

## **ROCK CRUSHING PLANT APPLICATIONS ADVICE**

This guidance is intended to help applicants prepare applications and certifications with a reduced amount of effort, yielding clearer and more accurate applications. We hope to steer new applicants around some common mistakes, allowing them to prepare applications which are complete on their first try.

There are two possible options: a site-specific permit or an Authorization under a General Operating Permit. The main differences between using a site-specific permit and a General Operating Permit are in the amount of text in the permit and the amount of time normally spent in processing. GOP Authorizations are normally issued quickly but then result in operators going through a lengthy document, trying to determine which standards are applicable and how to comply with them; these would be stated explicitly in a site-specific permit. If time is not of the essence in getting a plant construction commenced, the site-specific permit is preferred; if time is of the essence, the faster GOP Authorization is better. In addition, a separate construction permit is required for future expansions if a site-specific permit is selected, while certain expansions are pre-approved under the GOP.

The process involves preparation of facility descriptions, emissions estimates, and completion of some administrative forms. Two passes through the process may be required, calculating emissions and adjusting emissions if any level of significance is exceeded.

The pollutant of concern is particulate matter. If the facility has stationary engines (such as generators), you will also need to address nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), volatile organic compounds (VOC), particulate matter (PM), and sulfur dioxide (SO<sub>2</sub>). These are referred to as “regulated air pollutants.” In addition, there may be emissions of hazardous air pollutants (HAPs), primarily formaldehyde from the engine(s).

In general, a rock crushing plant will have a primary crusher, primary screen, secondary crusher(s) and secondary screen(s), and associated conveyors and stockpiles. It may also involve portable generators powered by diesel engines. Emissions of each pollutant must be less than 100 TPY for the facility to be a minor source.

Information as listed here may be attached to the application. Example formats are provided in this document.

### Administrative Forms

The first thing to do is acquire a copy of the forms....

- A. Log onto the DEQ web page: [www.deq.state.ok.us](http://www.deq.state.ok.us)
- B. Go to the “Air Quality” page

C. Select “Forms”

D. Select either “Rock Crushers & Sand & Gravel Application” or “Non-metallic Mineral Processing Minor Facility Air Quality General Permit Application.”

If you download the MS Word copies of these documents, they may be filled in on computer and stored for later needs.

On the “General Facility Information” Form 100-884, please do not mark both construction and operating permits as this makes your application self-contradictory. Construction permits and operating permits are applied for separately. Minor source applications are all listed as “Tier I.” The “SIC Code” means “Standard Industrial Classification Code,” 1422 for limestone, 1423 for granite, 1429 for other crushed stone, 1442 for sand and gravel, and 1221 for coal.

The “Landowner Notification Affidavit” must be completed and signed for all applications, but it is commonly overlooked, resulting in delays in processing applications and issuing permits.

Fees

Fee levels are detailed in the respective application guide.

Basic Information

Please be certain that your application technical information contains the following items:

- A. List plant equipment: each crusher, screen, conveyor, stacker, engine, organic liquids storage tank. Include make, model, serial number, and date of manufacture (the date the plant was first constructed or moved into the US).
- B. If any baghouse, wet scrubber, cyclone, etc., is used, stack height, diameter or dimensions, flow rate, and temperature.
- C. Emissions control device efficiency, including pressure differential range.
- D. For stationary engines: fuel type(s) and sulfur content, HP rating, manufacture date, and engine type (spark ignition or diesel, gas-fuel or other fuel).
- E. Maximum anticipated production (tons per hour and tons per year).
- F. Capacity (gallons), maximum annual throughput, and date of manufacture of all hydrocarbon (fuel) storage tanks associated with the plant.

## Preparing Emissions Estimates

Emissions factors for most are obtained from EPA's TTN web site:

- A. Log onto EPA's "Technology Transfer Network," [www.epa.gov/ttn](http://www.epa.gov/ttn)
- B. Select "CHIEF" (Clearinghouse for Inventories and Emissions Factors)
- C. Select "Emission Factors"
- D. Select "AP-42"
- E. Select Chapter 11 and download Section 11.19.2 for "Crushed Stone Processing."
- F. For engines, select Chapter 3 and download Section 3.3 for diesel engines smaller than 600 HP and Section 3.4 for diesel engines larger than 600 HP.
- G. For batch drop operations (unloading by front-end loaders), download Section 13.2.4. A 70% control efficiency may be applied for damp material.
- H. For storage piles, download Section 8.19.1. A 70% control efficiency may be applied for damp material.
- I. For tanks, at CHIEF, select "Emission Factor and Estimation Tools," then go down to TANKS to download the program which calculates emissions from hydrocarbon storage tanks.

If any unit venting into a baghouse was constructed after August 31, 1983, PM emissions estimates from equipment using a baghouse are best prepared based on stack flows and the federal limit (40 CFR Part 60, Subpart OOO) of 0.022 grains per dry standard cubic foot. Here, "grains" refers to the unit of weight; 7,000 grains equals one pound. At the temperatures and moisture contents normally seen, ACFM is nearly equal to SCFM. For a hypothetical plant with a baghouse and stack flow of 4,000 SCFM, the emission rate would be  $4,000 \text{ SCFM} * 0.022 \text{ gr/DSCF} * 60 \text{ min/hr} / 7,000 \text{ gr/lb} = 0.75 \text{ lb/hr}$ . If this plant operates up to 1,200 hours per year, annual emissions are  $0.75 \text{ lb/hr} * 1,200 \text{ hours/year} / 2,000 \text{ lb/ton} = 0.45 \text{ TPY}$  from the stack in question. Please be sure to include the stack height and dimensions.

## **PROCESS RATES**

Provided that 100 TPY of any regulated air pollutant (particulate matter is a regulated air pollutant) is not exceeded, it is recommended that conservatively-high estimates of operating hours and process rates be made. The capacity of the primary crusher is generally known, and therefore the process weight of the primary crusher, primary conveyor, and primary screen. After this point, it is frequently not easy to tell what process rates will be.

The material processed at the primary crusher and screen will be oversized and undersized. Oversized material is returned to the primary crusher, but the total of new material and returned material cannot exceed the capacity of the primary crusher.

A common source of confusion is in estimating material flows following the primary screen. You may pick reasonable percentages, such as 20% of material from the primary screen being returned to the primary crusher and 80% proceeding to the second crusher, or you may use worst-case flows. Worst-case flows will result in showing the discharges from a unit to be higher than the input. Although that is impossible, it is used only for estimating maximum emissions from each unit.

AP-42 is periodically updated, so limits based on these factors may become out-of-date. It may be to your advantage to include a safety factor on calculations provided that the resultant emissions do not exceed any level of significance such as a regulatory limit or a major source threshold.

## **EMISSION FACTORS**

### A. Process Operations

<b>Unit</b>	<b>CRUSHED ROCK Uncontrolled Emission Factor, lb/ton</b>	<b>COAL Uncontrolled Emission Factor, lb/ton</b>
Crusher feed	0.007	0.007
Primary crushers	0.00070	0.2
Primary screens	0.015	0.2
Secondary crushers	0.0024	0.2
Tertiary crushers	0.0024	NA
Fines crushing	0.015	NA
Fines screening	0.071	NA
Conveyor transfer points	0.0014	0.2
Batch drop (truck dumping, stackers, etc.) *	0.0031	0.12
Stockpiles	0.263 lb/acre/hr (active) 0.071 lb/acre/day (inactive)	7.2 lb/acre/hr

\* The batch drop factor is derived from the equation in AP-42, Section 13.2.4:

$$E \text{ (lb/ton)} = k * 0.0016 * (U/2.2)^{1.3} / (M/2)^{1.4}$$

where  $k = 0.35$  ( $PM_{10}$  factor),  $U =$  wind speed (15 mph assumed), and  $M =$  moisture content (1.5% assumed).

Coal handling factors were taken from "Compilation of Past Practices and Interpretations by EPA Region VIII on Air Quality Review of Surface Mining Operations."

B. Engines

<b>Pollutant</b>	<b>Diesel Engines Smaller than 600 HP, lb/hp-hr</b>	<b>Diesel Engines Larger than 600 HP, lb/hp-hr</b>
PM	0.0022	0.0007
CO	0.00668	0.0055
NOx	0.031	0.024
SO <sub>2</sub>	0.00205	0.00205
VOC	0.00251	0.0006
Formaldehyde	0.00046	0.00008

C. Storage Tanks

<b>Tank No.</b>	<b>Contents</b>	<b>Capacity (gallons)</b>	<b>Dimensions, Height / Diameter</b>	<b>Annual Throughput, Gallons</b>	<b>Manufacture Date</b>	<b>VOC Emissions, TPY</b>
1	Diesel	0,000	12' / 15'	100,000	12/98	0.06
2	No. 2 diesel	2,000	6' / 10'	9,000	1/79	0.01

The formats here are not rigid. Different formats may be used, but whatever is used should be clear enough that permit engineers can readily discern emission rates.

**EXAMPLE CALCULATIONS**

For this example, we will use a plant with a capacity of 300 TPH operated up to 1,500 hours per year. For the example, the facility will include a 650 HP diesel generator; fuel will be assumed to have 0.5% by weight sulfur.

A. 650 HP Engine

<b>Pollutant</b>	<b>Emission Factor, lb/hp-hr</b>	<b>Emissions</b>	
		<b>lb/hr</b>	<b>TPY</b>
PM	0.0007	0.46	0.34
CO	0.0055	3.58	2.68
NOx	0.024	15.60	11.70
SO <sub>2</sub>	0.00205	1.33	1.00
VOC	0.0006	0.39	0.29
Formaldehyde	0.00008	0.05	0.04

For example, the calculation for PM would be:

- 650 hp \* 0.0007 lb/hp-hr = 0.455 lb/hr
- 0.455 lb/hr \* 1500 hours per year / 2000 lb per ton = 0.34 TPY

**B. Rock Processing Operations**

Point ID	Description	Process Rate TPH	Factor lb/ton	Control Efficiency	PM Emissions	
					lb/hr	TPY
1	Feed to primary crusher	300	0.007	70%	0.630	0.473
2	Primary crusher	300	0.0007	70%	0.063	0.047
3	Conveyer: crusher to primary screen	300	0.0014	70%	0.126	0.095
4	Primary screen	300	0.015	70%	1.350	1.013
5	Conveyors from primary screen	300	0.0014	70%	0.126	0.095
6	Conveyor to secondary crusher	300	0.0014	70%	0.126	0.095
7	Secondary crusher	300	0.0024	70%	0.173	0.130
8	Conveyor from secondary crusher	240	0.0014	70%	0.101	0.076
9	Secondary screen	240	0.015	70%	1.080	0.810
10	Conveyors from secondary screen	240	0.0014	70%	0.101	0.076
11	Stacking rock from secondary screen	240	0.0031	70%	0.223	0.167
12	Stockpiles – active 1,500 hours	--	0.263		0.263	0.197
13	Stockpiles – inactive 7,260 hours	--	0.071			0.258
	<b>TOTALS</b>				4.362	3.532

**TOTAL EMISSIONS**

Operation	PM		CO		NO <sub>x</sub>		SO <sub>2</sub>		VOC	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
Processing	4.36	3.53	--	--	--	--	--	--	--	--
Engine	0.46	0.34	3.58	2.68	15.60	11.70	1.33	1.00	0.39	0.29
Fuel Tanks	--	--	--	--	--	--	--	--	--	0.07
<b>TOTALS</b>	<b>4.82</b>	<b>3.87</b>	<b>3.58</b>	<b>2.68</b>	<b>15.60</b>	<b>11.70</b>	<b>1.33</b>	<b>1.00</b>	<b>0.39</b>	<b>0.36</b>

Road dust is not calculated here since it is not counted toward determining whether a facility is major or minor.