AGGREGATE CRUSHING OPERATIONS

Date Initiated:

June 7, 1993

Dates Modified / Updated:

October 28, 1993

February 3, 1994

December 31, 1998

November, 2023

PROCESS DESCRIPTIONS:

Some mineral product industry sites include equipment and processes that involve aggregate crushing. Particulate emissions occur whenever aggregate and rock are mechanically shattered. The following calculation procedures to estimate crushing operation particulate emissions are based on Section 11.19.2 of AP-42 (1/95).

Ea = Ua x EF x Ci x (1 - e)

Eh = Uh x EF x Ci x (1 - e)

Where:

Ea = Annual emissions of each listed substance, (lbs/year)

Eh = Maximum hourly emissions of each listed substance, (lbs/hour)

Ua = Annual material throughput for each crusher, (tons/year)

Uh = Maximum hourly throughput for each crusher, (tons/hour)

EF = Particulate emission factor, (lbs/ton of material crushed)

Ci = Concentration of each listed substance in each material processed, (lbs/lb)

e = Control equipment efficiency, (%)

EMISSIONS INFORMATION:

A series of meetings was held in 1995 and 1996 between AWR Consultants, the San Diego County Mineral Products Industry, and the District regarding particulate emission estimation techniques applicable to aggregate operations. A District policy was drafted on 4/9/96 regarding Mineral Industry calculation procedures. This policy included a standardized approach to evaluating emissions from mineral industry aggregate crushing operations.

In general, it was decided to classify all crushing operations as either primary crushing, dry process material crushing, wet process material crushing, dry fines material crushing, or wet fines material crushing. Standardized PM10 emission factors were assigned to each classification based on the expected annual average particle size distributions and moisture contents. Predetermined fugitive dust control efficiencies were also identified for specific types of devices and techniques.

These standardized emission factors are based on information published in Table 11.19.2-2 of Section 11.19.2 of AP-42 (1/95). These emission factors are substantially different than those previously used by the District and are not affected by crusher type or size. Emissions are dependent only on material type and throughput. A summary of the crushing operation policy decisions is as follows;

DISTRICT POLICY ASSUMPTIONS (4/9/96) - CRUSHING OPERATIONS

Material Classification Policy Decisions

Material Type	Description
Primary Material	Feed streams with > 4 inch material (principally jaw and gyratory crushers)
Process Material	Feed streams containing 1/2 to 4 inch material (most standard and shorthead cones with some gyradisc and impact crushers)
Fines Material	Feed streams exclusively containing <1/2 inch material or crushers whose product is 30% or more by weight smaller in size than #4 mesh

Moisture Classification Policy Decisions

Material Type	Description
Dry Material	Process Material with an average annual moisture content of < 1.5% by weight, and Fines Material with an average annual moisture content of <3.0% by weight.
Wet Material	Process Material with an average annual moisture content of 1.5% or more by weight, and Fines Material with an average annual moisture content of 3.0% or more by weight.

Control Device Policy Decisions

Control Equipment Type	Assumed Capture and Control Efficiencies
Water Spray Controls	Assume a fugitive dust control efficiency of 50%
Water Spray Controls With Surfactant	Assume a fugitive dust control efficiency of 75%
Covered Crusher w/Central Fabric Filter	Assume a fugitive dust capture efficiency of 95% and a ducted release rate of 0.008 grains/ft3
Covered Crusher w/Insertable Fabric Filter	Assume a fugitive dust capture efficiency of 97.5% and a ducted release rate of 0.008 grains/ft3

Note: No additional control efficiency is assumed for "Wet Material".

Emission Factor Policy Decisions

Material Type	PM10 (lbs/ton processed)	TSP (lbs/ton processed)
Primary Crushing	0.00070	0.00148
Dry Process Material Crushing	0.00240	0.00507
Wet Process Material Crushing	0.00059	0.00125
Dry Fines Material Crushing	0.01500	0.03171
Wet Fines Material Crushing	0.00210	0.00444

The standardized PM10 emission factors specified above are based on the controlled and uncontrolled crushing values listed in Table 11.19.2-2 of Section 11.19.2 of AP-42 (1/95). The TSP factor was derived using the ratio of particulate size multipliers in 13.2.4 of AP-42 (1/95) and the PM10 factors;

TSP Factor = PM10 Factor x (0.74 / 0.35)

The change in emission factors between "wet" and "dry" material represents an equivalent 75.4% control efficiency for "process" material and a 86.7% control efficiency for "fines" material. These factors are substantially different from those used previously by the District.

Trace metal concentrations in aggregate dust released from aggregate crushing operations can vary between sites. District default trace metal and toxic emission concentrations should be used to estimate compound specific emissions where representative and District approved site specific information is unavailable. These estimates are based upon test results from several San Diego County mineral product facilities provided to the District by AWR Consultants in July 1996 (Profile 7 - Crushed Miscellaneous Base);

The Office of Environmental Health Hazard Assessment (OEHHA) has adopted a chronic reference exposure level (REL) for respirable crystalline silica, cristobalite (CAS 14464-46-1) and quartz (CAS 14808-60-7). The REL is based on the PM4 fraction of crystalline silica which is expected to have associated health risks. The District has chosen to implement a health protective value of 7.95% default PM4 to PM10 ratio from published data[1] in order to more accurately estimate the health risks associated with respirable crystalline silica. If available, the District recommends using District approved site-specific

[1] Richards, J. R., Brozell, T., Rea, C. E., Boraston, G., & Hayden, J. (2009). PM_4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California. Journal of the Air & Waste Management Association, 59(11), 1287–1295. https://doi.org/10.3155/1047-3289.59.11.128

data to refine the PM4 to PM10 ratio.

The District's current default crystalline silica emission factor is based on local test results, which is 10% of the PM10 default emission factor. The PM4 to PM10 ratio can be accurately applied to the crystalline silica default emission factor since the test results were sized to -10 micron which was used to represent the average composition of PM10. Both crystalline silica as PM10 and respirable crystalline silica as PM4 should be estimated.

ASSUMPTIONS / LIMITATIONS:

- Use site specific test data and trace metal concentrations instead of default values where applicable.

- The use of average particle size distributions and moisture contents to classify material streams for crushing operations was necessary since no definition of primary, secondary, tertiary, or fines crushing was provided in AP-42. The standardized factors developed and agreed to by the District - AWR - MPI working group should be used until otherwise advised.

- The "wet" factors listed above are actually identified as "controlled" factors in AP-42. As a result, no additional control efficiency will be applied to "wet" materials.

- The above capture and control efficiencies are already included in the "District standardized" calculation methods. These values cannot be modified by adjusting the release point information.

- Each crusher is considered a single device. Material throughputs should represent the entire device. However, the throughput for materials that are returned to a crusher multiple times should be reported "per pass".

- Ducted emissions (central baghouses and insertable filters) are quantified based on an assumed emission rate (0.008 grains/ft3) and the actual air flow rate. Care should be taken to accurately report the air flow rate for any control device with multiple collection points. The "double counting" of flow rates will result in a "double counting" of emissions. To correctly quantify emissions, the actual control device air flow rate may either be pro-rated over the associated collection points (transfer points) or combined and reported on a single form.