



Statement of Basis

**General Air Quality Permit
For Concrete Plants**

Croell, Inc.

Newel Portable Backup Batch Plant

Butte County, South Dakota

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1.0 Background

On March 23, 2019, Croell, Inc. submitted a notice of intent to operate a portable concrete plant throughout South Dakota. This truck mix concrete plant is seeking coverage under the general air and surface water quality permit for concrete plants permit #28.000067. The units covered under the general permit are listed below:

1. Stationary or Portable Concrete Plants;
2. Cement and Flyash Silos;
3. Boilers with a maximum heat input of less than 10 Million Btus; and
4. New emergency generators (i.e. generators constructed after 2005).

Table 1.1 displays the Equipment listed in the application.

Table 1.1 – Description of Equipment listed in Application

| Description | Maximum Operating Rate | Control Device |
|-------------------------|--------------------------|----------------|
| Portable Concrete Plant | 150 Cubic yards per hour | Baghouse |
| Cement Silo | 25 tons per hour | Baghouse |
| Flyash Silo | 25 tons per hour | Baghouse |

2.0 Typical Batch Plant Operation Information

Concrete batch plants eligible for coverage under the general air and surface water quality permit involve the same or substantially similar operations. Typical concrete batch plants store, convey, measure and discharge the product constituents into a central mixer or trucks for mixing and transport to a job site. Table 2.1 displays the typical material composition of one cubic yard of cement produced and was derived from EPA’s AP-42, Table 11.12-5, footnote ^a, page 11.12-10, 06/06.

Table 2.1 – Typical Composition of Cement

| Component | Amount per cubic yard | Weight fraction |
|-----------------------------|-----------------------|-----------------|
| Coarse Aggregate | 1,865 pounds | 0.46 |
| Sand | 1,428 pounds | 0.36 |
| Cement | 491 pounds | 0.12 |
| Cement Supplement (fly ash) | 73 pounds | 0.02 |
| Water | 167 pounds | 0.04 |
| Total = | 4,024 pounds | 1.00 |

The department will assume this composition to estimate emissions from concrete batch plants in the state. The product density for this composition is 2.012 tons per cubic yard (4,024 pounds per cubic yard divided by 2,000 pounds per ton).

The cement and fly ash 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 into the mixer or mixer truck.

3.0 New Source Performance Standards

There are no new source performance standards applicable to Croell, Inc.

4.0 Potential Emissions

To determine if a concrete plant may be covered by the general permit, annual potential emissions are calculated. A concrete plant must have potential uncontrolled emissions less than 100 tons per year of PM10, less than 10 tons per year of a single hazardous air pollutant, and less than 25 tons per year of hazardous air pollutant emissions in order to be eligible for coverage under the General Permit for Concrete Plants referenced as A and B general permits. If potential uncontrolled emissions exceed these thresholds, but the potential controlled emissions do not, a General Permit for Concrete Plants referenced as C and D general permits with federally enforceable operating restrictions is available.

4.1 Uncontrolled Emission Factors – Concrete Batch Plant

The potential uncontrolled emissions are calculated from the emission factor and the maximum operating rate for each process. The maximum operating rate assumes that each process operates at maximum design capacity every hour of every day of the year without any control equipment that is not part of the process.

Particulate matter consisting primarily of cement and fly ash (some aggregate and sand dust) emissions is the primary pollutant of concern. In addition, there are emissions of metal associated with the particulate matter that are considered hazardous air pollutants (HAPs).

The uncontrolled emission factors derived from EPA’s AP-42, Tables 11.12-2, 11.12-5, 06/06 are summarized in Table 4.1.

Table 4.1 – Uncontrolled Emission Factors

| Process | (pounds per cubic yard product) | | |
|--|---------------------------------|-------------------|------|
| | TSP ^a | PM10 ^b | HAPs |
| Aggregate delivery to ground storage | 0.0064 | 0.0031 | - |
| Sand delivery to ground storage | 0.0015 | 0.0007 | - |
| Aggregate delivery to conveyor | 0.0064 | 0.0031 | - |
| Sand delivery to conveyor | 0.0015 | 0.0007 | - |
| Aggregate transfer to elevated storage | 0.0064 | 0.0031 | - |

| Process | (pounds per cubic yard product) | | |
|--|---------------------------------|-------------------|----------------------------|
| | TSP ^a | PM10 ^b | HAPs |
| Sand transfer to elevated storage | 0.0015 | 0.0007 | - |
| Cement delivery to silos ^c | 0.1767 | 0.1129 | - |
| Fly ash delivery to silos ^c | 0.1146 | 0.0402 | - |
| Weigh hopper loading | 0.0079 | 0.0038 | - |
| Truck mixing loading ^c | 0.2806 | 0.0784 | - |
| Central mix loading ^c | 0.1534 | 0.0378 | - |
| Total – Truck mix plant | 0.6035 | 0.2467 | 2.5E-05^d |
| Total – Central mix plant | 0.4763 | 0.2061 | 3.7E-05^d |

^a – “TSP” means total suspended particulates;

^b – “PM10” means particulate matter 10 microns in diameter or less.

^c – These emission factors are derived from EPA’s AP-42, Table 11.12-2 and the units are in pounds per ton of the applicable material processed and converted to pounds per cubic yard of product; and;

^d – The metal emission factors are derived from EPA’s AP-42, Table 11.12-8 and the units are in pounds per ton of concrete and flyash processed and converted to pounds per cubic yard of product.

The department used Equation 4-1 to convert the emission factor for loading cement from pounds of particulate matter per ton of cement processed to pounds of particulate matter per cubic yard of concrete produced. “PM” means total suspended particulate matter and “PM₁₀” means particulate matter 10 microns in diameter or less. The “PM” and “PM₁₀” were derived from EPA’s AP-42, Tables 11.12-2, 06/06, and are 0.72 and 0.46 pounds of particulate matter per ton of cement processed, respectively. The 491 pounds of cement per cubic yard is derived from Table 2.1. The results from Equation 4-1 are found in Table 4.1.

Equation 4-1 – Emission Factor for Cement Delivery (pounds per cubic yard)

$$CementDelivery = PM, PM_{10} \left(\frac{lbs}{ton} \right) \times 491 \left(\frac{lbs}{yd^3} \right) \div 2000 \left(\frac{lbs}{ton} \right)$$

The department used Equation 4-2 to convert the emission factor for loading flyash from pounds of particulate matter per ton of flyash processed to pounds of particulate matter per cubic yard of concrete produced. “PM” means total suspended particulate matter and “PM₁₀” means particulate matter 10 microns in diameter or less. The “PM” and “PM₁₀” were derived from EPA’s AP-42, Tables 11.12-2, 06/06, and are 3.14 and 1.10 pounds of particulate matter per ton of flyash processed, respectively. The 73 pounds of flyash per cubic yard is derived from Table 2.1. The results from Equation 4-2 are found in Table 4.1.

Equation 4-2 – Emission Factor for Flyash Delivery (pounds per cubic yard)

$$FlyashDelivery = PM, PM_{10} \left(\frac{lbs}{ton} \right) \times 73 \left(\frac{lbs}{yd^3} \right) \div 2000 \left(\frac{lbs}{ton} \right)$$

The department used Equation 4-3 to convert the emission factor for central mix and truck loading from pounds of particulate matter per ton of cement and flyash processed to pounds of particulate matter per cubic yard of concrete produced. “PM” means total suspended particulate

matter and “PM₁₀” means particulate matter 10 microns in diameter or less. The “PM” and “PM₁₀” were derived from EPA’s AP-42, Tables 11.12-2, 06/06. For central mix, the “PM” and “PM₁₀” are 0.544 and 0.134 pounds per ton, respectively. For truck mix, the “PM” and “PM₁₀” are 0.995 and 0.278 pounds of particulate matter per ton of cement and flyash processed, respectively. The 564 pounds of concrete and flyash per cubic yard is derived from Table 2.1. The results from Equation 4-3 are found in Table 4.1.

Equation 4-3 – Emission Factor for Central Mix and Truck Loading (pounds per cubic yard)

$$CentralMixandTruckLoading = PM, PM_{10} \left(\frac{lbs}{ton} \right) \times 564 \left(\frac{lbs}{yd^3} \right) \div 2000 \left(\frac{lbs}{ton} \right)$$

The department used Equation 4-4 to convert the emission factor for central mix and truck loading from pounds of metal per ton of cement and flyash processed to pounds of metal per cubic yard of concrete produced. “Metal” is derived from EPA’s AP-42, Tables 11.12-8, 06/06. For central mix and truck loading, “Metal” is 8.7E-05 and 1.3E-04 pounds of metal per ton cement and flyash processed, respectively. The 564 pounds of concrete and flyash per cubic yard is derived from Table 2.1. The results from Equation 4-4 are found in Table 4.1.

Equation 4-4 – Emission Factor for Metals (pounds per cubic yard)

$$CentralMixandTruckLoading = Metal \left(\frac{lbs}{ton} \right) \times 564 \left(\frac{lbs}{yd^3} \right) \div 2000 \left(\frac{lbs}{ton} \right)$$

4.2 Potential Uncontrolled Emissions – Concrete Batch Plant

A comparison is conducted to determine if the capacity of the plant or the cement unloading process limits the amount of concrete produced in a year. Table 4.2 displays the comparison.

Table 4.2 – Concrete Production Comparison

| Description | Maximum Design Capacity | Potential Operation (hours per year) | Potential Production (cubic yards per year) |
|-----------------------|--------------------------|--------------------------------------|---|
| Concrete Plant | 150 cubic yards per hour | 8,760 | 1,314,000 ^a |
| Cement/fly ash system | 17 tons per hour | 8,760 | 518,319^b |

^a – Potential production = maximum design capacity x potential operation; and

^b – Potential production = maximum design capacity x potential operations / 0.14 tons cement/fly ash/cubic yard / 2.012 tons concrete/cubic yard (EPA’s AP-42, Table 11.12-5, footnote ^a, page 11.12-10, 06/06).

The comparison shows that the production of this facility is limited by the design of the cement/fly ash system. The potential production (shown in bold in Table 4.2), the appropriate emission factor (EF) from Table 4.1 and Equation 4-5 were used to estimate the potential annual emissions from the truck mix plant. Table 4.1 displays the potential uncontrolled emissions from the truck mix plant.

Equation 4-5 – Formula for Potential Concrete Batch Plant Emissions

$$Potential = potential\ production \left(\frac{cubic\ yards}{year} \right) \times EF \left(\frac{lbs}{cubic\ yard} \right) / 2,000 \left(\frac{lbs}{ton} \right)$$

4.3 Summary of Potential Uncontrolled Emissions

Table 4.3 provides a summary of potential emissions from Croell, Inc.’s truck mix plant.

Table 4.3 – Potential uncontrolled emissions

| Process | (tons of pollutant per year) | | | | | | |
|-----------------|------------------------------|------|-----------------|-----------------|-----|----|------|
| | TSP | PM10 | SO ₂ | NO _x | VOC | CO | HAPs |
| Truck Mix Plant | 156 | 64 | 0 | 0 | 0 | 0 | 0 |
| Facility Total | 156 | 64 | 0 | 0 | 0 | 0 | 0 |

This facility’s potential uncontrolled emissions are less than 100 tons per year. Therefore, Croell Inc. is eligible for coverage under the minor General Permit for Portable Concrete Plants.

5.0 New Source Review

The Administrative Rules of South Dakota (ARSD) 74:36:10:01 notes that New Source Review (NSR) regulations apply to areas of the state which are designated as nonattainment pursuant to the Clean Air Act for any pollutant regulated under the Clean Air Act. South Dakota is currently in attainment for all the pollutants regulated under the Clean Air Act. Therefore, Croell, Inc. is not subject to NSR review.

6.0 National Emission Standards for Hazardous Air Pollutants

DENR reviewed the Maximum Achievable Control Technology standards and determined that the following may be applicable.

7.0 Stormwater Requirements

Croell, Inc. must meet the storm water requirements in the general permit.

8.0 Rapid City Natural Events Action Plan

8.1 Submittal of Approval

In accordance with ARSD 74:36:04:15(10), the owner or operator shall submit a proposal to the Secretary for approval prior to conducting any projects located in or affecting the Rapid City

Natural Events Action Plan area for particulate matter less than or equal to 10 microns in diameter (PM10). The proposal shall consist of the following items and all supporting documentation:

1. The owner or operator shall determine the amount of PM10 emissions that will be generated during the project. The amount of PM10 emissions shall be determined and reported in tons per year for permitted units and fugitive emissions; and
2. The owner or operator shall describe what methods will be used to comply with Section VII - BACM for Particulate Emissions, in Rapid City's Natural Events Action Plan.

8.2 Notification of Operator

The Secretary will notify the owner or operator in writing within one week of receiving a proposal on whether the proposed project is approved or disapproved in the Rapid City Natural Events Action Plan Area. If the proposed project is denied, the Secretary will outline what needs to be completed for approval of the proposed project.

8.3 Compliance with Proposal

The owner or operator shall comply with the approved proposal at all times during the project. If the approved proposal is not complied with, it will constitute a violation of this permit.

8.4 Local Air Quality Ordinances

The owner or operator shall comply with all local (city and county) air quality ordinances that pertain to fugitive particulate emissions. The area regulated by these ordinances is different than the Rapid City Natural Events Action Plan area. The owner or operator should determine if these ordinances are applicable before locating in or near Rapid City.

9.0 State Restrictions on Visible Emissions

Visible emissions are applicable to units that discharge into the ambient air. In accordance with ARSD 74:36:12, a facility may not discharge into the ambient air more than 20 percent opacity for all units. The concrete batch plant must control the opacity at less than 20 percent for all units.

10.0 Eligible Coverage under General Permit

A source operating in South Dakota that meets the definition of a minor source is required to obtain a minor air quality operating permit under the ARSD 74:36:04. A minor source is defined as any source with potential emissions less than 100 tons per year of a criteria pollutant and hazardous air pollutant emissions are less than 10 tons per year for a single hazardous air pollutant and less than 25 tons per year for a combination of hazardous air pollutant. Based on the above potential emission calculations, this facility is classified as a minor source under the air

quality operating permit program and is eligible for the general permit.

Since the facility is a portable source with the potential to emit less than 100 tons of PM10 per year on an uncontrolled basis, the facility qualifies for the B general permit.

Any questions pertaining to this permit recommendation should be directed to Teresa Williams, Program Assistant, Department of Environment and Natural Resources, Air Quality Program.