

CONCRETE BATCH PLANT OPERATIONS

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PROCESS DESCRIPTIONS:

Concrete batch plants are sources of particulate emissions which typically contain arsenic, beryllium, cadmium, chromium, lead, manganese, mercury, nickel, selenium, zinc, and crystalline silica. Concrete is a mixture of water, sand, aggregate, and cement occasionally supplemented by small quantities of fly ash and organic additives. The composition of a typical yd³ of concrete (4000 lbs) is; 1900 lbs coarse aggregate, 1240 lbs sand, 500 lbs cement / fly ash, and 360 lbs water.

Production equipment usually consists of dozers, aggregate bins, conveyors, cement storage silos, fly ash storage silos, a weigh hopper, a mixer, a baghouse, and transport trucks. The concrete may be centrally mixed (at batch plants), transit mixed (added wet to trucks and mixed enroute), or dry batch loaded (mixed with water at the final destination). Concrete batch plant operations consist of weigh hopper loading, mixer loading, and / or truck loading activities. Additional emissions from the cement storage silos, fly ash storage silos, open aggregate storage piles, aggregate transfer points, and vehicle haul roads are calculated separately from the concrete batch plant operations. The following District approved batch plant estimation techniques are based upon procedures specified in Section 11.12 (1/95) of AP-42 and local material speciation results;

$$E_a = U_a \times E_F \times C_i$$

$$E_h = U_h \times E_F \times C_i$$

Where:

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

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

Ua = Annual production (yd3/yr for transit and central mix operations)

= Annual quantity of material charged, (tons/yr for dry batch and CTB operations)

Uh = Maximum hourly production (yd3/hr for transit and central mix operations)

= Maximum hourly material charge rate, (tons/hr for dry batch and CTB operations)

EF = TSP emission factor after controls, (lbs/yd3 for transit and central mix operations)

= TSP emission factor after controls, (lbs/ton charged for dry batch and CTB ops)

Ci = Concentration of listed substance in batch plant baghouse emissions, (lbs/lb TSP)

TSP emission factors for concrete batch plants are from Section 11.12 of AP-42 (1/95). An estimated weight fraction of 92% PM10 is applied to the concrete batching TSP emissions based on an ARB report titled "Information for Applying the State Ambient Air Quality Standards for PM10 to the Permitting of New and Modified Stationary Sources" dated December 1987. Default TSP and PM10 emission factor values for dry batch / CTB, transit mix, and central mix concrete batch plants are as follows;

DEFAULT VALUES - CONCRETE BATCH PLANTS

Plant Type:	Dry Batch / CTB	Transit Mix	Central Mix
Emission Factor Units	lbs TSP/ton material	lbs TSP/yd3 concrete	lbs TSP/yd3 concrete
Weigh Hopper Factor	0.02	0.04	0.04
Mixer Factor	NA	NA	0.07
Truck Loading Factor	0.02	0.04	NA
Total TSP Factor	0.04	0.08	0.11
PM10 Weight Fraction	92%	92%	92%
Weigh Hopper Factor	0.018	0.037	0.037
Mixer Factor	NA	NA	0.064
Truck Loading Factor	0.018	0.037	NA
Total PM10 Factor	0.037	0.074	0.10

Concrete batch plant emission speciation profiles have been developed from local sampling and material analyses. Default material compositions (lbs listed substance / lb particulate released) are as follows;

DEFAULT VALUES - TRACE METAL CONCENTRATIONS

Trace Metals	Range (ppmw)	Cement Dust	Fly Ash	Baghouse (Plant)
Asbestos	0	0	0	0
Aluminum	6000 to 21000	16000	17500	13000
Arsenic	1 to 40	22	15	15
Beryllium	0.5 to 3	1	2	1
Cadmium	1 to 5	1	1	1
Chromium (total)	15 to 300	58	26	50
Chromium (hexavalent)	3 to 80	5	3	2
Copper	10 to 60	30	23	46
Lead	5 to 140	12	15	33
Manganese	20 to 1600	400	80	420
Mercury	0 to 10	0	0	0
Nickel	3 to 120	25	12	18
Selenium	3 to 30	1	1	1
Silica (crystalline)	Little Data	0	0	10%
Zinc	20 to 450	92	30	140

EMISSIONS INFORMATION:

Section 11.12 of AP-42 (1/95) contains general information regarding concrete batch plant process descriptions, emission estimation techniques, emission factors, and control efficiencies. An ARB study published in 1987 determined an average weight fraction for the PM10 content of concrete batch plant particulate emissions. Cement, fly ash, and baghouse dust analyses were performed by several local mineral product firms ~1996. The above default emission factors and speciation profiles should be used where representative site specific information is unavailable .

Emissions from site open material storage, haul roads, transfer points, and storage silo loading should be calculated separately from batch plant operations. Process specific emission factors and speciation profiles have been developed for each of these emission sources.

ASSUMPTIONS / LIMITATIONS:

- Use site specific test data instead of default values where applicable.
- Previous District emission estimates may have incorrectly applied an additional control efficiency to the weigh hopper, mixer, and truck loading factors presented in AP-42. Upon further review, these factors appear to represent controlled emissions and no additional removal efficiency should be applied. The AP-42 documentation for concrete plant "controlled / uncontrolled" emission factors is

extremely difficult to interpret. Additional research regarding these values is being conducted by District and local Mineral Products Industry staff. The emission factors will be updated if appropriate.

- Previous District emission procedures assumed that ~51% of the batch plant weigh hopper, mixer, and truck loading dust emissions were PM10 based on a generic particulate weight fraction profile in Appendix B of AP-42. The AP-42 profile applies to overall plant emissions including storage areas and haul roads. More accurate process specific information for concrete batch plant operations exists in the 1987 ARB report "Information for Applying the State Ambient Air Quality Standards for PM10 to the Permitting of New and Modified Stationary Sources". A revised estimate of 92% PM10 for the weigh hoipper, mixer, and truck loading emissions is currently being used by the District for these processes.

FORMS:

Separate data request forms have been developed for transit, CTB, and central mix concrete batch plants so that production information can be submitted in the correct format / units. Other mineral processing operations on site must be evaluated independently due to the complex procedures developed for each mineral products industry process / release point.