects Data

No data available.

Tumorigenic Data

No data available.

Specific Target Organ Toxicity - Single Exposure

Respiratory system, digestive system

Specific Target Organ Toxicity - Repeated Exposure

Respiratory system, lungs

Aspiration Hazard

No data available.

12 ECOLOGICAL INFORMATION

Ecotoxicity

Component Analysis - Aquatic Toxicity

Silicon Dioxide (7631-86-9)

Fish: 96 Hr LC50 Brachydanio rerio: 5000 mg/L [static]
Algae: 72 Hr EC50 Pseudokirchneriella subcapitata: 440 mg/L
Invertebrate: 48 Hr EC50 Ceriodaphnia dubia: 7600 mg/L

Calcium oxide (1305-78-8)

Fish: 96 Hr LC50 Cyprinus carpio: 1070 mg/L [static]

Persistence and Degradability

No information available for the product.

Bioaccumulative Potential

No information available for the product.

Mobility

No information available for the product.

13. DISPOSAL CONSIDERATIONS

Disposal Methods

Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION

US DOT Information

Shipping Name: Not Regulated

IMDG Information

Shipping Name: Not Regulated

15. REGULATORY INFORMATION

Component Analysis

U.S. Federal Regulations

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 311/312 (40 CFR 370.21), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

Aluminum oxide (1344-28-1)

SARA 313: 1.0% de minimis concentration (fibrous forms)

SARA 311/312 Hazardous Categories

Acute Health: Yes **Chronic Health:** Yes **Fire:** No **Pressure:** No **Reactive:** No

U.S. State Regulations

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA
Iron oxide (Fe_2O_3)	1309-37-1	Yes	Yes	Yes	Yes	Yes
Silicon Dioxide	7631-86-9	Yes	Yes	Yes	Yes	Yes
Calcium oxide	1305-78-8	Yes	Yes	Yes	Yes	Yes
Aluminum oxide	1344-28-1	Yes	Yes	Yes	Yes	Yes
Titanium oxide	13463-67-7	Yes	Yes	No	Yes	Yes
Potassium oxide	12136-45-7	Yes	Yes	No	Yes	Yes
Magnesium oxide	1309-48-4	Yes	Yes	No	Yes	Yes
Sodium oxide	1313-59-3	Yes	Yes	Yes	Yes	Yes

Component Analysis - Inventory

Component	CAS	US	CA	EU	AU	PH	JP	KR	CN	NZ
Iron oxide (Fe_2O_3)	1309-37-1	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
Silicon Dioxide	7631-86-9	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
Calcium oxide	1305-78-8	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
Aluminum oxide	1344-28-1	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
Titanium oxide	7440-66-6	Yes	DSL	EIN	Yes	Yes	No	Yes	Yes	Yes
Potassium oxide	12136-45-7	Yes	DSL	EIN	Yes	Yes	No	Yes	Yes	Yes
Magnesium oxide	1309-48-4	Yes	DSL	EIN	Yes	Yes	No	Yes	Yes	Yes
Sodium oxide	1313-59-3	Yes	DSL	EIN	Yes	Yes	No	Yes	Yes	Yes

16. OTHER INFORMATION

NFPA Ratings: Health: 1 Fire: 0 Reactivity: 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Key / Legend

ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSL - Domestic Substances List; EEC - European Economic Community; EINECS - European Inventory of Existing Commercial Chemical Substances; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; JP - Japan; Kow - Octanol/water partition coefficient; KR - Korea; LEL - Lower Explosive Limit; LOLI - List Of Lists™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PH - Philippines; RCRA - Resource Conservation and Recovery Act; RID - European Rail Transport; RTECS - Registry of Toxic Effects of Chemical Substances®; SARA - Superfund Amendments and Reauthorization Act; STEL - Short-term Exposure Limit; TDG - Transportation of Dangerous Goods; TSCA - Toxic Substances Control Act; TWA - Time Weighted Average; UEL - Upper Explosive Limit; US - United States

Other Information

Disclaimer: Supplier gives no warranty whatsoever, including the warranties of merchantability or of fitness for a particular purpose. Any product purchased is sold on the assumption the purchaser shall determine the quality and suitability of the product. Supplier expressly disclaims any and all liability for incidental, consequential or any other damages arising out of the use or misuse of this product. No information provided shall be deemed to be a recommendation to use any product in conflict with any existing patent rights.

SAFETY DATA SHEET

HARSCO
METALS & MINERALS

Date Prepared : 04/02/2015
SDS No : 2014-04
Date Revised : 09/09/2015
Revision No : 4

1. PRODUCT AND COMPANY IDENTIFICATION

GENERAL USE: Abrasives, roofing products and other aggregate uses
PRODUCT DESCRIPTION: BLACK BEAUTY®
PRODUCT CODE: Coal-Fired Boiler Slag
PRODUCT FORMULATION NAME: Abrasive
GENERIC NAME: BLACK BEAUTY®

MANUFACTURER
Harsco Corporation
Metals & Minerals
5000 Ritter Road
Suite 205
Mechanicsburg, PA 17055
Emergency Contact: EHS Manager
Emergency Phone: 717-506-4666
Alternate Emergency Phone: 888-733-3646
E-Mail: reedcs@harsco.com

24 HR. EMERGENCY TELEPHONE NUMBERS
855-393-9889
Access Code 13793

2. HAZARDS IDENTIFICATION

GHS CLASSIFICATIONS

Health:

Not Classified.

Environmental:

Not Classified.

Physical:

Not Classified.

EMERGENCY OVERVIEW

PHYSICAL APPEARANCE: Solid

IMMEDIATE CONCERNS: BLACK BEAUTY® is not flammable, combustible or explosive; and poses no unusual hazard in an unused condition. During use for abrasive blasting, dust may irritate the respiratory tract, skin and eyes; and may cause inflammation and pulmonary fibrosis.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	Wt.%	CAS
Silica, Amorphous	40 - 53	60676-86-0
Aluminum Oxide	17 - 25	1344-28-1
Iron Oxide	5 - 31	1309-37-1
Calcium Oxide	3 - 20	1305-78-8
Magnesium Oxide	0.1 - 7	1309-48-4
Potassium Oxide	0.1 - 3	12136-45-7
Titanium Dioxide	0.1 - 2	13463-67-7
Silica, Crystalline	< 0.1	14808-60-7
Manganese	0.01 - 0.05	7439-96-5
Beryllium	0 - 0.001	7440-41-7
Cadmium	0 - 0.001	7440-43-9

4. FIRST AID MEASURES

EYES: Do not rub eyes. Remove contact lenses. Flush eyes thoroughly with water, taking care to rinse under eyelids. If irritation continues, continue flushing for 15 minutes, rinsing from time to time under the eyelids. If discomfort continues, consult a physician.

SKIN: Wash with soap and water. Get medical attention if irritation develops or persists.

INGESTION: Rinse mouth thoroughly if ingested. Do not induce vomiting. If discomfort continues, consult a physician.

INHALATION: Move to fresh air. If discomfort continues, consult a physician.

NOTES TO PHYSICIAN: Treat symptomatically.

COMMENTS: Show this Safety Data Sheet to physician in attendance.

5. FIRE FIGHTING MEASURES

FLAMMABLE CLASS: This product is non-combustible.

GENERAL HAZARD: None known

EXTINGUISHING MEDIA: Use fire-extinguishing media appropriate for surrounding materials.

FIRE FIGHTING PROCEDURES: Move product containers from fire area if it can be done without risk. Cool containers by flooding with water until heat is dissipated.

HAZARDOUS DECOMPOSITION PRODUCTS: None known

6. ACCIDENTAL RELEASE MEASURES

LARGE SPILL: Avoid runoff into storm sewers and ditches that lead to waterways. Collect spillage using a vacuum equipped with a HEPA filter. If not possible, gently moisten before collecting with shovel and broom. Dispose of collected materials inaccordance with Federal, State and local regulations.

GENERAL PROCEDURES: Never return spillage and clean-up materials to original product containers.

RELEASE NOTES: In the unused form, the material is non-hazardous as defined in state and federal regulations.

COMMENTS: Ensure clean-up is conducted by trained personnel wearing appropriate respiratory protection. Avoid inhalation of dust and contact with skin and eyes. Ventilate area if there is excessive airborne dust.

7. HANDLING AND STORAGE

GENERAL PROCEDURES: Avoid inhalation of dust and contact with skin and eyes. Use only with adequate venitilation. Use work methods that minimize dust production. Keep workplace clean. Observe good industrial hygiene practices.

HANDLING: Follow Safety Data Sheet and label precautions.

STORAGE: Keep container tightly closed. Store away from incompatible materials.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE GUIDELINES

OSHA HAZARDOUS COMPONENTS (29 CFR1910.1200)					
		EXPOSURE LIMITS			
		OSHA PEL		ACGIH TLV	
Chemical Name		ppm	mg/m^3	ppm	mg/m^3
Silica, Amorphous	TWA	20 mpp [1]	80 / $\%SiO_2$ [1]	[2]	10 [2]
Aluminum Oxide	TWA	[3]	15 [3]		1 R as aluminum metal
Iron Oxide	TWA		10 as iron oxide fume		5
Calcium Oxide	TWA		5		2
Magnesium Oxide	TWA		15 as magnesium oxide fume		10 I
Titanium Dioxide	TWA		15		10
Silica, Crystalline	TWA	[4]	10 / ($\%SiO_2$ + 2) [4]		0.025 R
Manganese	TWA				0.2

Footnotes:

1. mpp is millions of particles per ft^3
2. ACGIH TLV for Particles Not Otherwise Specified is 10 mg/m^3 for inhalable particles and 3 mg/m^3 for respirable particles.
3. PEL is 15 mg/m^3 total dust and 5 mg/m^3 respirable particles (as aluminum metal)
4. Respirable PEL = 10 mg/m^3 / ($\%SiO_2$ + 2) and Total Dust PEL = 30 mg/m^3 / ($\%SiO_2$ + 2)

ENGINEERING CONTROLS: Use process enclosures, local exhaust ventilation or other engineering controls to keep airborne levels below recommended exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields. Use tight fitting googles if dust is generated.

SKIN: Use protective gloves. Wear suitable protective clothing.

RESPIRATORY: Selection and use of respiratory protective equipment should be in accordance with OSHA General Industry Standard 29 CFR 1910.134; or in Canada with CSA Standard Z94.4.

WORK HYGIENIC PRACTICES: Wash hands after handling. Routinely wash work clothing and protective equipment. Handle in accordance with good industrial hygiene and safety practice.

COMMENTS: Proper and safe use of the material is solely the purchaser's responsibility. The manufacturer extends no warranties and makes no representations as to the suitability of the product for the purchaser's intended purpose or the consequences of purchaser's actions.

9. PHYSICAL AND CHEMICAL PROPERTIES

ODOR: None

APPEARANCE: Black, granular solid

COLOR: Black

pH: 8.2

FLASH POINT AND METHOD: Not Available

FLAMMABLE LIMITS: Not available

VAPOR PRESSURE: Not Available

VAPOR DENSITY: Not Available

BOILING POINT: Not Available

FREEZING POINT: Not Available

MELTING POINT: Not Available

SOLUBILITY IN WATER: None Expected

SPECIFIC GRAVITY: 2.6 - 2.8

VISCOSITY: Not Available

COMMENTS: For additional information contact manufacturer.

10. STABILITY AND REACTIVITY

STABILITY: This product is stable and non-reactive under normal conditions of use, storage and transport.

CONDITIONS TO AVOID: None known

POSSIBILITY OF HAZARDOUS REACTIONS: None

HAZARDOUS DECOMPOSITION PRODUCTS: None known

INCOMPATIBLE MATERIALS: Hydrofluoric acid

11. TOXICOLOGICAL INFORMATION

ACUTE

NOTES: Abrasive blasting agents may cause inflammation and pulmonary fibrosis. Ingestion of dusts generated during working operations may cause nausea and vomiting.

EYE EFFECTS: May cause eye irritation.

SKIN EFFECTS: May cause skin irritation.

CHRONIC: Frequent inhalation of dust over a long period of time increases the risk of developing lung diseases.

CARCINOGENICITY

IARC: Coal-Fired boiler slag is not listed by IARC.

NTP: Coal-Fired boiler slag is not listed by the National Toxicology Program in their Annual Report.

OSHA: Coal-Fired boiler slag is not listed by NIOSH on their Occupational Cancer List.

Notes:

ACGIH Carcinogens

- Aluminum oxide (CAS 1344-28-1) A4 Not classifiable as a human carcinogen.
- Beryllium (CAS 7440-41-7) A1 Confirmed human carcinogen.
- Cadmium (CAS 7440-43-9) A2 Suspected human carcinogen.
- Calcium oxide (CAS 1305-78-8) No designation listed.
- Iron oxide (CAS 1309-37-1) A4 Not classifiable as a human carcinogen.
- Magnesium oxide (CAS 1309-48-4) A4 Not classifiable as a human carcinogen.
- Manganese (CAS 7439-96-5) A4 Not classifiable as a human carcinogen.
- Potassium oxide (CAS 12136-45-7) No designation listed.
- Silica, amorphous (CAS 7631-86-9) No designation listed.

- Titanium dioxide (CAS 13463-67-7) A4 Not classifiable as a human carcinogen.

IARC Monographs. Overall Evaluation of Carcinogenicity

- Aluminum oxide (CAS 1344-28-1) Not listed.
- Beryllium (CAS 7440-41-7) Group 1. Monographs 58 and 100C (2012).
- Cadmium (CAS 7440-43-9) Group 1. Monographs 58 and 100C (2012).
- Calcium oxide (CAS 1305-78-8) Not listed.
- Iron oxide (CAS 1309-37-1) Not listed.
- Magnesium oxide (CAS 1309-48-4) Not listed.
- Manganese (CAS 7439-96-5) Not listed.
- Potassium oxide (CAS 12136-45-7) Not listed.
- Silica, amorphous (CAS 7631-86-9) Not listed.
- Titanium dioxide (CAS 13463-67-7) Group 2B. Monographs 47 and 93 (2010).

US NTP Report on Carcinogens

- Beryllium (CAS 7440-41-7) Known to be a human carcinogen.
- Cadmium (CAS 7440-43-9) Known to be a human carcinogen.

CORROSIVITY: None known

SENSITIZATION: Not a skin or respiratory sensitizer.

NEUROTOXICITY: None known

GENETIC EFFECTS: None known

REPRODUCTIVE EFFECTS: None known

TARGET ORGANS: Irritation of nose and throat. Irritation of eyes and mucous membranes. May cause respiratory tract irritation. Shortness of breath.

TERATOGENIC EFFECTS: None known

MUTAGENICITY: None known

COMMENTS: Although manufacturer has taken reasonable care in the preparation of this Safety Data Sheet, no warranties are made. Manufacturer makes no representations and assumes no responsibility as to the accuracy or suitability of the Safety Data Sheet for the applications intended by the purchaser.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

ECOTOXICOLOGICAL INFORMATION: This product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

BIOACCUMULATION/ACCUMULATION: This product is not bioaccumulating.

DISTRIBUTION: Not available

AQUATIC TOXICITY (ACUTE): None known

CHEMICAL FATE INFORMATION: Not available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose in accordance with all applicable regulations.

GENERAL COMMENTS: TCLP testing of unused product indicates that it is not hazardous waste by characteristic.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)

OTHER SHIPPING INFORMATION: Unused product is not regulated as a hazardous material by DOT.

COMMENTS: Unused product is not regulated as dangerous goods by the International Air Transport Association (IATA), International Maritime Dangerous Goods (IMDG) or Transport Canada (TDG).

15. REGULATORY INFORMATION

UNITED STATES

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

311/312 HAZARD CATEGORIES: Hazardous Chemical.

FIRE: No **PRESSURE GENERATING:** No **REACTIVITY:** No **ACUTE:** No **CHRONIC:** Yes

313 REPORTABLE INGREDIENTS: Aluminum oxide (CAS 1344-28-1)

302/304 EMERGENCY PLANNING

EMERGENCY PLAN: None

CERCLA (COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT)

Chemical Name	Wt.%	CERCLA RQ
Beryllium	0 - 0.001	10

CERCLA RQ: None

TSCA (TOXIC SUBSTANCE CONTROL ACT)

Chemical Name	CAS
Silica, Amorphous	60676-86-0
Aluminum Oxide	1344-28-1
Iron Oxide	1309-37-1
Calcium Oxide	1305-78-8
Magnesium Oxide	1309-48-4
Potassium Oxide	12136-45-7
Titanium Dioxide	13463-67-7
Silica, Crystalline	14808-60-7
Manganese	7439-96-5
Beryllium	7440-41-7

CLEAN AIR ACT

40 CFR PART 68—RISK MANAGEMENT FOR CHEMICAL ACCIDENT RELEASE PREVENTION: None

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

29 CFR1910.119—PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: None

CALIFORNIA PROPOSITION 65: WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

RCRA STATUS: Not regulated.

OSHA HAZARD COMM. RULE: Regulated.

CLEAN WATER ACT: Not covered by any water quality criteria under Section 304.

CARCINOGEN: Boiler slag is not listed by IARC, NIOSH or the NTP as a known or suspected carcinogen. However based upon the presence of beryllium and cadmium, the product would be classified as a Category 2 Carcinogen pursuant to the GHS Classification System.

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Not Controlled.

WHMIS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM): Not controlled.

WHMIS CLASS: This product has been classified in accordance with the hazard criteria of the CPR and the Safety Data Sheet contains all of the information required by the CPR.

DOMESTIC SUBSTANCE LIST (INVENTORY): Listed on Inventory.

MEXICO This Safety Data Sheet has been prepared in accordance with the Official Mexican Standard (NOM-018-STPS-2000).

16. OTHER INFORMATION

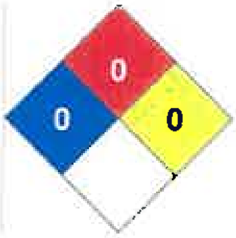
Date Revised: 09/09/2015

REVISION SUMMARY: This SDS replaces the 09/09/2015 SDS. Revised: **Section 16:** HMIS RATING - HEALTH.

HMIS RATING

HEALTH	☐	0
FLAMMABILITY		0
PHYSICAL HAZARD		0
PERSONAL PROTECTION		A

NFPA CODES



BASALITE®
CONCRETE PRODUCTS
VANCOUVER, ULC.

MATERIAL SAFETY DATA SHEET

Silica Fume

SECTION 1 PRODUCT IDENTIFICATION AND USE

Product identification: **Silica Fume**

PIN/ UN No: **N/AV**

MSDS Number: **3009**

Molecular Weight: **N/AV**

Chemical Name: **Silicon Dioxide**

Chemical Family: Amorphous Silica

Chemical Formula: **SiO2**

Pest Control Product (PCP #) : **N/AV**

Stock Number: **N/AV**

Product Group: **Pozzolan**

Product Use: **Pozzolan**

Synonyms: Fume, Densified Silica Fume, Silica Fumes, **Microsilica**

WHMIS Classification: **D2 E**

Means of Classification: **CLASS. BY MANUFACTURER**

Manufacturers Name: **Becancour Silicon Inc.**

Street Address: **6500 Yvon-Trudeau**

City: **Becancour**

Province: **Quebec**

Postal Code: **G0X 1B0**

Emergency Telephone No.
(819) 294-6000 ext.249

Suppliers Name: **Basalite Concrete Products Vancouver, ULC.**

Street Address: **1280 West 77th Avenue**

City: **Vancouver**

Province: **BC**

Postal Code: **V6P 3G8**

Emergency Telephone No.
604 – 269 – 2120

SECTION 2 HAZARDOUS INGREDIENTS

Hazardous Ingredients	% Ratio	CAS Number: PIN Number:	Exposure Limits:	LD_{50}/LC_{50}
Silica Fume	**60 – 100 W/W**	**69012-64-2**	**2 mg respirable dust/m^3**	**Unknown**
Magnesium Oxide (MgO)	**1 – 5 W/W**	**1309-48-4**	**10 mg total dust/m^3**	**Unknown**
Iron Oxide (Fe_2O_2)	**1 - 5 W/W**	**1309-37-1**	**5 mg respirable dust/m^3**	**Unknown**

SECTION 3 PHYSICAL DATA

Odour & Appearance: **Light to medium gray powder.**

Physical State: **SOLID (powder)**

Odour Threshold: **No distinct odour,**

Freezing Point (°C): **N/AP**

Boiling Point (°C): **2230**

Vapour pressure (mm Hg): **N/AP**

Vapour Density (Air=1): **N/AP**

Percent Volatile: **N/AP**

Evaporation Rate: **N/AP**

pH: **6-9**

Specific Gravity: **2.2**

Coeff. Water/ Oil Distribution: **N/AP**

Percent Soluble: **Slight**

SECTION 4 FIRE AND EXPLOSION DATA

Flammability: **N/AP**	If yes, under which conditions? **N/AP**	
Extinguishing Media: **N/AP**		
Special Fire Fighting Procedures: **N/AP**		
Unusual Fire and Explosion Hazards: **N/AP**		Auto-ignition temperature (°C): **N/AP**
Flashpoint (°C) and method: **N/AP**	Upper flammability limit (% by volume): **N/AP**	Lower flammability limit (% by volume): **N/AP**
Hazardous Combustion Products: **N/AP**		
Explosion data: Sensitivity to impact: **N/AP**	Sensitivity to static discharge: **N/AP**	

SECTION 5 REACTIVITY DATA

Chemical stability: YES ☒ NO ☐	If no, under which conditions? **N/AP**
Incompatibility with other substances: **N/AP**	If so, which ones? **N/AP**
Reactivity, and under what conditions: **Silica fume is soluble in hydrofluoric acid. With fluorine, oxygen fluoride and chorine trifuoride, this product will cause a fire.**	
Hazardous polymerization: **N/AP**	
Hazardous decomposition products: **None. Silica Fume is inert under normal conditions of temperature and pressure. When heated at 930 C for 16 hours, amorphous silica will transform to quartz, a crystalline structure of silica.**	

SECTION 6 TOXICOLOGICAL PROPERTIES

Route of Entry: Skin Contact ☒	Skin Absorption: ☐	Eye Contact: ☒	Inhalation: ☒	Ingestion: ☒
Effects of acute exposure to product: **EYES: Can irritate eyes.** **SKIN: Can dry skin.** **INHALATION: Irritating to nose & throat.**				
Effects of chronic exposure to product: **Coughing, sneezing and/or eye irritation.**				

BASALITE®
CONCRETE PRODUCTS
VANCOUVER, ULC.

MATERIAL SAFETY DATA SHEET

Silica Fume

Exposure Limits:

TWA: **2 mg/ m^3**

Other: **The TWA is for Silica Fume in the air.**

STEL: **N/AV**

C: **N/AV**

OSHA PEL: **N/AV**

ACGIH TLV: **N/AV**

Carcinogen by NTP: **N/AV**	Carcinogen by IARC: **N/AV**	OSHA Controlled: **N/AV**

Irritancy:

EYES: Can irritate the eyes.

SKIN: Can dry the skin and cause rashes.

INHALATION: Can irritate the nose & throat.

Sensitization: **Some people might develop a skin rash (Allergic Dermatitis).**

Carcinogenicty: **N/AV**

Teratogenicity: **N/AV**	Reproductive Toxicity: **N/AV**
Mutagenicity: **N/AV**	Synergistic Products: **N/AV**

Medical Conditions Aggravated by Exposure: **May aggravate open sores or dermatitis. Fine dust may aggravate asthma and other breathing conditions.**

SECTION 7 PREVENTATIVE MEASURES

Personal Protective Equipment:

Gloves (specify): **Rubber of PVC when the mix is wet.**	Respirator (specify) **NIOSH/MSHA approved Dust Mask, when the mix is dry.**	Eye (specify) **Tight-fitting goggles**
Footwear (specify): **Boots, that will not soak up the wet mix and will keep out wet or dry mix.**	Clothing (specify) **That will keep the powder or the wet mix off skin & clothes.**	Other (specify) **Barrier creams should be applied PRIOR TO contact with the product. Wash with soap and water after working with cement-containing products.**

Engineering controls: **VENTILATION: Local exhaust to control airborne dust levels below 2 mg/ m^3 TWA**

Leak & Spill Procedures: **AVOID BREATHING DUST. Use dry cleanup methods that do not send dust into the air.**

Waste Disposal: **Dispose of as common waste in accordance with applicable Federal, Provincial and local environmental regulations.**

Handling Procedures and Equipment: **No special handling equipment needed other than personal protective equipment.**

Storage Requirements: **Keep dry until mixed.**

Special Shipping Information: **Keep dry.**

SECTION 8 FIRST AID MEASURES

Specific Measures:

EYES: Flush with water for at least 15 minutes. Consult physician immediately.

SKIN: Wash with soap and water. If skin is burned, see doctor.

INHALATION: Move person to fresh air. Seek medical advice.

INGESTION: Drink copious amounts of water. Do not induce vomiting . Seek immediate medical attention.

SECTION 9 PREPARATION DATE OF MSDS

Prepared By: (Group, Department, Etc.) **Quality Control Department** **Basalite Concrete Products Vancouver, ULC.** **8650 130th Street** **Surrey, BC** **V3W 1G1**	Phone Number: **604 – 596 – 3844**	Date: **12 / 02 / 15** (yr / mm / dd)
Workplace MSDS Transcribed by: **Laura Vocl** **Basalite Concrete Products Vancouver, ULC.** **1280 W.77th Avenue** **Vancouver, BC** **V6P 3G8**	Phone Number: **604 - 269 – 2120**	Date: **12 / 02 / 15** (yr / mm / dd)

Attachment D
Facility Location Aerial Map

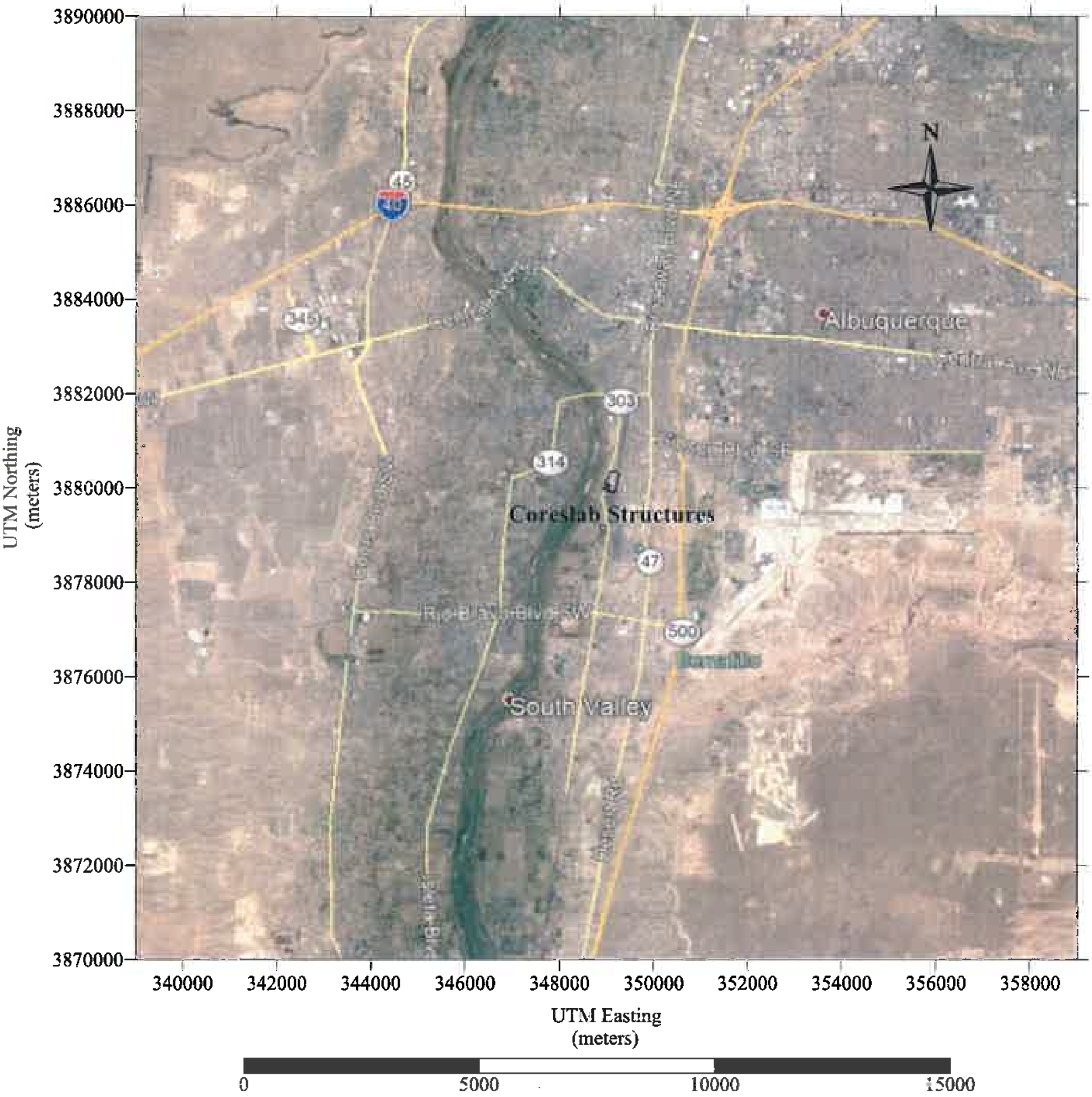


Figure D-1: Aerial Map Showing Site Location
NAD 83

Attachment E
Facility Process Description

Facility Process Description

This plant produces precast concrete products that include either mild reinforcing with steel reinforcement bars or prestressing strand that uses 7-wire strand that is elongated using stressing jacks. In both cases, the products use concrete that is mixed in a batch plant located on the premises.

The concrete process starts with delivery of aggregate and sand. The aggregate and sand are delivered by trucks (Unit 1) and unloaded/dumped into either uncovered stationary storage bins (Unit 22) on the ground or into a below ground hopper (Unit 2) and conveyed (Units 3 and 4) into uncovered elevated storage bins (Unit 5). The materials in the storage bins on the ground can be moved by a front-end loader to the below ground hopper as needed. A secondary conveyor system (Units 6 and 7) will move the aggregate and sand into the batch plant where it is weighed and loaded into one of two concrete mixers (Units 9 and 10). Cement, fly ash, and silica fume are delivered to the plant via truck and hopper trailer. The trailer uses a sealed blower and hose to unload into one of four elevated covered silos (Units 11, 12, 13, and 25). These silos are equipped with bag houses. These cementitious materials are delivered by a closed auger to a scale (Unit 15), where it is dropped into one of the mixers. Three of the four silos are exclusively marked for cement, fly ash or silica fume. The fourth smaller silo has been used to store white cement with an option to store additional fly ash when needed.

The final mixed concrete material is unloaded through a drop gate at the bottom of the mixer into a concrete delivery vehicle. This vehicle will be driven to a bed form where it is unloaded onto the form. Once the bed form is 100% filled with concrete, the remaining concrete is unloaded onto the ground by the batch plant to dry. The dried excess concrete is placed in a pile where it is loaded and hauled away to an off-site location to be recycled/crushed.

After the bed forms are filled with concrete, they are covered with a tarp and a steam generator is used to accelerate the curing process (Units 16, 19, 20, and 21). The steam generators are enclosed in a building and have steam pipes that are placed under the bed forms. The steam heat is typically run under the bed forms at night.

There are four (4) locations where emergency materials (Unit 22) will be stored. As you can see in Figure A-1, you can see the locations of all emergency piles and their relationship to the proposed abrasive blasting sites. Of the four emergency pile locations, three have the potential for worst-case impacts in the particulate dispersion model analysis. To provide the worst-case modeling results for particulate emissions, two scenarios were modeled;

- Abrasive blasting at the main location in the southern part of the site along with all Unit 22 emissions from emergency pile 4. This would address the effect of these two sources operating at the same time, nearest the same facility boundary, where the highest concentrations for PM_{10} 24 hour averaging period modeling result.

- Abrasive blasting at the alternative location east of the concrete silos along with emergency piles 1 and 2. This would address the combined emissions from abrasive blasting and emissions from the Unit 22 emergency pile emissions operating in the same general location. These two emergency piles are closest to Coreslab's boundary and should have greater impact then locating emergency pile emissions from emergency pile 3.

Occasionally, there is a customer request to expose the aggregate on a surface of the precast products. To complete this action, the plant will use one of two media blasting machines to blast away the concrete surface to expose the aggregate (Units 23 and 24). The media used is either a black slag or sand. There is a limited area in the plant to perform this activity.

Attachment F

Regulatory Applicability Determinations

The following is a list of city and federal regulations that may or may not be applicable to Coreslab

Albuquerque/Bernalillo County Regulations

20.11.1 NMAC– General Provisions: Applicable to Coreslab

Requirement: Compliance with ambient air quality standards.

Compliance: Compliance with 20.11.8 NMAC is compliance with this regulation.

20.11.2 NMAC– Permit Fees: Applicable to Coreslab

Requirement: A one-time permit application fee will be assessed by the Albuquerque/Bernalillo County Environmental Department.

Compliance: Coreslab will pay all required permit revision application fees applicable to their facility.

20.11.5 NMAC– Visible Air Contaminants: Applicable to Coreslab

Requirement: Places limits of 20 percent opacity on stationary combustion equipment.

Compliance: Coreslab will perform any required opacity observations using Method 9 and/or Method 22 with certified opacity observers.

20.11.8 NMAC– Ambient Air Quality Standards: Applicable to Coreslab

Requirement: Compliance with all federal, state and local ambient air quality standards.

Compliance: Coreslab's Albuquerque Facility demonstrated compliance by performing and submitting dispersion modeling analysis for applicable pollutants per Albuquerque/ Bernalillo County and New Mexico State Environmental Department's modeling guidelines.

20.11.20 NMAC– Airborne Particulate Matter: Applicable to Coreslab

Requirement: Requires the facility to obtain a permit prior to start of surface disturbances.

Compliance: Coreslab will apply for a 20.11.20 NMAC permit prior to start of surface disturbances.

20.11.41 NMAC– Authority to Construct: Applicable to Coreslab

Requirement: Requires the facility to obtain a permit prior to start of construction.

Compliance: Coreslab is applying for a revision to an existing 20.11.41 NMAC permit with this application.

20.11.49 NMAC– Excess Emissions: Applicable to Coreslab

Requirement: To implement requirements for the reporting of excess emissions and establish affirmative defense provisions for facility owners and operators for excess emissions.

Compliance: Coreslab will report all excess emissions following 20.11.49 NMAC guidelines.

20.11.63 NMAC– New Source Performance Standards: Not Applicable to Coreslab

Requirement: Adoption of all federal 40 CFR Part 60 new source performance standards.

Compliance: No applicable 40 CFR Part 60 NSPS that have been identified for this facility.

20.11.64 NMAC– Emission Standards for Hazardous Air Pollutants for Stationary Sources: Applicable to Coreslab

Requirement: Adoption of all federal 40 CFR Part 61 and 63 National Emissions Standards for Hazardous Air Pollutants (HAPS).

Compliance: 40 CFR Part 63 NESHAP Subpart CCCCCC has been identified for the 300-gallon gasoline storage tank in this permit application.

20.11.66 NMAC– Process Equipment: Applicable to Coreslab

Requirement: The objective of this Part is to achieve attainment of regulatory air pollution standards and to minimize air pollution emissions.

Compliance: Except as otherwise provided in this section, Coreslab shall not cause or allow the emission of particulate matter to the atmosphere from process equipment in any one hour in total quantities in excess of the amount shown in 20.11.66.18 NMAC Table 1.

20.11.90 NMAC– Administration, Enforcement, Inspection: Applicable to Coreslab

Requirement: General requirement on record keeping and data submission. Coreslab will notify the bureau regarding periods of excess emissions along with cause of the excess and actions taken to minimize duration and recurrence.

Compliance: It is expected that specific record keeping and data submission requirements will be specified in the 20.11.41 NMAC permit issued to Coreslab. It is expected the 20.11.41 NMAC permit issued to Coreslab will contain specific methods for determining compliance with each specific emission limitation. Coreslab's Albuquerque Facility will report any periods of excess emissions as required by specific 20.11.90 NMAC provisions.

Federal Regulations

40 CFR 50 – National Ambient Air Quality Standards: Applicable to Coreslab

Requirement: Compliance with federal ambient air quality standards.

Compliance: Coreslab's Albuquerque Facility will demonstrate compliance by performing and submitting dispersion modeling analysis for applicable pollutants per the Albuquerque/ Bernalillo County and New Mexico State Environmental Department's modeling guidelines.

40 CFR 60 Kb – NSPS Standards of Performance for Volatile Liquid Storage Vessels: Not applicable to Coreslab

Requirement: For any volatile liquid storage vessel greater than or equal to 75 m^3, but less than 151 m^3 storing liquid with a true vapor pressure less than 15.0 kPa constructed, reconstructed or modified after July 23, 1984 shall keep records of the dimensions and capacity of applicable storage tanks

Compliance: At present, Coreslab will have no volatile liquid storage vessel greater than or equal to 75 m^3 with a vapor pressure less than 15.0 kPa constructed, reconstructed or modified after July 23, 1984.

40 CFR 60 OOO – NSPS Standards of Performance for Aggregate Facilities: Not Applicable to Coreslab

Requirement: No facility will discharge or cause to discharge gases containing particulate matter in excess of 0.05 gr/dscm from any stack. No facility will discharge or cause to discharge from any transfer point on belt conveyors or screen exhibiting opacities greater than 7 percent. No facility will discharge or cause to discharge from any crusher exhibiting opacities greater than 12 percent.

Compliance: Coreslab's Albuquerque Facility does not meet the definition of an aggregate facilities defined in the regulation.

40 CFR 63 CCCCCC – National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Dispensing Facilities: Applicable to Coreslab

Requirement: This subpart applies is each gasoline dispensing facility (GDF) that is located at an area source. The affected source includes each gasoline cargo tank during the delivery of product to a GDF and also includes each storage tank.

Compliance: 40 CFR Part 63 NESHAP Subpart CCCCCC has been identified for the 300-gallon gasoline storage tank in this permit application. The storage tank's monthly throughput is less than 10,000 gallons a month so only 40 CFR Part 63.11116 applies.

Attachment G

Dispersion Modeling Summary

DISPERSION MODEL REPORT FOR CORESLAB STRUCTURES (ALBUQUERQUE), INC. PERMIT #359-M2-RV1 REVISION

Albuquerque, New Mexico

PREPARED FOR
CORESLAB STRUCTURES (ALBUQUERQUE), INC.

April 17, 2019
Revised June 6, 2019

Prepared by

Montrose Air Quality Services, LLC.

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1.0 INTRODUCTION

This dispersion modeling analysis was conducted by Montrose Air Quality Services, LLC. (Montrose) on behalf of Coreslab Structures (Albuquerque), Inc. (Coreslab), to evaluate ambient air quality impacts from addition of dry abrasive blasting (in one of two locations at the site) and an additional silo. The location of the Albuquerque facility is 2800 2nd Street SE in Albuquerque, NM. The objective of this evaluation is to determine whether ambient air concentrations from the maximum operation of the proposed project for nitrogen dioxide, carbon monoxide, sulfur dioxide, and particulate matter; both 10 microns or less (PM_{10}) and 2.5 microns or less ($PM_{2.5}$); are below Class II federal and state ambient air quality standards (NAAQS and NMAAQS) found in 40 CFR part 50 and the City of Albuquerque/Bernalillo County (COABC) air quality regulation 20.11.8 NMAC.

The dispersion modeling was conducted using the American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee Dispersion Model (AERMOD), Version 18018. This model is recommended by EPA for determining Class II impacts within 50 km of the source being assessed. Additionally, AERMOD was developed to handle complex terrain. In this analysis, AERMOD was used to estimate pollutant ambient air concentrations of NO_2, CO, SO_2, PM_{10} and $PM_{2.5}$ from the Coreslab facility emission sources. Montrose employs the general modeling procedures outlined in "Permit Modeling Guidelines, Albuquerque Environmental Health Department", revised 12/20/2018, "New Mexico Air Pollution Control Bureau, Dispersion Modeling Guidelines", revised 01/01/2019, and the most up to date EPA's *Guideline on Air Quality Models*.

Aggregate material handling equipment, stockpiles, and haul roads was input into the model as volume sources. Model input parameters for feeders and transfer points will follow the NMED model guidelines Table 27 and site release heights. Model input parameters for haul roads will follow the NMED model guidelines Tables 28 and 29.

Figure 1 below shows the location of the site overview. For abrasive blasting there are two locations modeled that would allow operation in either location to be used. For the emergency piles there are three locations modeled that would allow operation in either location.

Additional neighboring sources identified by the COABC AQP Program that was included in the dispersion model analysis is Quikrete located directly north of this site, Pet Crematory, C&C Services, Albuquerque Asphalt, PNM's Rio Bravo Generating Station, and CEI Industries. For Quikrete, a site visit was performed to identify all permitted sources and their model input information for combustion and particulate matter emissions. Information on nitrogen dioxide model inputs for the other neighboring sources was obtained from the COABC AQP modeling section.

FIGURE 1: Coreslab Site Layout Overview

2.0 DISPERSION MODELING PROTOCOL

This section identifies the technical approach and dispersion model inputs that will be used for the Class II federal and State ambient air quality standards for this source. COABC Air Quality Program (AQP) requires that all applicable criteria pollutant emissions be modeled using the most recent versions of US EPA's approved models and be compared with National Ambient Air Quality Standards (NAAQS), and Bernalillo County Ambient Air Quality Standards. Table 1 shows the NAAQS and Bernalillo County Ambient Air Quality Standards that the source's ambient impacts must meet in order to demonstrate compliance. Table 1 also lists the Class II Significant Impact Levels (SILs) which are used to assess whether a source has a significant impact at downwind receptors.

The dispersion modeling analysis will be performed to estimate concentrations resulting from the operation of the Coreslab sources using the existing permitted emission rates and maximum emission rates for new sources while all emission sources are operating. The modeling will determine the maximum off site concentrations for nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), and particulate matter; both 10 microns or less (PM_{10}) and 2.5 microns or less ($PM_{2.5}$), for comparison with modeling significance levels, national/Bernalillo County ambient air quality standards (AAQS). The modeling will follow the guidance and protocols outlined in the "Permit Modeling Guidelines, Albuquerque Environmental Health Department", revised 12/20/2018, "New Mexico Air Pollution Control Bureau, Dispersion Modeling Guidelines", revised 01/01/2019, and the most up to date EPA's *Guideline on Air Quality Models*.

Initial modeling will be performed with Coreslab sources only to determine pollutant and averaging periods that exceeds pollutant SILs. If initial modeling for any pollutant and averaging period exceeds SILs, than cumulative modeling was performed for those pollutants and averaging periods for all receptors that exceeds the SILs which included significant neighboring sources along with background ambient concentrations.

TABLE 1: National and New Mexico Ambient Air Quality Standard Summary

Pollutant	Avg. Period	Sig. Lev. (μg/m^3)	Class I Sig. Lev. (μg/m^3)	NAAQS	NMAAQS	PSD Increment Class I	PSD Increment Class II
CO	8-hour	500		9,000 ppb(1)	8,700 ppb(2)		
	1-hour	2,000		35,000 ppb(1)	13,100 ppb(2)		
NO$_2$	annual	1.0	0.1	53 ppb(3)	50 ppb(2)	2.5 μg/m^3	25 μg/m^3
	24-hour	5.0			100 ppb(2)		
	1-hour	7.52		100 ppb(4)			
PM$_{2.5}$	annual	0.2	0.05	12 μg/m^3(5)		1 μg/m^3	4 μg/m^3
	24-hour	1.2	0.27	35 μg/m^3(6)		2 μg/m^3	9 μg/m^3
PM$_{10}$	annual	1.0	0.2			4 μg/m^3	17 μg/m^3
	24-hour	5.0	0.3	150 μg/m^3(7)		8 μg/m^3	30 μg/m^3
SO$_2$	annual	1.0	0.1		20 ppb(2)	2 μg/m^3	20 μg/m^3
	24-hour	5.0	0.2		100 ppb(2)	5 μg/m^3	91 μg/m^3
	3-hour	25.0	1.0	500 ppb(1)		25 μg/m^3	512 μg/m^3
	1-hour	7.8		75 ppb(8)			

Standards converted from ppb to μg/m^3 use a reference temperature of 25° C and a reference pressure of 760 millimeters of mercury.

(1) Not to be exceeded more than once each year.
(2) Not to be exceeded.
(3) Annual mean.
(4) 98th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
(5) Annual mean, averaged over 3 years.
(6) 98th percentile, averaged over 3 years.
(7) Not to be exceeded more than once per year on average over 3 years.
(8) 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.

2.1 DISPERSION MODEL SELECTION

The dispersion modeling will be conducted using the American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee Dispersion Model (AERMOD), Version 18081. This model is recommended by EPA for determining Class II impacts within 50 km of the source being assessed. Additionally, AERMOD was developed to handle complex terrain. In this analysis, AERMOD will be used to estimate pollutant ambient air concentrations of NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$ from Coreslab emission sources.

AERMOD is a Gaussian plume dispersion model that is based on planetary boundary layer principles for characterizing atmospheric stability. The model evaluates the non-Gaussian vertical behavior of plumes during convective conditions with the probability density function and the superposition of several Gaussian plumes. AERMOD modeling system has three components: AERMAP, AERMET, and AERMOD. AERMAP is the terrain preprocessor program. AERMET is the meteorological data preprocessor. AERMOD includes the dispersion modeling algorithms and was developed to handle simple and complex terrain issues using improved algorithms. AERMOD uses the dividing streamline concept to address plume interactions with elevated terrain.

AERMOD was run using all the regulatory default options including use of:

- Gradual Plume Rise
- Stack-tip Downwash
- Buoyancy-induced Dispersion
- Calms and Missing Data Processing Routine
- Upper-bound downwash concentrations for super-squat buildings
- Default wind speed profile exponents
- Calculate Vertical Potential Temperature Gradient
- No use of gradual plume rise
- Rural Dispersion

2.2 BUILDING WAKE EFFECTS

Coreslab Services structures will be included in the model as a building and analyzed as a building downwash source using the BPIP-Prime program. The results of the BPIP-Prime output will be inputted into the AERMOD model.

2.3 METEOROLOGICAL DATA

Dispersion model meteorological input file to be used in this modeling analysis are years 2001 - 2005 Albuquerque met data (AERMET version 16216 dated 01/30/2017) available from the COABC AQP.

2.4 RECEPTORS AND TOPOGRAPHY

Modeling will be completed using as many receptor locations to ensure that the maximum estimated impacts are identified. Initial radius of impact modeling will be performed with receptors within 3 kilometers of the model boundary. Because of the nature of the emissions from the site, it is expected the maximum concentrations will be on or near the site fenceline.

The refined receptor grid will include receptors located at 50 meters apart out to 500 meters from the property line, 100 meters apart from 500 meters out to 1000 meters, and 250 meters apart from 1000 meters out to 3000 meters. Fenceline receptor spacing will be 25 meters.

All refined model receptors will be preprocessed using the AERMAP software associated with AERMOD. The AERMAP software establishes a base elevation and a height scale for each receptor location. The height scale is a measure of the receptor's location and base elevation and its relation to the terrain feature that has the greatest influence in dispersion for that receptor. AERMAP will be run using U.S. Geological Survey (USGS) digital elevation model (DEM) data. Output from AERMAP will be used as input to the AERMOD runstream file for each model run.

2.5 MODELED EMISSION SOURCES INPUTS

The permitted operating time for the facilities concrete production is 12 hours per day (7 AM to 7 PM). For proposed abrasive blasting operations, Coreslab will take site-specific conditions on daily abrasive use and hours of operation. For the months of March through October the daily throughput will be limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 7 PM. For the months of November through February the daily throughput will be limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 6 PM. For modeling, the hourly blocks vary starting from 7 AM then shifting on 2-hour intervals for 5 separate model runs as summarized on Table 2.

TABLE 2: **Abrasive Blasting Model Scenario Time Segments**

Model Scenario	Time Segments 5-Hour Blocks March - October	Time Segments 5-Hour Blocks November - December
1	7 AM to 12 PM	7 AM to 12 PM
2	9 AM to 2 PM	9 AM to 2 PM
3	11 AM to 4 PM	11 AM to 4 PM
4	1 PM to 6 PM	1 PM to 6 PM
5	2 PM to 7 PM	1 PM to 6 PM

2.5.1 Coreslab Facility Road Vehicle Traffic Model Inputs

The access road fugitive dust for truck traffic will be modeled as a line of volume sources. The NMED AQB's approved procedure for Modeling Haul Roads will be followed to develop modeling input parameters for haul roads. Volume source characterization followed the steps described in the NMED Air Quality Bureau's Guidelines.

2.5.2 Coreslab Facility Material Handling Volume Source Model Inputs

Particulate emissions from material handling and process from aggregate unloading, transfers and storage will be modeled as volume sources. Model input parameters for feeders and transfer points follow the NMED Air Quality Bureau's model guidelines Table 27 and site release heights.

2.5.3 Coreslab Facility Point Source Model Inputs

Emissions from exhaust stacks from the dust collectors will be modeled as point sources. Model input parameters are based on previously permitted release height, release diameter, release velocity or flow rate, and ambient temperature. The steam generator's combustion emissions are release along with the steam at the steam beds. To represent steam generator combustion emissions, the source will be represented as point sources. These sources will have a diameter of the steam beds, a release height of zero feet, a velocity of 0.001 meters per second, and a steam temperature of 400 degrees F. For horizontal or raincap releases, the AERMOD version for horizontal and raincap releases will be used with actual release parameters.

Tables 3 through 5 summarize the model input for the Coreslab Facility.

TABLE 3: Summary of Particulate Model Inputs for Point Sources at the Coreslab Facility

Source Description	Model ID	Stack Height (m)	Stack Temp. (K)	Exit Vel. (m/s)	Stack Dia. (m)	PM10 Emission Rate (lbs/hr)	PM2.5 Emission Rate (lbs/hr)
Mixer #1 (Unit #9)	MIXLOAD1	10.67	0.00	0.0999	0.9144	0.01000	0.00020
Mixer #2 (Unit #10)	MIXLOAD2	10.67	0.00	0.0999	0.9144	0.01000	0.00020
Silo #1 Cement (Unit #11)	SILO1	13.72	0.00	9.7021	0.3048	0.01000	0.00018
Silo #2 Cement (Unit #12)	SILO2	13.72	0.00	9.7021	0.3048	0.01000	0.00018
Silo #3 Fly Ash (Unit #13)	SILO3	13.72	0.00	9.7021	0.3048	0.01000	0.00018
Silo #4 Silica Fume (Unit #25)	SILO4	13.72	0.00	9.7021	0.3048	0.05000	0.00090
Steam Generators 1&4 (Units 16&19) Stack 1	BED1_1	0.000	477.594	0.001	17.0000	0.00900	0.00900
Steam Generators 1&4 (Units 16&19) Stack 2	BED1_2	0.000	477.594	0.001	17.0000	0.00900	0.00900
Steam Generators 1&4 (Units 16&19) Stack 3	BED1_3	0.000	477.594	0.001	17.0000	0.00900	0.00900
Steam Generators 1&4 (Units 16&19) Stack 4	BED1_4	0.000	477.594	0.001	17.0000	0.00900	0.00900
Steam Generators 1&4 (Units 16&19) Stack 5	BED1_5	0.000	477.594	0.001	17.0000	0.00900	0.00900
Steam Generators 1&4 (Units 16&19) Stack 6	BED1_6	0.000	477.594	0.001	17.0000	0.00900	0.00900
Steam Generators 5&6 (Units 20&21) Stack1	BED2_1	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack2	BED2_2	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack3	BED2_3	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack4	BED2_4	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack5	BED2_5	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack6	BED2_6	0.000	477.594	0.001	16.0000	0.00340	0.00340

Source Description	Model ID	Stack Height (m)	Stack Temp. (K)	Exit Vel. (m/s)	Stack Dia. (m)	PM10 Emission Rate (lbs/hr)	PM2.5 Emission Rate (lbs/hr)
Steam Generators 5&6 (Units 20&21) Stack7	BED2_7	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack8	BED2_8	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack9	BED2_9	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack10	BED2_10	0.000	477.594	0.001	16.0000	0.00340	0.00340

TABLE 4: Summary of Combustion Model Inputs for Point Sources at the Coreslab Facility

Source Description	Model ID	Stack Height (m)	Stack Temp. (K)	Exit Vel. (m/s)	Stack Dia. (m)	NOx Emission Rate (lbs/hr)	CO Emission Rate (lbs/hr)	SO2 Emission Rate (lbs/hr)
Steam Generators 1&4 (Units 16&19) Stack 1	BED1_1	0.000	477.594	0.001	17.0000	0.12500	0.10500	0.00038
Steam Generators 1&4 (Units 16&19) Stack 2	BED1_2	0.000	477.594	0.001	17.0000	0.12500	0.10500	0.00038
Steam Generators 1&4 (Units 16&19) Stack 3	BED1_3	0.000	477.594	0.001	17.0000	0.12500	0.10500	0.00038
Steam Generators 1&4 (Units 16&19) Stack 4	BED1_4	0.000	477.594	0.001	17.0000	0.12500	0.10500	0.00038
Steam Generators 1&4 (Units 16&19) Stack 5	BED1_5	0.000	477.594	0.001	17.0000	0.12500	0.10500	0.00038
Steam Generators 1&4 (Units 16&19) Stack 6	BED1_6	0.000	477.594	0.001	17.0000	0.12500	0.10500	0.00038
Steam Generators 5&6 (Units 20&21) Stack1	BED2_1	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack2	BED2_2	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack3	BED2_3	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack4	BED2_4	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack5	BED2_5	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack6	BED2_6	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023

Source Description	Model ID	Stack Height (m)	Stack Temp. (K)	Exit Vel. (m/s)	Stack Dia. (m)	NOx Emission Rate (lbs/hr)	CO Emission Rate (lbs/hr)	SO2 Emission Rate (lbs/hr)
Steam Generators 5&6 (Units 20&21) Stack7	BED2_7	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack8	BED2_8	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack9	BED2_9	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack10	BED2_10	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023

TABLE 5: Summary of Model Inputs for Volume Sources at the Coreslab Facility

Source Description	Model ID	Release Height (meter)	Horizontal Dimension (meters)	Vertical Dimension (meters)	PM10 Emission Rate (lbs/hr)	PM2.5 Emission Rate (lbs/hr)
Sand/Gravel Hopper Loading (Unit #2)	HOPPER	0.0000	1.1600	2.3300	0.12000	0.01817
Sand/Gravel Hopper Unloading (Unit #3)	HOPCONV	2.0000	0.4700	0.9300	0.03000	0.00454
Bin Conveyor (Unit #4)	BINCONV	8.2296	0.4700	0.9300	0.03000	0.00454
Bin Loading (Unit #5)	BINLOAD	7.6200	1.1600	2.3300	0.12000	0.01817
Bin Unloading (Unit #6)	BINUNLD	3.0480	1.1600	2.3300	0.06000	0.00909
Mixer Conveyor (Unit #7)	MIXCONV	12.1920	0.4700	0.9300	0.06000	0.00909
Cement Hopper (Unit #15)	CEMENTHOP	4.5720	0.4700	0.9300	0.03000	0.00454
Emerg. Pile (Unit #22)	AGGHNDL	3.0480	1.4200	2.8300	0.04000	0.00606
Aggregate Blasting (Unit #23/24)	AGGBLAST	2.4400	2.8300	1.1300	1.36991	0.09730
Plant Access Road Volume 1-6 (Unit #1)	HR_0001-6	3.40	6.05	3.16	0.10000	0.01000

2.6 $PM_{2.5}$ SECONDARY EMISSIONS MODELING

The form of the $PM_{2.5}$ 24 hour design value is based on the 98th percentile or the highest 8th high result. Calculated $PM_{2.5}$ combustion emission rates included into the model consist of both filterable and condensable components. Secondary $PM_{2.5}$ emissions from combustion sources are created by the conversion to nitrates and sulfates as the exhaust plume travels away from the source and mixes with ambient air. Fugitive dust emission sources do not consist of a condensable component and will not create secondary emissions of $PM_{2.5}$.

$PM_{2.5}$ secondary emission concentration analysis will follow EPA guidelines. Based on requested permitted emission rates, the Tier 1 analysis was used since direct $PM_{2.5}$ emissions are less than 10 tpy, and NOx and SO_2 emissions are less than 40 tpy. The comparison with the $PM_{2.5}$ 24 hour NAAQS with model results will be based on the 98th percentile or highest 8th high.

2.7 NO_2 DISPERSION MODELING ANALYSIS

The AERMOD model predicts ground-level concentrations of any generic pollutant without chemical transformations. Thus, the modeled NO_X emission rate will give ground-level modeled concentrations of NO_X. NAAQS values are presented as NO_2.

EPA has a three-tier approach to modeling NO_2 concentrations.

- Tier I – total conversion, or all NOx = NO_2
- Tier II –Ambient Ratio Method 2 (ARM2)
- Tier III – case-by-case detailed screening methods, such as OLM and Plume Volume Molar Ratio Method (PVMRM) and NO_2/NO_X in-stack ratio

Initial modeling will be performed using both Tier I and Tier II methodologies. If these modeling iterations demonstrate that less conservative methods for determining 1-hour, 24-hour, and annual NO_2 compliance would be needed for this project, then ambient impact of 1-hour, 24-hour, and annual NOx predicted by the model will use Tier III – OLM or PVMRM.

For OLM or PVMRM, three inputs can be selected in the model, the ISR, the NO_2/NO_X equilibrium ratio for the ambient air, and the ambient ozone concentration. The ISR will be determined for each source or group of sources. The NO_2/NO_X equilibrium ratio will be the EPA default of 0.90. Ozone input will be from monitored ozone data collected from city monitoring station.

It is evident from modeling experience that at distances close to a modeled source, the modeled NO_2/NO_X ratio (and, thus, the NO_2 concentration) is highly dependent upon the assumed in-stack ratio. The use of the default ratio of 0.5 can result in large over predictions at a facility fence line. Proposed NO_2/NOx ratio are listed below.

Natural Gas-fired heater/boiler – NO_2/NOx ratio = 0.20

For NOx, NAAQS and NMAAQS applicable averaging periods include 1-hour, 24-hour and annual averages.

Model Ozone Data

For OLM or PVMRM, modeling of the project-generated 1-hour NO_2 concentrations requires use of ambient monitored O_3 concentrations. Background ambient O_3 concentrations for the project area during the 2001-2005 meteorological data years have been obtained from the Del Norte (Years 2001 - 2002)[1] monitoring station and South Valley (Years 2003 – 2005) monitoring station, which is the monitoring site nearest to the project.

Concerning data substitution for missing hourly O_3 ambient monitoring data, the hourly O_3 data are used within the AERMOD air dispersion model when operated using the PVMRM option that simulates the atmospheric chemistry of O_3 reacting with initially emitted nitric oxide (NO) to form NO_2. If there is only a limited amount of O_3 in the plume, then the reaction is limited, forming less NO_2 than occurs with the simplifying assumption of complete conversion. The model disperses the initial NOx emissions, which are mostly NO, during each of the 8,760 hours in a 365-day year. If the hourly ambient O_3 data from the nearest monitoring station have missing data, the missing O_3 hours are given substituted concentrations with the following procedure to better simulate the resulting NO_2 concentrations:

- If two or fewer consecutive hours of O_3 ambient concentrations are missing, the missing concentrations will be based on the highest previous or subsequent hour concentrations.
- If three or more consecutive hours of O_3 ambient concentrations are missing, then substitution for each missing concentration will be based on the highest 1 hour for same hour in the day over that month. Example: for data missing in January for the first hour of the day will be substituted for the highest value for all first hour of the day in January, etc.

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[1] Ozone monitoring did not begin at the South Valley monitoring station until July 2002. Del Norte monitoring station data is substituted for years 2001 - 2002 into the background ozone data input into the dispersion model.

2.8 AMBIENT MODELING BACKGROUND

Ambient background concentrations will be added to the dispersion modeling results and compared to the NAAQS and NMAAQS. Background concentrations were obtained from the COABC AQP Modeling Section with the exception of the 1-hour NO_2 background methodology discussed below.

CO 1-hr:	2635 micrograms per cubic meter
CO 8-hr:	1718 micrograms per cubic meter
NO_2 Annual:	30 micrograms per cubic meter
SO_2 1-hr:	13.1 micrograms per cubic meter
SO_2 24-hr:	0 micrograms per cubic meter
SO_2 Annual:	0 micrograms per cubic meter
PM_{10} 24-hr:	35 micrograms per cubic meter
$PM_{2.5}$ 24-hr:	18.0 micrograms per cubic meter
$PM_{2.5}$ annual:	7.2 micrograms per cubic meter

NO_2 1-hour Background data

NO_2 1-hour background data will be based on the Tier 2 procedure found in EPA guidance documents[2] for determining background concentrations.

> *"Based on this guidance, we believe that an appropriate methodology for incorporating background concentrations in the cumulative impact assessment for the 1-hour NO_2 standard would be to use multiyear averages of the 98th-percentile of the available background concentrations by season and hour-of-day, excluding periods when the source in question is expected to impact the monitored concentration (which is only relevant for modified sources). For situations involving a significant mobile source component to the background monitored concentrations, inclusion of a day-of-week component to the temporal variability may also be appropriate. The rank associated with the 98th-percentile of daily maximum 1-hour values should be generally consistent with the number of "samples" within that distribution for each combination based on the temporal resolution but also account for the number of samples "ignored" in specifying the 98th-percentile based on the annual distribution. For example, Table 1 in Section 5 of Appendix S specifies the rank associated with the 98th-percentile value based on the annual number of days with valid data. Since the number of days per season will range from 90 to 92, Table 1 would indicate that the 2nd-highest value from the seasonal distribution should be used to represent the 98th-percentile. On the other hand use of the 2nd-highest value for each season would effectively "ignore" only 4 values for the year rather than the 7 values "ignored" from the annual distribution. Balancing these considerations, we recommend that background values by season and hour-of-day used in this context should be based on the 3rd-highest value for each season and hour-of-day combination, whereas the 8th-highest value should be used if values vary by hour-of-day only. For more detailed temporal pairing, such as season by hour-of- day and day-of-week or month by hour-of-*

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[2] Memo: "Additional Clarification Regarding Application of Appendix W Modeling Guidance for 1-hour N02 National Ambient Air Quality Standard" Tyler Fox, Leader, Air Quality Modeling Group, C439-01, dated March 1, 2011.

> *day, the 1st-highest values from the distribution for each temporal combination should be used."*

The NO_2 background data was provided by the COAAQP Modeling Section and is presented below.

TABLE 6: Monitored Seasonal NO_2 Background – 3rd Highest Hourly µg/m³

Hour	Winter	Spring	Summer	Fall
1	72.1	47.6	29.3	65.6
2	67.8	48.3	27.7	59.7
3	67.7	46	26.4	57.9
4	68.4	48.9	26.6	58.9
5	69.1	51.7	32.7	58
6	69.7	63.9	39.3	57.8
7	72.8	70.7	46.4	63.5
8	77.6	71.8	48.5	64.5
9	80	61.1	34.2	65.9
10	71.4	48	27.3	55
11	62	28.6	24.3	47.3
12	48.1	18.9	19.9	35.4
13	36.9	17.6	17	28.2
14	35.1	15.7	15.9	25.3
15	33.6	14.8	17.4	24.2
16	37.2	15.3	19.4	28
17	48.4	17.1	20.4	38
18	73	19.4	19.3	69.6
19	79.3	38.5	21.7	79.1
20	78.1	53.2	30.9	77.1
21	77.3	48	34.1	73.4
22	76.5	56.3	30.8	70.4
23	75	58.8	34.9	69.7
24	72.4	57.9	33.6	70.9

3.0 MODEL SUMMARY

This section summarizes the model results, following the technical approach approved in Section 2 of this report for Class II federal ambient air quality standards for this facility. Model results show for each modeled criteria pollutant and applicable averaging periods for nitrogen dioxide, carbon monoxide, sulfur dioxide, and particulate matter; both 10 microns or less (PM_{10}) and 2.5 microns or less ($PM_{2.5}$), the proposed permit revision application of the Coreslab does not contribute to an exceedance of Class II federal and state ambient air quality standards (NAAQS and NMAAQS) and the City of Albuquerque/Bernalillo County (COABC) air quality regulation 20.11.8 NMAC. The modeling followed the guidance and protocols outlined in the protocol found in Section 2 of this report, the "Permit Modeling Guidelines, Albuquerque Environmental Health Department", revised 12/20/2018, "New Mexico Air Pollution Control Bureau, Dispersion Modeling Guidelines", revised 01/01/2019, and the most up to date EPA's *Guideline on Air Quality Models*.

The permitted operating time for the facilities concrete production is 12 hours per day (7 AM to 7 PM). For proposed abrasive blasting operations, Coreslab will take site-specific conditions on daily abrasive use and hours of operation. For the months of March through October the daily hours of operation was limited to 7 AM to 7 PM. For the months of November through February the daily hours of operation was limited to 7 AM to 6 PM. For modeling, the hourly blocks vary starting from 7 AM then shifting on 2-hour intervals for 5 separate model runs as summarized on Table 7.

TABLE 7: Abrasive Blasting Model Scenario Time Segments

Model Scenario	Time Segments 5-Hour Blocks March - October	Time Segments 5-Hour Blocks November - December
1	7 AM to 12 PM	7 AM to 12 PM
2	9 AM to 2 PM	9 AM to 2 PM
3	11 AM to 4 PM	11 AM to 4 PM
4	1 PM to 6 PM	1 PM to 6 PM
5	2 PM to 7 PM	1 PM to 6 PM

For particulate modeling, neighboring Quikrete can operate 16 hours per day anytime in a 24-hour period or the equivalent to two 8-hour shifts. To determine the potential worst-case modeling impacts from Quikrete, Coreslab will analyze modeling for combined shifts 2 and 3 (6 AM to 10 PM) or shifts 3 and 1 (2 PM to 6 AM). Of these two options the shifts 2 and 3 option (2 PM to 6 AM) would have the facility operating during all nighttime hours. Historically, nighttime hours provide the highest concentrations for ground release fugitive sources due to low wind speeds and a stable boundary layer. Additionally, $PM_{2.5}$ annual modeling will include an hourly factor to address the difference in modeled hours and permit annual hours of operation limit. If the model ran for 16 hours per day, 365 days per year, this is equals 5,840 hours per year. The annual hours of operation in the permit is 4,992 hours per year. This is equivalent to an hourly factor of 0.855 (4,992/5,840) which will be input into the $PM_{2.5}$ annual modeling.

3.1 SIGNIFICANT IMPACT LEVEL (SILs) MODELING ANALYSIS

Significant impact level AERMOD dispersion modeling was completed for NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$. All significant impact models were run in terrain mode and building downwash with Coreslab emission sources only. Table 8 lists the results of the modeling for pollutant and averaging period that falls below the applicable SILs.

TABLE 8: Summary of Air Dispersion Modeling Results below SILs

Parameter	Maximum Modeled Concentration ($\mu g/m^3$)	Significant Impact Level ($\mu g/m^3$)	% of SIL
CO 1 Hr.	113.5	2000	5.7
CO 8 Hr.	91.9	500	18.4
SO_2 1 Hr.	0.41	7.8	5.3
SO_2 3 Hr.	0.37	25.0	1.5
SO_2 24 Hr.	0.26	5.0	5.2
SO_2 Annual	0.031	1.0	3.1

For CO and SO_2, the results show impacts below the SILs. No cumulative impact analysis modeling for CO and SO_2 was performed.

3.2 CUMULATIVE IMPACT ANALYSIS (CIA) MODEL RESULTS

The model results using the maximum operation at Coreslab Structures (Albuquerque), significant neighboring sources, and approved ambient background are summarized below in Table 9. Dispersion modeling analysis followed the modeling protocol outline in Section 2 of this report.

TABLE 9: Summary of CIA Modeling Results Including Background

Parameter	Maximum Modeled Concentration (μg/m^3)	Significant Impact Level (μg/m^3)	Maximum Modeled Concentration With Background (μg/m^3)	Lowest Applicable Standard (μg/m^3)	% of Standard
NO_2 1 Hr. 8th highest 1 hour daily maximum	107.0	7.52	180.0	188	95.7
NO_2 24 Hr.	71.7	5	101.7	188	54.1
NO_2 Annual	10.0	1	40.0	94	42.6
$PM_{2.5}$ 24 Hr. High 8th High	12.0	1.2	30.0	35	85.7
$PM_{2.5}$ Annual	4.3	0.2	11.5	12	95.8
PM_{10} 24 Hr. High 2nd High	112.7	5	147.7	150	98.5

Note: Background concentrations are found in Section 2.7 of the modeling protocol. Dispersion modeling inputs and settings are presented in Section 2.

3.2.1 NO_2 Cumulative Impact Analysis Modeling Results

NO_2 CIA modeling was performed with terrain elevations and building downwash for Coreslab. NO_X emission rates represented the maximum hourly rate for Coreslab point sources, significant neighboring sources, and all Coreslab initial modeling receptors that were above the NO2 SILs. Significant neighbors include; Quikrete, Pet Cemetery, C&C, Albuquerque Asphalt, PNM Rio Bravo Station, and CEI.

Table 10 shows the NO_2 1 Hour 8th highest 1 hour daily maximum and annual model results and locations.

TABLE 10: NO_2 CIA MODEL RESULTS

	Modeled Concentration (µg/m³)	Modeled Concentration With Background (µg/m³)	Location UTMs E/N	
NO_2 1 Hr. 8th highest 1-hour daily maximum	107.0	180.0	349252.9	3880314.0
NO_2 24 Hr.	71.7	101.7	349233.0	3880341.7
NO_2 Annual	10.0	40.0	349185.0	3880349.1

For NO_2 1-hour modeling, the Tier II ARM2 approach found in Section 2.7 of this report was used for the analysis.

Dispersion modeling meteorology for this analysis included 5 years of data, 2001 – 2005 Albuquerque Meteorological data, was obtained from the COABC AQP.

Albuquerque Del Norte Monitor, years 2012 – 2014, 1-hour and annual NO_2 background concentrations found in Section 2.7 of this report were added to the modeled results and compared to the lowest applicable ambient standard.

Model results show the highest 24 hour and annual concentrations, where Coreslab source makes a significant contribution, occurred along the northern Coreslab restricted boundary. Maximum 1-hour concentration, where Coreslab source makes a significant contribution, occurred along the northeastern Coreslab restricted boundary.

Figure 2 shows aa aerial map of the NO_2 8th highest 1 hour daily maximum concentration, highest 24-hour concentration, and highest annual concentration locations including background where Coreslab sources contribute above the NO_2 SILs.

Figure 2: Aerial Map Showing the Location of the NO_2 Highest Concentration Model Result ($\mu g/m^3$)

3.2.2 $PM_{2.5}$ Direct and Secondary Formation CIA Modeling Results

Particulate matter includes both "primary" PM, which is directly emitted into the air, and "secondary" PM, which forms indirectly from fuel combustion and other sources. Primary PM consists of carbon (soot)—emitted from cars, trucks, heavy equipment, forest fires, and burning waste—and crustal material from unpaved roads, stone crushing, construction sites, and metallurgical operations. Secondary PM forms in the atmosphere from gases. Some of these reactions require sunlight and/or water vapor. Secondary PM includes:

- Sulfates formed from sulfur dioxide emissions from power plants and industrial facilities;
- Nitrates formed from nitrogen oxide emissions from cars, trucks, industrial facilities, and power plants; and
- Carbon formed from reactive organic gas emissions from cars, trucks, industrial facilities, forest fires, and biogenic sources such as trees.

AERMOD does not account for secondary formation of $PM_{2.5}$ for near-field modeling. Any secondary contribution of the Coreslab's source emissions is not explicitly accounted for in the model results. While representative background monitoring data for $PM_{2.5}$ should adequately account for secondary contribution from existing background sources, Coreslab sources emits less than significant emission rate (SER) of $PM_{2.5}$ precursors (NO_X, SO_2, VOC), so no assessment of their potential contribution to cumulative impacts as secondary $PM_{2.5}$ was performed. Total permit modification emissions of precursors include:

- Nitrogen Oxides (NO_X) – 2.74 tons per year (below SER)
- Sulfur Dioxides(SO_2) – 0.014 tons per year (below SER)
- Volatile Organic Carbon (VOC) – 0.29 tons per year (below SER).

CIA direct "primary" $PM_{2.5}$ modeling was performed with terrain and meteorology which included 5 years of data, 2001 – 2005 Albuquerque Meteorological data, obtained from the AEHD AQP. Modeling was performed for both 24 hour and annual averaging periods with maximum $PM_{2.5}$ hourly emission rate for Coreslab sources, annual modeling hourly factor, significant neighboring sources (Quikrete), and all Coreslab initial modeling receptors that were above the $PM_{2.5}$ SILs. $PM_{2.5}$ emission rates represented the maximum hourly rate for all emission sources. South Valley representative 24-hour and annual $PM_{2.5}$ background concentrations was added to the modeled results and compared to the lowest applicable ambient standard. The 24-hour and annual background concentrations that were used for $PM_{2.5}$ averaging periods are found in Section 2.8 of this report.

For the Coreslab, direct "primary" $PM_{2.5}$ emission rates are less than 10 tons per year (Significant Emission Rate - SER), and NO_X and SO_2 emission rates are less than 40 tons per year (SER), falling into category "Case 1" in EPA's May, 2014 "Guidance for $PM_{2.5}$ Permit Modeling". For Case 1, no secondary $PM_{2.5}$ ambient impacts associated with the Coreslab are required to be addressed. Direct "primary" $PM_{2.5}$ concentrations using AERMOD dispersion model are summarized in Table 12.

The permitted operating time for the facilities concrete production is 12 hours per day (7 AM to 7 PM). For proposed abrasive blasting operations, Coreslab will take site-specific conditions on daily abrasive use and hours of operation. For the months of March through October the daily throughput was limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 7 PM. For the months of November through February the daily throughput was limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 6 PM. For modeling, the hourly blocks vary starting from 7 AM then shifting on 2-hour intervals for 5 separate model runs as summarized on Table 11.

TABLE 11: Abrasive Blasting Model Scenario Time Segments

Model Scenario	Time Segments 5-Hour Blocks March - October	Time Segments 5-Hour Blocks November - December
1	7 AM to 12 PM	7 AM to 12 PM
2	9 AM to 2 PM	9 AM to 2 PM
3	11 AM to 4 PM	11 AM to 4 PM
4	1 PM to 6 PM	1 PM to 6 PM
5	2 PM to 7 PM	1 PM to 6 PM

Results showed that direct "primary" $PM_{2.5}$ from Coreslab sources, where Coreslab source makes a significant contribution, are located on the eastern Quikrete boundary. At these locations the highest concentrations are due to Quikrete sources. The result from direct "primary" $PM_{2.5}$ emissions dispersion modeling, plus a representative $PM_{2.5}$ background concentrations from Section 2.8 of this report, which includes monitored secondary $PM_{2.5}$ concentrations, were used to show compliance with national $PM_{2.5}$ annual and 24-hour average AAQS.

TABLE 12: $PM_{2.5}$ CIA MODEL RESULTS

	Modeled Concentration (µg/m³)	Modeled Concentration With Background (µg/m³)	Location UTMs E/N	
24 Hour Average Highest 8th High	12.0	30.0	349257.0	3880397.0
Annual Average	4.3	11.5	349234.5	3880417.5

Figure 3 summarize the results of the modeling analysis.

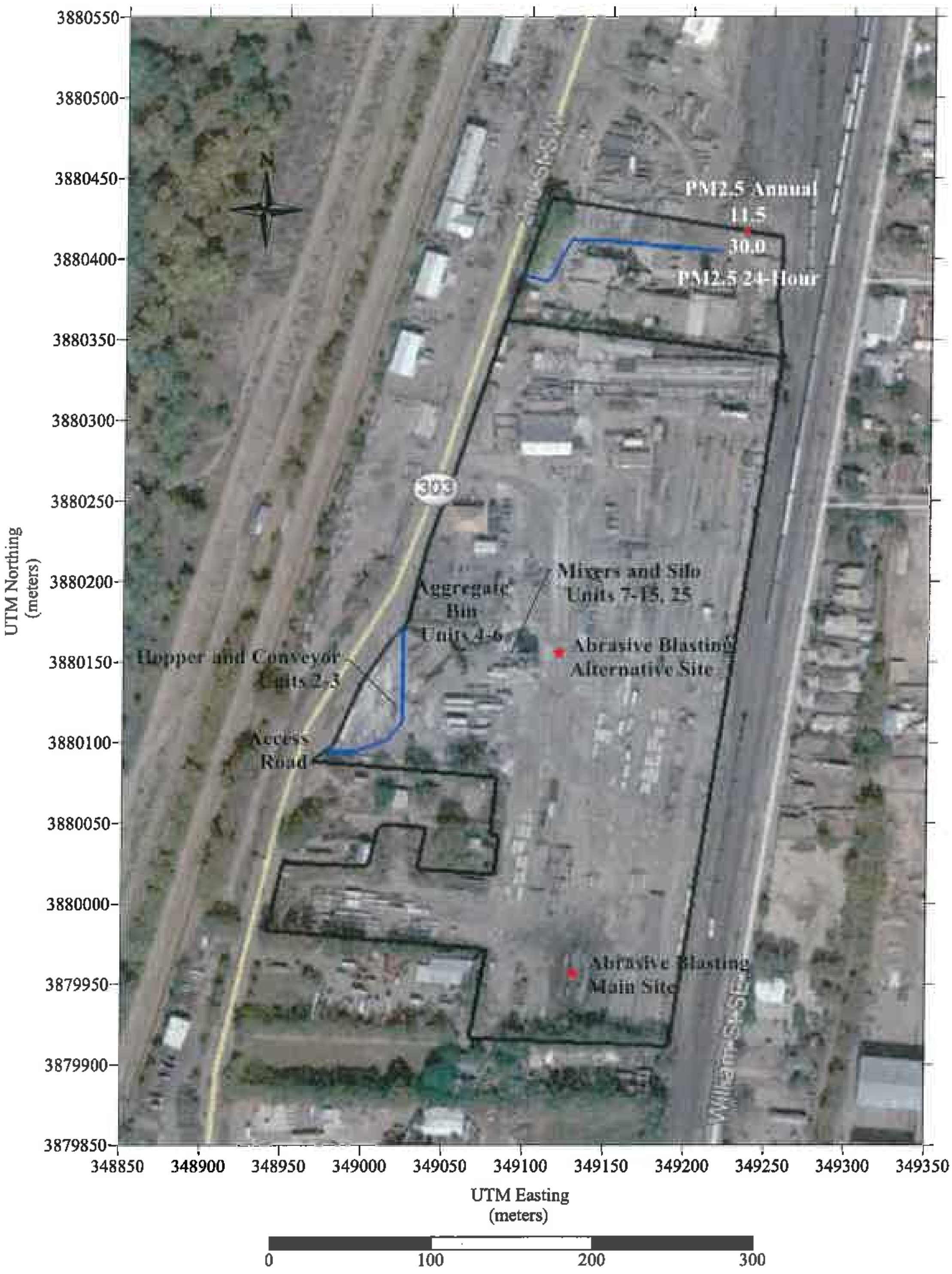

Figure 3: Aerial Map Showing the Location of the $PM_{2.5}$ Highest Model Results ($\mu g/m^3$)

3.2.3 PM_{10} Cumulative Impact Analysis Modeling Results

CIA PM_{10} modeling was performed with terrain and meteorology which included 5 years of data, 2001 – 2005 Albuquerque Meteorological data, obtained from the AEHD AQP. Modeling was performed for the 24-hour averaging periods with maximum PM_{10} hourly emission rate for Coreslab sources, significant neighboring sources (Quikrete), and all Coreslab initial modeling receptors that were above the PM_{10} 24-hour SIL. South Valley representative 24-hour PM_{10} background concentrations was added to the modeled results and compared to the lowest applicable ambient standard. The 24-hour background concentrations that were used for PM_{10} averaging period are found in Section 2.8 of this report.

The permitted operating time for the facilities concrete production is 12 hours per day (7 AM to 7 PM). For proposed abrasive blasting operations, Coreslab will take site-specific conditions on daily abrasive use and hours of operation. For the months of March through October the daily throughput was limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 7 PM. For the months of November through February the daily throughput was limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 6 PM. For modeling, the hourly blocks vary starting from 7 AM then shifting on 2-hour intervals for 5 separate model runs as summarized on Table 13.

TABLE 13: Abrasive Blasting Model Scenario Time Segments

Model Scenario	Time Segments 5-Hour Blocks March - October	Time Segments 5-Hour Blocks November - December
1	7 AM to 12 PM	7 AM to 12 PM
2	9 AM to 2 PM	9 AM to 2 PM
3	11 AM to 4 PM	11 AM to 4 PM
4	1 PM to 6 PM	1 PM to 6 PM
5	2 PM to 7 PM	1 PM to 6 PM

Results showed that PM_{10} from Coreslab sources, where Coreslab source makes a significant contribution, are located on the southern Coreslab boundary. At these locations the highest concentrations are due to Coreslab sources. The result from PM_{10} emissions dispersion modeling, plus a representative PM_{10} background concentrations from Section 2.8 of this report, were used to show compliance with national PM_{10} 24-hour average AAQS. PM_{10} 24-hour concentrations using the AERMOD dispersion model are summarized in Table 14.

TABLE 14: PM_{10} CIA MODEL RESULTS

	Modeled Concentration (µg/m³)	Modeled Concentration With Background (µg/m³)	Location UTMs E/N	
24 Hour Average Highest 2nd High	112.7	147.7	349111.4	3879910.2

Figure 4 summarize the results of the modeling analysis.

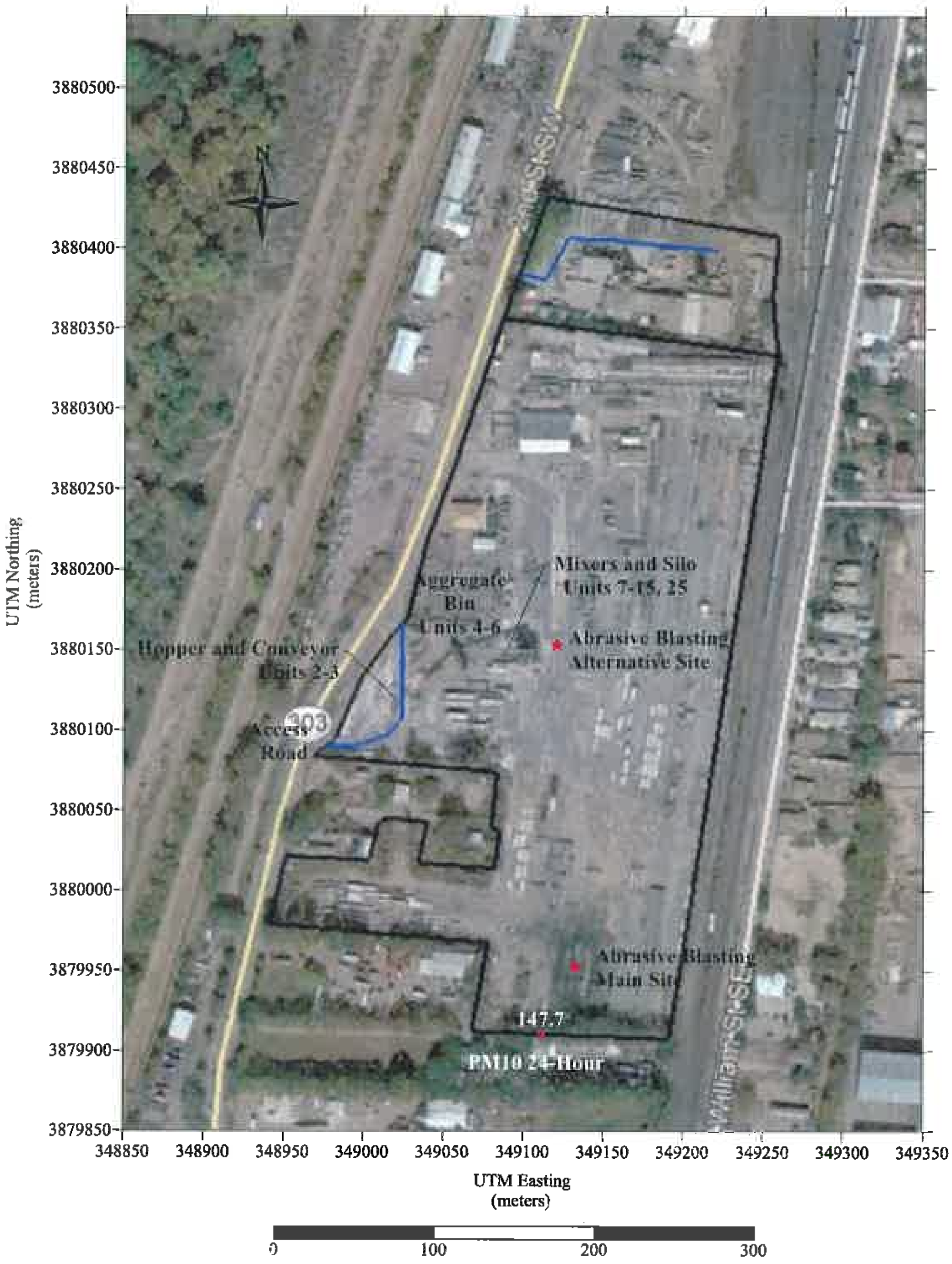

Figure 4: Aerial Map Showing the Location of the PM_{10} Highest 2nd High 24-Hour Model Results ($\mu g/m^3$)

Modeling File List

Model File Name	Description
CoreslabCombustROI	Coreslab Combustion ROI modeling
CoreslabNO2	Coreslab CIA NO_2 24-hour and annual average modeling
CoreslabNO21Hr	Coreslab CIA NO_2 1-hour average modeling
CoreslabPMS1ROI	Coreslab PM ROI modeling for Abrasive Blasting at Main Site using Scenario 1
CoreslabPMS1ROIAlt	Coreslab PM ROI modeling for Abrasive Blasting at Alternative Site using Scenario 1
CoreslabPMS5ROI	Coreslab PM ROI modeling for Abrasive Blasting at Main Site using Scenario 5
CoreslabPMS5ROIAlt	Coreslab PM ROI modeling for Abrasive Blasting at Alternative Site using Scenario 5
CoreslabPM2.5S1-5An	Coreslab CIA PM2.5 Annual for Abrasive Blasting at Main Site using Scenarios 1-5, Quikrete Operating Shifts 1 and 2
CoreslabPM2.5S1-5AnAlt	Coreslab CIA PM2.5 Annual for Abrasive Blasting at Alternative Site using Scenarios 1-5, Quikrete Operating Shifts 1 and 2
CoreslabPM2.5S1-5AnE	Coreslab CIA PM2.5 Annual for Abrasive Blasting at Main Site using Scenarios 1-5, Quikrete Operating Shifts 2 and 3
CoreslabPM2.5S1-5AnAltE	Coreslab CIA PM2.5 Annual for Abrasive Blasting at Alternative Site using Scenarios 1-5, Quikrete Operating Shifts 2 and 3
CoreslabPMS1-5	Coreslab CIA PM2.5 24-Hour and PM10 24 Hour for Abrasive Blasting at Main Site using Scenarios 1-5, Quikrete Operating Shifts 1 and 2
CoreslabPMS1-5Alt	Coreslab CIA PM2.5 24-Hour and PM10 24 Hour for Abrasive Blasting at Alternative Site using Scenarios 1-5, Quikrete Operating Shifts 1 and 2
CoreslabPMS1-5E	Coreslab CIA PM2.5 24-Hour and PM10 24 Hour for Abrasive Blasting at Main Site using Scenarios 1-5, Quikrete Operating Shifts 2 and 3
CoreslabPMS1-5AltE	Coreslab CIA PM2.5 24-Hour and PM10 24 Hour for Abrasive Blasting at Alternative Site using Scenarios 1-5, Quikrete Operating Shifts 2 and 3

Attachment H
Public Notice Documents

Environmental Health Department

Air Quality Program

Interoffice Memorandum

Tim Keller, Mayor

Danny Nevarez, Acting Director

TO: PAUL WADE, SENIOR ENGINEER, MONTROSE AIR QUALITY SERVICES

FROM: REGAN EYERMAN, SENIOR ENVIRONMENTAL HEALTH SCIENTIST

SUBJECT: DETERMINATION OF NEIGHBORHOOD ASSOCIATIONS AND COALITIONS WITHIN 0.5 MILES OF 2800 2ND ST. SW, ALBUQUERQUE, NM 87102

DATE: JANUARY 15, 2019

DETERMINATION:

On January 15, 2019 I used the City of Albuquerque Zoning Advanced Map Viewer (http://sharepoint.cabq.gov/gis) to review which City of Albuquerque (COA) Neighborhood Associations (NAs) and Neighborhood Coalitions (NCs) are located within 0.5 miles of 2800 2nd St. SW, Albuquerque in Bernalillo County, NM.

I then used the City of Albuquerque Office of Neighborhood Coordination's Monthly Master NA List dated January 2019 and the Bernalillo County Monthly Neighborhood Association January 2019 Excel file to determine the contact information for each NA and NC located within 0.5 miles of 2800 2nd St. SW, Albuquerque in Bernalillo County, NM.

Duplicates have been deleted:

From http://sharepoint.cabq.gov/gis using the zoning advanced map viewer and the list of NAs and NCs from CABQ Office of Neighborhood Coordination:

COA Association or Coalition	Name	Email or Mailing Address
Barelas N/A	Julia Archibeque-Guerra	julia.guerra@comcast.net
Barelas N/A	Alicia Romero	aliciamromero1@gmail.com
Barelas N/A	N/A Association	barelasna@gmail.com
South Broadway N/A	Frances Armijo Gwen Colonel	sbnaabq@gmail.com
South Valley Coalition of NAs	Rod Mahoney	rmahoney01@comcast.net
South Valley Coalition of NAs	Marcia Fernandez	mbfernandez1@gmail.com
Southwest Alliance of Neighborhoods	Johnny Pena	johnnyepena@comcast.net
Southwest Alliance of Neighborhoods	Jerry Gallegos	jgallegoswccdg@gmail.com
Westside Coalition	Rene Horvath	aboard10@juno.com land@trna.org
Westside Coalition	Harry Hendriksen	hlhen@comcast.net

From http://sharepoint.cabq.gov/gis using the zoning advanced map viewer and the list of NA's and NC's from County of Bernalillo:

BC Association or Coalition	Name	Email or Mailing Address
Mountain View Community Action	Marla Painter	marladesk@gmail.com
Mountain View Community Action	Sandy Ragan	sragan75@outlook.com
Mountain View NA	Nora Garcia	ngarcia49@yahoo.com
Mountain View NA	Julian Vargas	julianv@gmail.com javargasconst@gmail.com
San Jose N/A	Robert Brown and Olivia M.G. Price	sjnase@gmail.com

MONTROSE ENVIRONMENTAL

Paul Wade <pwade@montrose-env.com>

Notice of Intent Coreslab Permit Revision

1 message

Paul Wade <pwade@montrose-env.com>
Tue, Apr 16, 2019 at 9:59 AM
To: julia.guerra@comcast.net, aliciamromero1@gmail.com, barelasna@gmail.com, sbnaabq@gmail.com, rmahoney01@comcast.net, Marcia Fernandez <mbfernandez1@gmail.com>, johnnyepena@comcast.net, jgallegoswccdg@gmail.com, aboard10@juno.com, land@trna.org, hlhen@comcast.net, Marla Painter <marladesk@gmail.com>, sragan75@outlook.com, ngarcia49@yahoo.com, julianv@gmail.com, julian vargas <javargasconst@gmail.com>, sjnase@gmail.com
Cc: Greg Krause <gkrause@coreslab.com>, "Eyerman, Regan V." <reyerman@cabq.gov>, "Tavarez, Isreal L." <ITavarez@cabq.gov>

Under 20.11.41.13B NMAC, the owner/operator is required to provide public notice by certified mail or electronic mail to the designated representative(s) of the recognized neighborhood associations and recognized coalitions that are within one-half mile of the exterior boundaries of the property on which the source is or is proposed to be located if they propose to construct or establish a new facility or make modifications to an existing facility that is subject to 20.11.41 NMAC – Construction Permits.

The attached notices are to inform you that Coreslab Structures (Albuquerque), Inc is preparing to submit a permit revision to their present Permit #359-M2-RV1.

Any questions, comments, or concerns can be addressed to the contacts listed on the Notice of Intent.

Respectfully,

MEG Logo_Signature

Paul Wade

Sr. Engineer

Montrose Air Quality Services, LLC

3500 G Comanche Rd. NE, Albuquerque, NM 87107

T: 505.830.9680 x6 | F: 505.830.9678

PWade@montrose-env.com

www.montrose-env.com

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2 attachments

Coreslab NOI.docx
185K

Coreslab Public Notice Cover Letter.docx
16K

SUBJECT: Public Notice of Proposed Air Quality Construction Permit Application

Dear Neighborhood Association/Coalition Representative(s),

Why did I receive this public notice?
You are receiving this notice in accordance with New Mexico Administrative Code (NMAC) 20.11.41.13.B(1) which requires any applicant seeking an Air Quality Construction Permit pursuant to 20.11.41 NMAC to provide public notice by certified mail or electronic mail to the designated representative(s) of the recognized neighborhood associations and recognized coalitions that are within one-half mile of the exterior boundaries of the property on which the source is or is proposed to be located.

What is the Air Quality Permit application review process?
The City of Albuquerque, Environmental Health Department, Air Quality Program (Program) is responsible for the review and issuance of Air Quality Permits for any stationary source of air contaminants within Bernalillo County. Once the application is received, the Program reviews each application and rules it either complete or incomplete. Complete applications will then go through a 30-day public comment period. Within 90 days after the Program has ruled the application complete, the Program shall issue the permit, issue the permit subject to conditions, or deny the requested permit or permit modification. The Program shall hold a Public Information Hearing pursuant to 20.11.41.15 NMAC if the Director determines there is significant public interest and a significant air quality issue is involved.

What do I need to know about this proposed application?

Applicant Name	Coreslab Structures (Albuquerque), Inc.
Site or Facility Name	Coreslab Structures (Albuquerque), Inc.
Site or Facility Address	2800 2nd Street SW, Albuquerque, NM 87102
New or Existing Source	Existing Source - Permit #359-M2-RV1
Anticipated Date of Application Submittal	April 19, 2019
Summary of Proposed Source to Be Permitted	Coreslab Structures (Albuquerque), Inc. is submitting a significant revision application to include additional sources to their Albuquerque Facility operations. These additional sources include; dry outdoor abrasive blasting, additional storage silo, and 300-gallon gasoline storage tank

What emission limits and operating schedule are being requested?
See attached Notice of Intent to Construct form for this information.

How do I get additional information regarding this proposed application?
For inquiries regarding the proposed source, contact:

- Greg Krause
- gkrause@coreslab.com
- (505) 247-3725

For inquiries regarding the air quality permitting process, contact:

- City of Albuquerque Environmental Health Department Air Quality Program
- aqd@cabq.gov
- (505) 768-1972

Notice of Intent to Construct

Under 20.11.41.13B NMAC, the owner/operator is required to *provide public notice by certified mail or electronic mail to the designated representative(s) of the recognized neighborhood associations and recognized coalitions that are with-in one-half mile of the exterior boundaries of the property on which the source is or is proposed to be located* if they propose to construct or establish a new facility or make modifications to an existing facility that is subject to 20.11.41 NMAC – Construction Permits. **A copy of this form must be included with the application.**

Applicant's Name and Address: Coreslab Structures (Albuquerque), Inc., 2800 2nd Street SW, Albuquerque, NM 87102

Owner / Operator's Name and Address: Coreslab Structures (Albuquerque), Inc., 2800 2nd Street SW, Albuquerque, NM 87102

Actual or Estimated Date the Application will be submitted to the Department: April 19, 2019

Exact Location of the Source or Proposed Source: 2800 2nd Street SW, Albuquerque, NM 87102

Description of the Source: Manufacturing of Pre-Stressed Concrete Products

Nature of the Business: Manufacturing of Pre-Stressed Concrete Products

Process or Change for which the permit is requested: Permit revision to include abrasive blasting, additional storage silo, and 300-gallon gasoline storage tank.

Preliminary Estimate of the Maximum Quantities of each regulated air contaminant the source will emit:

Initial Construction Permit

	Pounds Per Hour (lbs/hr)	Tons Per Year (tpy)
CO	***	***
NOx	***	***
NOx + NMHC	***	***
VOC	***	***
SO_2	***	***
TSP	***	***
PM10	***	***
PM2.5	***	***
VHAP	***	***

Net Changes In Emissions

(Only for permit Modifications or Technical Revisions)

	lbs/hr	tpy	Estimated Total TPY
CO	+/- 0.0	+/- 0.0	2.29
NOx	+/- 0.0	+/- 0.0	2.74
NOx + NMHC	***	***	***
VOC	+ 0.032	+ 0.14	0.29
SO_2	+/- 0.0	+/- 0.0	0.014
TSP	+ 5.84	+ 4.48	6.66
PM10	+ 1.48	+ 1.11	2.07
PM2.5	+ 0.11	+ 0.079	0.36
VHAP	+/- 0.0	+/- 0.0	<0.01

Maximum Operating Schedule: 6 AM to 7 PM, 6 days per week

Normal Operating Schedule: 6 AM to 5 PM, 6 days per week

Current Contact Information for Comments and Inquires:
Name: Greg Krause, General Manager
Address: 2800 2nd Street SW, Albuquerque, NM 87102
Phone Number: (505) 247-3725
E-Mail Address: gkrause@coreslab.com

If you have any comments about the construction or operation of the above facility, and you want your comments to be made as part of the permit review process, you must submit your comments in writing to the address below:

Environmental Health Manager

Permitting Division

Albuquerque Environmental Health Department

Air Quality Program

PO Box 1293

Albuquerque, New Mexico 87103

(505) 768-1972

Other comments and questions may be submitted verbally.

Please refer to the company name and facility name, as used in this notice or send a copy of this notice along with your comments, since the Department may not have received the permit application at the time of this notice. Please include a legible mailing address with your comments. Once the Department has performed a preliminary review of the application and its air quality impacts, if required, the Department's notice will be published on the City of Albuquerque's website, https://www.cabq.gov/airquality/air-quality-permits and mailed to neighborhood associations and neighborhood coalitions near the facility location or near the facility proposed location.

Introduction

With this 20.11.41 NMAC Permit #359-M2-RV1 revision application, Coreslab Structures (Albuquerque), Inc. (Coreslab) is submitting a significant revision application to include additional sources to their Albuquerque Facility operations. These additional sources include; dry outdoor abrasive blasting, additional storage silo, and 300-gallon gasoline storage tank.

Coreslab has retained Montrose Air Quality Services, LLC (Montrose) to assist with the permit application. The location of Coreslab Albuquerque Facility is 2800 2nd Street SW.

The permitted operating time for the facility's concrete production is 12 hours per day (7 AM to 7 PM) at 250 cubic yards per day.

For proposed abrasive blasting operations, Coreslab will take site-specific conditions on daily abrasive use and hours of operation. For the months of November through February the daily usage will be limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 6 PM. For the months of March through October the daily usage will be limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 7 PM. For modeling, the hourly blocks vary starting from 7 AM then shifting on 2-hour intervals for 5 separate model runs as summarized on Table 1.

TABLE 1: Abrasive Blasting Model Scenario Time Segments

Model Scenario	Time Segments 5-Hour Blocks March - October	Time Segments 5-Hour Blocks November - February
1	7 AM to 12 PM	7 AM to 12 PM
2	9 AM to 2 PM	9 AM to 2 PM
3	11 AM to 4 PM	11 AM to 4 PM
4	1 PM to 6 PM	1 PM to 6 PM
5	2 PM to 7 PM	1 PM to 6 PM

No change in existing permitted sources is proposed with this permit revision. No startup/shutdown emission rates are expected to be greater than what is proposed for normal operations of the new sources. All new controls will be operating and functioning correctly prior to the start of production.

If you have any questions regarding this permit application please call Paul Wade of Montrose Air Quality Services, LLC at (505) 830-9680 x6 or Greg Krause of Coreslab Services at (505) 967-8137.

The contents of this application packet include:

20.11.41 NMAC Permit Fee Review
20.11.41 NMAC Permit Checklist
20.11.41 NMAC Permit Application Forms
Attachment A: Figure A-1: Coreslab Structure's Albuquerque Facility Site Layout
Attachment B: Emission Calculations
Attachment C: Emission Calculations Support Documents
Attachment D: Figure D-1: Aerial Map Showing Site Location
Attachment E: Facility Process Description
Attachment F: Regulatory Applicability Determinations
Attachment G: Dispersion Modeling Summary and Report
Attachment H: Public Notice Documents

Attachment A
Facility Process Plot Plan

Figure A-1: Coreslab Structure's Albuquerque Facility Site Layout

Attachment B
Emissions Calculations

Pre-Control Particulate Emission Rates

MATERIAL HANDLING ($PM_{2.5}$, PM_{10}, AND TSP)

To estimate pre-control particulate emission rates for abrasive blasting, emission factor for PM was obtained from EPA AP-42 Section 11.12 adjusted to Grit or Similar abrasive by multiplying Table 13.2.6-1 emission rate of 55 lbs/1000 lbs of abrasive (for windspeeds of 10 MPH) by 24% (AP-42 Section 13.2.6.3). This is equal to a Total PM emission rate of 13.2 lbs/1000 pounds of abrasive. To determine emission factors for TSP, PM_{10} and $PM_{2.5}$, particulate size distribution testing found in Advanced Technology Institute document "Residual Risk from Abrasive Blasting Emissions: Particle Size and Metal Speciation", dated December 2005, Table 2: "Size Distribution of Airborne Particles from Dry Abrasive Blasting, Single Particle Optical Scanning (SPOS) Method" was used. In Table 2, of abrasive that is proposed for the site, the highest percentage for PM_{30} (TSP), PM_{10} and $PM_{2.5}$ is found in coal slag abrasive at PM_{30} – 36.62%, PM_{10} – 8.87%, and $PM_{2.5}$ – 0.63%.

Table 2: Size Distribution of Airborne Particles from Dry Abrasive Blasting Single Particle Optical Scanning (SPOS) Method

Particle Size Micron	Cumulative Mass % (all particles less than the size indicated)					
	Barshot %	Coal Slag %	Copper Slag %	Garnet %	Steel Grit %	Sp. Sand %
1.01	0.16	0.19	0.22	0.16	0.33	0.17
2.46	0.37	0.63	0.54	0.37	0.92	0.57
3.93	0.56	1.28	0.86	0.56	1.56	1.13
6.99	1.16	3.89	2.42	1.16	4.56	3.06
10.07	2.11	8.87	7.27	2.11	9.92	6.19
15.29	4.09	18.74	21.47	4.09	17.62	12.00
19.86	6.02	25.59	30.62	6.02	23.15	16.30
24.47	8.46	31.13	36.18	8.46	28.82	20.67
30.16	12.54	36.62	40.98	12.54	35.94	26.89
400	100.00	100.00	100.00	100.00	100.00	100.00

Normalizing this to Total PM (PM_{400}), the ratio of TSP/ PM_{400} is 0.3662 the ratio of PM_{10}/ PM_{400} is 0.0877, and for $PM_{2.5}$/ PM_{400} is 0.0063. The emission rates for abrasive blasting are as follows:

Pollutant	Particle Size Distribution %	Ratio to PM400	Emission Factor (lbs/1000 lbs of abrasives)
PM400	100.0		13.2
PM30	36.62	0.3662	4.833840
PM10	8.87	0.0887	1.170840
PM2.5	0.63	0.0063	0.083160

Pre-control particulate emissions rates for the proposed additional silo loading was obtained from EPA's Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Fifth

Edition, Section 11.12 (06/06), Table 11.12-2 "Cement Unloading to Elevated Storage Silo". To determine missing $PM_{2.5}$ emission factors the ratio of 0.995/0.050 from TSP/$PM_{2.5}$ uncontrolled emission equations found in AP-42 Section 11.12 (06/06), Table 11.12-3 "Cement Unloading to Elevated Storage Silo" was used.

Abrasive Blasting Emission Factors:

Process Unit	TSP Emission Factor (lbs/1000 lbs of Abrasive)	PM_{10} Emission Factor (lbs/1000 lbs of Abrasive)	$PM_{2.5}$ Emission Factor (lbs/1000 lbs of Abrasive)
Uncontrolled Abrasive Blasting	4.833840	1.170840	0.083160

AP-42 Section 11.12 Table 11.12-2 Uncontrolled Emission Factors:

Process Unit	TSP Emission Factor (lbs/ton)	PM_{10} Emission Factor (lbs/ton)	$PM_{2.5}$ Emission Factor (lbs/ton)
Mineral Filler Silo Loading	0.73	0.46	0.036

The following equation was used to calculate the hourly emission rate for each process unit:

Emission Rate = Process Rate * Emission Factor

The following equation was used to calculate the annual emission rate for each process unit:

$$\text{Emission Rate} = \frac{\text{Emission Rate} * 3756 \text{ (permit limit hr/year)}}{2000 \text{ lbs/ton}}$$

Table B-1 Pre-Controlled Additional Particulate Emission Rates

Unit #	Process Unit Description	Process Rate	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
23/ 24	Abrasive Blasting	2459 lbs/hr 9,236,004 lbs/yr	11.89	22.32	2.88	5.41	0.20	0.38
25	Silica Fume Silo	25 ton/hr 14,976 tons/yr	18.25	5.47	11.50	3.44	0.90	0.27

Controlled Particulate Emission Rates

No controls or emission reductions for abrasive blasting (Units 23 and/or 24) with the exception of limiting annual abrasive blasting usage.

Particulate emission control for silica fume silo loading is a baghouse with a control efficiency of at least 99%. Additionally, the loading of silica fume is restricted to annual production limits.

CONTROLLED MATERIAL HANDLING ($PM_{2.5}$, PM_{10}, AND TSP)

Abrasive Blasting Emission Factors:

Process Unit	TSP Emission Factor (lbs/1000 lbs of Abrasive)	PM_{10} Emission Factor (lbs/1000 lbs of Abrasive)	$PM_{2.5}$ Emission Factor (lbs/1000 lbs of Abrasive)
Uncontrolled Abrasive Blasting	4.833840	1.170840	0.083160

AP-42 Section 11.12 Table 11.12-2 Controlled Emission Factors:

Process Unit	TSP Emission Factor (lbs/ton)	PM_{10} Emission Factor (lbs/ton)	$PM_{2.5}$ Emission Factor (lbs/ton)
Mineral Filler Silo Loading	0.0073	0.0046	0.00036

The following equation was used to calculate the hourly emission rate for each process unit:

$$\text{Emission Rate (lbs/hour)} = \text{Process Rate} * \text{Emission Factor}$$

The following equation was used to calculate the annual emission rate for each process unit:

$$\text{Emission Rate (tons/year)} = \frac{\text{Hourly Emission Factor} * \text{Annual Throughput}}{2000 \text{ lbs/ton}}$$

Table B-2 Controlled Additional Particulate Emission Rates

Unit #	Process Unit Description	Process Rate	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
23/ 24	Abrasive Blasting	2459 lbs/hr 3,848,335 lbs/yr	11.89	9.30	2.88	2.25	0.20	0.16
25	Silica Fume Silo	25 ton/hr 14,976 tons/yr	0.18	0.055	0.12	0.034	0.0090	0.0027

To calculate existing source $PM_{2.5}$ emission rates, a $PM_{2.5}/PM_{10}$ ratio was used. The following ratios were used:

Operation Type	PM10 Factor	PM2.5 Factor	PM2.5/PM10 Ratio	Basis
Cement/Fly Ash Mixers, Cement/Fly Ash Silos, and Cement Hopper	0.13	0.03	0.23077	AP-42 Table 11.12-4 "Controlled Central Mixer" k factor
Aggregate Handling	0.35	0.053	0.15143	AP-42 Table 13.2.4, k factor
Haul Road	1.5	0.15	0.10	AP-42 Table 13.2.2-2, k factor

300-Gallon Gasoline Storage Tank (Unit 26)

EPA's TANK 4.0.9d emission rate program was used to determine VOC emission rates from the above ground 300-gallon gasoline storage tank (Unit 26). The annual gasoline throughput of 4,500 gallons per year. The following is the output report for the 300-gallon gasoline storage tank. Hourly VOC emission rate is 0.032 lbs/hr and 0.14 tons/year.

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Table B-3 Summary of Allowable NOx, CO, SO2, and PM Emission Rates

		Allowable Emission Totals													
Unit #	Description	CO		NOx		SO_2		VOC		TSP		PM_{10}		$PM_{2.5}$	
		lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
1	Haul road									0.46	0.58	0.09	0.12	0.009	0.012
2	Sand/Gravel Hopper									0.26	0.32	0.12	0.15	0.018	0.023
3	Incline Truss Conveyor Belt 1									0.07	0.08	0.03	0.04	0.0045	0.0061
4	Shuttle Conveyor									0.07	0.08	0.03	0.04	0.0045	0.0061
5	Storage Bins (6)									0.26	0.32	0.12	0.15	0.018	0.023
6	Weight Belt Conveyor									0.13	0.17	0.06	0.08	0.0091	0.0121
7	Incline Truss Conveyor Belt 2									0.13	0.17	0.06	0.08	0.0091	0.0121
9	Mixer #1 with Baghouse									0.02	0.03	0.01	0.01	0.0023	0.0023
10	Mixer #2 with Baghouse									0.02	0.03	0.01	0.01	0.0023	0.0023
11	100 Ton Cement Silo with Baghouse									0.01	0.02	0.01	0.01	0.0023	0.0023
12	100 Ton Cement Silo with Baghouse									0.01	0.02	0.01	0.01	0.0023	0.0023
13	100 Ton Fly Ash Silo with Baghouse									0.01	0.02	0.01	0.01	0.0023	0.0023
15	Cement Hopper									0.06	0.07	0.03	0.04	0.0069	0.0092
16	Boiler #1	0.04	0.09	0.05	0.11	0.0003	0.001	0.003	0.007	0.004	0.01	0.004	0.01	0.004	0.01
17	Boiler #2	0.04	0.09	0.05	0.11	0.0003	0.001	0.003	0.007	0.004	0.01	0.004	0.01	0.004	0.01
18	Boiler #3	0.04	0.09	0.05	0.11	0.0003	0.001	0.003	0.007	0.004	0.01	0.004	0.01	0.004	0.01
19	Boiler #4	0.59	1.29	0.7	1.53	0.002	0.005	0.02	0.08	0.05	0.1	0.05	0.1	0.05	0.1
20	Boiler #5	0.29	0.64	0.35	0.77	0.002	0.005	0.02	0.04	0.03	0.02	0.03	0.02	0.03	0.02
21	Boiler #6	0.04	0.09	0.05	0.11	0.0003	0.0007	0.003	0.007	0.004	0.01	0.004	0.01	0.004	0.01

Table B-3 Summary of Allowable NOx, CO, SO2, and PM Emission Rates

Allowable Emission Totals															
Unit #	Description	CO		NOx		SO_2		VOC		TSP		PM_{10}		$PM_{2.5}$	
		lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
22	Aggregate Handling									0.09	0.11	0.04	0.05	0.0061	0.0076
23	Aggregate Blaster #1									11.89	9.30	2.88	2.25	0.20	0.16
24	Aggregate Blaster #2														
25	Silica Fume Silo with Baghouse									0.18	0.055	0.12	0.034	0.0090	0.0027
26	300-Gallon Gasoline Storage Tank							0.032	0.14						
	Total	**1.04**	**2.29**	**1.25**	**2.74**	**0.0052**	**0.014**	**0.084**	**0.29**	**13.76**	**11.52**	**3.71**	**3.23**	**0.40**	**0.42**

TANKS 4.0.9d

Emissions Report - Detail Format

Tank Identification and Physical Characteristics

Identification		
User Identification:	Coreslab	
City:	Albuquerque	
State:	New Mexico	
Company:	Coreslab	
Type of Tank:	Horizontal Tank	
Description:	Coreslab 300 Gallon Gasoline Storage Tank	
Tank Dimensions		
Shell Length (ft):		6.00
Diameter (ft):		3.00
Volume (gallons):		300.00
Turnovers:		15.00
Net Throughput(gal/yr):		4,500.00
Is Tank Heated (y/n):	N	
Is Tank Underground (y/n):	N	
Paint Characteristics		
Shell Color/Shade:	Aluminum/Diffuse	
Shell Condition	Good	
Breather Vent Settings		
Vacuum Settings (psig):		-0.03
Pressure Settings (psig)		0.03

Meteorological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Coreslab - Horizontal Tank
Albuquerque, New Mexico

		Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp	Vapor Pressure (psia)			Vapor Mol.	Liquid Mass	Vapor Mass	Mol.	Basis for Vapor Pressure
Mixture/Component	Month	Avg.	Min.	Max.	(deg F)	Avg.	Min.	Max.	Weight.	Fract.	Fract.	Weight	Calculations
Gasoline (RVP 10)	All	65.98	53.54	78.42	58.75	5.8155	4.5676	7.3220	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Coreslab - Horizontal Tank
Albuquerque, New Mexico

Annual Emission Calculations	
Standing Losses (lb):	238.5522
Vapor Space Volume (cu ft):	27.0137
Vapor Density (lb/cu ft):	0.0680
Vapor Space Expansion Factor:	0.5199
Vented Vapor Saturation Factor:	0.6838
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	27.0137
Tank Diameter (ft):	3.0000
Effective Diameter (ft):	4.7885
Vapor Space Outage (ft):	1.5000
Tank Shell Length (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0680
Vapor Molecular Weight (lb/lb-mole):	66.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.8155
Daily Avg. Liquid Surface Temp. (deg. R):	525.6478
Daily Average Ambient Temp. (deg. F):	56.1542
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	518.4242
Tank Paint Solar Absorptance (Shell):	0.6000
Daily Total Solar Insulation Factor (Btu/sqft day):	1,765.3167
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.5199
Daily Vapor Temperature Range (deg. R):	49.7633
Daily Vapor Pressure Range (psia):	2.7544
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.8155
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	4.5676
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	7.3220
Daily Avg. Liquid Surface Temp. (deg R):	525.6478
Daily Min. Liquid Surface Temp. (deg R):	513.2069
Daily Max. Liquid Surface Temp. (deg R):	538.0886
Daily Ambient Temp. Range (deg. R):	27.9250
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.6838
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	5.8155
Vapor Space Outage (ft):	1.5000
Working Losses (lb):	41.1236
Vapor Molecular Weight (lb/lb-mole):	66.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.8155
Annual Net Throughput (gal/yr.):	4,500.0000
Annual Turnovers:	15.0000
Turnover Factor:	1.0000
Tank Diameter (ft):	3.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	279.6758

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Coreslab - Horizontal Tank
Albuquerque, New Mexico

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 10)	41.12	238.55	279.68

Attachment C
Emission Calculations Supporting Documents

11.12 CONCRETE BATCHING

11.12-1 Process Description [1-5]

Concrete is composed essentially of water, cement, sand (fine aggregate) and coarse aggregate. Coarse aggregate may consist of gravel, crushed stone or iron blast furnace slag. Some specialty aggregate products could be either heavyweight aggregate (of barite, magnetite, limonite, ilmenite, iron or steel) or lightweight aggregate (with sintered clay, shale, slate, diatomaceous shale, perlite, vermiculite, slag pumice, cinders, or sintered fly ash). Supplementary cementitious materials, also called mineral admixtures or pozzolan minerals may be added to make the concrete mixtures more economical, reduce permeability, increase strength, or influence other concrete properties. Typical examples are natural pozzolans, fly ash, ground granulated blast-furnace slag, and silica fume, which can be used individually with portland or blended cement or in different combinations. Chemical admixtures are usually liquid ingredients that are added to concrete to entrain air, reduce the water required to reach a required slump, retard or accelerate the setting rate, to make the concrete more flowable or other more specialized functions.

Approximately 75 percent of the U.S. concrete manufactured is produced at plants that store, convey, measure and discharge these constituents into trucks for transport to a job site. At most of these plants, sand, aggregate, cement and water are all gravity fed from the weight hopper into the mixer trucks. The concrete is mixed on the way to the site where the concrete is to be poured. At some of these plants, the concrete may also be manufactured in a central mix drum and transferred to a transport truck. Most of the remaining concrete manufactured are products cast in a factory setting. Precast products range from concrete bricks and paving stones to bridge girders, structural components, and panels for cladding. Concrete masonry, another type of manufactured concrete, may be best known for its conventional 8 x 8 x 16-inch block. In a few cases concrete is dry batched or prepared at a building construction site. Figure 11.12-1 is a generalized process diagram for concrete batching.

The raw materials can be delivered to a plant by rail, truck or barge. The cement is transferred to elevated storage silos pneumatically or by bucket elevator. The sand and coarse aggregate are transferred to elevated bins by front end loader, clam shell crane, belt conveyor, or bucket elevator. From these elevated bins, the constituents are fed by gravity or screw conveyor to weigh hoppers, which combine the proper amounts of each material.

11.12-2 Emissions and Controls [6-8]

Particulate matter, consisting primarily of cement and pozzolan dust but including some aggregate and sand dust emissions, is the primary pollutant of concern. In addition, there are emissions of metals that are associated with this particulate matter. All but one of the emission points are fugitive in nature. The only point sources are the transfer of cement and pozzolan material to silos, and these are usually vented to a fabric filter or "sock". Fugitive sources include the transfer of sand and aggregate, truck loading, mixer loading, vehicle traffic, and wind erosion from sand and aggregate storage piles. The amount of fugitive emissions generated during the transfer of sand and aggregate depends primarily on the surface moisture content of these materials. The extent of fugitive emission control varies widely from plant to plant. Particulate emission factors for concrete batching are give in Tables 11.12-1 and 11.12-2.

TABLE 11.12-2 (ENGLISH UNITS)
EMISSION FACTORS FOR CONCRETE BATCHING [a]

Source (SCC)	Uncontrolled				Controlled			
	Total PM	Emission Factor Rating	Total PM_{10}	Emission Factor Rating	Total PM	Emission Factor Rating	Total PM_{10}	Emission Factor Rating
Aggregate transfer [b] (3-05-011-04,-21,23)	0.0069	D	0.0033	D	ND		ND	
Sand transfer [b] (3-05-011-05,22,24)	0.0021	D	0.00099	D	ND		ND	
Cement unloading to elevated storage silo (pneumatic)[c] (3-05-011-07)	0.72	E	0.46	E	0.00099	D	0.00034	D
Cement supplement unloading to elevated storage silo (pneumatic)[d] (3-05-011-17)	3.14	E	1.10	E	0.0089	D	0.0049	E
Weigh hopper loading [e] (3-05-011-08)	0.0051	D	0.0024	D	ND		ND	
Mixer loading (central mix)[f] (3-05-011-09)	0.544 or Eqn. 11.12-1	B	0.134 or Eqn. 11.12-1	B	0.0173 or Eqn. 11.12-1	B	0.0048 or Eqn. 11.12-1	B
Truck loading (truck mix)[g] (3-05-011-10)	0.995	B	0.278	B	0.0568 or Eqn. 11.12-1	B	0.0160 or Eqn. 11.12-1	B
Vehicle traffic (paved roads)	See AP-42 Section 13.2.1							
Vehicle traffic (unpaved roads)	See AP-42 Section 13.2.2							
Wind erosion from aggregate and sand storage piles	See AP-42 Section 13.2.5							

ND = No data

[a] All emission factors are in lb of pollutant per ton of material loaded unless noted otherwise. Loaded material includes course aggregate, sand, cement, cement supplement and the surface moisture associated with these materials. The average material composition of concrete batches presented in references 9 and 10 was 1865 lbs course aggregate, 1428 lbs sand, 491 lbs cement and 73 lbs cement supplement. Approximately 20 gallons of water was added to this solid material to produce 4024 lbs (one cubic yard) of concrete.

[b] Reference 9 and 10. Emission factors are based upon an equation from AP-42, Section 13.2.2, with $k_{PM\text{-}10} = .35$, $k_{PM} = .74$, U = 10mph, $M_{aggregate} = 1.77\%$, and $M_{sand} = 4.17\%$. These moisture contents of the materials ($M_{aggregate}$ and M_{sand}) are the averages of the values obtained from Reference 9 and Reference 10.

[c] The uncontrolled PM & PM-10 emission factors were developed from Reference 9. The controlled emission factor for PM was developed from References 9, 10, 11, and 12. The controlled emission factor for PM-10 was developed from References 9 and 10.

[d] The controlled PM emission factor was developed from Reference 10 and Reference 12, whereas the controlled PM-10 emission factor was developed from only Reference 10.

[e] Emission factors were developed by using the Aggregate and Sand Transfer Emission Factors in conjunction with the ratio of aggregate and sand used in an average yard^3 of concrete. The unit for these emission factors is lb of pollutant per ton of aggregate and sand.

[f] References 9, 10, and 14. The emission factor units are lb of pollutant per ton of cement and cement supplement. The general factor is the arithmetic mean of all test data.

[g] Reference 9, 10, and 14. The emission factor units are lb of pollutant per ton of cement and cement supplement. The general factor is the arithmetic mean of all test data.

The particulate matter emissions from truck mix and central mix loading operations are calculated in accordance with the values in Tables 11.12-1 or 11.12-2 or by Equation 11.12-1[14] when site specific data are available.

$$E = k\,(0.0032)\left[\frac{U^a}{M^b}\right] + c \qquad \text{Equation 11.12-1}$$

E = Emission factor in lbs./ton of cement and cement supplement
k = Particle size multiplier (dimensionless)
U = Wind speed, miles per hour (mph)
M = Minimum moisture (% by weight) of cement and cement supplement
a, b = Exponents
c = Constant

The parameters for Equation 11.12-1 are summarized in Tables 11.12-3 and 11.12-4.

Table 11.12-3. Equation Parameters for Truck Mix Operations

Condition	Parameter Category	k	a	b	c
Controlled[1]	Total PM	0.8	1.75	0.3	0.013
	PM_{10}	0.32	1.75	0.3	0.0052
	$PM_{10\text{-}2.5}$	0.288	1.75	0.3	0.00468
	$PM_{2.5}$	0.048	1.75	0.3	0.00078
Uncontrolled[1]	Total PM	0.995			
	PM_{10}	0.278			
	$PM_{10\text{-}2.5}$	0.228			
	$PM_{2.5}$	0.050			

Table 11.12-4. Equation Parameters for Central Mix Operations

Condition	Parameter Category	k	a	b	c
Controlled[1]	Total PM	0.19	0.95	0.9	0.0010
	PM_{10}	0.13	0.45	0.9	0.0010
	$PM_{10\text{-}2.5}$	0.12	0.45	0.9	0.0009
	$PM_{2.5}$	0.03	0.45	0.9	0.0002
Uncontrolled[1]	Total PM	5.90	0.6	1.3	0.120
	PM_{10}	1.92	0.4	1.3	0.040
	$PM_{10\text{-}2.5}$	1.71	0.4	1.3	0.036
	$PM_{2.5}$	0.38	0.4	1.3	0

1. Emission factors expressed in lbs/tons of cement and cement supplement

To convert from units of lbs/ton to units of kilograms per mega gram, the emissions calculated by Equation 11.12-1 should be divided by 2.0.

Particulate emission factors per yard of concrete for an average batch formulation at a typical facility are given in Tables 11.12-4 and 11.12-5. For truck mix loading and central mix loading, the

* PAUL WADE

HAZARD IDENTIFICATIONS

Abrasive Blasting Nozzles cannot be returned for credit or replacement after being place into service. Damage to abrasive blasting nozzle liner or jacket may occur during shippin If you receive a damaged abrasive blasting nozzle, contact your distributor immediately for replacement.

NOTICE

- Abrasive Blasting Nozzles cannot be returned for credit or replacement after being placed into service. Inspect abrasive blasting nozzle for damage before use. If damage is found, contact Marco.
- Do not use abrasive blasting nozzle as a hammer or drop on hard surface. Doing so may crack liner. Failure to comply with the above notice could pose a hazard to personnel or property.
- Inspect abrasive blasting nozzle washer for wear or damage. Replace washer if worn, soft, or distorted. Failure comply with the above notice could pose a hazard to personnel or property.
- Point the abrasive blasting nozzle only at the surface being abrasive blasted. Never point the abrasive blasting nozzle or abrasive stream at yourself or others. Failure to comply with the above notice could pose a hazard to personnel or property.

⚠ WARNING

- Before using this equipment, read, understand and follow all instructions in the Operator's Manuals provided with this equipment. If the user and/or assistants cannot read or understand the warnings and instructions, the employer of the user and/or assistants must provide adequate and necessary training to ensure proper operati and compliance with all safety procedures pertaining to this equipment. If Operator's Manuals have been lost, please visit www.marco.us, or contact Marco at 563.324.2519 for replacements.

NOTICE

When it comes to air & abrasive mixtures, more is not necessarily better. Optimum abrasive blasting efficiency takes place when a lean air & abrasive mixture is used. To correctly set the abrasive metering valve, begin with the valve fully closed and slowly increase the amount of abrasive entering the airstream. As you increase the abrasive flow, watch for a "blue flame" at the exit of the abrasive blasting nozzle. Faster cutting, reduced abrasive consumption and lower clean up costs, are benefits of the "blue flame".

NOTICE

Replace abrasive blasting nozzle if liner or jacket is cracked or damaged. Replace abrasive blasting nozzle if original orifice size has worn 1/16" or more. Determine abrasive blasting nozzle wear by inserting a drill bit 1/16" larger than original size of abrasive blasting nozzle orifice. If the drill bit passes through abrasive blasting nozzle, replacement is needed.

Dry

"Blue Flame"

Air & Abrasive Consumption Chart*

Nozzle Orifice	Pressure at the Nozzle (PSI)								Air (in cfm), Abrasive & Compressor Requirements
	50	60	70	80	90	100	125	140	
No. 2 (1/8")	11 67 2.5	13 77 3	15 88 3.5	17 101 4	18 112 4.5	20 123 5	25 152 5.5	28 170 6.2	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 3 (3/16")	26 150 6	30 171 7	33 196 8	38 216 9	41 238 10	45 264 10	55 319 12	62 357 13	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 4 (1/4")	47 268 11	54 312 12	61 354 14	68 408 16	74 448 17	81 494 18	98 608 22	110 681 25	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 5 (5/16")	77 468 18	89 534 20	101 604 23	113 672 26	126 740 28	137 812 31	168 982 37	188 1100 41	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 6 (3/8")	108 668 24	126 764 28	143 864 32	161 960 36	173 1052 39	196 1152 44	237 1393 52	265 1560 58	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 7 (7/16")	147 896 33	170 1032 38	194 1176 44	217 1312 49	240 1448 54	254 1584 57	314 1931 69	352 2163 77	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 8 (1/2")	195 1160 44	224 1336 50	252 1512 56	280 1680 63	309 1856 69	338 2024 75	409 2459 90	458 2754 101	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 10 (5/8")	308 1875 68.5	356 2140 79.5	404 2422 90	452 2690 100.5	504 2973 112	548 3250 122	663 3932 146	742 4405 165	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower
No. 12 (3/4")	432 2672 96	504 3056 112	572 3456 127	644 3840 143	692 4208 154	784 4608 174.5	948 5570 209	1062 6238 236	Air (cfm) Abrasive (lbs/hr) Compressor Horsepower

*Abrasive consumption is based on abrasive with a bulk density of 100 lbs per Cubic Foot

13.2.6 Abrasive Blasting

13.2.6.1 General[1-2]

Abrasive blasting is the use of abrasive material to clean or texturize a material such as metal or masonry. Sand is the most widely used blasting abrasive. Other abrasive materials include coal slag, smelter slags, mineral abrasives, metallic abrasives, and synthetic abrasives. Industries that use abrasive blasting include the shipbuilding industry, automotive industry, and other industries that involve surface preparation and painting. The majority of shipyards no longer use sand for abrasive blasting because of concerns about silicosis, a condition caused by respiratory exposure to crystalline silica. In 1991, about 4.5 million tons of abrasives, including 2.5 million tons of sand, 1 million tons of coal slag, 500 thousand tons of smelter slag, and 500 thousand tons of other abrasives were used for domestic abrasive blasting operations.

13.2.6.2 Process Description[1-9]

Abrasive blasting systems typically include three essential components: an abrasive container (i. e., blasting pot); a propelling device; and a blasting nozzle or nozzles. The exact equipment used depends to a large extent on the specific application and type(s) of abrasive.

Three basic methods can be used to project the abrasive towards the surface being cleaned: air pressure; centrifugal wheels; or water pressure. Air blast (or dry) systems use compressed air to propel the abrasive using either a suction-type or pressure-type process. Centrifugal wheel systems use a rotating impeller to mechanically propel the abrasive by a combination of centrifugal and inertial forces. Finally, the water (or wet) blast method uses either air pressure or water pressure to propel an abrasive slurry towards the cleaned surface.

Abrasive materials used in blasting can generally be classified as sand, slag, metallic shot or grit, synthetic, or other. The cost and properties associated with the abrasive material dictate its application. The following discusses the general classes of commonly used abrasives.

Silica sand is commonly used for abrasive blasting where reclaiming is not feasible, such as in unconfined abrasive blasting operations. Sand has a rather high breakdown rate, which can result in substantial dust generation. Worker exposure to free crystalline silica is of concern when silica sand is used for abrasive blasting.

Coal and smelter slags are commonly used for abrasive blasting at shipyards. Black Beauty™, which consists of crushed slag from coal-fired utility boilers, is a commonly used slag. Slags have the advantage of low silica content, but have been documented to release other contaminants, including hazardous air pollutants (HAP), into the air.

Metallic abrasives include cast iron shot, cast iron grit, and steel shot. Cast iron shot is hard and brittle and is produced by spraying molten cast iron into a water bath. Cast iron grit is produced by crushing oversized and irregular particles formed during the manufacture of cast iron shot. Steel shot is produced by blowing molten steel. Steel shot is not as hard as cast iron shot, but is much more durable. These materials typically are reclaimed and reused.

Synthetic abrasives, such as silicon carbide and aluminum oxide, are becoming popular substitutes for sand. These abrasives are more durable and create less dust than sand. These materials typically are reclaimed and reused.

Other abrasives include mineral abrasives (such as garnet, olivine, and staurolite), cut plastic, glass beads, crushed glass, and nutshells. As with metallic and synthetic abrasives, these other abrasives are generally used in operations where the material is reclaimed. Mineral abrasives are reported to create significantly less dust than sand and slag abrasives.

The type of abrasive used in a particular application is usually specific to the blasting method. Dry blasting is usually done with sand, metallic grit or shot, aluminum oxide (alumina), or silicon carbide. Wet blasters are operated with either sand, glass beads, or other materials that remain suspended in water.

13.2.6.3 Emissions And Controls[1,3,5-11]

Emissions —

Particulate matter (PM) and particulate HAP are the major concerns relative to abrasive blasting. Table 13.2.6-1 presents total PM emission factors for abrasive blasting as a function of wind speed. Higher wind speeds increase emissions by enhanced ventilation of the process and by retardation of coarse particle deposition.

Table 13.2.6-1 also presents fine particulate emission factors for abrasive blasting. Emission factors are presented for PM-10 and PM-2.5, which denote particles equal to or smaller than 10 and 2.5 microns in aerodynamic diameter, respectively. Emissions of PM of these size fractions are not significantly wind-speed dependent. Table 13.2.6-1 also presents an emission factor for controlled emissions from an enclosed abrasive blasting operation controlled by a fabric filter; the blasting media was 30/40 mesh garnet.

Limited data from Reference 3 give a comparison of total PM emissions from abrasive blasting using various media. The study indicates that, on the basis of tons of abrasive used, total PM emissions from abrasive blasting using grit are about 24 percent of total PM emissions from abrasive blasting with sand. The study also indicates that total PM emissions from abrasive blasting using shot are about 10 percent of total PM emissions from abrasive blasting with sand.

Hazardous air pollutants, typically particulate metals, are emitted from some abrasive blasting operations. These emissions are dependent on both the abrasive material and the targeted surface.

Controls —

A number of different methods have been used to control the emissions from abrasive blasting. Theses methods include: blast enclosures; vacuum blasters; drapes; water curtains; wet blasting; and reclaim systems. Wet blasting controls include not only traditional wet blasting processes but also high pressure water blasting, high pressure water and abrasive blasting, and air and water abrasive blasting. For wet blasting, control efficiencies between 50 and 93 percent have been reported. Fabric filters are used to control emissions from enclosed abrasive blasting operations.

Table 13.2.6-1. PARTICULATE EMISSION FACTORS FOR ABRASIVE BLASTING[a]

EMISSION FACTOR RATING: E

Source	Particle size	Emission factor, lb/1,000 lb abrasive
Sand blasting of mild steel panels[b] (SCC 3-09-002-02)	Total PM	
	5 mph wind speed	27
	10 mph wind speed	55
	15 mph wind speed	91
	PM-10[c]	13
	PM-2.5[c]	1.3
Abrasive blasting of unspecified metal parts, controlled with a fabric filter[d] (SCC 3-09-002-04)	Total PM	0.69

[a] One lb/1,000 lb is equal to 1 kg/Mg. Factors represent uncontrolled emissions, unless noted. SCC = Source Classification Code.

[b] Reference 10.

[c] Emissions of PM-10 and PM-2.5 are not significantly wind-speed dependent.

[d] Reference 11. Abrasive blasting with garnet blast media.

References For Section 13.2.6

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Residual Risk from Abrasive Blasting Emissions: Particle Size and Metal Speciation

Final Report

Prepared for:
Advanced Technology Institute
5300 International Boulevard
North Charleston, SC 29418

Reference No.:
Support Services Agreement No. 2006-317

Prepared by:
Bhaskar Kura, Ph.D., P.E.

December 2005

Category B Data - Government Purpose Rights
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INTRODUCTION

Recently, there is a shift in regulatory emphasis from "emissions-based regulations" to "public health risk-based regulations" by the state and federal regulations. This is evidenced by the increased scrutiny of the health risks associated with air pollutant emissions resulting from shipyard operations. Based on the preliminary assessments, it appears that welding and blasting operations are driving the public health risks in the shipbuilding sector due to anticipated metal emissions and their associated toxicity. Welding emissions are relatively well studied compared to blasting emissions. Only recently, UNO studies published emission factors for TPM (total particulate matter) under a grant from EPA Region VI and the Office of Naval Research (ONR). However, due to limited resources and funding, particle size and metal speciation of blasting emissions could not be studied as part of the earlier UNO study. For health risk assessments, emission data (or emission factors) for inhalable particulate matter (typically PM_{10}, particulate matter less than 10 micron in size) and its chemical speciation is desired. Incorrect PM_{10} fraction and chemical speciation (e.g., metal fraction) can lead to incorrect calculated health risk that will be different from the true health risks. Health risk assessment process is illustrated in the following figure, Figure 1.

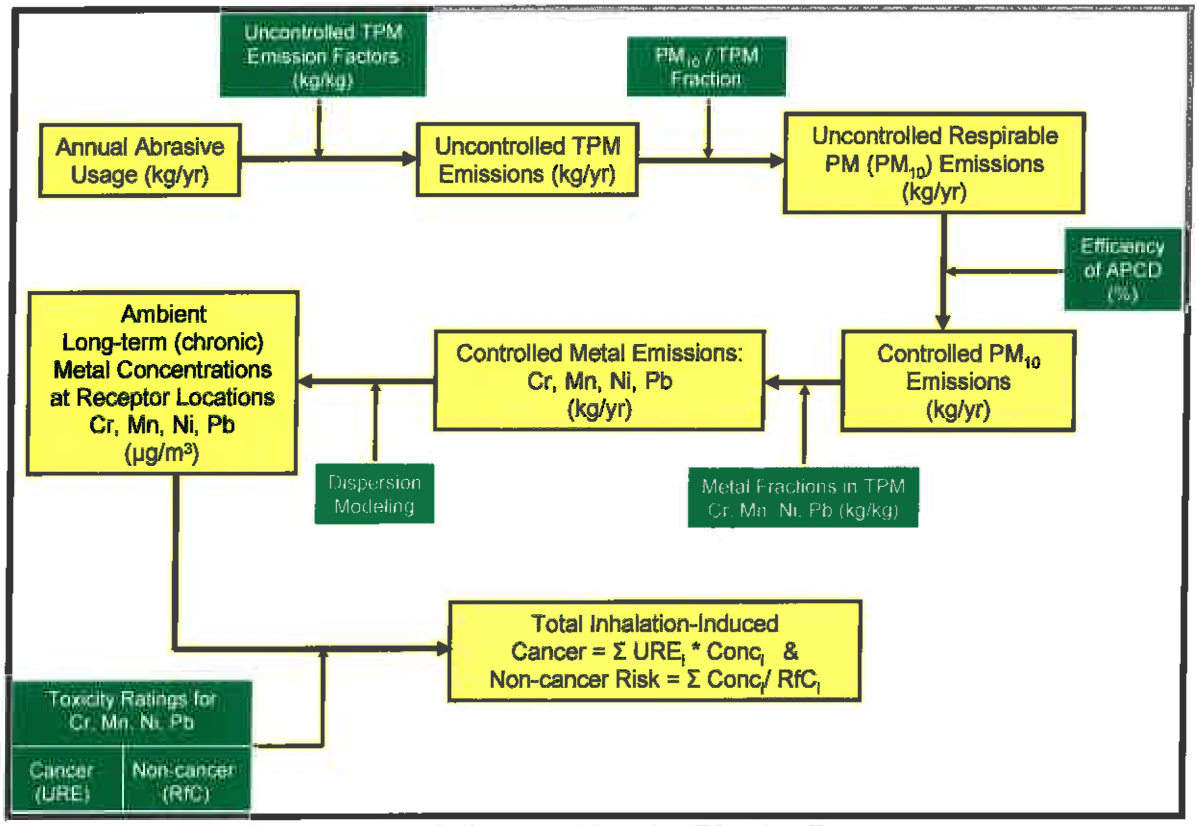


Figure 1a: Residual Risk Analysis for Dry Abrasive Blasting Process

Problem Statement

From Figure 1, it may be noted that PM_{10} fraction which is being considered as the inhalable/respirable fraction in residual risk assessment is an important input. EPA recognizes that only the PM_{10} fraction is of concern in residual risk analysis; higher PM10 fraction leads to higher potential public health risk

Similarly, it may be noted from Figure 1 that the metal fraction contained in the particulate matter emitted from dry abrasive blasting is another important input in calculating residual risk from dry abrasive blasting. These metals may include both, carcinogenic and non-carcinogenic metals. Chromium (Cr), lead (Pb), manganese (Mn), and nickel (Ni) are considered important in blasting emissions due to possible contamination or presence of these metals in abrasives and the base plate. Again, higher metal fraction within air emissions results in increased public health risks.

As it can be seen from Figure 1, respirable fraction (PM_{10} fraction of TPM) and the metal fraction have a multiplying effect on the calculated residual risk. There is a concern that the compiled literature data for PM_{10} and metal fractions to be applied in the health risk assessment are high and are not applicable to the shipbuilding industry as most of it came from different sources not relevant to the shipbuilding and ship repair industry sector. There is no reliable data on PM_{10} and metal fractions of airborne particulates resulting from dry abrasive blasting as this process was not studied well in the past. In order to estimate the true public health risk resulting from the blasting operations, more realistic data is required on (1) PM_{10} fraction of TPM emissions and (2) metal fractions of PM_{10} or TPM.

Scope of Work

Main objective of this project was to generate additional data on (1) PM_{10}/TPM fraction and (2) metal fractions of TPM for total chromium, manganese, nickel and lead. Filters with airborne particulate matter (PM) collected on them were available from earlier study titled, "Environmentally-friendly Abrasives" project for use in this project.

In the original proposal, Scanning Electron Microscope (SEM) was proposed for PM_{10}/TPM determination. SEM involves a two dimensional scanning/imaging which gives the area of a particle. Considering that all the particles are spheroids, volumes of the individual particles are calculated to finally arrive at mass fractions. Whereas, Interferometer technique involves scanning of particles at various heights to arrive at true volume of various sized particles which results in more accurate mass-based particle size distribution. As the Interferometer was available to the investigator for use in this project, Interferometer in combination with Micro Sieves was used to determine the particle size. Additionally, Single Particle Optical Sizing (SPOS) method was also used to determine the particle size.

For metal fraction determination, X-Ray Fluorescence (XRF) Spectrometer was utilized. The project results will help eliminate errors in the residual risk assessment due to data-quality problems.

Brief Description of UNO's Environmentally-Friendly Abrasives Project

Because the "airborne PM collected on filters" came from UNO's study titled, Environmentally-friendly Abrasives, it was felt appropriate to include this section that describes the earlier study, its goals, the equipment used, and the research methodology adopted.

Goals

The main purpose of the UNO study was to rank six commonly used abrasives namely, barshot (hematite), coal slag, copper slag, garnet, steel grit/shot, and specialty sand based on (1) productivity (ft^2/hr), (2) abrasive consumption (lb/ft^2), (3) used-abrasive generation potential (lb/ft^2), and (4) particulate emission factors (lb/lb and/or lb/ft^2). The portion of the study that dealt with particulate emission factors is relevant to the current study which is described further in this section.

Influencing Parameters

Atmospheric particulate emissions from dry abrasive blasting are influenced by (a) blast pressure, (b) abrasive feed rate, (c) properties of abrasive (type, size, shape, and hardness), (d) number of reuses of the abrasive, (e) nozzle size, (f) angle between blast nozzle and base plate, (g) stand-off distance, (h) ventilation conditions / exhaust fan capacity in case of indoor blasting, (i) wind speed in case of outdoors, and (j) the expertise of the worker, (k) initial surface contamination (rust, paint, others), and (l) desired surface finish. UNO study involved varying, (1) abrasives (six abrasives were tested), (2) blast pressure (80, 100, 120 PSI), (3) abrasive feed rate (Schmidt feed valve #6 set at 3, 4, 5 turns). All other conditions were kept unchanged from experiment to experiment. Average exhaust fan capacity used was 3000 cfm. Emission factors reported were "uncontrolled emission factors for total particulate matter" as these emissions were measured before the particulate collection device.

Mild steel plates were used with two initial surface conditions, rusted and painted, were used. However, only the samples collected from the testing of painted panels were utilized in this current study. Plates were painted with a 1:1 volume mixture of Rust Oleum© Safety Yellow paint and thinner. Painting was carried out with spray gun and hand rollers with an average transfer efficiency of 50% and the average paint thickness was 0.73 mils.

Emissions Test Facility Design

Dry abrasive blasting operations were simulated within the UNO's Emissions Test Facility (ETF) of size 3.7 x 3 x 2.5 m (12 x 10 x 8 feet) in order to measure particulates emitted during blasting operations. Figure 1b shows ETF utilized for the Environmentally-friendly Abrasives project which provided filter samples for this current study. A 600 lbs (273 kg) capacity Abec© blast pot was used as the abrasive supply unit. For all blasting operations, a standard Bazooka #6 nozzle was used. A Schmidt feed valve fitted below the hopper of the blast pot was used to regulate the abrasive flow rate during the blasting experiments. Sullair Model 375H© and Ingersoll Rand© compressors capable of providing a maximum of 150 PSI fitted with appropriate pressure gauges and moisture traps were used to provide the compressed air. Mild steel plates, each of dimensions 2.5 x 1.5 m (8 x 5 feet) were mounted on steel carts for ease of movement in and out of the chamber. Both rusted and painted panels were tested using six abrasives namely, barshot (hematite), coal slag, copper slag, garnet, steel grit/shot, and specialty

sand. However, it should be noted that only the samples collected from the painted panels were utilized in this study as those samples from rusted panels were not available.

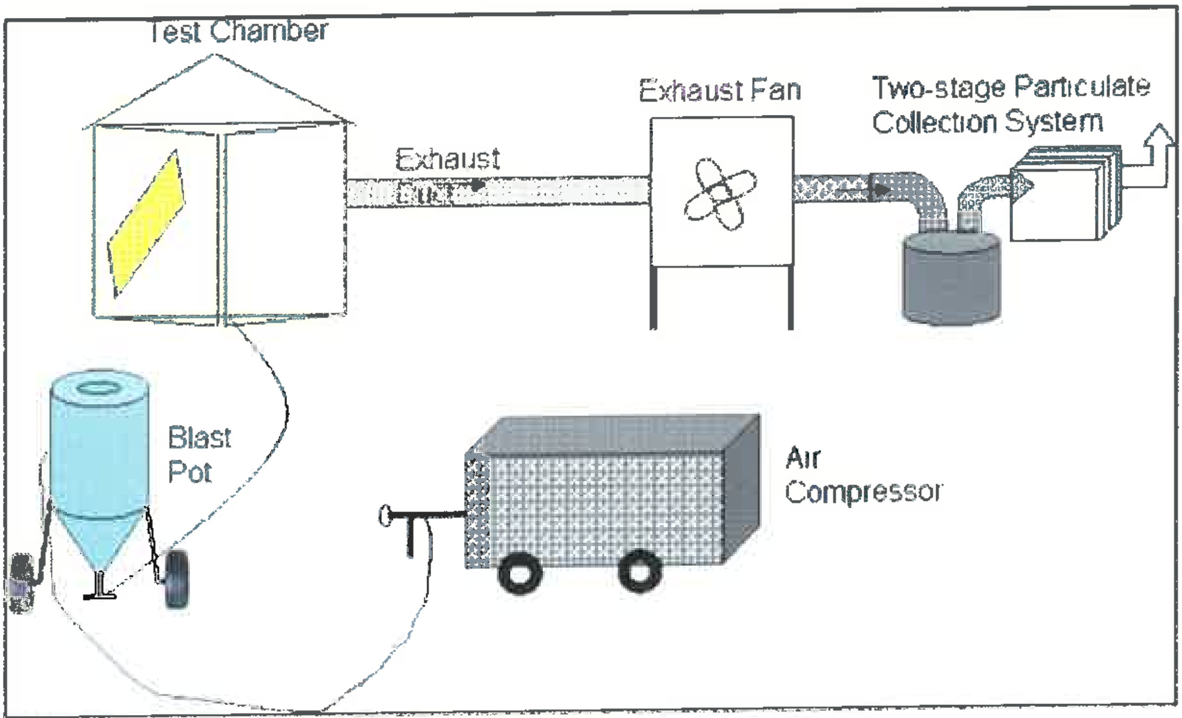


Figure 1b: UNO's Emissions Test Facility (ETF)

Exhaust Duct and Two-Stage Particle Collection System
A variable speed fan with 60 rpm was used to vent the particulates from the test chamber through an exhaust duct. The exhaust duct was designed to comply with the EPA guidelines for source monitoring. A straight, smooth circular duct of diameter 0.31 m (12 inches) was used. Sampling port was positioned at a downstream distance of 8 diameters from the air intake (flow disturbance) and 2 diameters upstream of the variable speed fan (flow disturbance) to minimize the flow turbulence. A two-stage particulate collection system was designed and installed downstream of the exhaust fan to collect the particles and prevent nuisance to the ambient environment. The first stage collected the coarse particles by changing the direction of the gas flow. The second stage collected fine particles by using a fabric filter. Since the sampling was carried out at upstream side of the particulate collection systems, the measured emission factors represent "uncontrolled total particulate emission factors."

Stack Sampling Equipment
Stack sampling and velocity measurements were carried out as per EPA Source Test Methods 1 through 5 for total particulate matter. Figure 1c shows the stack monitoring in progress. An S-type pitot tube was used for taking velocity and flow measurements within the duct. A sampling train in accordance with EPA Method 4 was used for determining moisture content and evaluating the volumetric gas flow rate. EPA Method 5 sampling train consisting of a sampling nozzle, S-type pitot tube, temperature probe, dry gas meter, PM sampling filter holder, glass impingers, hot and cold bath was used in the study. The glass impingers were connected in

series inside an ice bath to condense the water vapor. The first two impingers were filled with 100 ml of distilled water to allow the moisture to condense. The third impinger was left dry for further condensation. The fourth impinger contained known quantity of silica gel (adsorbent) to remove water vapor as the gas passed through it before entering the dry gas meter inlet.

Figure 1c: PM Emissions Monitoring in Progress Using Stack Testing Equipment

Stack Test Procedure

As per EPA Source Test Method 1, a total of eight traverse points were chosen for velocity and flow measurements in the circular exhaust duct used in this study. The traverse points were measured and marked on the sampling probe to ensure accuracy and ease of traverse. For ensuring isokinetic flow conditions inside the duct, a nozzle with inner diameter of 4.57 mm (0.018 inches) was used for particulate sampling during all the runs. Pilot tests were conducted to determine the nozzle diameter to obtain isokinetic sampling conditions. For carrying out the blasting operations, three persons were trained by professionals on the operating procedures and safety issues. A pre-weighed, known amount of medium grade abrasive was loaded into the blast pot through a sieve to remove any foreign material that may interfere with the smooth flow of the abrasive. The air flow was regulated at the compressor to provide required nozzle pressures (80, 100 and 120 PSI) and the Schmidt valve was opened to the required number of turns (3, 4, and 5 turns).

Leak checks were performed before and after sampling to ensure accuracy of flow rate and velocity measurements. Conditioned, pre-weighed Whatman No. 10 filter papers were used to collect the particulate emissions. While blasting was in progress inside the chamber, sampling was carried out at the sampling port by traversing the sampling probe unit through the duct. The necessary parameters for flow and velocity measurements namely velocity head, stack

temperature, vacuum, DGM flow readings, hot and cold bath temperatures were recorded at the eight traverse points. The sampling time was two minutes at each traverse point and hence the total sampling time for each experiment was sixteen minutes. Blasting time varied from run to run and it was measured using a stopwatch. Blasting was carried out until all the material in blast pot was consumed. A near-white (SP 10) surface finish was achieved in all the runs and the personnel were trained to visually examine and ensure this finish. Once blasting was complete, the filter was conditioned in the dessicator and the final weight was recorded. The sampling probe was rinsed thoroughly with acetone thrice according to EPA method 5 to collect the particles on the probe walls. The wash off liquid was collected in a pre-weighed beaker and was later evaporated in a dessicator. The blasted area was measured using a measuring tape with appropriate approximations for non-quadrilateral geometries. Due care was taken to ensure isokinetic flow conditions for each sampling run.

After conditioning and weighting, filters with PM on them were stored in zip lock bags for future examination of particle size and metal analysis as the funding was not adequate at that time. These samples were used in the current study to evaluate particle size and the metal analysis.

METHODOLOGY

In order to reach the goals of the project, the following tasks were undertaken to analyze the PM_{10}/TPM fraction and the metal speciation. The methodology used for these tasks are briefly discussed in the following section.

Determination of Particles Size Using Interferometry

MicroXAM MP8, a vertical scanning interferometer (VSI) was used in this experiment which provides high (angstrom to nanometer-scale) vertical resolution, and a lateral resolution of 500 X 500 nanometer (with a Nikon 50X Mirau objective). Figure 2a is a photograph of the MicroXAM MP8 used and Figure 2b illustrates the white light VSI principle.

Saved samples from previous research project were utilized to analyze particle size using Interferometer. Because of the wide particle size (submicron to 400 micron), samples had to be separated into a narrow size range prior to using Interferometer. For separating the particles into narrow size ranges, micro sieves were used. Micro sieves employed in this exercise confirmed to the ASTM standard ASTM E 161 – 00.

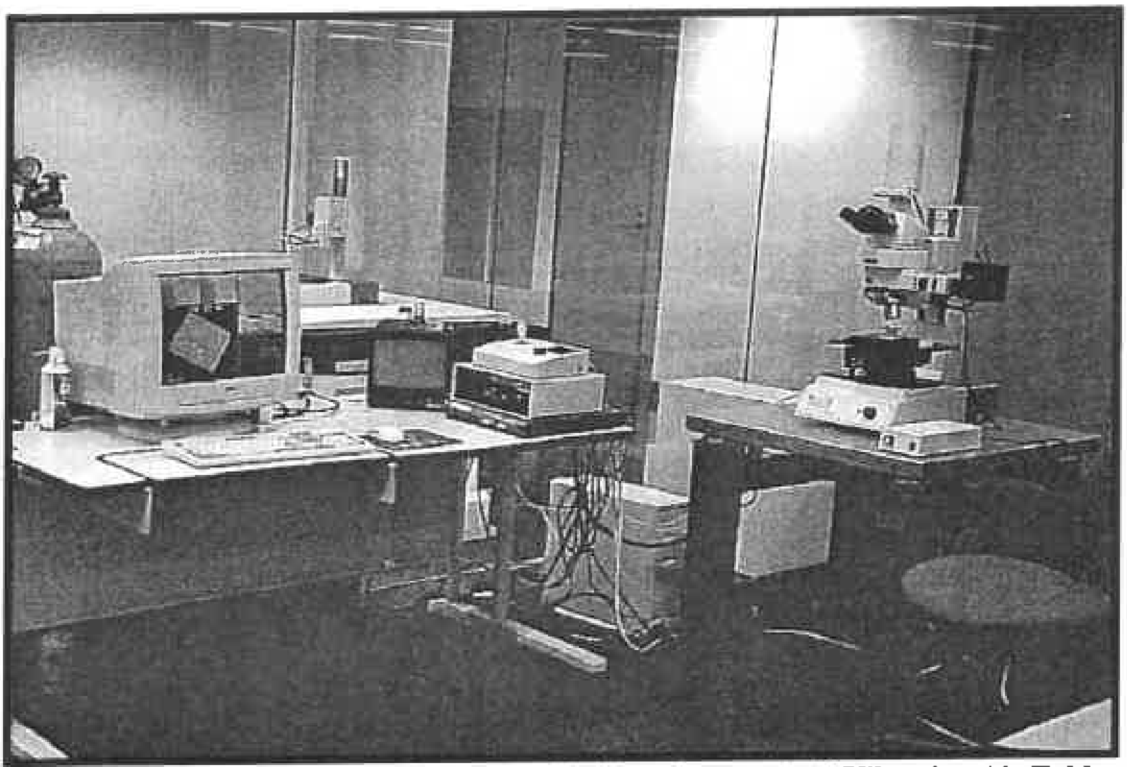


Fig 2a. MicroXAM MP8 Interferometer Positioned on an Anti-Vibration Air Table
Source: A. Luttge *et al.*

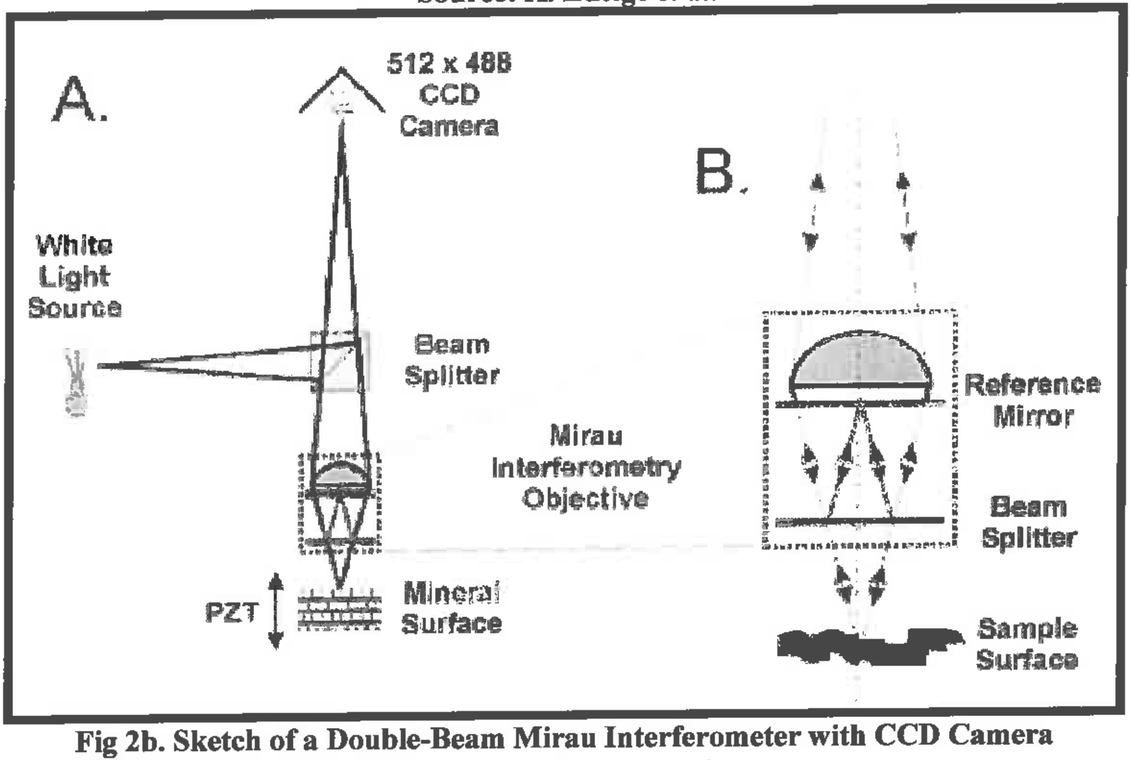


Fig 2b. Sketch of a Double-Beam Mirau Interferometer with CCD Camera
Source: A. Luttge *et al.*

The measured particles were imaged at randomly from the field of particles on the glass surface. Only the discrete particles, those that were not touching one another were chosen for measurement. This potential bias or error source would be common to all optical techniques.

The length, width, height, and volume of 100 particles were measured in each sample. Airborne particle samples from all six abrasives, viz. coal slag, specialty sand, garnet, copper slag, barshot (hematite), and steel grit were analyzed. The length, width, and height are given in microns. For irregularly shaped particles, the length and width are somewhat arbitrarily chosen. For the most part, longest dimensions of the particles were measured since these are the dimensions that didn't allow the particles to pass through the sieve. The height measurement is very arbitrary since any number of heights could be chosen from the array of pixels in the interferometry height map of each particle. Most representative height of the surface of the particle was measured, i.e. a plateau produced by many pixels of the same height. The volume of each particle is given in cubic nanometers. This was measured using the volume analysis tool provided as part of the ADE-Phase Shift software package that works in combination with the MicroXAM interferometer. Each particle was isolated using a data masking tool and if the resulting image subset had any bad pixels, they were filled using nearest neighbor approximations. Each image was also "flattened" before the volume analysis tool was employed. A horizontal plane representing the glass slide was chosen and the volume analysis tool provided the volume of each particle by calculating the volume of the pixels that rose above the plane of the glass. The error associated with this volume measurement, both, in terms of repeatability and bad or missing pixels was not considered to be higher than 10%. The volume measured in this way is much more precise and accurate than the length, width, and height measurements since it maps the height of each pixel for the entire 2D area of the particle. Therefore this volume measurement should be considered the primary number assigned to each particle. The particles were sorted in the spreadsheet according to the shortest length or width dimension.

Information obtained from the micro sieve analysis and the Interferometry were combined to obtain the particle size distribution from sub micron to 30 micron. Particles between 30 and 400 micron were lumped to one category, though there were a few particles that were larger than 400 micron. Size of these large particles (which were very few) could not be determined. However, their mass was included in calculation so there is no error in determining the mass percentages of various size fractions.

Determination of Particle Size Using Single Particle Optical Sizing (SPOC)

Single Particle Optical Sizing (SPOC) method involves the following procedure. Particles flow into illuminated view volume one at a time as illustrated in the Figure 2c. Detector picks up the decrease in light transmission due to particle obstruction. Decrease in light transmission corresponds to particle size/volume which is measured using a calibration curve. Each pass through the view volume produces a pulse which is counted.

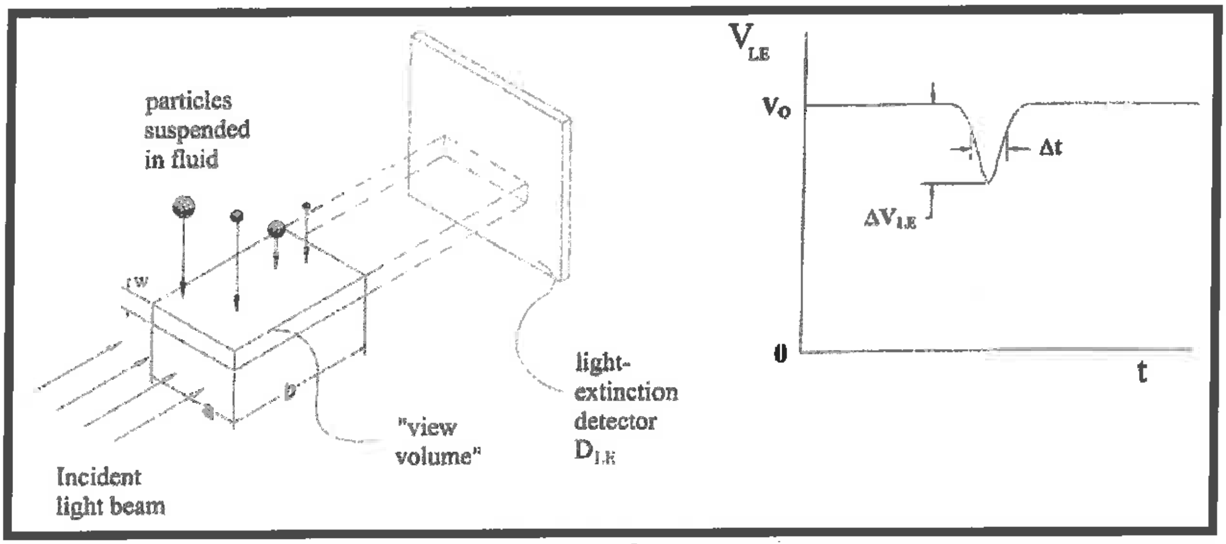


Fig 2c. Principle of SPOC Measurement Method

Sample preparation method involved taking each sample into particle free container then adding Triton-X, a non-ionic surfactant. To this sample, about 20 ml of distilled water was added. Particles were allowed to disperse uniformly by manual shaking and with the aid of sonic bath for five minutes. Sample was shook vigorously before an aliquot was injected into the Accusizer. Measurements were made with two thresholds; one set at 0.5 micron and one at 2 micron and the data was combined to obtain consolidated particle size distribution.

Determination of Metal Fraction of Airborne TPM Using XRF Spectrometry

This task involved analysis of filters containing particulate emissions from abrasive blasting to determine metal content (Cr, Mn, Ni, and Pb) using XRF Spectrometer. Metals analyzed in this study are elemental metals and not their compounds. Also, the chromium reported is total chromium not hexavalent chromium. XRF method, measurement principle, advantages are briefly described in the following section.

XRF Spectrometry method is used to identify elements in a substance and quantify the amount of those elements present to ultimately determine the elemental composition of a material. An element is identified by its characteristic X-ray emission wavelength (λ) or energy (E). The amount of an element present is quantified by measuring the intensity (I) of its characteristic emission. XRF Spectrometry identifies and quantifies elements over a wide dynamic concentration range, from PPM levels up to virtually 100% by weight.

In XRF Spectrometry, the primary interference is from other specific elements in a substance that can influence (matrix effects) the analysis of the element(s) of interest. However, these interferences are well known and documented; and, instrumentation advancements and mathematical corrections in the system's software easily and quickly correct for them. In certain cases, the geometry of the sample can affect XRF analysis, but this is easily compensated for by

selecting the optimum sampling area, grinding or polishing the sample, or by pressing a pellet or making glass beads.

Quantitative elemental analysis for XRF Spectrometry is typically performed using Empirical Methods (calibration curves using standards similar in property to the unknown) or Fundamental Parameters (FP). FP is frequently preferred because it allows elemental analysis to be performed without standards or calibration curves. The capabilities of modern computers allow the use of this no-standard mathematical analysis, FP, accompanied by stored libraries of known materials, to determine not only the elemental composition of an unknown material quickly and easily, but even to identify the unknown material itself. XRF analytical procedure is illustrated in Figure 2d below.

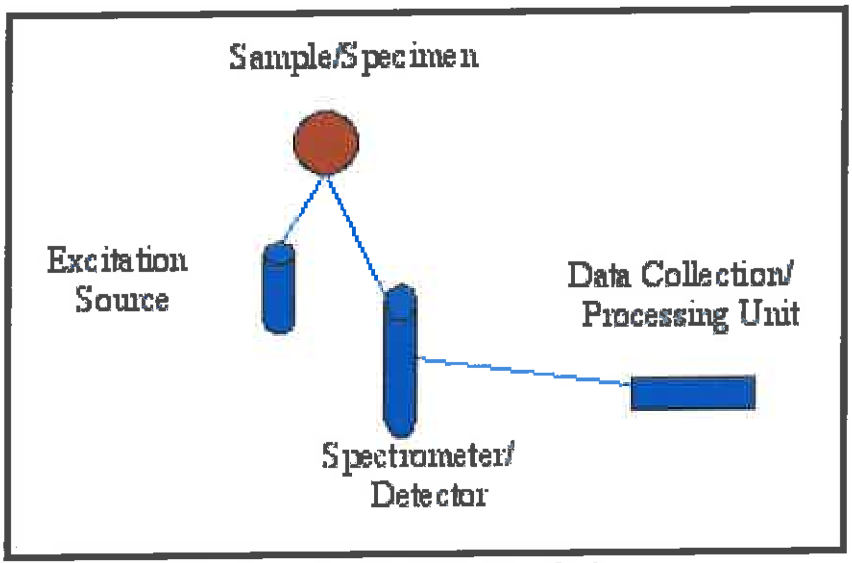


Fig 2d. XRF Spectrometry for Metal Analysis

RESULTS

Final, processed results are organized into various tables and figures for convenient use which are briefly discussed in this section. In lieu of long explanation of results, care was taken to prepare these tables and figures efficiently so that they are self-explanatory to the reader. Necessary particle size data and metal concentration data for six abrasives can be extracted from the results presented in this section for ready use in the residual risk analysis.

Particle Size Using Interferometry

Table 1 includes the particle size data obtained using the combination of micro sieving and Interferometer. Table 1 includes average particle size distribution (PSD) of airborne particulate matter (PM) emitted from dry abrasive blasting using six different abrasives. These six abrasives are garnet (GA), coal slag (CO), copper slag (CU), garnet (GA), steel grit (SG), and specialty sand (SS).

Table 1: Size Distribution of Airborne Particles from Dry Abrasive Blasting

Particle Size, Micron	Cumulative Mass % (all particles less than the size indicated)					
	Barshot	Coal Slag	Copper Slag	Garnet	Steel Grit	Specialty Sand
10	1.52	0.73	0.03	0.36	0.00	0.20
15	2.29	0.92	0.10	0.49	0.00	0.27
20	3.57	1.16	0.29	0.93	0.00	0.39
25	4.39	1.45	0.61	1.61	0.00	0.62
30	5.03	1.62	1.15	2.20	0.91	0.65
400	100.00	100.00	100.00	100.00	100.00	100.00

Figures 3 through 8 illustrate the size distribution of airborne particles for each of the six abrasives studied. Airborne particles were collected on filter media in a previous study that involved blasting on painted panels using Bazooka blast nozzle number 6 in an enclosed test chamber. Blasting pressure used ranged from 80 to 120 psi at the tip of the nozzle. All abrasives used in the study were of medium grade. Specialty sand refers to sand that is washed and graded to reduce the dust emissions and improve its abrasive properties.

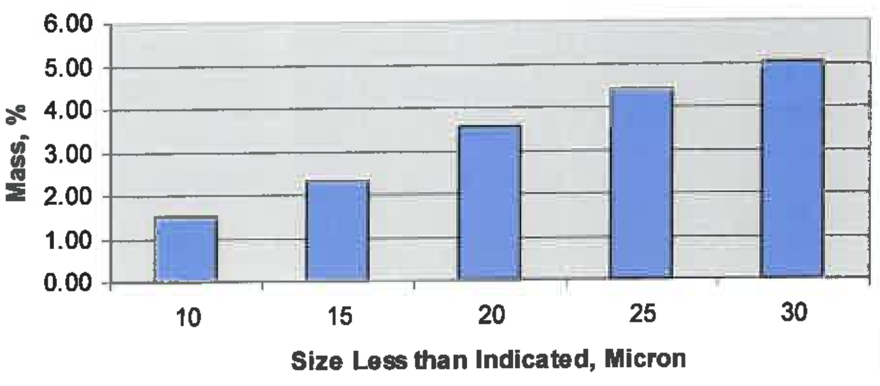


Fig 3. PSD of Airborne PM - Barshot Blasting

Fig 4. PSD of Airborne PM - Coal Slag Blasting

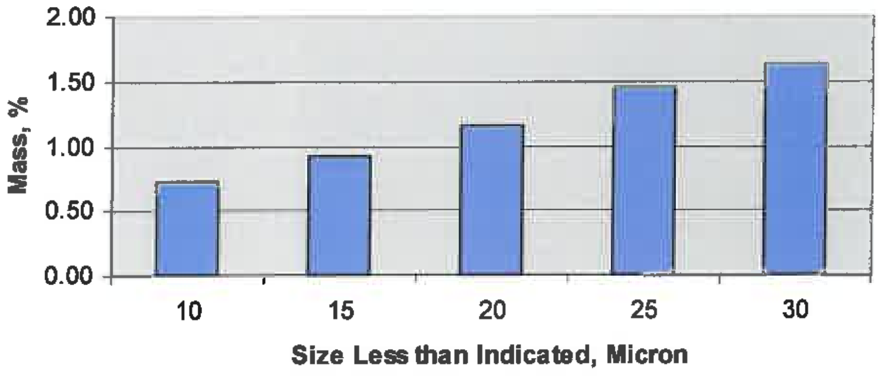


Fig 5. PSD of Airborne PM - Copper Slag Blasting

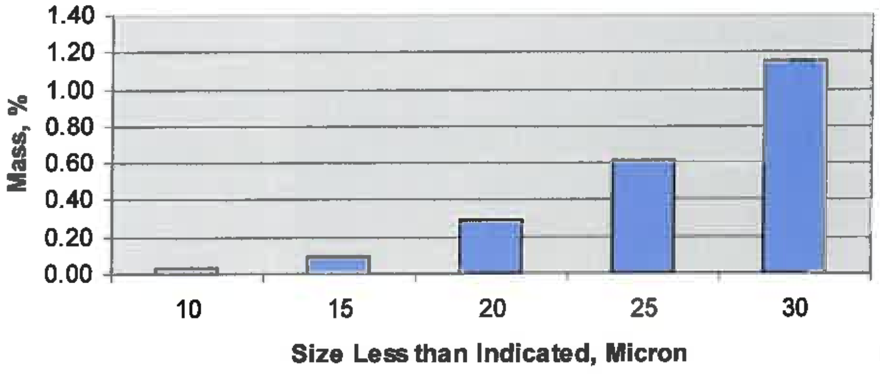
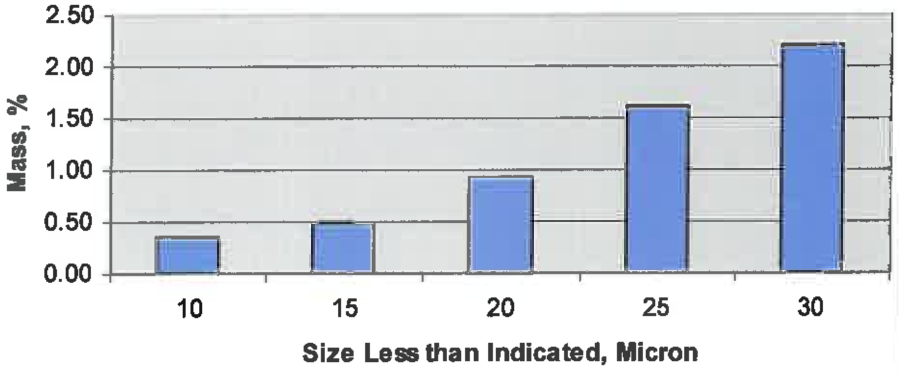
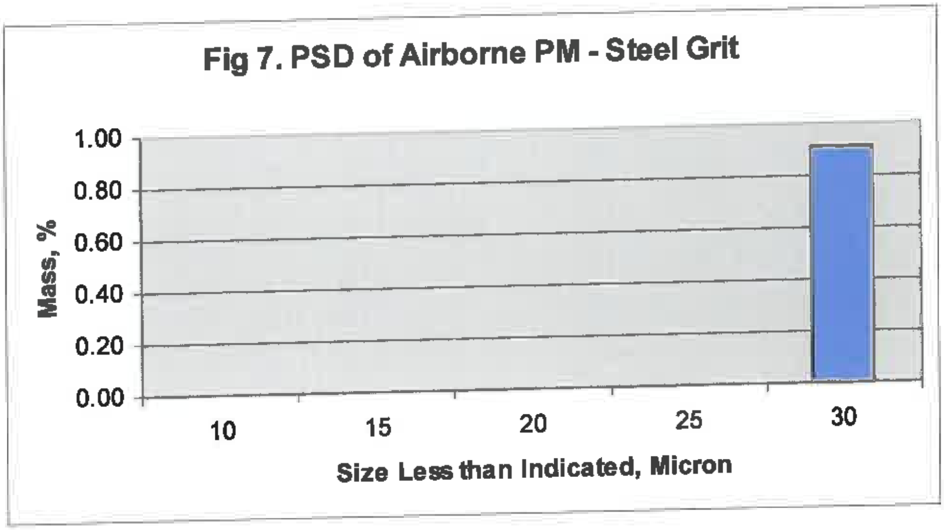
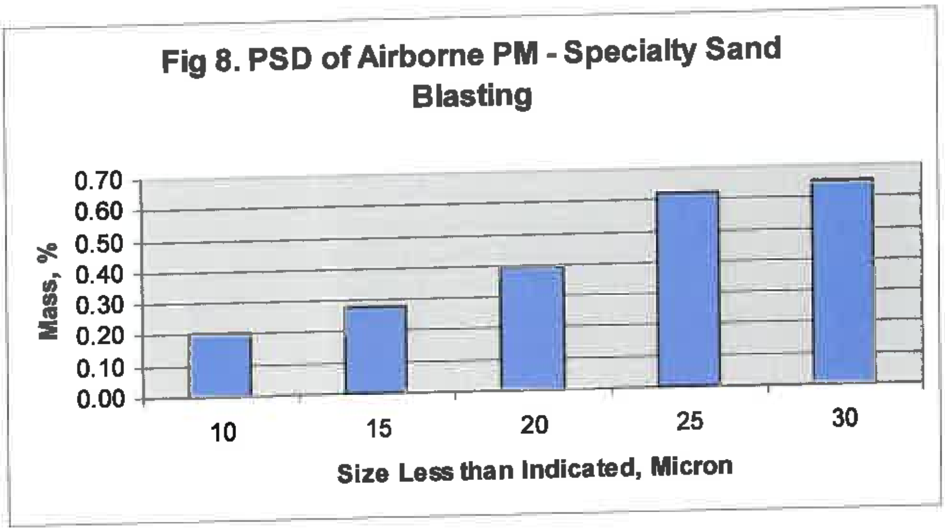


Fig 6. PSD of Airborne PM - Garnet Blasting







Particle Size Using Single Particle Optical Scanning (SPOS)

Table 2 presents the particle size data of airborne particles emitted from dry abrasive blasting using six different abrasives. Figures 9 through 14 illustrate the PSD trends.

Table 2: Size Distribution of Airborne Particles from Dry Abrasive Blasting Single Particle Optical Scanning (SPOS) Method

Particle Size, Micron	Cumulative Mass % (all particles less than the size indicated)					
	Barshot	Coal Slag	Copper Slag	Garnet	Steel Grit	Sp. Sand
1.01	0.16	0.19	0.22	0.16	0.33	0.17
2.46	0.37	0.63	0.54	0.37	0.92	0.57
3.93	0.56	1.28	0.85	0.56	1.56	1.13
6.99	1.16	3.89	2.42	1.16	4.56	3.06
10.07	2.11	8.87	7.27	2.11	9.92	6.19
15.29	4.09	18.74	21.47	4.09	17.62	12.00
19.86	6.02	25.59	30.62	6.02	23.15	16.30
24.47	8.46	31.13	36.18	8.46	28.82	20.67
30.16	12.54	36.62	40.98	12.54	35.94	26.89
400	100.00	100.00	100.00	100.00	100.00	100.00

Fig 9. PSD of Airborne PM - Barshot Blasting (SPOS)

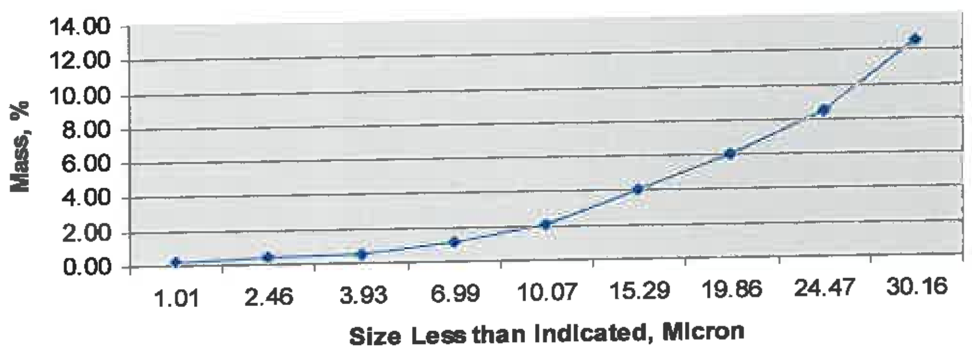


Fig 10. PSD of Airborne PM - Coal Slag Blasting (SPOS)

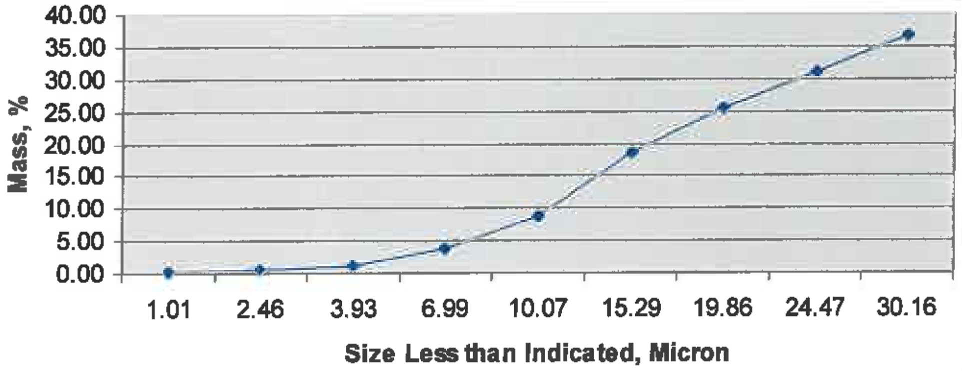


Fig 11. PSD of Airborne PM - Copper Slag (SPOS)

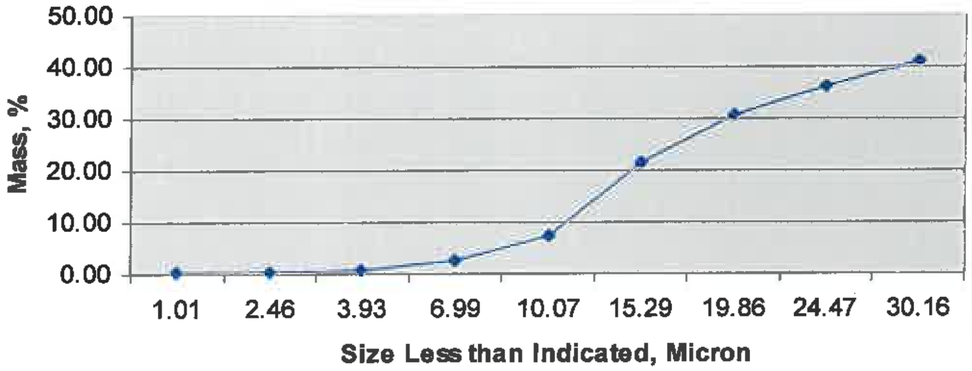
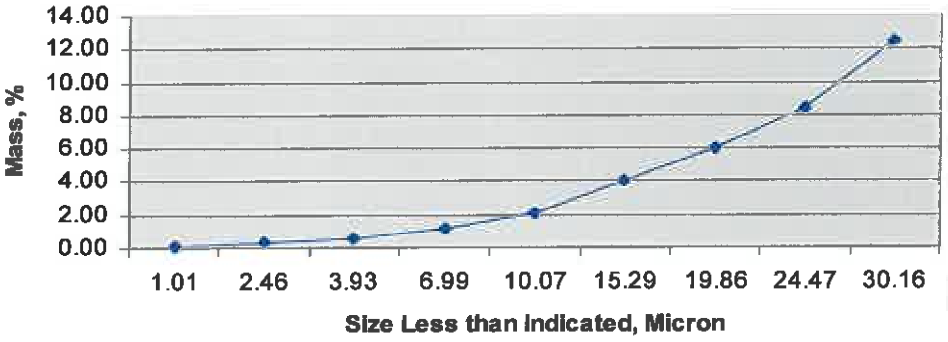


Fig 12. PSD of Airborne PM - Garnet Blasting (SPOS)



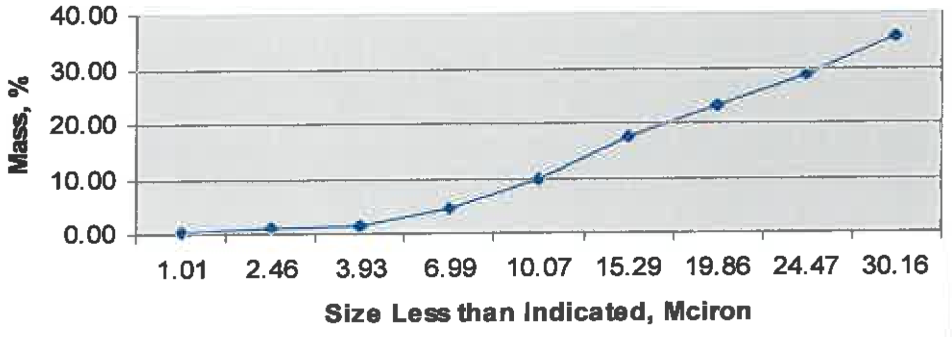


Fig 13. PSD of Airborne PM - Steel Grit Blasting (SPOS)

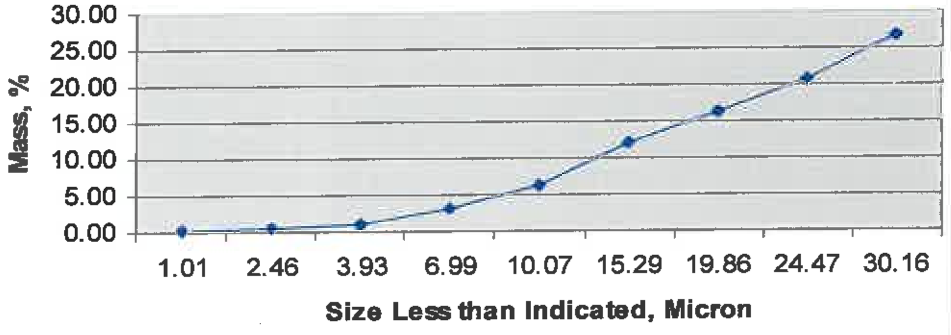


Fig 14. PSD of Airborne PM - Specialty Sand Blasting (SPOS)

Metal Fraction of Airborne TPM Using XRF Spectroscopy

Original scope included analysis of only four metals, Cr, Mn, Ni, and Pb. However, all metals that were possible to be analyzed using XRF were analyzed and included in the results. Table 3 includes the summary of metals analyzed, EPA's classification - if it is carcinogen or non-carcinogen, respective toxicity values, and the specific health effects. It is important to note that the toxicity values given in Table 3 are for various metal compounds. Whereas, the results presented in Table 4 and 5 represent the elemental metals. In case of chromium the results presented are total chromium, not hexavalent chromium. Due care should be taken when calculating various input data for the risk assessment of emissions from dry abrasive blasting. Cancer toxicity values are indicated by the unit risk estimate (URE) and the non-cancer toxicity values are indicated by the reference concentrations (RfC) values. URE and RfC are defined as follows:

SAFETY DATA SHEET

Product Name: Black Diamond, Black Magnum
Product Description: coal slag particles

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION, AND OF THE COMPANY/UNDERTAKING

1.1 Identification of the substance or preparation

Product Names: Black Diamond

1.2 Other means of identification

1.3 Use of the substance / preparation – Abrasive blasting media

1.4 Supplier

Company Name:	AGSCO Corporation	Emergency number: 847-520-4455
Address:	160 West Hintz Road	Information number: 847-520-4455
	Wheeling Illinois 60090	Date prepared: January 2015

2. HAZARDS IDENTIFICATION

Classification in accordance with 29 CFR 1910.1200

Acute Toxicity (Oral), Category 4 (20% unknown)
Skin Corrosion / Irritation, Category 3
Eye Damage / Irritation, Category 2A
Carcinogenicity, Category 2
Specific Target Organ Toxicity - Single Exposure, Category 2 (respiratory system)
Specific Target Organ Toxicity - Single Exposure, Category 2 (digestive system and/or systemic toxicity)
Specific Target Organ Toxicity - Repeated Exposure, Category 2 (respiratory system, lungs)

GHS LABEL ELEMENTS
Symbol(s)

NFPA Label

Signal Word

WARNING

Hazard Statement(s)

Harmful if swallowed. Can cause skin irritation.
May cause damage to respiratory system, lungs through prolonged or repeated exposure.

Precautionary Statement(s)

Prevention

Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/clothing and eye/face protection. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required.

Response

IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.

IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. Rinse mouth.

Storage

Store locked up. Store in a secure, controlled area.

Disposal

Dispose in accordance with all applicable regulations.

3. COMPOSITION / INFORMATION ON INGREDIENTS

CAS	Component	Percent %
7631-86-9	Amorphous Silicon Dioxide	48-50
1344-28-1	Aluminum oxide	18-22
1309-37-1	Iron oxide (Fe2O3)	18-22
1305-78-8	Calcium Oxide	5-7
12136-45-7	Potassium Oxide	1-2
13463-67-7	Titanium Oxide	0-1
1309-48-4	Magnesium Oxide	0-1
1313-59-3	Sodium Oxide	0-1
14808-60-7	Quartz	0-0.1
14464-46-1	Cristobalite	0-0.1
7440-41-7	Beryllium	0-0.0005

Others

Evidence may exist to indicate that components present in this material in concentrations of less than one percent (or in the case of carcinogens, less than 0.1 percent) could be released in concentrations which would exceed an established OSHA permissible exposure limit or ACGIH Threshold Limit Value, or could present a health risk to employees in those concentrations.

Employee exposure monitoring should be performed to determine exposure levels.

4. FIRST AID MEASURES

Description of Necessary Measures

Inhalation

If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

Skin	If adverse effects occur, wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed.
Eyes	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Do not rub eyes. Continue rinsing. Then get immediate medical attention.
Ingestion	If a large amount is swallowed, get immediate medical attention. Rinse mouth.

Most Important Symptoms/Effects

Acute	Respiratory tract irritation, skin irritation, eye irritation.
Delayed	Respiratory system damage, lung damage.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Use extinguishing agents appropriate for surrounding fire.

Unsuitable Extinguishing Media

None known.

Specific Hazards Arising from the Chemical

Negligible fire hazard.

Hazardous Combustion Products

None known.

Fire Fighting Measures

Use extinguishing agents appropriate for surrounding fire. Stay upwind and keep out of low areas. Avoid inhalation of material or combustion by-products.

Special Protective Equipment and Precautions for Firefighters

Wear full protective firefighting gear including self-contained breathing apparatus (SCBA) for protection against possible exposure.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

Wear personal protective clothing and equipment, see Section 8. Avoid release to the environment.

Methods and Materials for Containment and Cleaning Up

Collect spilled material in appropriate container for disposal. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). If sweeping of a contaminated area is necessary, use a dust suppressant agent. Move containers away from spill to a safe area. Wet down area with water.

7. HANDLING AND STORAGE

Precautions for Safe Handling

Wash thoroughly after handling. Do not breathe dust. Do not eat, drink or smoke when using this product. Wear protective gloves/clothing and eye/face protection. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required.

Conditions for Safe Storage, including any Incompatibilities

Store and handle in accordance with all current regulations and standards. Protect from physical damage.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Component Exposure Limits

Iron oxide (Fe2O3) (1309-37-1)

ACGIH: 5 mg/m3 TWA (respirable fraction)
NIOSH: 5 mg/m3 TWA (as Fe, dust and fume)
2500 mg/m3 IDLH (as Fe, dust and fume)
OSHA (US): 10 mg/m3 TWA (fume); 15 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable fraction)
Mexico: 5 mg/m3 TWA LMPE-PPT
10 mg/m3 STEL [LMPE-CT] (as Fe)

Silicon Dioxide (7631-86-9)

NIOSH: 6 mg/m3 TWA
3000 mg/m3 IDLH
OSHA (US): 20 mppcf TWA; (80)/(% SiO2) mg/m3 TWA

Calcium oxide (1305-78-8)

ACGIH: 2 mg/m3 TWA
NIOSH: 2 mg/m3 TWA
25 mg/m3 IDLH
OSHA (US): 5 mg/m3 TWA
Mexico: 2 mg/m3 TWA LMPE-PPT

Aluminum oxide (1344-28-1)

OSHA (US): 15 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable
Mexico: 10 mg/m3 TWA LMPE-PPT

Appropriate Engineering Controls

Provide local exhaust or process enclosure ventilation system. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment).

Individual Protection Measures, such as Personal Protective Equipment

Eyes/Face Protection

Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Skin Protection

Wear appropriate chemical resistant clothing.

Glove Recommendations

Wear appropriate chemical resistant gloves.

Respiratory Protection

Where dust or vapor concentration exceeds or is likely to exceed applicable exposure limits, a NIOSH approved respirator is required.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Coarse Solid	Appearance:	black shiny solid
Color:	Black	Physical Form:	Solid
Odor:	No characteristic odor	Odor Threshold:	Not available
pH:	Not available	Melting Point:	Not available
Boiling Point:	Not applicable	Flash Point:	Non-flammable; non-explosive
Decomposition:	Not available	Evaporation Rate:	Not available
OSHA Flammability Class:	Non - Flammable	LEL:	Not available
UEL:	Not available	Vapor Pressure:	Not applicable
Vapor Density (air = 1):	Not applicable	Density:	Not available
Specific Gravity (water = 1):	Not available	Water Solubility:	Marginal
Log KOW:	Not available	Coeff. Water/Oil Dist:	Not available
Viscosity:	Not available		

Other Property Information

No additional information is available.

10. STABILITY AND REACTIVITY

Reactivity

No reactivity hazard is expected.

Chemical Stability

Stable at normal temperatures and pressure.

Possibility of Hazardous Reactions

Will not polymerize.

Conditions to Avoid

Avoid accumulation of airborne dusts.

Incompatible Materials

None

Hazardous Decomposition

Combustion: miscellaneous decomposition products.

11. TOXICOLOGICAL INFORMATION

Acute and Chronic Toxicity

Component Analysis - LD50/LC50

The components of this material have been reviewed in various sources and the following endpoints are published:

Iron oxide (Fe_2O_3) (1309-37-1)

Oral LD50 Rat >10000 mg/kg

Silicon Dioxide (7631-86-9)

Oral LD50 Rat >5000 mg/kg; Dermal LD50 Rabbit >2000 mg/kg

Calcium oxide (1305-78-8)

Oral LD50 Rat 500 mg/kg

Aluminum oxide (1344-28-1)

Oral LD50 Rat >5000 mg/kg

Information on Likely Routes of Exposure

Inhalation

Throat irritation, difficulty breathing.

Ingestion

Diarrhea, stomach pain, difficulty breathing

Skin Contact

Skin irritant

Eye Contact

Eye irritant

Immediate Effects

Eye and Skin Irritant, Shortness of Breath

Delayed Effects

Respiratory system damage

Medical Conditions Aggravated by Exposure

Respiratory disorders, eye disorders, skin disorders

Irritation/Corrosivity Data

Respiratory tract irritant, skin irritant, eye irritant.

Local Effects

Calcium oxide (1305-78-8)

Corrosive: inhalation, skin, eye, ingestion

Respiratory Sensitization

No data available.

Dermal Sensitization:

No data available.

Carcinogenicity

Available data characterizes components of this product as possible carcinogen hazards.

Component Carcinogenicity

Iron oxide (Fe2O3) (1309-37-1)

ACGIH: A4 - Not Classifiable as a Human Carcinogen

IARC: Supplement 7 [1987]; Monograph 1 [1972] (Group 3 (not classifiable))

DFG: Category 3B (could be carcinogenic for man, with the exception of non-bioavailable ferrous oxides)

Silicon Dioxide (7631-86-9)

IARC: Monograph 68 [1997]; Supplement 7 [1987] (Group 3 (not classifiable))

Aluminum oxide (1344-28-1)

DFG: Category 2 (considered to be carcinogenic for man, fiber dust)

Mutagenic Data

No data available.

Reproductive Effects Data

No data available.

Tumorigenic Data

No data available.

Specific Target Organ Toxicity - Single Exposure

Respiratory system, digestive system

Specific Target Organ Toxicity - Repeated Exposure

Respiratory system, lungs

Aspiration Hazard

No data available.

12 ECOLOGICAL INFORMATION

Ecotoxicity

Component Analysis - Aquatic Toxicity

Silicon Dioxide (7631-86-9)

Fish:	96 Hr LC50 Brachydanio rerio: 5000 mg/L [static]
Algae:	72 Hr EC50 Pseudokirchneriella subcapitata: 440 mg/L
Invertebrate:	48 Hr EC50 Ceriodaphnia dubia: 7600 mg/L

Calcium oxide (1305-78-8)

Fish: 96 Hr LC50 Cyprinus carpio: 1070 mg/L [static]

Persistence and Degradability

No information available for the product.

Bioaccumulative Potential

No information available for the product.

Mobility

No information available for the product.

13. DISPOSAL CONSIDERATIONS

Disposal Methods

Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION

US DOT Information

Shipping Name: Not Regulated

IMDG Information

Shipping Name: Not Regulated

SAFETY DATA SHEET

15. REGULATORY INFORMATION

Component Analysis

U.S. Federal Regulations

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 311/312 (40 CFR 370.21), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

Aluminum oxide (1344-28-1)

SARA 313: 1.0% de minimis concentration (fibrous forms)

SARA 311/312 Hazardous Categories

Acute Health: Yes **Chronic Health:** Yes **Fire:** No **Pressure:** No **Reactive:** No

U.S. State Regulations

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA
Iron oxide (Fe_2O_3)	1309-37-1	Yes	Yes	Yes	Yes	Yes
Silicon Dioxide	7631-86-9	Yes	Yes	Yes	Yes	Yes
Calcium oxide	1305-78-8	Yes	Yes	Yes	Yes	Yes
Aluminum oxide	1344-28-1	Yes	Yes	Yes	Yes	Yes
Titanium oxide	13463-67-7	Yes	Yes	No	Yes	Yes
Potassium oxide	12136-45-7	Yes	Yes	No	Yes	Yes
Magnesium oxide	1309-48-4	Yes	Yes	No	Yes	Yes
Sodium oxide	1313-59-3	Yes	Yes	Yes	Yes	Yes

Component Analysis - Inventory

Component	CAS	US	CA	EU	AU	PH	JP	KR	CN	NZ
Iron oxide (Fe_2O_3)	1309-37-1	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
Silicon Dioxide	7631-86-9	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
Calcium oxide	1305-78-8	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
Aluminum oxide	1344-28-1	Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	Yes
Titanium oxide	7440-66-6	Yes	DSL	EIN	Yes	Yes	No	Yes	Yes	Yes
Potassium oxide	12136-45-7	Yes	DSL	EIN	Yes	Yes	No	Yes	Yes	Yes
Magnesium oxide	1309-48-4	Yes	DSL	EIN	Yes	Yes	No	Yes	Yes	Yes
Sodium oxide	1313-59-3	Yes	DSL	EIN	Yes	Yes	No	Yes	Yes	Yes

16. OTHER INFORMATION

NFPA Ratings: Health: 1 Fire: 0 Reactivity: 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Key / Legend

ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSL - Domestic Substances List; EEC - European Economic Community; EINECS - European Inventory of Existing Commercial Chemical Substances; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; JP - Japan; Kow - Octanol/water partition coefficient; KR - Korea; LEL - Lower Explosive Limit; LOLI - List Of LIsts™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PH - Philippines; RCRA - Resource Conservation and Recovery Act; RID - European Rail Transport; RTECS - Registry of Toxic Effects of Chemical Substances®; SARA - Superfund Amendments and Reauthorization Act; STEL - Short-term Exposure Limit; TDG - Transportation of Dangerous Goods; TSCA - Toxic Substances Control Act; TWA - Time Weighted Average; UEL - Upper Explosive Limit; US - United States

Other Information

Disclaimer: Supplier gives no warranty whatsoever, including the warranties of merchantability or of fitness for a particular purpose. Any product purchased is sold on the assumption the purchaser shall determine the quality and suitability of the product. Supplier expressly disclaims any and all liability for incidental, consequential or any other damages arising out of the use or misuse of this product. No information provided shall be deemed to be a recommendation to use any product in conflict with any existing patent rights.

SAFETY DATA SHEET

Date Prepared : 04/02/2015
SDS No : 2014-04
Date Revised : 09/09/2015
Revision No : 4

1. PRODUCT AND COMPANY IDENTIFICATION

GENERAL USE: Abrasives, roofing products and other aggregate uses
PRODUCT DESCRIPTION: BLACK BEAUTY®
PRODUCT CODE: Coal-Fired Boiler Slag
PRODUCT FORMULATION NAME: Abrasive
GENERIC NAME: BLACK BEAUTY®

MANUFACTURER

Harsco Corporation
Metals & Minerals
5000 Ritter Road
Suite 205
Mechanicsburg, PA 17055
Emergency Contact: EHS Manager
Emergency Phone: 717-506-4666
Alternate Emergency Phone: 888-733-3646
E-Mail: reedcs@harsco.com

24 HR. EMERGENCY TELEPHONE NUMBERS

855-393-9889
Access Code 13793

2. HAZARDS IDENTIFICATION

GHS CLASSIFICATIONS

Health:

Not Classified.

Environmental:

Not Classified.

Physical:

Not Classified.

EMERGENCY OVERVIEW

PHYSICAL APPEARANCE: Solid

IMMEDIATE CONCERNS: BLACK BEAUTY® is not flammable, combustible or explosive; and poses no unusual hazard in an unused condition. During use for abrasive blasting, dust may irritate the respiratory tract, skin and eyes; and may cause inflammation and pulmonary fibrosis.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	Wt.%	CAS
Silica, Amorphous	40 - 53	60676-86-0
Aluminum Oxide	17 - 25	1344-28-1
Iron Oxide	5 - 31	1309-37-1
Calcium Oxide	3 - 20	1305-78-8
Magnesium Oxide	0.1 - 7	1309-48-4
Potassium Oxide	0.1 - 3	12136-45-7
Titanium Dioxide	0.1 - 2	13463-67-7
Silica, Crystalline	< 0.1	14808-60-7
Manganese	0.01 - 0.05	7439-96-5
Beryllium	0 - 0.001	7440-41-7
Cadmium	0 - 0.001	7440-43-9

4. FIRST AID MEASURES

EYES: Do not rub eyes. Remove contact lenses. Flush eyes thoroughly with water, taking care to rinse under eyelids. If irritation continues, continue flushing for 15 minuites, rinsing from time to time under the eyelids. If discomfort continues, consult a physician.

SKIN: Wash with soap and water. Get medical attention if irritation develops or persists.

INGESTION: Rinse mouth thoroughly if ingested. Do not induce vomiting. If discomfort continues, consult a physician.

INHALATION: Move to fresh air. If discomfort continues, consult a physician.

NOTES TO PHYSICIAN: Treat symptomatically.

COMMENTS: Show this Safety Data Sheet to physician in attendance.

5. FIRE FIGHTING MEASURES

FLAMMABLE CLASS: This product is non-combustible.

GENERAL HAZARD: None known

EXTINGUISHING MEDIA: Use fire-extinguishing media appropriate for surrounding materials.

FIRE FIGHTING PROCEDURES: Move product containers from fire area if it can be done without risk. Cool containers by flooding with water until heat is dissipated.

HAZARDOUS DECOMPOSITION PRODUCTS: None known

6. ACCIDENTAL RELEASE MEASURES

LARGE SPILL: Avoid runoff into storm sewers and ditches that lead to waterways. Collect spillage using a vacuum equipped with a HEPA filter. If not possible, gently moisten before collecting with shovel and broom. Dispose of collected materials inaccordance with Federal, State and local regulations.

GENERAL PROCEDURES: Never return spillage and clean-up materials to original product containers.

RELEASE NOTES: In the unused form, the material is non-hazardous as defined in state and federal regulations.

COMMENTS: Ensure clean-up is conducted by trained personnel wearing appropriate respiratory protection. Avoid inhalation of dust and contact with skin and eyes. Ventilate area if there is excessive airborne dust.

7. HANDLING AND STORAGE

GENERAL PROCEDURES: Avoid inhalation of dust and contact with skin and eyes. Use only with adequate venitilation. Use work methods that minimize dust production. Keep workplace clean. Observe good industrial hygiene practices.

HANDLING: Follow Safety Data Sheet and label precautions.

STORAGE: Keep container tightly closed. Store away from incompatible materials.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE GUIDELINES

OSHA HAZARDOUS COMPONENTS (29 CFR1910.1200)					
		EXPOSURE LIMITS			
		OSHA PEL		ACGIH TLV	
Chemical Name		ppm	mg/m^3	ppm	mg/m^3
Silica, Amorphous	TWA	20 mpp [1]	80 / $\%SiO_2$ [1]	[2]	10 [2]
Aluminum Oxide	TWA	[3]	15 [3]		1 R as aluminum metal
Iron Oxide	TWA		10 as iron oxide fume		5
Calcium Oxide	TWA		5		2
Magnesium Oxide	TWA		15 as magnesium oxide fume		10 I
Titanium Dioxide	TWA		15		10
Silica, Crystalline	TWA	[4]	10 / ($\%SiO_2$ + 2) [4]		0.025 R
Manganese	TWA				0.2

Footnotes:

1. mpp is millions of particles per ft^3
2. ACGIH TLV for Particles Not Otherwise Specified is 10 mg/m^3 for inhalable particles and 3 mg/m^3 for respirable particles.
3. PEL is 15 mg/m^3 total dust and 5 mg/m^3 respirable particles (as aluminum metal)
4. Respirable PEL = 10 mg/m^3 / ($\%SiO_2$ + 2) and Total Dust PEL = 30 mg/m^3 / ($\%SiO_2$ + 2)

ENGINEERING CONTROLS: Use process enclosures, local exhaust ventilation or other engineering controls to keep airborne levels below recommended exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields. Use tight fitting googles if dust is generated.

SKIN: Use protective gloves. Wear suitable protective clothing.

RESPIRATORY: Selection and use of respiratory protective equipment should be in accordance with OSHA General Industry Standard 29 CFR 1910.134; or in Canada with CSA Standard Z94.4.

WORK HYGIENIC PRACTICES: Wash hands after handling. Routinely wash work clothing and protective equipment. Handle in accordance with good industrial hygiene and safety practice.

COMMENTS: Proper and safe use of the material is solely the purchaser's responsibility. The manufacturer extends no warranties and makes no representations as to the suitability of the product for the purchaser's intended purpose or the consequences of purchaser's actions.

9. PHYSICAL AND CHEMICAL PROPERTIES

ODOR: None

APPEARANCE: Black, granular solid

COLOR: Black

pH: 8.2

FLASH POINT AND METHOD: Not Available

FLAMMABLE LIMITS: Not available

VAPOR PRESSURE: Not Available

VAPOR DENSITY: Not Available

BOILING POINT: Not Available

FREEZING POINT: Not Available

MELTING POINT: Not Available

SOLUBILITY IN WATER: None Expected

SPECIFIC GRAVITY: 2.6 - 2.8

VISCOSITY: Not Available

COMMENTS: For additional information contact manufacturer.

10. STABILITY AND REACTIVITY

STABILITY: This product is stable and non-reactive under normal conditions of use, storage and transport.

CONDITIONS TO AVOID: None known

POSSIBILITY OF HAZARDOUS REACTIONS: None

HAZARDOUS DECOMPOSITION PRODUCTS: None known

INCOMPATIBLE MATERIALS: Hydrofluoric acid

11. TOXICOLOGICAL INFORMATION

ACUTE

NOTES: Abrasive blasting agents may cause inflammation and pulmonary fibrosis. Ingestion of dusts generated during working operations may cause nausea and vomiting.

EYE EFFECTS: May cause eye irritation.

SKIN EFFECTS: May cause skin irritation.

CHRONIC: Frequent inhalation of dust over a long period of time increases the risk of developing lung diseases.

CARCINOGENICITY

IARC: Coal-Fired boiler slag is not listed by IARC.

NTP: Coal-Fired boiler slag is not listed by the National Toxicology Program in their Annual Report.

OSHA: Coal-Fired boiler slag is not listed by NIOSH on their Occupational Cancer List.

Notes:

ACGIH Carcinogens

- Aluminum oxide (CAS 1344-28-1) A4 Not classifiable as a human carcinogen.
- Beryllium (CAS 7440-41-7) A1 Confirmed human carcinogen.
- Cadmium (CAS 7440-43-9) A2 Suspected human carcinogen.
- Calcium oxide (CAS 1305-78-8) No designation listed.
- Iron oxide (CAS 1309-37-1) A4 Not classifiable as a human carcinogen.
- Magnesium oxide (CAS 1309-48-4) A4 Not classifiable as a human carcinogen.
- Manganese (CAS 7439-96-5) A4 Not classifiable as a human carcinogen.
- Potassium oxide (CAS 12136-45-7) No designation listed.
- Silica, amorphous (CAS 7631-86-9) No designation listed.

- Titanium dioxide (CAS 13463-67-7) A4 Not classifiable as a human carcinogen.

IARC Monographs. Overall Evaluation of Carcinogenicity

- Aluminum oxide (CAS 1344-28-1) Not listed.
- Beryllium (CAS 7440-41-7) Group 1. Monographs 58 and 100C (2012).
- Cadmium (CAS 7440-43-9) Group 1. Monographs 58 and 100C (2012).
- Calcium oxide (CAS 1305-78-8) Not listed.
- Iron oxide (CAS 1309-37-1) Not listed.
- Magnesium oxide (CAS 1309-48-4) Not listed.
- Manganese (CAS 7439-96-5) Not listed.
- Potassium oxide (CAS 12136-45-7) Not listed.
- Silica, amorphous (CAS 7631-86-9) Not listed.
- Titanium dioxide (CAS 13463-67-7) Group 2B. Monographs 47 and 93 (2010).

US NTP Report on Carcinogens

- Beryllium (CAS 7440-41-7) Known to be a human carcinogen.
- Cadmium (CAS 7440-43-9) Known to be a human carcinogen.

CORROSIVITY: None known

SENSITIZATION: Not a skin or respiratory sensitizer.

NEUROTOXICITY: None known

GENETIC EFFECTS: None known

REPRODUCTIVE EFFECTS: None known

TARGET ORGANS: Irritation of nose and throat. Irritation of eyes and mucous membranes. May cause respiratory tract irritation. Shortness of breath.

TERATOGENIC EFFECTS: None known

MUTAGENICITY: None known

COMMENTS: Although manufacturer has taken reasonable care in the preparation of this Safety Data Sheet, no warranties are made. Manufacturer makes no representations and assumes no responsibility as to the accuracy or suitability of the Safety Data Sheet for the applications intended by the purchaser.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

ECOTOXICOLOGICAL INFORMATION: This product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

BIOACCUMULATION/ACCUMULATION: This product is not bioaccumulating.

DISTRIBUTION: Not available

AQUATIC TOXICITY (ACUTE): None known

CHEMICAL FATE INFORMATION: Not available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose in accordance with all applicable regulations.

GENERAL COMMENTS: TCLP testing of unused product indicates that it is not hazardous waste by characteristic.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)

OTHER SHIPPING INFORMATION: Unused product is not regulated as a hazardous material by DOT.

COMMENTS: Unused product is not regulated as dangerous goods by the International Air Transport Association (IATA), International Maritime Dangerous Goods (IMDG) or Transport Canada (TDG).

15. REGULATORY INFORMATION

UNITED STATES

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

311/312 HAZARD CATEGORIES: Hazardous Chemical.

FIRE: No **PRESSURE GENERATING:** No **REACTIVITY:** No **ACUTE:** No **CHRONIC:** Yes

313 REPORTABLE INGREDIENTS: Aluminum oxide (CAS 1344-28-1)

302/304 EMERGENCY PLANNING

EMERGENCY PLAN: None

CERCLA (COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT)

Chemical Name	Wt.%	CERCLA RQ
Beryllium	0 - 0.001	10

CERCLA RQ: None

TSCA (TOXIC SUBSTANCE CONTROL ACT)

Chemical Name	CAS
Silica, Amorphous	60676-86-0
Aluminum Oxide	1344-28-1
Iron Oxide	1309-37-1
Calcium Oxide	1305-78-8
Magnesium Oxide	1309-48-4
Potassium Oxide	12136-45-7
Titanium Dioxide	13463-67-7
Silica, Crystalline	14808-60-7
Manganese	7439-96-5
Beryllium	7440-41-7

CLEAN AIR ACT

40 CFR PART 68—RISK MANAGEMENT FOR CHEMICAL ACCIDENT RELEASE PREVENTION: None

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

29 CFR1910.119—PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: None

CALIFORNIA PROPOSITION 65: WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

RCRA STATUS: Not regulated.

OSHA HAZARD COMM. RULE: Regulated.

CLEAN WATER ACT: Not covered by any water quality criteria under Section 304.

CARCINOGEN: Boiler slag is not listed by IARC, NIOSH or the NTP as a known or suspected carcinogen. However based

upon the presence of beryllium and cadmium, the product would be classified as a Category 2 Carcinogen pursuant to the GHS Classification System.

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Not Controlled.

WHMIS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM): Not controlled.

WHMIS CLASS: This product has been classified in accordance with the hazard criteria of the CPR and the Safety Data Sheet contains all of the information required by the CPR.

DOMESTIC SUBSTANCE LIST (INVENTORY): Listed on Inventory.

MEXICO This Safety Data Sheet has been prepared in accordance with the Official Mexican Standard (NOM-018-STPS-2000).

16. OTHER INFORMATION

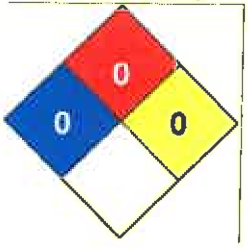
Date Revised: 09/09/2015

REVISION SUMMARY: This SDS replaces the 09/09/2015 SDS. Revised: **Section 16:** HMIS RATING - HEALTH.

HMIS RATING

HEALTH	☐	0
FLAMMABILITY		0
PHYSICAL HAZARD		0
PERSONAL PROTECTION		A

NFPA CODES



BASALITE®
CONCRETE PRODUCTS
VANCOUVER, ULC.

MATERIAL SAFETY DATA SHEET

Silica Fume

SECTION 1 PRODUCT IDENTIFICATION AND USE

Product identification: **Silica Fume**			
PIN/ UN No: **N/AV**	MSDS Number: **3009**	Molecular Weight: **N/AV**	
Chemical Name: **Silicon Dioxide**			
Chemical Family: Amorphous Silica		Chemical Formula: **SiO2**	
Pest Control Product (PCP #) : **N/AV**	Stock Number: **N/AV**	Product Group: **Pozzolan**	
Product Use: **Pozzolan**		Synonyms: Fume, Densified Silica Fume, Silica Fumes, Microsilica	
WHMIS Classification: **D2 E**		Means of Classification: **CLASS. BY MANUFACTURER**	
Manufacturers Name: **Becancour Silicon Inc.**		Suppliers Name: **Basalite Concrete Products Vancouver, ULC.**	
Street Address: **6500 Yvon-Trudeau**		Street Address: **1280 West 77th Avenue**	
City: **Becancour**	Province: **Quebec**	City: **Vancouver**	Province: **BC**
Postal Code: **G0X 1B0**	Emergency Telephone No. **(819) 294-6000 ext.249**	Postal Code: **V6P 3G8**	Emergency Telephone No. **604 – 269 – 2120**

SECTION 2 HAZARDOUS INGREDIENTS

Hazardous Ingredients	% Ratio	CAS Number: PIN Number:	Exposure Limits:	LD_{50}/LC_{50}
Silica Fume	**60 – 100 W/W**	**69012-64-2**	**2 mg respirable dust/m^3**	**Unknown**
Magnesium Oxide (MgO)	**1 – 5 W/W**	**1309-48-4**	**10 mg total dust/m^3**	**Unknown**
Iron Oxide (Fe_2O_2)	**1 - 5 W/W**	**1309-37-1**	**5 mg respirable dust/m^3**	**Unknown**

SECTION 3 PHYSICAL DATA

Odour & Appearance: **Light to medium gray powder.**			
Physical State: **SOLID (powder)**		Odour Threshold: **No distinct odour,**	
Freezing Point (°C): **N/AP**		Boiling Point (°C): **2230**	
Vapour pressure (mm Hg): **N/AP**	Vapour Density (Air=1): **N/AP**	Percent Volatile: **N/AP**	Evaporation Rate: **N/AP**
pH: **6-9**	Specific Gravity: **2.2**	Coeff. Water/ Oil Distribution: **N/AP**	Percent Soluble: **Slight**

N/AV and NV = Not Available   N/AP and NP = Not Applicable

SECTION 4 FIRE AND EXPLOSION DATA

Flammability: **N/AP**	If yes, under which conditions? **N/AP**	
Extinguishing Media: **N/AP**		
Special Fire Fighting Procedures: **N/AP**		Auto-Ignition temperature (°C): **N/AP**
Unusual Fire and Explosion Hazards: **N/AP**		Lower flammability limit (% by volume): **N/AP**
Flashpoint (°C) and method: **N/AP**	Upper flammability limit (% by volume): **N/AP**	
Hazardous Combustion Products: **N/AP**		
Explosion data: Sensitivity to impact: **N/AP**	Sensitivity to static discharge: **N/AP**	

SECTION 5 REACTIVITY DATA

Chemical stability: YES ☒ NO ☐	If no, under which conditions? **N/AP**
Incompatibility with other substances: **N/AP**	If so, which ones? **N/AP**
Reactivity, and under what conditions: **Silica fume is soluble in hydrofluoric acid. With fluorine, oxygen fluoride and chorine trifuoride, this product will cause a fire.**	
Hazardous polymerization: **N/AP**	
Hazardous decomposition products: **None. Silica Fume is inert under normal conditions of temperature and pressure. When heated at 930 C for 16 hours, amorphous silica will transform to quartz, a crystalline structure of silica.**	

SECTION 6 TOXICOLOGICAL PROPERTIES

Route of Entry: Skin Contact ☒	Skin Absorption: ☐	Eye Contact: ☒	Inhalation: ☒	Ingestion: ☒

Effects of acute exposure to product:

EYES: Can irritate eyes.

SKIN: Can dry skin.

INHALATION: Irritating to nose & throat.

Effects of chronic exposure to product:

Coughing, sneezing and/or eye irritation.

Exposure Limits:

TWA: **2 mg/ m^3**

Other: **The TWA is for Silica Fume in the air.**

STEL: **N/AV**

C: **N/AV**

OSHA PEL: **N/AV**

ACGIH TLV: **N/AV**

Carcinogen by NTP: **N/AV**	Carcinogen by IARC: **N/AV**	OSHA Controlled: **N/AV**

Irritancy:

EYES: Can irritate the eyes.

SKIN: Can dry the skin and cause rashes.

INHALATION: Can irritate the nose & throat.

Sensitization: **Some people might develop a skin rash (Allergic Dermatitis).**

Carcinogenicty: **N/AV**

Teratogenicity: **N/AV**	Reproductive Toxicity: **N/AV**
Mutagenicity: **N/AV**	Synergistic Products: **N/AV**

Medical Conditions Aggravated by Exposure: **May aggravate open sores or dermatitis. Fine dust may aggravate asthma and other breathing conditions.**

SECTION 7 PREVENTATIVE MEASURES

Personal Protective Equipment:

Gloves (specify): **Rubber of PVC when the mix is wet.**	Respirator (specify) **NIOSH/MSHA approved Dust Mask, when the mix is dry.**	Eye (specify) **Tight-fitting goggles**
Footwear (specify): **Boots, that will not soak up the wet mix and will keep out wet or dry mix.**	Clothing (specify) **That will keep the powder or the wet mix off skin & clothes.**	Other (specify) **Barrier creams should be applied PRIOR TO contact with the product. Wash with soap and water after working with cement-containing products.**

Engineering controls: **VENTILATION: Local exhaust to control airborne dust levels below 2 mg/m^3 TWA**

Leak & Spill Procedures: **AVOID BREATHING DUST. Use dry cleanup methods that do not send dust into the air.**

Waste Disposal: **Dispose of as common waste in accordance with applicable Federal, Provincial and local environmental regulations.**

Handling Procedures and Equipment: **No special handling equipment needed other than personal protective equipment.**

Storage Requirements: **Keep dry until mixed.**

Special Shipping Information: **Keep dry.**

Silica Fume

SECTION 8 FIRST AID MEASURES

Specific Measures:

EYES: **Flush with water for at least 15 minutes. Consult physician immediately.**

SKIN: **Wash with soap and water. If skin is burned, see doctor.**

INHALATION: **Move person to fresh air. Seek medical advice.**

INGESTION: **Drink copious amounts of water. Do not induce vomiting . Seek immediate medical attention.**

SECTION 9 PREPARATION DATE OF MSDS

Prepared By: (Group, Department, Etc.) **Quality Control Department** **Basalite Concrete Products Vancouver, ULC.** **8650 130th Street** **Surrey, BC** **V3W 1G1**	Phone Number: **604 – 596 – 3844**	Date: **12 / 02 / 15** (yr / mm / dd)
Workplace MSDS Transcribed by: **Laura Voci** **Basalite Concrete Products Vancouver, ULC.** **1280 W.77th Avenue** **Vancouver, BC** **V6P 3G8**	Phone Number: **604 - 269 – 2120**	Date: **12 / 02 / 15** (yr / mm / dd)

Attachment D
Facility Location Aerial Map

Coreslab Structures, Inc. Albuquerque Facility – Aerial Location Map

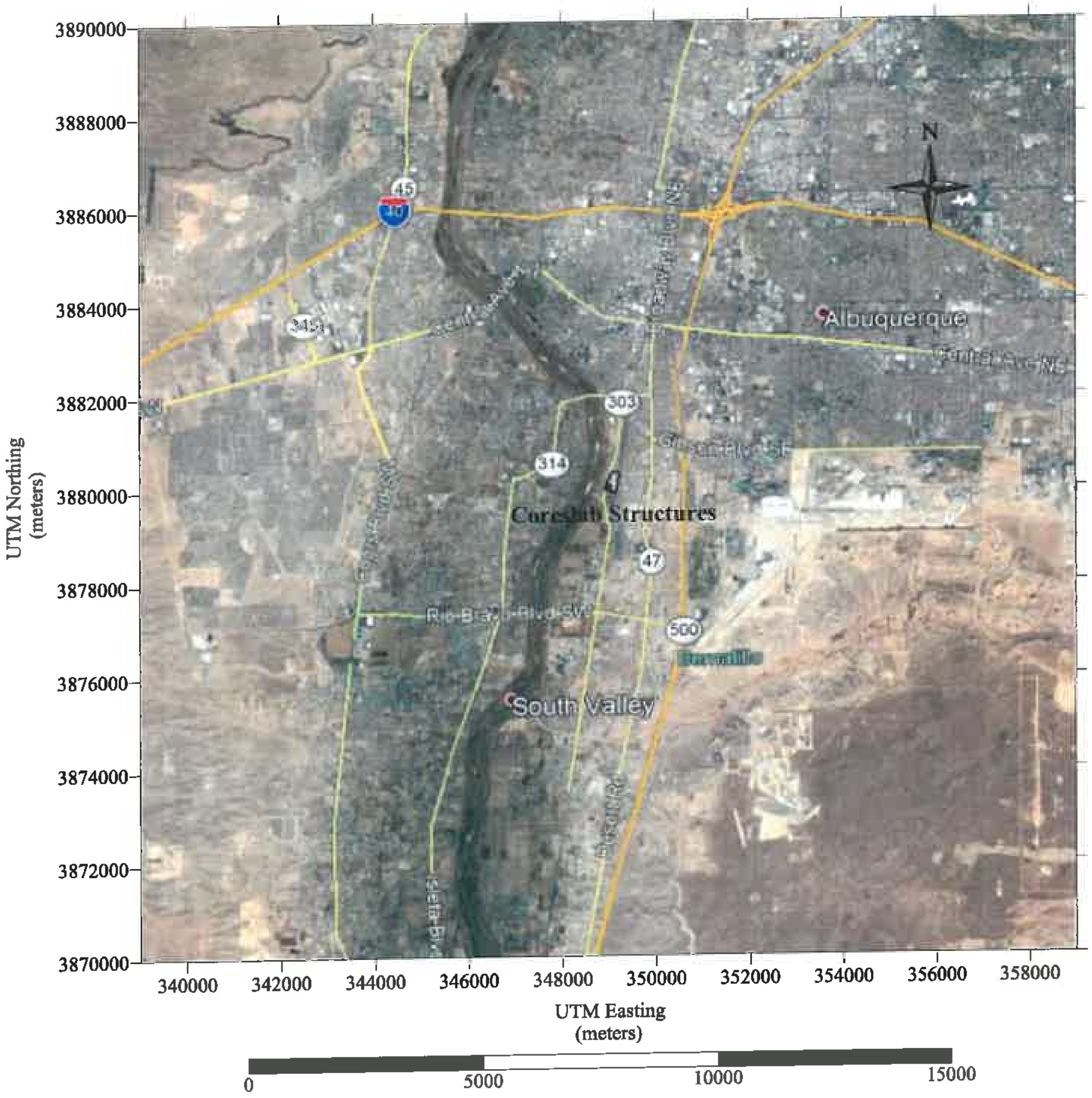


Figure D-1: Aerial Map Showing Site Location
NAD 83

Attachment E
Facility Process Description

Facility Process Description

This plant produces precast concrete products that include either mild reinforcing with steel reinforcement bars or prestressing strand that uses 7-wire strand that is elongated using stressing jacks. In both cases, the products use concrete that is mixed in a batch plant located on the premises.

The concrete process starts with delivery of aggregate and sand. The aggregate and sand are delivered by trucks (Unit 1) and unloaded/dumped into either uncovered stationary storage bins (Unit 22) on the ground or into a below ground hopper (Unit 2) and conveyed (Units 3 and 4) into uncovered elevated storage bins (Unit 5). The materials in the storage bins on the ground can be moved by a front-end loader to the below ground hopper as needed. A secondary conveyor system (Units 6 and 7) will move the aggregate and sand into the batch plant where it is weighed and loaded into one of two concrete mixers (Units 9 and 10). Cement, fly ash, and silica fume are delivered to the plant via truck and hopper trailer. The trailer uses a sealed blower and hose to unload into one of four elevated covered silos (Units 11, 12, 13, and 25). These silos are equipped with bag houses. These cementitious materials are delivered by a closed auger to a scale (Unit 15), where it is dropped into one of the mixers. Three of the four silos are exclusively marked for cement, fly ash or silica fume. The fourth smaller silo has been used to store white cement with an option to store additional fly ash when needed.

The final mixed concrete material is unloaded through a drop gate at the bottom of the mixer into a concrete delivery vehicle. This vehicle will be driven to a bed form where it is unloaded onto the form. Once the bed form is 100% filled with concrete, the remaining concrete is unloaded onto the ground by the batch plant to dry. The dried excess concrete is placed in a pile where it is loaded and hauled away to an off-site location to be recycled/crushed.

After the bed forms are filled with concrete, they are covered with a tarp and a steam generator is used to accelerate the curing process (Units 16, 19, 20, and 21). The steam generators are enclosed in a building and have steam pipes that are placed under the bed forms. The steam heat is typically run under the bed forms at night.

Occasionally, there is a customer request to expose the aggregate on a surface of the precast products. To complete this action, the plant will use one of two media blasting machines to blast away the concrete surface to expose the aggregate (Units 23 and 24). The media used is either a black slag or sand. There is a limited area in the plant to perform this activity.

Attachment F

Regulatory Applicability Determinations

The following is a list of city and federal regulations that may or may not be applicable to Coreslab

Albuquerque/Bernalillo County Regulations

20.11.1 NMAC– General Provisions: Applicable to Coreslab

Requirement: Compliance with ambient air quality standards.

Compliance: Compliance with 20.11.8 NMAC is compliance with this regulation.

20.11.2 NMAC– Permit Fees: Applicable to Coreslab

Requirement: A one-time permit application fee will be assessed by the Albuquerque/Bernalillo County Environmental Department.

Compliance: Coreslab will pay all required permit revision application fees applicable to their facility.

20.11.5 NMAC– Visible Air Contaminants: Applicable to Coreslab

Requirement: Places limits of 20 percent opacity on stationary combustion equipment.

Compliance: Coreslab will perform any required opacity observations using Method 9 and/or Method 22 with certified opacity observers.

20.11.8 NMAC– Ambient Air Quality Standards: Applicable to Coreslab

Requirement: Compliance with all federal, state and local ambient air quality standards.

Compliance: Coreslab's Albuquerque Facility demonstrated compliance by performing and submitting dispersion modeling analysis for applicable pollutants per Albuquerque/ Bernalillo County and New Mexico State Environmental Department's modeling guidelines.

20.11.20 NMAC– Airborne Particulate Matter: Applicable to Coreslab

Requirement: Requires the facility to obtain a permit prior to start of surface disturbances.

Compliance: Coreslab will apply for a 20.11.20 NMAC permit prior to start of surface disturbances.

20.11.41 NMAC– Authority to Construct: Applicable to Coreslab

Requirement: Requires the facility to obtain a permit prior to start of construction.

Compliance: Coreslab is applying for a revision to an existing 20.11.41 NMAC permit with this application.

20.11.49 NMAC– Excess Emissions: Applicable to Coreslab

Requirement: To implement requirements for the reporting of excess emissions and establish affirmative defense provisions for facility owners and operators for excess emissions.

Compliance: Coreslab will report all excess emissions following 20.11.49 NMAC guidelines.

20.11.63 NMAC– New Source Performance Standards: Not Applicable to Coreslab

Requirement: Adoption of all federal 40 CFR Part 60 new source performance standards.

Compliance: No applicable 40 CFR Part 60 NSPS that have been identified for this facility.

20.11.64 NMAC– Emission Standards for Hazardous Air Pollutants for Stationary Sources: Applicable to Coreslab

Requirement: Adoption of all federal 40 CFR Part 61 and 63 National Emissions Standards for Hazardous Air Pollutants (HAPS).

Compliance: 40 CFR Part 63 NESHAP Subpart CCCCCC has been identified for the 300-gallon gasoline storage tank in this permit application.

20.11.66 NMAC– Process Equipment: Applicable to Coreslab

Requirement: The objective of this Part is to achieve attainment of regulatory air pollution standards and to minimize air pollution emissions.

Compliance: Except as otherwise provided in this section, Coreslab shall not cause or allow the emission of particulate matter to the atmosphere from process equipment in any one hour in total quantities in excess of the amount shown in 20.11.66.18 NMAC Table 1.

20.11.90 NMAC– Administration, Enforcement, Inspection: Applicable to Coreslab

Requirement: General requirement on record keeping and data submission. Coreslab will notify the bureau regarding periods of excess emissions along with cause of the excess and actions taken to minimize duration and recurrence.

Compliance: It is expected that specific record keeping and data submission requirements will be specified in the 20.11.41 NMAC permit issued to Coreslab. It is expected the 20.11.41 NMAC permit issued to Coreslab will contain specific methods for determining compliance with each specific emission limitation. Coreslab's Albuquerque Facility will report any periods of excess emissions as required by specific 20.11.90 NMAC provisions.

Federal Regulations

40 CFR 50 – National Ambient Air Quality Standards: Applicable to Coreslab

Requirement: Compliance with federal ambient air quality standards.

Compliance: Coreslab's Albuquerque Facility will demonstrate compliance by performing and submitting dispersion modeling analysis for applicable pollutants per the Albuquerque/ Bernalillo County and New Mexico State Environmental Department's modeling guidelines.

40 CFR 60 Kb – NSPS Standards of Performance for Volatile Liquid Storage Vessels: Not applicable to Coreslab

Requirement: For any volatile liquid storage vessel greater than or equal to 75 m^3, but less than 151 m^3 storing liquid with a true vapor pressure less than 15.0 kPa constructed, reconstructed or modified after July 23, 1984 shall keep records of the dimensions and capacity of applicable storage tanks

Compliance: At present, Coreslab will have no volatile liquid storage vessel greater than or equal to 75 m^3 with a vapor pressure less than 15.0 kPa constructed, reconstructed or modified after July 23, 1984.

40 CFR 60 OOO – NSPS Standards of Performance for Aggregate Facilities: Not Applicable to Coreslab

Requirement: No facility will discharge or cause to discharge gases containing particulate matter in excess of 0.05 gr/dscm from any stack. No facility will discharge or cause to discharge from any transfer point on belt conveyors or screen exhibiting opacities greater than 7 percent. No facility will discharge or cause to discharge from any crusher exhibiting opacities greater than 12 percent.

Compliance: Coreslab's Albuquerque Facility does not meet the definition of an aggregate facilities defined in the regulation.

40 CFR 63 CCCCCC – National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Dispensing Facilities: Applicable to Coreslab

Requirement: This subpart applies is each gasoline dispensing facility (GDF) that is located at an area source. The affected source includes each gasoline cargo tank during the delivery of product to a GDF and also includes each storage tank.

Compliance: 40 CFR Part 63 NESHAP Subpart CCCCCC has been identified for the 300-gallon gasoline storage tank in this permit application. The storage tank's monthly throughput is less than 10,000 gallons a month so only 40 CFR Part 63.11116 applies.

Attachment G

Dispersion Modeling Summary

DISPERSION MODEL REPORT FOR CORESLAB STRUCTURES (ALBUQUERQUE), INC.
PERMIT #359-M2-RV1 REVISION

Albuquerque, New Mexico

PREPARED FOR
CORESLAB STRUCTURES (ALBUQUERQUE), INC.

April 17, 2019

Prepared by

Montrose Air Quality Services, LLC.

MONTROSE
AIR QUALITY SERVICES

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1.0 INTRODUCTION

This dispersion modeling analysis will be conducted by Montrose Air Quality Services, LLC. (Montrose) on behalf of Coreslab Structures (Albuquerque), Inc. (Coreslab), to evaluate ambient air quality impacts from addition of dry abrasive blasting (in one of two locations at the site) and an additional silo. The location of the Albuquerque facility is 2800 2nd Street SE in Albuquerque, NM. The objective of this evaluation is to determine whether ambient air concentrations from the maximum operation of the proposed project for nitrogen dioxide, carbon monoxide, sulfur dioxide, and particulate matter; both 10 microns or less (PM_{10}) and 2.5 microns or less ($PM_{2.5}$); are below Class II federal and state ambient air quality standards (NAAQS and NMAAQS) found in 40 CFR part 50 and the City of Albuquerque/Bernalillo County (COABC) air quality regulation 20.11.8 NMAC.

The dispersion modeling will be conducted using the American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee Dispersion Model (AERMOD), Version 18018. This model is recommended by EPA for determining Class II impacts within 50 km of the source being assessed. Additionally, AERMOD was developed to handle complex terrain. In this analysis, AERMOD will be used to estimate pollutant ambient air concentrations of NO_2, CO, SO_2, PM_{10} and $PM_{2.5}$ from the Coreslab facility emission sources. Montrose employs the general modeling procedures outlined in "Permit Modeling Guidelines, Albuquerque Environmental Health Department", revised 12/20/2018, "New Mexico Air Pollution Control Bureau, Dispersion Modeling Guidelines", revised 01/01/2019, and the most up to date EPA's *Guideline on Air Quality Models*.

Aggregate material handling equipment, stockpiles, and haul roads will be input into the model as volume sources. Model input parameters for feeders and transfer points will follow the NMED model guidelines Table 27 and site release heights. Model input parameters for haul roads will follow the NMED model guidelines Tables 28 and 29.

Figure 1 below shows the location of the site overview. For abrasive blasting there are two locations modeled that would allow operation in either location to be used.

Additional neighboring sources identified by the COABC AQP Program that will be included in the dispersion model analysis is Quikrete located directly north of this site, Pet Crematory, C&C Services, Albuquerque Asphalt, PNM's Rio Bravo Generating Station, and CEI Industries. For Quikrete, a site visit was performed to identify all permitted sources and their model input information for combustion and particulate matter emissions. Information on nitrogen dioxide model inputs for the other neighboring sources was obtained from the COABC AQP modeling section.

FIGURE 1: Coreslab Site Layout Overview

2.0 DISPERSION MODELING PROTOCOL

This section identifies the technical approach and dispersion model inputs that will be used for the Class II federal and State ambient air quality standards for this source. COABC Air Quality Program (AQP) requires that all applicable criteria pollutant emissions be modeled using the most recent versions of US EPA's approved models and be compared with National Ambient Air Quality Standards (NAAQS), and Bernalillo County Ambient Air Quality Standards. Table 1 shows the NAAQS and Bernalillo County Ambient Air Quality Standards that the source's ambient impacts must meet in order to demonstrate compliance. Table 1 also lists the Class II Significant Impact Levels (SILs) which are used to assess whether a source has a significant impact at downwind receptors.

The dispersion modeling analysis will be performed to estimate concentrations resulting from the operation of the Coreslab sources using the existing permitted emission rates and maximum emission rates for new sources while all emission sources are operating. The modeling will determine the maximum off site concentrations for nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), and particulate matter; both 10 microns or less (PM_{10}) and 2.5 microns or less ($PM_{2.5}$), for comparison with modeling significance levels, national/Bernalillo County ambient air quality standards (AAQS). The modeling will follow the guidance and protocols outlined in the "Permit Modeling Guidelines, Albuquerque Environmental Health Department", revised 12/20/2018, "New Mexico Air Pollution Control Bureau, Dispersion Modeling Guidelines", revised 01/01/2019, and the most up to date EPA's *Guideline on Air Quality Models*.

Initial modeling will be performed with Coreslab sources only to determine pollutant and averaging periods that exceeds pollutant SILs. If initial modeling for any pollutant and averaging period exceeds SILs, than cumulative modeling was performed for those pollutants and averaging periods for all receptors that exceeds the SILs which included significant neighboring sources along with background ambient concentrations.

TABLE 1: National and New Mexico Ambient Air Quality Standard Summary

Pollutant	Avg. Period	Sig. Lev. (µg/m^3)	Class I Sig. Lev. (µg/m^3)	NAAQS	NMAAQS	PSD Increment Class I	PSD Increment Class II
CO	8-hour	500		9,000 ppb$^{(1)}$	8,700 ppb$^{(2)}$		
	1-hour	2,000		35,000 ppb$^{(1)}$	13,100 ppb$^{(2)}$		
NO_2	annual	1.0	0.1	53 ppb$^{(3)}$	50 ppb$^{(2)}$	2.5 µg/m^3	25 µg/m^3
	24-hour	5.0			100 ppb$^{(2)}$		
	1-hour	7.54		100 ppb$^{(4)}$			
$PM_{2.5}$	annual	0.3	0.06	12 µg/m$^{3(5)}$		1 µg/m^3	4 µg/m^3
	24-hour	1.2	0.07	35 µg/m$^{3(6)}$		2 µg/m^3	9 µg/m^3
PM_{10}	annual	1.0	0.2			4 µg/m^3	17 µg/m^3
	24-hour	5.0	0.3	150 µg/m$^{3(7)}$		8 µg/m^3	30 µg/m^3
SO_2	annual	1.0	0.1		20 ppb$^{(2)}$	2 µg/m^3	20 µg/m^3
	24-hour	5.0	0.2		100 ppb$^{(2)}$	5 µg/m^3	91 µg/m^3
	3-hour	25.0	1.0	500 ppb$^{(1)}$		25 µg/m^3	512 µg/m^3
	1-hour	7.8		75 ppb$^{(8)}$			

Standards converted from ppb to µg/m^3 use a reference temperature of 25° C and a reference pressure of 760 millimeters of mercury.

(1) Not to be exceeded more than once each year.
(2) Not to be exceeded.
(3) Annual mean.
(4) 98th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
(5) Annual mean, averaged over 3 years.
(6) 98th percentile, averaged over 3 years.
(7) Not to be exceeded more than once per year on average over 3 years.
(8) 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.

2.1 DISPERSION MODEL SELECTION

The dispersion modeling will be conducted using the American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee Dispersion Model (AERMOD), Version 18081. This model is recommended by EPA for determining Class II impacts within 50 km of the source being assessed. Additionally, AERMOD was developed to handle complex terrain. In this analysis, AERMOD will be used to estimate pollutant ambient air concentrations of NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$ from Coreslab emission sources.

AERMOD is a Gaussian plume dispersion model that is based on planetary boundary layer principles for characterizing atmospheric stability. The model evaluates the non-Gaussian vertical behavior of plumes during convective conditions with the probability density function and the superposition of several Gaussian plumes. AERMOD modeling system has three components: AERMAP, AERMET, and AERMOD. AERMAP is the terrain preprocessor program. AERMET is the meteorological data preprocessor. AERMOD includes the dispersion modeling algorithms and was developed to handle simple and complex terrain issues using improved algorithms. AERMOD uses the dividing streamline concept to address plume interactions with elevated terrain.

AERMOD was run using all the regulatory default options including use of:

- Gradual Plume Rise
- Stack-tip Downwash
- Buoyancy-induced Dispersion
- Calms and Missing Data Processing Routine
- Upper-bound downwash concentrations for super-squat buildings
- Default wind speed profile exponents
- Calculate Vertical Potential Temperature Gradient
- No use of gradual plume rise
- Rural Dispersion

2.2 BUILDING WAKE EFFECTS

Coreslab Services structures will be included in the model as a building and analyzed as a building downwash source using the BPIP-Prime program. The results of the BPIP-Prime output will be inputted into the AERMOD model.

2.3 METEOROLOGICAL DATA

Dispersion model meteorological input file to be used in this modeling analysis are years 2001 - 2005 Albuquerque met data (AERMET version 16216 dated 01/30/2017) available from the COABC AQP.

2.4 RECEPTORS AND TOPOGRAPHY

Modeling will be completed using as many receptor locations to ensure that the maximum estimated impacts are identified. Initial radius of impact modeling will be performed with receptors within 3 kilometers of the model boundary. Because of the nature of the emissions from the site, it is expected the maximum concentrations will be on or near the site fenceline.

The refined receptor grid will include receptors located at 50 meters apart out to 500 meters from the property line, 100 meters apart from 500 meters out to 1000 meters, and 250 meters apart from 1000 meters out to 3000 meters. Fenceline receptor spacing will be 25 meters.

All refined model receptors will be preprocessed using the AERMAP software associated with AERMOD. The AERMAP software establishes a base elevation and a height scale for each receptor location. The height scale is a measure of the receptor's location and base elevation and its relation to the terrain feature that has the greatest influence in dispersion for that receptor. AERMAP will be run using U.S. Geological Survey (USGS) digital elevation model (DEM) data. Output from AERMAP will be used as input to the AERMOD runstream file for each model run.

2.5 MODELED EMISSION SOURCES INPUTS

The permitted operating time for the facilities concrete production is 12 hours per day (7 AM to 7 PM). For proposed abrasive blasting operations, Coreslab will take site-specific conditions on daily abrasive use and hours of operation. For the months of March through October the daily throughput will be limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 7 PM. For the months of November through February the daily throughput will be limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 6 PM. For modeling, the hourly blocks vary starting from 7 AM then shifting on 2-hour intervals for 5 separate model runs as summarized on Table 2.

TABLE 2: Abrasive Blasting Model Scenario Time Segments

Model Scenario	Time Segments 5-Hour Blocks March - October	Time Segments 5-Hour Blocks November - December
1	7 AM to 12 PM	7 AM to 12 PM
2	9 AM to 2 PM	9 AM to 2 PM
3	11 AM to 4 PM	11 AM to 4 PM
4	1 PM to 6 PM	1 PM to 6 PM
5	2 PM to 7 PM	1 PM to 6 PM

2.5.1 Coreslab Facility Road Vehicle Traffic Model Inputs

The access road fugitive dust for truck traffic will be modeled as a line of volume sources. The NMED AQB's approved procedure for Modeling Haul Roads will be followed to develop modeling input parameters for haul roads. Volume source characterization followed the steps described in the NMED Air Quality Bureau's Guidelines.

2.5.2 Coreslab Facility Material Handling Volume Source Model Inputs

Particulate emissions from material handling and process from aggregate unloading, transfers and storage will be modeled as volume sources. Model input parameters for feeders and transfer points follow the NMED Air Quality Bureau's model guidelines Table 27 and site release heights.

2.5.3 Coreslab Facility Point Source Model Inputs

Emissions from exhaust stacks from the dust collectors will be modeled as point sources. Model input parameters are based on previously permitted release height, release diameter, release velocity or flow rate, and ambient temperature. The steam generator's combustion emissions are release along with the steam at the steam beds. To represent steam generator combustion emissions, the source will be represented as point sources. These sources will have a diameter of the steam beds, a release height of zero feet, a velocity of 0.001 meters per second, and a steam temperature of 400 degrees F. For horizontal or raincap releases, the AERMOD version for horizontal and raincap releases will be used with actual release parameters.

Tables 3 through 5 summarize the model input for the Coreslab Facility.

TABLE 3: Summary of Particulate Model Inputs for Point Sources at the Coreslab Facility

Source Description	Model ID	Stack Height (m)	Stack Temp. (K)	Exit Vel. (m/s)	Stack Dia. (m)	PM10 Emission Rate (lbs/hr)	PM2.5 Emission Rate (lbs/hr)
Mixer #1 (Unit #9)	MIXLOAD1	10.67	0.00	0.0999	0.9144	0.01000	0.00020
Mixer #2 (Unit #10)	MIXLOAD2	10.67	0.00	0.0999	0.9144	0.01000	0.00020
Silo #1 Cement (Unit #11)	SILO1	13.72	0.00	9.7021	0.3048	0.01000	0.00018
Silo #2 Cement (Unit #12)	SILO2	13.72	0.00	9.7021	0.3048	0.01000	0.00018
Silo #3 Fly Ash (Unit #13)	SILO3	13.72	0.00	9.7021	0.3048	0.01000	0.00018
Silo #4 Silica Fume (Unit #25)	SILO4	13.72	0.00	9.7021	0.3048	0.05000	0.00090
Steam Generators 1&4 (Units 16&19) Stack 1	BED1_1	0.000	477.594	0.001	17.0000	0.00900	0.00900
Steam Generators 1&4 (Units 16&19) Stack 2	BED1_2	0.000	477.594	0.001	17.0000	0.00900	0.00900
Steam Generators 1&4 (Units 16&19) Stack 3	BED1_3	0.000	477.594	0.001	17.0000	0.00900	0.00900
Steam Generators 1&4 (Units 16&19) Stack 4	BED1_4	0.000	477.594	0.001	17.0000	0.00900	0.00900
Steam Generators 1&4 (Units 16&19) Stack 5	BED1_5	0.000	477.594	0.001	17.0000	0.00900	0.00900
Steam Generators 1&4 (Units 16&19) Stack 6	BED1_6	0.000	477.594	0.001	17.0000	0.00900	0.00900
Steam Generators 5&6 (Units 20&21) Stack1	BED2_1	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack2	BED2_2	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack3	BED2_3	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack4	BED2_4	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack5	BED2_5	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack6	BED2_6	0.000	477.594	0.001	16.0000	0.00340	0.00340

Source Description	Model ID	Stack Height (m)	Stack Temp. (K)	Exit Vel. (m/s)	Stack Dia. (m)	PM10 Emission Rate (lbs/hr)	PM2.5 Emission Rate (lbs/hr)
Steam Generators 5&6 (Units 20&21) Stack7	BED2_7	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack8	BED2_8	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack9	BED2_9	0.000	477.594	0.001	16.0000	0.00340	0.00340
Steam Generators 5&6 (Units 20&21) Stack10	BED2_10	0.000	477.594	0.001	16.0000	0.00340	0.00340

TABLE 4: Summary of Combustion Model Inputs for Point Sources at the Coreslab Facility

Source Description	Model ID	Stack Height (m)	Stack Temp. (K)	Exit Vel. (m/s)	Stack Dia. (m)	NOx Emission Rate (lbs/hr)	CO Emission Rate (lbs/hr)	SO2 Emission Rate (lbs/hr)
Steam Generators 1&4 (Units 16&19) Stack 1	BED1_1	0.000	477.594	0.001	17.0000	0.12500	0.10500	0.00038
Steam Generators 1&4 (Units 16&19) Stack 2	BED1_2	0.000	477.594	0.001	17.0000	0.12500	0.10500	0.00038
Steam Generators 1&4 (Units 16&19) Stack 3	BED1_3	0.000	477.594	0.001	17.0000	0.12500	0.10500	0.00038
Steam Generators 1&4 (Units 16&19) Stack 4	BED1_4	0.000	477.594	0.001	17.0000	0.12500	0.10500	0.00038
Steam Generators 1&4 (Units 16&19) Stack 5	BED1_5	0.000	477.594	0.001	17.0000	0.12500	0.10500	0.00038
Steam Generators 1&4 (Units 16&19) Stack 6	BED1_6	0.000	477.594	0.001	17.0000	0.12500	0.10500	0.00038
Steam Generators 5&6 (Units 20&21) Stack1	BED2_1	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack2	BED2_2	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack3	BED2_3	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack4	BED2_4	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack5	BED2_5	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack6	BED2_6	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023

Source Description	Model ID	Stack Height (m)	Stack Temp. (K)	Exit Vel. (m/s)	Stack Dia. (m)	NOx Emission Rate (lbs/hr)	CO Emission Rate (lbs/hr)	SO2 Emission Rate (lbs/hr)
Steam Generators 5&6 (Units 20&21) Stack7	BED2_7	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack8	BED2_8	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack9	BED2_9	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023
Steam Generators 5&6 (Units 20&21) Stack10	BED2_10	0.000	477.594	0.001	16.0000	0.04000	0.03300	0.00023

TABLE 5: Summary of Model Inputs for Volume Sources at the Coreslab Facility

Source Description	Model ID	Release Height (meter)	Horizontal Dimension (meters)	Vertical Dimension (meters)	PM10 Emission Rate (lbs/hr)	PM2.5 Emission Rate (lbs/hr)
Sand/Gravel Hopper Loading (Unit #2)	HOPPER	0.0000	1.1600	2.3300	0.12000	0.01817
Sand/Gravel Hopper Unloading (Unit #3)	HOPCONV	2.0000	0.4700	0.9300	0.03000	0.00454
Bin Conveyor (Unit #4)	BINCONV	8.2296	0.4700	0.9300	0.03000	0.00454
Bin Loading (Unit #5)	BINLOAD	7.6200	1.1600	2.3300	0.12000	0.01817
Bin Unloading (Unit #6)	BINUNLD	3.0480	1.1600	2.3300	0.06000	0.00909
Mixer Conveyor (Unit #7)	MIXCONV	12.1920	0.4700	0.9300	0.06000	0.00909
Cement Hopper (Unit #15)	CEMENTHOP	4.5720	0.4700	0.9300	0.03000	0.00454
Emerg. Pile (Unit #22)	AGGHNDL	3.0480	1.4200	2.8300	0.04000	0.00606
Aggregate Blasting (Unit #23/24)	AGGBLAST	2.4400	2.8300	1.1300	1.36991	0.09730
Plant Access Road Volume 1-6 (Unit #1)	HR_0001-6	3.40	6.05	3.16	0.10000	0.01000

2.6 $PM_{2.5}$ SECONDARY EMISSIONS MODELING

The form of the $PM_{2.5}$ 24 hour design value is based on the 98th percentile or the highest 8th high result. Calculated $PM_{2.5}$ combustion emission rates included into the model consist of both filterable and condensable components. Secondary $PM_{2.5}$ emissions from combustion sources are created by the conversion to nitrates and sulfates as the exhaust plume travels away from the source and mixes with ambient air. Fugitive dust emission sources do not consist of a condensable component and will not create secondary emissions of $PM_{2.5}$.

$PM_{2.5}$ secondary emission concentration analysis will follow EPA guidelines. Based on requested permitted emission rates, the Tier 1 analysis was used since direct $PM_{2.5}$ emissions are less than 10 tpy, and NOx and SO_2 emissions are less than 40 tpy. The comparison with the $PM_{2.5}$ 24 hour NAAQS with model results will be based on the 98th percentile or highest 8th high.

2.7 NO_2 DISPERSION MODELING ANALYSIS

The AERMOD model predicts ground-level concentrations of any generic pollutant without chemical transformations. Thus, the modeled NOx emission rate will give ground-level modeled concentrations of NOx. NAAQS values are presented as NO_2.

EPA has a three-tier approach to modeling NO_2 concentrations.

- Tier I – total conversion, or all NOx = NO_2
- Tier II –Ambient Ratio Method 2 (ARM2)
- Tier III – case-by-case detailed screening methods, such as OLM and Plume Volume Molar Ratio Method (PVMRM) and NO_2/NOx in-stack ratio

Initial modeling will be performed using both Tier I and Tier II methodologies. If these modeling iterations demonstrate that less conservative methods for determining 1-hour, 24-hour, and annual NO_2 compliance would be needed for this project, then ambient impact of 1-hour, 24-hour, and annual NOx predicted by the model will use Tier III – OLM or PVMRM.

For OLM or PVMRM, three inputs can be selected in the model, the ISR, the NO_2/NOx equilibrium ratio for the ambient air, and the ambient ozone concentration. The ISR will be determined for each source or group of sources. The NO_2/NOx equilibrium ratio will be the EPA default of 0.90. Ozone input will be from monitored ozone data collected from city monitoring station.

It is evident from modeling experience that at distances close to a modeled source, the modeled NO_2/NOx ratio (and, thus, the NO_2 concentration) is highly dependent upon the assumed in-stack

ratio. The use of the default ratio of 0.5 can result in large over predictions at a facility fence line. Proposed NO_2/NOx ratio are listed below.

Natural Gas-fired heater/boiler – NO_2/NOx ratio = 0.20

For NOx, NAAQS and NMAAQS applicable averaging periods include 1-hour, 24-hour and annual averages.

Model Ozone Data

For OLM or PVMRM, modeling of the project-generated 1-hour NO_2 concentrations requires use of ambient monitored O_3 concentrations. Background ambient O_3 concentrations for the project area during the 2001-2005 meteorological data years have been obtained from the Del Norte (Years 2001 - 2002)[1] monitoring station and South Valley (Years 2003 – 2005) monitoring station, which is the monitoring site nearest to the project.

Concerning data substitution for missing hourly O_3 ambient monitoring data, the hourly O_3 data are used within the AERMOD air dispersion model when operated using the PVMRM option that simulates the atmospheric chemistry of O_3 reacting with initially emitted nitric oxide (NO) to form NO_2. If there is only a limited amount of O_3 in the plume, then the reaction is limited, forming less NO_2 than occurs with the simplifying assumption of complete conversion. The model disperses the initial NOx emissions, which are mostly NO, during each of the 8,760 hours in a 365-day year. If the hourly ambient O_3 data from the nearest monitoring station have missing data, the missing O_3 hours are given substituted concentrations with the following procedure to better simulate the resulting NO_2 concentrations:

- If two or fewer consecutive hours of O_3 ambient concentrations are missing, the missing concentrations will be based on the highest previous or subsequent hour concentrations.
- If three or more consecutive hours of O_3 ambient concentrations are missing, then substitution for each missing concentration will be based on the highest 1 hour for same hour in the day over that month. Example: for data missing in January for the first hour of the day will be substituted for the highest value for all first hour of the day in January, etc.

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[1] Ozone monitoring did not begin at the South Valley monitoring station until July 2002. Del Norte monitoring station data is substituted for years 2001 - 2002 into the background ozone data input into the dispersion model.

2.8 AMBIENT MODELING BACKGROUND

Ambient background concentrations will be added to the dispersion modeling results and compared to the NAAQS and NMAAQS. Background concentrations were obtained from the COABC AQP Modeling Section with the exception of the 1-hour NO_2 background methodology discussed below.

CO 1-hr:	2635 micrograms per cubic meter
CO 8-hr:	1718 micrograms per cubic meter
NO_2 Annual:	30 micrograms per cubic meter
SO_2 1-hr:	13.1 micrograms per cubic meter
SO_2 24-hr:	0 micrograms per cubic meter
SO_2 Annual:	0 micrograms per cubic meter
PM_{10} 24-hr:	35 micrograms per cubic meter
$PM_{2.5}$ 24-hr:	18.0 micrograms per cubic meter
$PM_{2.5}$ annual:	7.2 micrograms per cubic meter

NO_2 1-hour Background data

NO_2 1-hour background data will be based on the Tier 2 procedure found in EPA guidance documents[2] for determining background concentrations.

> *"Based on this guidance, we believe that an appropriate methodology for incorporating background concentrations in the cumulative impact assessment for the 1-hour NO_2 standard would be to use multiyear averages of the 98th-percentile of the available background concentrations by season and hour-of-day, excluding periods when the source in question is expected to impact the monitored concentration (which is only relevant for modified sources). For situations involving a significant mobile source component to the background monitored concentrations, inclusion of a day-of-week component to the temporal variability may also be appropriate. The rank associated with the 98th-percentile of daily maximum 1-hour values should be generally consistent with the number of "samples" within that distribution for each combination based on the temporal resolution but also account for the number of samples "ignored" in specifying the 98th-percentile based on the annual distribution. For example, Table 1 in Section 5 of Appendix S specifies the rank associated with the 98th-percentile value based on the annual number of days with valid data. Since the number of days per season will range from 90 to 92, Table 1 would indicate that the 2nd-highest value from the seasonal distribution should be used to represent the 98th-percentile. On the other hand use of the 2nd-highest value for each season would effectively "ignore" only 4 values for the year rather than the 7 values "ignored" from the annual distribution. Balancing these considerations, we recommend that background values by season and hour-of-day used in this context should be based on the 3rd-highest value for each season and hour-of-day combination, whereas the 8th-highest value should be used if values vary by hour-of-day only. For more detailed temporal pairing, such as season by hour-of- day and day-of-week or month by hour-of-*

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[2] Memo: "Additional Clarification Regarding Application of Appendix W Modeling Guidance for 1-hour N02 National Ambient Air Quality Standard" Tyler Fox, Leader, Air Quality Modeling Group, C439-01, dated March 1, 2011.

> *day, the 1st-highest values from the distribution for each temporal combination should be used."*

The NO_2 background data was provided by the COAAQP Modeling Section and is presented below.

TABLE 6: Monitored Seasonal NO_2 Background – 3rd Highest Hourly µg/m³

Hour	Winter	Spring	Summer	Fall
1	72.1	47.6	29.3	65.6
2	67.8	48.3	27.7	59.7
3	67.7	46	26.4	57.9
4	68.4	48.9	26.6	58.9
5	69.1	51.7	32.7	58
6	69.7	63.9	39.3	57.8
7	72.8	70.7	46.4	63.5
8	77.6	71.8	48.5	64.5
9	80	61.1	34.2	65.9
10	71.4	48	27.3	55
11	62	28.6	24.3	47.3
12	48.1	18.9	19.9	35.4
13	36.9	17.6	17	28.2
14	35.1	15.7	15.9	25.3
15	33.6	14.8	17.4	24.2
16	37.2	15.3	19.4	28
17	48.4	17.1	20.4	38
18	73	19.4	19.3	69.6
19	79.3	38.5	21.7	79.1
20	78.1	53.2	30.9	77.1
21	77.3	48	34.1	73.4
22	76.5	56.3	30.8	70.4
23	75	58.8	34.9	69.7
24	72.4	57.9	33.6	70.9

3.0 MODEL SUMMARY

This section summarizes the model results, following the technical approach approved in Section 2 of this report for Class II federal ambient air quality standards for this facility. Model results show for each modeled criteria pollutant and applicable averaging periods for nitrogen dioxide, carbon monoxide, sulfur dioxide, and particulate matter; both 10 microns or less (PM_{10}) and 2.5 microns or less ($PM_{2.5}$), the proposed permit revision application of the Coreslab does not contribute to an exceedance of Class II federal and state ambient air quality standards (NAAQS and NMAAQS) and the City of Albuquerque/Bernalillo County (COABC) air quality regulation 20.11.8 NMAC. The modeling followed the guidance and protocols outlined in the protocol found in Section 2 of this report, the "Permit Modeling Guidelines, Albuquerque Environmental Health Department", revised 12/20/2018, "New Mexico Air Pollution Control Bureau, Dispersion Modeling Guidelines", revised 01/01/2019, and the most up to date EPA's *Guideline on Air Quality Models*.

The permitted operating time for the facilities concrete production is 12 hours per day (7 AM to 7 PM). For proposed abrasive blasting operations, Coreslab will take site-specific conditions on daily abrasive use and hours of operation. For the months of March through October the daily hours of operation will be limited to 7 AM to 7 PM. For the months of November through February the daily hours of operation will be limited to 7 AM to 6 PM. For modeling, the hourly blocks vary starting from 7 AM then shifting on 2-hour intervals for 5 separate model runs as summarized on Table 7.

TABLE 7: Abrasive Blasting Model Scenario Time Segments

Model Scenario	Time Segments 5-Hour Blocks March - October	Time Segments 5-Hour Blocks November - December
1	7 AM to 12 PM	7 AM to 12 PM
2	9 AM to 2 PM	9 AM to 2 PM
3	11 AM to 4 PM	11 AM to 4 PM
4	1 PM to 6 PM	1 PM to 6 PM
5	2 PM to 7 PM	1 PM to 6 PM

3.1 SIGNIFICANT IMPACT LEVEL (SILs) MODELING ANALYSIS

Significant impact level AERMOD dispersion modeling was completed for NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$. All significant impact models were run in terrain mode and building downwash with Coreslab emission sources only. Table 8 lists the results of the modeling for pollutant and averaging period that falls below the applicable SILs.

TABLE 8: Summary of Air Dispersion Modeling Results below SILs

Parameter	Maximum Modeled Concentration (µg/m³)	Significant Impact Level (µg/m³)	% of SIL
CO 1 Hr.	113.5	2000	5.7
CO 8 Hr.	91.9	500	18.4
SO_2 1 Hr.	0.41	7.8	5.3
SO_2 3 Hr.	0.37	25.0	1.5
SO_2 24 Hr.	0.26	5.0	5.2
SO_2 Annual	0.031	1.0	3.1

For CO and SO_2, the results show impacts below the SILs. No cumulative impact analysis modeling for CO and SO_2 was performed.

3.2 CUMULATIVE IMPACT ANALYSIS (CIA) MODEL RESULTS

The model results using the maximum operation at Coreslab Structures (Albuquerque), significant neighboring sources, and approved ambient background are summarized below in Table 9. Dispersion modeling analysis followed the modeling protocol outline in Section 2 of this report.

TABLE 9: Summary of CIA Modeling Results Including Background

Parameter	Maximum Modeled Concentration (µg/m^3)	Significant Impact Level (µg/m^3)	Maximum Modeled Concentration With Background (µg/m^3)	Lowest Applicable Standard (µg/m^3)	% of Standard
NO_2 1 Hr. 8th highest 1 hour daily maximum	106.0	7.52	180.0	188	95.7
NO_2 24 Hr.	71.7	5	101.7	188	54.1
NO_2 Annual	10.0	1	40.0	94	42.6
$PM_{2.5}$ 24 Hr. High 8th High	10.8	1.2	28.8	35	82.3
$PM_{2.5}$ Annual	4.51	0.2	11.71	12	97.6
PM_{10} 24 Hr. High 2nd High	110.7	5	145.7	150	

Note: Background concentrations are found in Section 2.7 of the modeling protocol. Dispersion modeling inputs and settings are presented in Section 2.

3.2.1 NO_2 Cumulative Impact Analysis Modeling Results

NO_2 CIA modeling was performed with terrain elevations and building downwash for Coreslab. NOx emission rates represented the maximum hourly rate for Coreslab point sources, significant neighboring sources, and all Coreslab initial modeling receptors that were above the NO2 SILs. Significant neighbors include; Quikrete, Pet Cemetery, C&C, Albuquerque Asphalt, PNM Rio Bravo Station, and CEI.

Table 10 shows the NO_2 1 Hour 8th highest 1 hour daily maximum and annual model results and locations.

TABLE 10: NO_2 CIA MODEL RESULTS

	Modeled Concentration (µg/m³)	Modeled Concentration With Background (µg/m³)	Location UTMs E/N	
NO_2 1 Hr. 8th highest 1 hour daily maximum	106.0	180.0	349252.9	3880314.0
NO_2 24 Hr.	71.7	101.7	349233.0	3880341.7
NO_2 Annual	10.0	40.0	349185.0	3880349.1

For NO_2 1-hour modeling, the Tier II ARM2 approach found in Section 2.7 of this report was used for the analysis.

Dispersion modeling meteorology for this analysis included 5 years of data, 2001 – 2005 Albuquerque Meteorological data, was obtained from the COABC AQP.

Albuquerque Del Norte Monitor, years 2012 – 2014, 1-hour and annual NO_2 background concentrations found in Section 2.7 of this report were added to the modeled results and compared to the lowest applicable ambient standard.

Model results show the highest 24 hour and annual concentrations, where Coreslab source makes a significant contribution, occurred along the northern Coreslab restricted boundary. Maximum 1-hour concentration, where Coreslab source makes a significant contribution, occurred along the northeastern Coreslab restricted boundary.

Figure 2 shows aa aerial map of the NO_2 8th highest 1 hour daily maximum concentration, highest 24-hour concentration, and highest annual concentration locations including background where Coreslab sources contribute above the NO_2 SILs.

Figure 2: Aerial Map Showing the Location of the NO₂ Highest Concentration Model Result ($\mu g/m^3$)

3.2.2 $PM_{2.5}$ Direct and Secondary Formation CIA Modeling Results

Particulate matter includes both "primary" PM, which is directly emitted into the air, and "secondary" PM, which forms indirectly from fuel combustion and other sources. Primary PM consists of carbon (soot)—emitted from cars, trucks, heavy equipment, forest fires, and burning waste—and crustal material from unpaved roads, stone crushing, construction sites, and metallurgical operations. Secondary PM forms in the atmosphere from gases. Some of these reactions require sunlight and/or water vapor. Secondary PM includes:

- Sulfates formed from sulfur dioxide emissions from power plants and industrial facilities;
- Nitrates formed from nitrogen oxide emissions from cars, trucks, industrial facilities, and power plants; and
- Carbon formed from reactive organic gas emissions from cars, trucks, industrial facilities, forest fires, and biogenic sources such as trees.

AERMOD does not account for secondary formation of $PM_{2.5}$ for near-field modeling. Any secondary contribution of the Coreslab's source emissions is not explicitly accounted for in the model results. While representative background monitoring data for $PM_{2.5}$ should adequately account for secondary contribution from existing background sources, Coreslab sources emits less than significant emission rate (SER) of $PM_{2.5}$ precursors (NO_X, SO_2, VOC), so no assessment of their potential contribution to cumulative impacts as secondary $PM_{2.5}$ was performed. Total permit modification emissions of precursors include:

- Nitrogen Oxides (NO_X) – 2.74 tons per year (below SER)
- Sulfur Dioxides(SO_2) – 0.014 tons per year (below SER)
- Volatile Organic Carbon (VOC) – 0.29 tons per year (below SER).

CIA direct "primary" $PM_{2.5}$ modeling was performed with terrain and meteorology which included 5 years of data, 2001 – 2005 Albuquerque Meteorological data, obtained from the AEHD AQP. Modeling was performed for both 24 hour and annual averaging periods with maximum $PM_{2.5}$ hourly emission rate for Coreslab sources, significant neighboring sources (Quikrete), and all Coreslab initial modeling receptors that were above the $PM_{2.5}$ SILs. $PM_{2.5}$ emission rates represented the maximum hourly rate for all emission sources. South Valley representative 24-hour and annual $PM_{2.5}$ background concentrations was added to the modeled results and compared to the lowest applicable ambient standard. The 24-hour and annual background concentrations that were used for $PM_{2.5}$ averaging periods are found in Section 2.8 of this report.

For the Coreslab, direct "primary" $PM_{2.5}$ emission rates are less than 10 tons per year (Significant Emission Rate - SER), and NO_X and SO_2 emission rates are less than 40 tons per year (SER), falling into category "Case 1" in EPA's May, 2014 "Guidance for $PM_{2.5}$ Permit Modeling". For Case 1, no secondary $PM_{2.5}$ ambient impacts associated with the Coreslab are required to be

addressed. Direct "primary" $PM_{2.5}$ concentrations using AERMOD dispersion model are summarized in Table 12.

The permitted operating time for the facilities concrete production is 12 hours per day (7 AM to 7 PM). For proposed abrasive blasting operations, Coreslab will take site-specific conditions on daily abrasive use and hours of operation. For the months of March through October the daily throughput will be limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 7 PM. For the months of November through February the daily throughput will be limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 6 PM. For modeling, the hourly blocks vary starting from 7 AM then shifting on 2-hour intervals for 5 separate model runs as summarized on Table 11.

TABLE 11: Abrasive Blasting Model Scenario Time Segments

Model Scenario	Time Segments 5-Hour Blocks March - October	Time Segments 5-Hour Blocks November - December
1	7 AM to 12 PM	7 AM to 12 PM
2	9 AM to 2 PM	9 AM to 2 PM
3	11 AM to 4 PM	11 AM to 4 PM
4	1 PM to 6 PM	1 PM to 6 PM
5	2 PM to 7 PM	1 PM to 6 PM

Results showed that direct "primary" $PM_{2.5}$ from Coreslab sources, where Coreslab source makes a significant contribution, are located on the eastern Quikrete boundary. At these locations the highest concentrations are due to Quikrete sources. The result from direct "primary" $PM_{2.5}$ emissions dispersion modeling, plus a representative $PM_{2.5}$ background concentrations from Section 2.8 of this report, which includes monitored secondary $PM_{2.5}$ concentrations, were used to show compliance with national $PM_{2.5}$ annual and 24-hour average AAQS.

TABLE 12: $PM_{2.5}$ CIA MODEL RESULTS

	Modeled Concentration (µg/m³)	Modeled Concentration With Background (µg/m³)	Location UTMs E/N	
24 Hour Average Highest 8th High	10.8	28.8	349257.0	3880397.0
Annual Average	4.51	11.71	349235.5	3880417.5

Figure 3 summarize the results of the modeling analysis.

Figure 3: Aerial Map Showing the Location of the $PM_{2.5}$ Highest Model Results ($\mu g/m^3$)

3.2.3 PM_{10} Cumulative Impact Analysis Modeling Results

CIA PM_{10} modeling was performed with terrain and meteorology which included 5 years of data, 2001 – 2005 Albuquerque Meteorological data, obtained from the AEHD AQP. Modeling was performed for the 24-hour averaging periods with maximum PM_{10} hourly emission rate for Coreslab sources, significant neighboring sources (Quikrete), and all Coreslab initial modeling receptors that were above the PM_{10} 24-hour SIL. South Valley representative 24-hour PM_{10} background concentrations was added to the modeled results and compared to the lowest applicable ambient standard. The 24-hour background concentrations that were used for PM_{10} averaging period are found in Section 2.8 of this report.

The permitted operating time for the facilities concrete production is 12 hours per day (7 AM to 7 PM). For proposed abrasive blasting operations, Coreslab will take site-specific conditions on daily abrasive use and hours of operation. For the months of March through October the daily throughput will be limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 7 PM. For the months of November through February the daily throughput will be limited to 12,295 pounds (5 hours maximum at 2459 lbs/hr) from 7 AM to 6 PM. For modeling, the hourly blocks vary starting from 7 AM then shifting on 2-hour intervals for 5 separate model runs as summarized on Table 13.

TABLE 13: Abrasive Blasting Model Scenario Time Segments

Model Scenario	**Time Segments 5-Hour Blocks March - October**	**Time Segments 5-Hour Blocks November - December**
1	7 AM to 12 PM	7 AM to 12 PM
2	9 AM to 2 PM	9 AM to 2 PM
3	11 AM to 4 PM	11 AM to 4 PM
4	1 PM to 6 PM	1 PM to 6 PM
5	2 PM to 7 PM	1 PM to 6 PM

Results showed that PM_{10} from Coreslab sources, where Coreslab source makes a significant contribution, are located on the southern Coreslab boundary. At these locations the highest concentrations are due to Quikrete sources. The result from PM_{10} emissions dispersion modeling, plus a representative PM_{10} background concentrations from Section 2.8 of this report, were used to show compliance with national PM_{10} 24-hour average AAQS. PM_{10} 24-hour concentrations using the AERMOD dispersion model are summarized in Table 14.

TABLE 14: PM_{10} CIA MODEL RESULTS

	Modeled Concentration (µg/m³)	Modeled Concentration With Background (µg/m³)	Location UTMs E/N	
24 Hour Average Highest 2nd High	110.7	145.7	349111.4	3879910.2

Figure 4 summarize the results of the modeling analysis.

Figure 4: Aerial Map Showing the Location of the PM_{10} Highest 2nd High 24-Hour Model Results ($\mu g/m^3$)

Modeling File List

Model File Name	Description
CoreslabCombustROI	Coreslab Combustion ROI modeling
CoreslabNO2	Coreslab CIA NO_2 24-hour and annual average modeling
CoreslabNO21Hr	Coreslab CIA NO_2 1-hour average modeling
CoreslabPMS1ROI	Coreslab PM ROI modeling for Abrasive Blasting at Main Site using Scenario 1
CoreslabPMS1ROIAlt	Coreslab PM ROI modeling for Abrasive Blasting at Alternative Site using Scenario 1
CoreslabPMS5ROI	Coreslab PM ROI modeling for Abrasive Blasting at Main Site using Scenario 5
CoreslabPMS5ROIAlt	Coreslab PM ROI modeling for Abrasive Blasting at Alternative Site using Scenario 5
CoreslabPMS1-5An	Coreslab CIA PM2.5 24-hour and Annual, and PM10 24-hour modeling for Abrasive Blasting at Main Site using Scenarios 1-5
CoreslabPMS1-5AnAlt	Coreslab CIA PM2.5 24-hour and Annual, and PM10 24-hour modeling for Abrasive Blasting at Alternative Site using Scenarios 1-5

Attachment H
Public Notice Documents

1706

Tim Keller, Mayor

Environmental Health Department

Air Quality Program

Interoffice Memorandum

Danny Nevarez, Acting Director

TO: PAUL WADE, SENIOR ENGINEER, MONTROSE AIR QUALITY SERVICES

FROM: REGAN EYERMAN, SENIOR ENVIRONMENTAL HEALTH SCIENTIST

SUBJECT: DETERMINATION OF NEIGHBORHOOD ASSOCIATIONS AND COALITIONS WITHIN 0.5 MILES OF 2800 2ND ST. SW, ALBUQUERQUE, NM 87102

DATE: JANUARY 15, 2019

DETERMINATION:

On January 15, 2019 I used the City of Albuquerque Zoning Advanced Map Viewer (http://sharepoint.cabq.gov/gis) to review which City of Albuquerque (COA) Neighborhood Associations (NAs) and Neighborhood Coalitions (NCs) are located within 0.5 miles of 2800 2nd St. SW, Albuquerque in Bernalillo County, NM.

I then used the City of Albuquerque Office of Neighborhood Coordination's Monthly Master NA List dated January 2019 and the Bernalillo County Monthly Neighborhood Association January 2019 Excel file to determine the contact information for each NA and NC located within 0.5 miles of 2800 2nd St. SW, Albuquerque in Bernalillo County, NM.

Duplicates have been deleted:

From http://sharepoint.cabq.gov/gis using the zoning advanced map viewer and the list of NAs and NCs from CABQ Office of Neighborhood Coordination:

COA Association or Coalition	**Name**	**Email or Mailing Address**
Barelas N/A	Julia Archibeque-Guerra	julia.guerra@comcast.net
Barelas N/A	Alicia Romero	aliciamromero1@gmail.com
Barelas N/A	N/A Association	barelasna@gmail.com
South Broadway N/A	Frances Armijo Gwen Colonel	sbnaabq@gmail.com
South Valley Coalition of NAs	Rod Mahoney	rmahoney01@comcast.net
South Valley Coalition of NAs	Marcia Fernandez	mbfernandez1@gmail.com
Southwest Alliance of Neighborhoods	Johnny Pena	johnnyepena@comcast.net
Southwest Alliance of Neighborhoods	Jerry Gallegos	jgallegoswccdg@gmail.com
Westside Coalition	Rene Horvath	aboard10@juno.com land@trna.org
Westside Coalition	Harry Hendriksen	hlhen@comcast.net

From http://sharepoint.cabq.gov/gis using the zoning advanced map viewer and the list of NA's and NC's from County of Bernalillo:

BC Association or Coalition	Name	Email or Mailing Address
Mountain View Community Action	Marla Painter	marladesk@gmail.com ✓
Mountain View Community Action	Sandy Ragan	sragan75@outlook.com ✓
Mountain View NA	Nora Garcia	ngarcia49@yahoo.com ✓
Mountain View NA	Julian Vargas	julianv@gmail.com ✓ javargasconst@gmail.com ✓
San Jose N/A	Robert Brown and Olivia M.G. Price	sjnase@gmail.com ✓

MONTROSE

Paul Wade <pwade@montrose-env.com>

Notice of Intent Coreslab Permit Revision

1 message

Paul Wade <pwade@montrose-env.com> Tue, Apr 16, 2019 at 9:59 AM
To: julia.guerra@comcast.net, aliciamromero1@gmail.com, barelasna@gmail.com, sbnaabq@gmail.com, rmahoney01@comcast.net, Marcia Fernandez <mbfernandez1@gmail.com>, johnnyepena@comcast.net, jgallegoswccdg@gmail.com, aboard10@juno.com, land@tma.org, hlhen@comcast.net, Marla Painter <marladesk@gmail.com>, sragan75@outlook.com, ngarcia49@yahoo.com, julianv@gmail.com, julian vargas <javargasconst@gmail.com>, sjnase@gmail.com
Cc: Greg Krause <gkrause@coreslab.com>, "Eyerman, Regan V." <reyerman@cabq.gov>, "Tavarez, Isreal L." <ITavarez@cabq.gov>

Under 20.11.41.13B NMAC, the owner/operator is required to provide public notice by certified mail or electronic mail to the designated representative(s) of the recognized neighborhood associations and recognized coalitions that are within one-half mile of the exterior boundaries of the property on which the source is or is proposed to be located if they propose to construct or establish a new facility or make modifications to an existing facility that is subject to 20.11.41 NMAC – Construction Permits.

The attached notices are to inform you that Coreslab Structures (Albuquerque), Inc is preparing to submit a permit revision to their present Permit #359-M2-RV1.

Any questions, comments, or concerns can be addressed to the contacts listed on the Notice of Intent.

Respectfully,

--

MEG Logo_Signature

Paul Wade

Sr. Engineer

Montrose Air Quality Services, LLC

3500 G Comanche Rd. NE, Albuquerque, NM 87107

T: 505.830.9680 x6 | F: 505.830.9678

PWade@montrose-env.com

www.montrose-env.com

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2 attachments

Coreslab NOI.docx
185K

Coreslab Public Notice Cover Letter.docx
16K

SUBJECT: **Public Notice of Proposed Air Quality Construction Permit Application**

Dear Neighborhood Association/Coalition Representative(s),

Why did I receive this public notice?
You are receiving this notice in accordance with New Mexico Administrative Code (NMAC) 20.11.41.13.B(1) which requires any applicant seeking an Air Quality Construction Permit pursuant to 20.11.41 NMAC to provide public notice by certified mail or electronic mail to the designated representative(s) of the recognized neighborhood associations and recognized coalitions that are within one-half mile of the exterior boundaries of the property on which the source is or is proposed to be located.

What is the Air Quality Permit application review process?
The City of Albuquerque, Environmental Health Department, Air Quality Program (Program) is responsible for the review and issuance of Air Quality Permits for any stationary source of air contaminants within Bernalillo County. Once the application is received, the Program reviews each application and rules it either complete or incomplete. Complete applications will then go through a 30-day public comment period. Within 90 days after the Program has ruled the application complete, the Program shall issue the permit, issue the permit subject to conditions, or deny the requested permit or permit modification. The Program shall hold a Public Information Hearing pursuant to 20.11.41.15 NMAC if the Director determines there is significant public interest and a significant air quality issue is involved.

What do I need to know about this proposed application?

Applicant Name	Coreslab Structures (Albuquerque), Inc.
Site or Facility Name	Coreslab Structures (Albuquerque), Inc.
Site or Facility Address	2800 2nd Street SW, Albuquerque, NM 87102
New or Existing Source	Existing Source - Permit #359-M2-RV1
Anticipated Date of Application Submittal	April 19, 2019
Summary of Proposed Source to Be Permitted	Coreslab Structures (Albuquerque), Inc. is submitting a significant revision application to include additional sources to their Albuquerque Facility operations. These additional sources include; dry outdoor abrasive blasting, additional storage silo, and 300-gallon gasoline storage tank

What emission limits and operating schedule are being requested?
See attached Notice of Intent to Construct form for this information.

How do I get additional information regarding this proposed application?
For inquiries regarding the proposed source, contact:

- Greg Krause
- gkrause@coreslab.com
- (505) 247-3725

For inquiries regarding the air quality permitting process, contact:

- City of Albuquerque Environmental Health Department Air Quality Program
- aqd@cabq.gov
- (505) 768-1972

Notice of Intent to Construct

Under 20.11.41.13B NMAC, the owner/operator is required to *provide public notice by certified mail or electronic mail to the designated representative(s) of the recognized neighborhood associations and recognized coalitions that are with-in one-half mile of the exterior boundaries of the property on which the source is or is proposed to be located* if they propose to construct or establish a new facility or make modifications to an existing facility that is subject to 20.11.41 NMAC – Construction Permits. **A copy of this form must be included with the application.**

Applicant's Name and Address: Coreslab Structures (Albuquerque), Inc., 2800 2nd Street SW, Albuquerque, NM 87102

Owner / Operator's Name and Address: Coreslab Structures (Albuquerque), Inc., 2800 2nd Street SW, Albuquerque, NM 87102

Actual or Estimated Date the Application will be submitted to the Department: April 19, 2019

Exact Location of the Source or Proposed Source: 2800 2nd Street SW, Albuquerque, NM 87102

Description of the Source: Manufacturing of Pre-Stressed Concrete Products

Nature of the Business: Manufacturing of Pre-Stressed Concrete Products

Process or Change for which the permit is requested: Permit revision to include abrasive blasting, additional storage silo, and 300-gallon gasoline storage tank.

Preliminary Estimate of the Maximum Quantities of each regulated air contaminant the source will emit:

Initial Construction Permit

	Pounds Per Hour (lbs/hr)	Tons Per Year (tpy)
CO	***	***
NOx	***	***
NOx + NMHC	***	***
VOC	***	***
SO_2	***	***
TSP	***	***
PM10	***	***
PM2.5	***	***
VHAP	***	***

Net Changes In Emissions

(Only for permit Modifications or Technical Revisions)

	lbs/hr	tpy	Estimated Total TPY
CO	+/- 0.0	+/- 0.0	2.29
NOx	+/- 0.0	+/- 0.0	2.74
NOx + NMHC	***	***	***
VOC	+ 0.032	+ 0.14	0.29
SO_2	+/- 0.0	+/- 0.0	0.014
TSP	+ 5.84	+ 4.48	6.66
PM10	+ 1.48	+ 1.11	2.07
PM2.5	+ 0.11	+ 0.079	0.36
VHAP	+/- 0.0	+/- 0.0	<0.01

Maximum Operating Schedule: 6 AM to 7 PM, 6 days per week

Normal Operating Schedule: 6 AM to 5 PM, 6 days per week

Last Revised 10/25/2018

City of Albuquerque- Environmental Health Department
Air Quality Program- Permitting Division
Phone: (505) 768-1972 Email: aqd@cabq.gov

Current Contact Information for Comments and Inquires:
Name: Greg Krause, General Manager
Address: 2800 2nd Street SW, Albuquerque, NM 87102
Phone Number: (505) 247-3725
E-Mail Address: gkrause@coreslab.com

If you have any comments about the construction or operation of the above facility, and you want your comments to be made as part of the permit review process, you must submit your comments in writing to the address below:

Environmental Health Manager

Permitting Division

Albuquerque Environmental Health Department

Air Quality Program

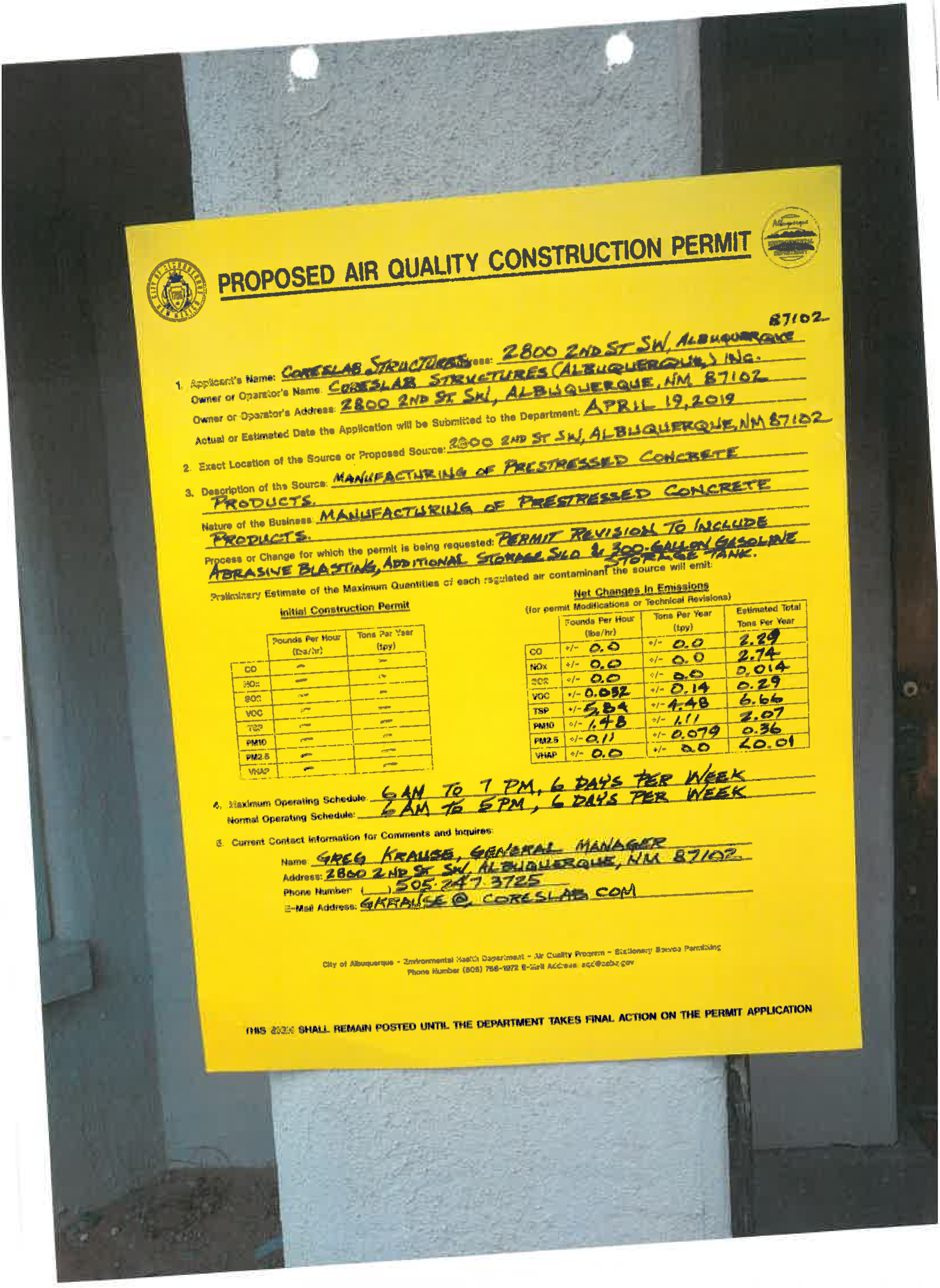
PO Box 1293

Albuquerque, New Mexico 87103

(505) 768-1972

Other comments and questions may be submitted verbally.

Please refer to the company name and facility name, as used in this notice or send a copy of this notice along with your comments, since the Department may not have received the permit application at the time of this notice. Please include a legible mailing address with your comments. Once the Department has performed a preliminary review of the application and its air quality impacts, if required, the Department's notice will be published on the City of Albuquerque's website, https://www.cabq.gov/airquality/air-quality-permits and mailed to neighborhood associations and neighborhood coalitions near the facility location or near the facility proposed location.



PROPOSED AIR QUALITY CONSTRUCTION PERMIT

1. Applicant's Name: CORESLAB STRUCTURES Address: 2800 2ND ST SW, ALBUQUERQUE 87102
Owner or Operator's Name: CORESLAB STRUCTURES (ALBUQUERQUE) INC.
Owner or Operator's Address: 2800 2ND ST SW, ALBUQUERQUE, NM 87102
Actual or Estimated Date the Application will be Submitted to the Department: APRIL 19, 2019

2. Exact Location of the Source or Proposed Source: 2800 2ND ST SW, ALBUQUERQUE, NM 87102

3. Description of the Source: MANUFACTURING OF PRESTRESSED CONCRETE PRODUCTS.
Nature of the Business: MANUFACTURING OF PRESTRESSED CONCRETE PRODUCTS.
Process or Change for which the permit is being requested: PERMIT REVISION TO INCLUDE ABRASIVE BLASTING, ADDITIONAL STORAGE SILO & 300-GALLON GASOLINE STORAGE TANK.

Preliminary Estimate of the Maximum Quantities of each regulated air contaminant the source will emit:

Initial Construction Permit

	Pounds Per Hour (lbs/hr)	Tons Per Year (tpy)
CO	–	–
NOx	–	–
SO2	–	–
VOC	–	–
TSP	–	–
PM10	–	–
PM2.5	–	–
VHAP	–	–

Net Changes in Emissions
(for permit Modifications or Technical Revisions)

	Pounds Per Hour (lbs/hr)	Tons Per Year (tpy)	Estimated Total Tons Per Year
CO	+/- 0.0	+/- 0.0	2.29
NOx	+/- 0.0	+/- 0.0	2.74
SO2	+/- 0.0	+/- 0.0	0.014
VOC	+/- 0.032	+/- 0.14	0.29
TSP	+/- 5.84	+/- 4.48	6.66
PM10	+/- 1.48	+/- 1.11	2.07
PM2.5	+/- 0.11	+/- 0.079	0.36
VHAP	+/- 0.0	+/- 0.0	<0.01

4. Maximum Operating Schedule: 6 AM TO 7 PM, 6 DAYS PER WEEK
Normal Operating Schedule: 6 AM TO 5 PM, 6 DAYS PER WEEK

5. Current Contact Information for Comments and Inquires:
Name: GREG KRAUSE, GENERAL MANAGER
Address: 2800 2ND ST SW, ALBUQUERQUE, NM 87102
Phone Number: ( ) 505.247.3725
E-Mail Address: GKRAUSE@CORESLAB.COM

City of Albuquerque - Environmental Health Department - Air Quality Program - Stationary Source Permitting
Phone Number (505) 768-1972 E-Mail Address: aqd@cabq.gov

THIS [illegible] SHALL REMAIN POSTED UNTIL THE DEPARTMENT TAKES FINAL ACTION ON THE PERMIT APPLICATION