YEAR 2012 AIR EMISSIONS INVENTORY GUIDANCE DOCUMENT

Minor Sources

AIR QUALITY DIVISION

Questionnaire Due By June 1, 2013

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Arizona Department of Environmental Quality

YEAR 2012 EMISSIONS INVENTORY QUESTIONNAIRE

SECTION I - Introduction

A. Purpose

Pursuant to Arizona Administrative Code (AAC), Title 18, Article 2, Section 327 (R18-2-327), any source that is subject to a permit requirement should complete and submit to the Director an annual emissions inventory questionnaire. A current air pollutant emissions inventory of both permitted and non-permitted sources within the State is necessary to properly evaluate air quality program effectiveness, as well as assessing emission fees.

The Arizona Department of Environmental Quality (ADEQ) is responsible for the preparation and submittal of an emissions inventory report to the United States Environmental Protection Agency (EPA) for sources and emission points prescribed in Code of Federal Regulations, Title 40, Part 51, Section 51.322 (40 CFR 51.322) and for sources that require a permit under Arizona Revised Statute (ARS) 49-426 for criteria pollutants. The term criteria pollutants includes oxides of nitrogen (NO2), oxides of sulfur (SOx), volatile organic compounds (VOCs) which are precursors to ozone (O3), carbon monoxide (CO), lead (Pb), total particulate matter (PT), particulate matter 10 microns or less in diameter (PM-10) and particulate matter 2.5 microns (PM2.5). Additionally, pursuant to AAC R18-2-326, ADEQ is responsible for assessing fees based on the actual emissions submitted in the emission inventory for sources subject to a federal regulation and are under ADEQ jurisdiction.

B. Who Must Complete the Survey?

Any facility subject to a permit requirement under AAC R18-2-302: Applicability; Classes of Permits, whether or not a permit has been issued or an application has been filed, and emitting (I) any single regulated air pollutant in a quantity greater than one ton or a pollutant emitted in an amount greater than that listed in AAC R18-2-101.106.a, whichever is less or (II) any combination of regulated air pollutants in a quantity greater than 2½ tons.

C. Timeframes

The completed 2012 survey is due **June 1, 2013**.

D. ADEQ Contact

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SECTION II - DEVELOPING AN EMISSIONS INVENTORY

I. Introduction

The purpose of an emissions inventory (EI) is to account for all air pollutants emitted into the atmosphere. This accounting forms the basis for all aspects of the air quality planning process at the county, state and national levels. The effectiveness of air quality rules and regulations established by the agency will be as good as the Emissions Inventory data upon which they are based. Development and submission of a comprehensive, accurate and well-documented emissions inventory is one way for industry to participate in improving air quality and minimize the impact of Air Quality regulations cost on their operations. A comprehensive inventory can form the basis for permit revisions, and will document much of the data needed to satisfy permit provisions, reporting requirements, as well as other compliance and enforcement related activities. Though this document has been mainly designed for a facility completing its initial inventory, this can be used as a reference to all others.

Following the methodology outlined in this document can be cost and time effective and will result in an accurate and comprehensive collection of emissions data. The methodology has been adopted from the Texas Natural Resource Conservation Commission and the Exxon, Inc. with minor modifications. This methodology will identify and document all operations, processes and permit conditions applicable to the facility and accounts for the type and actual quantity of all air pollutant emissions using the appropriate estimating tools.

There are four steps involved in this methodology:

1. Planning
2. Data Gathering
3. Calculations
4. Documentation

1. Planning

This section outlines the initial planning necessary to get started on the inventory process. The personnel or team assigned to complete the EI must have a thorough understanding of your facility or plant's operations and processes. They must be able to answer questions such as "What operations are performed at the plant? What types of equipment are used? In the end, the plan should ensure that the following questions are answers:

1. What operations take place within the facility?
2. What processes and equipment are linked to each of those operations?
3. How should I calculate the emissions from each of those processes and what reference material do I need to ensure accurate calculations?
4. What material data (production rate, fuel usage, etc.) do I need from each process to calculate emissions from that process?

5. What information about my equipment do I need to gather?
6. How will I document my emissions calculations?
7. How will I fill out the ADEQ Emissions Inventory forms?
8. How will I check all of the data collected and the completed EI forms for accuracy and completeness?

Plan Outline:

This outline can be refined in your planning process so that it applies specifically to your overall plant operation. You should review this plan outline as well as read the subsequent section which is discuss each aspect of the plan in detail prior to beginning the planning process.

1. Physical Plant Survey - An actual walkthrough of the entire plant

   During this survey, list all the operations, which take place within the facility in a tabular form. Include all the processes, which are part of an operation. Finally list all equipment and any stacks or vents that are associated with any process. Then using the above information - draft a Process Flow Diagram for the entire facility/plant, and finally review of your facility's permit.

2. Emissions Estimation Methodology: Determine the appropriate methodology for estimating emissions for each process or operation considered in order of preference:
   A. Any valid Continuous Emissions Monitoring System (CEMS) data or Performance Test conducted during the EI year
   B. An AP-42 emission factor
   C. Material Balance using engineering knowledge of process
   D. Any other equivalent methods approved by the Director

3. Process Information: Record the process rate, hours of operation, amount of material used, and control equipment information necessary to calculate emissions using the methodologies that you have selected. This may require additional plant surveys and generally will be the most time consuming portion of completing your emissions inventory.

4. Emissions Calculations: Calculate and document your emissions estimates. Make sure you "show your calculations". This includes emissions from your processes, from process support generators, and fugitives. **In addition, please be sure to include data on all regulated pollutants, including individual hazardous air pollutants to be included with your facility's total emissions.** Make sure you "show your calculations." This will expedite internal review and acceptance of your EI by ADEQ.

5. EI Form: Review the EI forms and the instructions. Ensure that you have all questions answered and have receive needed clarification on applicable instructions where needed before you begin filling out the forms. Transcribe the

correct data to appropriate forms or format for submission.

6. Quality Check: Check for accuracy of your Draft Emissions Inventory. Develop a written plan for the quality assurance process. This plan should include the data elements to be reviewed as well as establish the standards the data must meet prior to completion.

7. Additional Copies: Ensure you have a copy of your final EI as well as supporting documentation for your future reference. While the plan and recommended methodologies may seem complex at first, it is a tried and true method. Keep in mind that 90% of the effort in producing a good emissions inventory is a one-time effort. For subsequent emissions inventories you will only need to update process rate and material data, recalculate emissions, transcribe the data to appropriate format, and execute your quality assurance plan.

The remaining sections of this section will provide "how to" details as well as show how a typical Concrete Batch Plant might use this methodology to complete an emissions inventory. Other types of facilities should be able to expand upon this example as needed to complete their emissions inventory.

2. DATA GATHERING

Process Flow Diagram

The process flow diagram is a pictorial representation of a sequence of operations. Any air emissions emitted from a particular process can also be identified. This diagram can be used to assist in setting up the "E.I. Data Structure", ensuring that all sources of emissions are accounted for in the EI, taking into account all control equipment used to reduce emissions. This diagram does not have to be a blueprint. A neat and clearly legible drawing will serve the purpose.

EXAMPLE:

We will now refer to our fictional Concrete Batch Plant to demonstrate how to develop a process flow diagram.

Background: Acme Concrete Batch Company (ACBC) has just received the 2010 Emissions Inventory Survey from ADEQ. ACBC has never prepared an emissions inventory. Therefore, ACBC decides to follow the complete EI development process to ensure an accurate inventory in the proper format with all the required information.

Description: ACBC's concrete batch operation consists of the following process:

1. Railcar and truck unloading of sand and aggregate
2. Open storage of stockpiled sand and aggregate
3. Loading sand and aggregate onto conveyor system using a front-end loader
4. Conveyor transfer of sand and aggregate to weigh hoppers
5. Truck unloading of cement
6. Pneumatic conveyor transfer of cement from unloading point to the cement silo

7. Loading system for loading measured cement, sand aggregate and water into trucks or mixing drum
8. Water spray systems used for spray cooling of sand and aggregate

The first step in developing a good process flow diagram is a complete inventory or listing of Operations, Processes, Equipment and Stacks. Definitions of these terms can be found in Section III of this document. A partial example of the survey is summarized below:

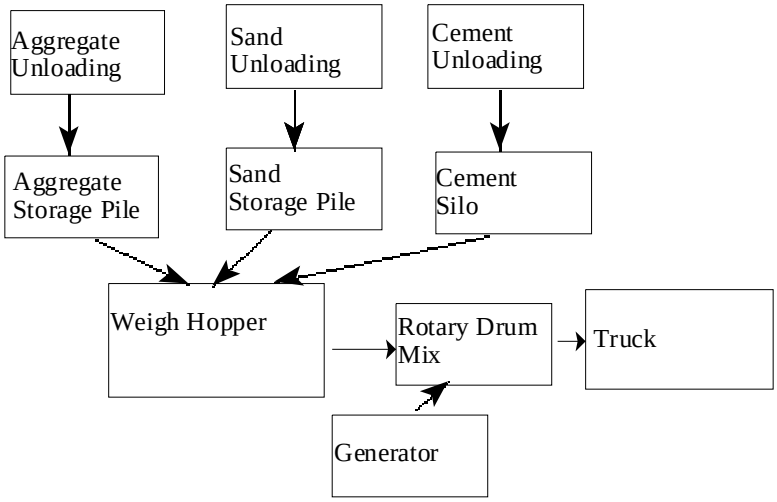
Operation Name	**Process Name**	**Equip-ment ID**	**Equipment Description**	**Stack ID**	**Pollutant Control Device**
Material Handling (Loading -L & Unloading-UL)	Sand -UL	301	Truck	-	
	Gravel-UL	302	Truck	-	-
	Cement-UL	303	Pnuematic Unloading from Truck	-	-
	Sand-L	304	Front End Loader	-	-
	Gravel-L	305	Front End Loader	-	-
	Cement L	306	Cement Silo	401	Cement Silo Baghouse Stack
Material Storage	Aggregate Storage Pile	-	-	-	-
	Sand Storage Pile	-	-	-	-
	Cement Silo	307	Cement Silo	401	Cement Silo Baghouse Stack
Material Transfer	Aggregate Transfer to Weigh Hopper	308 - 311	Conveyor Belt	-	-
	Cement transfer to Weigh Hopper	312	Conveyor Belt	-	-
Fuel Burning	Fuel - Diesel	313	Generator	402	Generator Stack
Haul Roads	Truck traffic	314	Cement Trucks	-	-

Process Data:

Obtain all the necessary material processed at the plant from the plant manager or any other person responsible for maintaining production records. Below is a partial list of data collected from the Concrete Batch Plant:

Total amount of sand brought into the facility during the EI year = 66,000 tons
Total tons of Cement brought into the facility = 8220 tons
Total miles traveled by the cement trucks, front end loaders or any other process vehicle on facility non-paved roads = 644.8 miles per year

Process Flow Diagram:
The next step would be to develop a Process Flow Diagram from the list starting with the process names. A partial process flow diagram is shown in the diagram below: When complete, the process flow diagram along with the Operation/Process/Equipment/Stack Cross Reference Listing will help you organize your emissions report in an easily identifiable and understandable fashion. This should facilitate your efforts at completing the Emissions Inventory Survey Forms. In addition, you should submit a copy of the Process Flow Diagram along with the completed Emissions Inventory, to ADEQ in their review of your EI.



3. CALCULATING EMISSIONS

Determine the Appropriate Calculation Methodology

By producing a Process Flow Diagram and Cross Reference list of Operations and Processes, you have created a "road map" which outlines a logical approach to estimating the emissions for all operations and processes at your facility or plant.

In order to calculate emissions from a facility, the appropriate emission factor should be chosen. In the case of the Batch Plant, emission factors from AP-42, Chapter 8, Section 8.10, Concrete Batching (Figure 9), are the most readily available methodology. However, these factors are incomplete because there are no emission factors in AP-42 for PM10 emissions. ADEQ Air Quality Permits Section has published emission factors for PM10 emissions specifically for concrete batch plants. Therefore, a combination of AP-42 and ADEQ Emission factors is appropriate here. Should you find it necessary to use emission factors from multiple sources to calculate your emissions be sure to document the source of those emission factors or emission calculation methodologies used.

The emission factors can be obtained from the AP-42 document. For our example, Section 11.12 - Concrete Batching lists all the emission factors available. These factors and the process data from our example are used to calculate the emissions from the facility. A few sample calculations are shown below:

A. Operation: Aggregate Unloading
Process: Sand Unloading

$$E = (P \times EF)/(2000 \text{ lbs/ton})$$

Where:

1 tons = 2000 pounds (lbs)
E - Emissions of particulate matter (PM) (tons/year)
P - Process rate (tons of sand unloaded per year) = 66,000 tons
EF - Emission Factor (pounds of PM emitted /ton of sand unloaded) (lbs/ton)
= 0.029 lbs/ton

Inputting all the required data collected in our pervious step, we can calculate the emissions of particulate matter from the unloading process.

E = (66,000 tons of sand x 0.029 lbs/ton unloaded)/2000 lbs/ton
E = 0.957 tons/year of PM emissions

The same formula with appropriate emission factor applies for PM10 emissions.
EF = 0.00033 lbs of PM10/ton of sand unloaded

E = (66,000 tons sand x 0.00033 lbs/tons unloaded) / 2000 lbs/ton
E = 0.0109 tons/year PM10 emissions

B. Operation: Material Transfer
Process: Cement Transfer to Weigh Hopper

NOTE: These emissions are vented through the stack of a baghouse, which serves as a control device for the cement transfer process.

$$E = ((P \times EF) \times (1 - C_{eff})) /2000 \text{ lbs/ton}$$

E - Emissions (tons/year)

P - Process rate (tons of cement unloaded) = 8220 tons
EF - Emission Factor (lb/ton) = 0.27 lbs/ton
C_{eff} - Control efficiency of the baghouse (provided by manufacturer) =98%
98% control efficiency means that 98% of the dust is captured in the baghouse and 100-98% = 2% of cement dust escapes into the atmosphere as emissions.

Using the above formula:

E = ((8220 tons cement x 0.27 lbs/ton) x (1-0.98)) / 2000 lbs/ton
E = 0.022 tons/year Total Particulate Emissions

Using the same formula with the factor for PM10 emissions:

E = ((8220 tons cement x 0.0018 lbs/ton) x (1-0.98))/2000
E = 0.0001 tons/year PM10 emissions

C. Operation: Haul Roads
Process: Truck Traffic

E = (VMTxEF) / (2000 lbs/ton)
E = Emissions (tons/year)
VMT - Vehicle Miles Traveled (miles) per year = 644.8
EF = Emission Factor (lbs/VMT) = 16 lbs of PM/VMT

Using the above formula

E = (644.8 vehicle miles traveled x 16 lbs/VMT) / (2000 lbs/ton)
E = 5.158 tons/year Total Suspended Particulate Emissions

The same formula using the PM10 factor reveals:

E = (644.8 vehicle miles traveled x 0.267 lbs/VMT)/2000 lbs/ton
E = 0.086 tons/year PM10 emissions

After all the calculations are completed, save a copy for your records and a copy of each type of emission calculation to submit to ADEQ with the emissions inventory survey.

The reference example used emission factors from AP-42 and ADEQ to calculate annual emissions. This is just one of the approved methodologies for estimating air pollutant emissions. The Arizona Administrative Code prioritizes and lists the approved general methods for estimating emissions such as:

1. Properly certified and maintained Continuous Emissions Monitors
2. Data from approved Source Performance Testing (stacks tests)
3. AP-42 Emission Factors or Estimation Methodologies
4. Material Balance using engineering knowledge of process, or
5. Any other equivalent methods approved by the Director.

4. DOCUMENTATION

Review the Forms & Instructions and Transcribe the Data

After calculating and documenting the facility's emissions, you will need to know which EI Forms to use and where on those forms to record all of the data you have collected or calculated. Consequently, you should review the Emissions Inventory Forms and read the instructions in Section V for completing those forms. During this review process, you should be looking for any information that is required in the forms, which you still need to collect. If you still have questions regarding how to complete the forms or regarding the information required, call the following number between 8:30 AM and 4.00 PM Arizona time at:

1-800-234-5677 ext 7662

Quality assure your draft Emissions Inventory

The quality assurance process ensures a complete E.I. Companies should develop a quality assurance plan that fits their unique needs. However, there are several common elements, which should be in any quality assurance plan:

(1) Required data elements properly entered on all forms
(2) Emissions calculations are based on approved and correct methodologies, and the results can be reproduced from the data included in your report
(3) There is sufficient documentation where the emission factors were obtained from and copies of manufacturer's data to show the control efficiency used, etc. Such documentation allow a reviewing official to easily recreate your results
(4) New or added information can be easily distinguished from changed or edited information.
(5) A contact person who can answer questions regarding this El along with a current address, phone number and email address has been designated.

In addition to completing checks to ensure that all of the tables are filled, you should review your data to make sure that significant changes from previous El submissions are explained or documented. For example, are major changes in overall facility or plant emissions explained by commensurate changes in process rates, operating schedules or process changes? This type of review should extend to each operation and process recorded in the emissions inventory. When this review is complete, your emissions inventory is complete and ready for submission to ADEQ.

Make a complete copy of all data submitted

Since the U.S. Mail and regulatory agency administrative systems are not entirely reliable, protect yourself by retaining a complete copy of your final Emissions Inventory, and all supporting documentation. This will also serve you well should there be future questions regarding your E.I.

SECTION III - DEFINITIONS

Identifier	***Characteristics***	***Definition***
Operation	*A unique three digit identifier* *e.g. 101* *Note: Do not use leading zeros*	*Operations are major divisions of a facility's overall activities. It can contain 1 or more processes. The grouping of processes within an operation must be unique. This means that a process can be linked to more than one operation, but the combination of processes cannot be the same for any two operations in a facility.*
Process	--	*An activity within an operation that emits air contaminants. Use of some sort of equipment and material is involved in a process.*
Stack	*A unique three digit identifier* *e.g. 301* *Note: Do not use leading zeros*	*Generally an exhaust stack or vent. The physical outlet where air emissions are released into the atmosphere.*
Equipment	*A unique three digit identifier* *e.g. 401* *Note: Do not use leading zeros*	*Piece of machinery associated with a process*
Material	--	*Substance used in or acted upon by a process. e.g., fuel in a combustion process, solvent in a degreaser, or sand in a concrete batch process.*

CONVERSION FACTORS

To Convert From	*To*	*Multiply by*	*Unit Conversion Factor*
1	*1,000,000 (MM)*	*X*	*1000000*
1	*1,000 (M)*	*X*	*1000*
1,000 (M)	*1,000,000 (MM)*	*X*	*1000*
1,000 square feet	*Acres*	*X*	*0.022957*
1,000 (M)	*1*	*X*	*0.001*
1,000,000 (MM)	*1,000 (M)*	*X*	*0.001*
1,000,000 (MM)	*1*	*X*	*0.000001*
Acres	*1,000 square feet*	*X*	*43.56*
Barrels (bbls)	*Gallons (gals)*	*X*	*42*
BTUs	*Hp-Hr*	*X*	*0.0003928*
Cubic yards (cu yd)	*Cubic feet (cu ft)*	*X*	*0.1111111*
Cubic feet (cu ft)	*Cubic yards (cu yd)*	*X*	*9*
Gallons (gals)	*Barrels (bbls)*	*X*	*0.0238095*
Grams (g)	*Pounds (lbs)*	*X*	*0.0022046*
Hp-Hr	*BTUs*	*X*	*2546.149*
Kilograms (kg)	*Pounds (lbs)*	*X*	*2.204622*
Kilograms (kg)	*Tons*	*X*	*0.0011023*
Megagrams (Mg)	*Tons*	*X*	*1.1023*
Pounds (lbs)	*Kilograms (kg)*	*X*	*0.45359*
Pounds (lbs)	*tons*	*X*	*0.0005*
Pounds (lbs)	*Grams (g)*	*X*	*453.59*
Tons	*Kilograms (kg)*	*X*	*907.19*
Tons	*Megagrams (Mg)*	*X*	*0.90719*
Tons	*Pounds (lbs)*	*X*	*2000*