

**GENERAL AIR QUALITY PERMIT
FOR HUMAN AND ANIMAL CREMATORIES**

TECHNICAL SUPPORT DOCUMENT

May 19, 2020

I. GENERAL COMMENTS

The Pima County Department of Environmental Quality (PDEQ) has created this general permit application for human and animal crematories to streamline the permitting process for the numerous sources which would otherwise require substantially similar individual source permits. This permit action shall also reduce PDEQ's workload and afford decreased permitting timeframes. To obtain coverage under this general permit, the Applicant shall complete the general permit application form in order to obtain an *Authorization to Operate* (ATO) certificate.

II. SOURCE DESCRIPTION

Sources covered by this general permit include any human and animal cremator(s) located at sources which do not otherwise require an air quality permit for other equipment or processes located or conducted on-site. Sources with other non human and animal crematory equipment or processes cannot obtain this general permit and shall be required to submit a complete permit application and obtain an individual air quality permit from PDEQ.

The primary pollutants emitted from such human and animal cremator(s) are NO_x, CO, SO_x, PM₁₀, and VOC. Sources covered by this general permit shall emit less than major source thresholds on an individual basis for all criteria pollutants.

III. EMISSION ESTIMATES

Based on standard AP-42 emission factors (or test results submitted by the source) the sum of all emissions from any source operating under this general permit shall be less than the major source threshold defined in PCC 17.04.340.A 128.

Facilities covered by this general permit shall be **Class III, Minor, Stationary Sources**.¹

IV. APPLICABLE REQUIREMENTS

A. New Source Performance Standards (NSPS)

No NSPS rules apply to applicable sources. If NSPS applies, the source is excluded from coverage under this general permit.

B. National Emissions Standards for Hazardous Air Pollutants (NESHAP)

No NESHAP rules apply to applicable sources. If NESHAP applies, the source is excluded from coverage under this General Permit.

¹ Minor status is by operational design or via SEL.

C. Pima County Code (PCC)

The following PCC rules apply:

- 17.16.010 Local Rules and Standards; Applicability of more than one Standard
- 17.16.030 Odor Limiting Standard
- 17.16.050 Visibility Limiting Standard
- 17.16.170 Incinerators (cremation units)

V. Alternate Operating Scenarios

There are no alternate operating scenarios for pieces of equipment covered by this General Permit.

VI. Miscellaneous Comments

A. Cremator Design

Cremators are usually designed with a primary and secondary combustion chamber. They are predominately single-ended units which process one container at a time. The coffin is placed inside the primary chamber which has burners that combust the remains. The combustion gases from the primary chamber are then fed by a series of ducts into the secondary chamber, which is heated with afterburners and supplied with air to complete the combustion and reduce the emissions of carbon based particulate matter, volatile organic compounds and odors. The secondary chamber usually has a residence time for the gases of 1 to 2 seconds.

The time taken for the cremation to be complete varies depending upon the type of cremator and the weight and size of the person/animal. Generally cremation takes between 1.5 and 5 hours, including a cooling period.

B. Emission and Controls

The major emissions from cremators are nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_x), particulate matter (PM₁₀), mercury (Hg), hydrogen fluoride (HF), hydrogen chloride (HCl), other heavy metals, and some organic pollutants VOC which include dioxins and furans. The emission rates depend on the design of the cremator, combustion temperature, gas retention time, duct design, duct temperature and any control devices.

Particulates such as dust, soot, ash and other unburned particles originate from the cremation container, human/animal remains, and other contents of the container. Carbon-based organic particulates should be removed in the secondary combustion chamber and through proper adjustment and operation of the cremation equipment.

Carbon monoxide results from the incomplete combustion of the container, human/animal remains, fuel, and other contents. Carbon monoxide may be minimized through proper adjustment and operation of the cremation equipment.

Sulfur dioxide is produced from the combustion of fossil fuels, container, and contents. The sulfur content of natural gas and human/animal remains is low, but other fuels may contain a significant portion of sulfur. Sulfur oxide emissions are limited within this permit through the specific use of low sulfur fuels, i.e. natural gas and liquefied petroleum gas.

Nitrogen oxides are formed by high temperature combustion processes through the reaction of the nitrogen in air with oxygen. Nitrogen oxide emissions from human and animal cremators are low and are not of major concern. Control of nitrogen oxides can be achieved through temperature control and burner design.

Mercury emissions originate from the silver amalgam dental fillings found in some human bodies. Silver amalgam dental fillings containing mercury have been common for many years, but their use appears to be in significant decline. Testing for mercury in crematoria emissions was conducted by the Environmental Protection Agency using EPA Method 29 for metal emissions testing. This testing was the most extensive comprehensive emissions test of its kind ever conducted on human cremations. Nine human cremations were tested at The Woodland Cemetery in the Bronx, New York. The average mercury emission from these documented tests was 0.001292 lbs (0.586 grams) of mercury per body cremated. The potential mercury emissions from cremators as determined by The Arizona Department of Environmental Quality's emissions inventory spreadsheet is 0.052 pounds/ton. If we assume that the maximum charging rate for a typical cremator is 150 lbs/hr operating 4380 hrs per year, then using this emission factor would generate 0.01 tons of mercury each year. Mercury emissions from cremators are therefore not a significant concern. With the continued decline in silver amalgam dental fillings, and thus mercury emissions it, would be burdensome and of no environmental benefit to require additional controls for mercury.

Dioxins and furans can form from the combustion of wood cellulose, chlorinated plastics, and operating within a temperature range that leads to the formation of dioxins and furans. Dioxins and furans may be reduced through reduction in the chlorinated plastics and with sufficiently high temperature and residence time in the secondary combustion chamber.

Regulations for human and animal cremators are predominately developed by the designated local or state agency; The United States Environmental Protection Agency has no existing regulations covering the design, installation and operation of such units. USEPA determined that human and animal cremators should not be regulated as part of the final Other Solid Waste Incineration (OSWI) Units regulations promulgated on November 30, 2005 or any other existing Clean Air Act, Section 129 incineration regulation.

All human and animal cremators operating within Pima County are required to meet the environmental regulations of this county pursuant to Title 17 of the Pima County Code (PCC).

C. Particulate Matter

PCC 17.16.170.C.1 limits the emissions of particulate matter from the cremator(s). A demonstration to show compliance with this emission standard is not required in this general permit as the allowable emissions of particulate matter (0.08 grains per cubic foot) is well above the potential emissions of many cremator(s). The 0.08 grains per cubic foot (g/ft³) emission rate would equate to about 1.5 pounds per hour (lb/hr), see calculation below:

$$\begin{aligned} 0.08 \text{ g/ft}^3 &= 0.18 \text{ grams/m}^3 \quad (\text{per second}) && (\text{Standard mass emission conversion}) \\ &= 0.000402 \text{ lbs/m}^3 \quad (\text{per second}) \\ &= 1.5 \text{ lbs/m}^3/\text{hr} \end{aligned}$$

The proper physical operation and maintenance of the cremator according to manufacturer's guidelines and or industry standards is integral for preventing the potential release of excessive particulate matter.

The cremation unit(s) are generally designed to meet the particulate matter standard if operated in accordance with vender-supplied operations and instructions or a PDEQ approved operation and maintenance plan. PDEQ has determined that opacity checks and work practice (operating) standards may be used as a surrogate for emission testing.

D. Temperature Control

Keeping the temperature of the secondary chamber constant is critical for the proper operation of a human and animal cremator and to prevent the generation of unwanted emissions from the stack. The Permittee shall operate the cremation unit(s) at all times according to the approved operation and maintenance plan.

E. Hours of Operation

Human and animal cremation units are limited to operate between the hours of official sunrise to sunset, except when the following operational conditions are present:

1. The cremation unit is equipped with a continuous monitoring and recording opacity meter;
2. The cremation unit used solely for the destruction of materials which would cause or contribute to air pollution if disposed of in any other practical manner;
3. The incinerating process cannot be operated efficiently during only daylight hours;
4. The opacity monitoring-and-recording equipment is calibrated and maintained in accordance with the manufacturer's specifications; and
5. The opacity monitoring records are kept for at least five years.

F. Operational Conditions for Animal Crematories

PDEQ has determined that the standards of practice associated with the cremation of animal remains shall be consistent with the standards of practice established for human cremation. All animal crematories will be subject to the same permit and operational conditions as human crematories. Facilities seeking alternative operating conditions for animal cremations shall be required to submit testing results supported by manufacture's specifications that outline the emissions associated with and the procedures used to cremate animal remains.

G. Requirements That Are Not Applicable

The following New Source Performance Standard (NSPS) is not applicable for the following reason:

- 40 CFR Part 60 Subpart A - General Provisions - applicable to equipment subject to 40 CFR Part 60, Subparts EEEE as described below.
- 40 CFR Part 60 Subpart E – Incinerators – does not apply because cremation units are not used in the process of burning solid waste. The definition of solid waste in Subpart E means refuse, more than 50 percent of which is municipal type waste consisting of a mixture of paper, wood, yard wastes, food wastes, plastics, leather, rubber, and other combustibles, and noncombustible materials such as glass and rock.
- The Final Rule for Standards issued in a Federal Register notice on December 16, 2005 for the Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Other Solid Waste Incineration Units, states that “EPA has determined that the human body should not be labeled or considered “solid waste.” Therefore, human crematories are not solid waste combustion units, and are not a subcategory of OSWI for regulation.” Animal crematories are also excluded from this rule.

The final rule is available through this link: <https://publicaccess.zendesk.com/hc/en-us/articles/212071007-What-are-the-EPA-regulations-for-crematories-and-pathological-incinerators>.

- Pathological waste means waste material consisting of only human or animal remains, anatomical parts, and/or tissue, the bags/containers used to collect and transport the waste material, and animal bedding (if applicable).” Pathological incinerators are also addressed in the final EPA rule mentioned above.

VII. IMPACTS TO AMBIENT AIR QUALITY

Only major sources are required to conduct impacts to ambient air quality and major sources are excluded from this General Permit.

VIII. CONTROL TECHNOLOGY DETERMINATION

Control Technologies are not required for applicable sources.

IX. PERMIT CONTENTS

I. Introduction

Human and Animal Cremator(s) located at a source which is only required to obtain a permit pursuant to Title 17 of the Pima County Code (PCC) 17.11.090.B.3.a.

II. General Requirements

The Permittee shall ensure that the Human and Animal Crematory facilities covered under this General Permit meets the several general permit requirements identified in the permit.

III. Emission Limitations and Standards

Condition	Discussion	Authority
9	Prohibition from emitting particulate matter exceeding 0.08 grains per cubic foot, based on dry flue gas at standard conditions, corrected to 12 percent carbon dioxide, except for not more than 30 seconds in any 60 minute period.	PCC 17.16.170.C.1 & PCC 17.16.170.E.1
10	Prohibition from emitting smoke from cremation unit(s) in excess of 20% opacity; for not more than 30 seconds in any 60 minute period.	PCC 17.16.040, PCC 17.16.170.B & PCC 17.16.170.E.1
11	Prohibition from emitting gaseous or odorous materials from equipment, operations or premises under control in such quantities or concentrations as to cause air pollution.	PCC 17.16.030
12	Operating requirements for all cremation unit(s). Hour limitation, firing rate, temperature control and fuel limitation.	PCC 17.16.170.A & PCC 17.13.020.A.2
13	The Control Officer may require the installation of abatement equipment where a stack, vent or other outlet is at such a level that fumes, gas mist, odor, smoke, vapor or any combination thereof constituting air pollution are discharged to adjoining property. Abatement may include the alteration of such stack, vent or other outlet by the Permittee thereof to a degree that will adequately reduce or eliminate the discharge of air pollution to adjoining property.	PCC 17.16.020.B

III. Emission Limitations and Standards (continued)

Condition	Discussion	Authority
14	Requirement for the Permittee to apply for the appropriate permit revision application prior to modifying existing emission equipment or switching fuels.	PCC 17.13.110, PCC 17.13.130 & PCC 17.13.140

IV. Monitoring Requirements

Condition	Discussion	Authority
15	Requirement to operate and maintain the cremation unit(s) at all times - including periods of startup, shutdown, and malfunction - in a manner consistent with good air pollution control practices and consistent with manufacturers' guidelines.	PCC 17.13.020.A.3
16	Requirement to conduct daily visible emissions checks and keep records of such inspections.	
17	Requirement to monitor the charging rate, time of operation and hours of operation of the cremation unit(s).	
18	Requirement to install and maintain a measuring device to read the secondary chamber temperature.	

V. Recordkeeping Requirements

Condition	Discussion	Authority
19	Requirement to record all opacity monitoring observations.	PCC 17.13.020.A.4
20	Requirement to maintain an operational log showing the charging rate and hours of operation.	PCC 17.16.170.F
21	Requirement to maintain the operational log at the end of each operating day.	PCC 17.13.020.A.4
22	Requirement to retain records for at least five years.	PCC 17.13.020.A.4.b
23	Requirement to maintain records at the permit site or obtain approval from the Control Officer for maintaining records at alternate site.	PCC 17.11.060

VI. Reporting Requirements

Condition	Discussion	Authority
24	Requirement to report all observations as identified in the additional permit conditions.	PCC 17.13.020.A.5

VII. Testing Requirements

Condition	Discussion	Authority
26	When required, EPA Test Method 4 and 5 shall be performed to determine the concentration of particulate matter and associated moisture content.	PCC 17.13.020.A.3.a, PCC 17.16.170.G.1.a. & PCC 17.20.010
27	When required, EPA Method 9 visible emission observations on facility operations to demonstrate compliance with the opacity standard.	PCC 17.13.190.B & PCC 17.20.010
28	The Permittee may use an alternative test method to demonstrate compliance with the emission limitations and standards. All alternative test methods are required to be approved by the Control Officer.	PCC 17.11.160.D

X. APPLICATION PACKAGE

An application package has been drafted in conjunction with this general permit to further expedite the process. The package should help lower the rate of incomplete applications as well as provide the permit engineer with a less intensive, standardized approach to processing this type of source.

A. Instructions

Step 1 – Applicability Determination.

The applicant is responsible for determining if other activities or equipment conducted or located on-site exclude the source from coverage under this permit. Broadly stated, exclusions from applicability include other equipment or activities co-located onsite that are subject to a permitting standard under PCC 17.11.090 via applicability to a particular standard or by potential emissions.

Finally, as this general permit does not cover Class I sources, the applicant must be willing to accept a synthetic emission limitation if necessary.

Step 2 – Standard Permit Application Form.

This form has been altered or tailored for the general permit and has slight differences from the form that is used for regular Class II and III sources.

Step 3 – Equipment List.

The equipment list form has been altered from previous PDEQ forms included with the standard permit application package. This form has specific columns for identifying the cremator firing/charge rate (lbs/hr), allowable fuel(s) and any other information needed for issuing a valid ATO.

Step 4 – Statement of Compliance.

This form contains a statement of compliance, standard truth, accuracy, and completeness language as well as a requirement for the applicant to supplement this application when necessary/appropriate.