

**Addendum  
No. 2**

Addendum Date: August 19, 2019  
Project: Incinerator Replacement at the DE Dept. of Agriculture  
DFM Project No: MC6501000001

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The work herein shall be considered part of the bid documents for the referenced project and carried out in accordance with the following supplemental instructions issued in accordance with the Contract Documents without change in Contract Sum or Contract Time. Acknowledge receipt of addendum on the bid form as indicated.

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**Clarifications:**

1. The owner has been issued a permit for construction by DNREC for the base bid, 225 lb/hr incinerator, and is attached. All building and/or trade permits are the responsibility of the contractor. As part of add alternate #4, the contractor is required to submit DNREC forms AQM-1, AQM-2, AQM-5, and AQM-3.11 with \$490 permitting fee to seek a permit for construction for the 300 lb/hr incinerator.
2. The existing unit is to be demolished and removed by the contractor and does not require inspection prior to removal.
3. DNREC is required to inspect the new incinerator prior to operation. The required DNREC inspection is to be coordinated by the contractor and does not require an inspection fee.
4. Any demolition or erection activities that require crane work such as to present a safety hazard to building occupants are to be performed during weekend hours.
5. The contractor is to provide site restoration and seeding following exterior site work.

**Questions / Responses:**

1. **Question** – We are being told that the specified Opacity Meter cannot tolerate the temperature of the incinerator, therefore, the specified incinerator model will not be submitting a price for Alternate 3. This being the case, how are we supposed to price alternate 3? Maybe delete it or apply an allowance for it?  
**Response** – Alternate No. 3 is to be replaced by \$40,000. See “Changes to Specifications.”
2. **Question** – Are there any substitute incinerators that have been approved?  
**Response** – No, Pennram is the only approved manufacturer for the project.

3. **Question** – Section 2.04 Base Bid and 2.05 Alternate #4 Combustion Chamber specs do not match with Pennram’s specifications for the 225 and 300 unit incinerators.  
**Response** – *11 91 01 Incinerators and Crematories* has been revised and reissued. See “Changes to Specifications.”
4. **Question** – Will the state be responsible for cleaning or disinfecting the existing incinerator before it’s demolished?  
**Response** – No, the incinerator and its contents shall be property of the contractor. The contractor may assume no biological hazards are present but if suspected material is encountered during the course of demolition, the contractor is to stop work and notify the engineer.

**Changes to Specifications:**

1. *11 91 01 Incinerators and Crematories* – See attached revised specification.
2. *00 41 13 Bid Form* – Add Alternate No. 3 is to be replaced by a cash allowance of \$40,000 to include installation of an opacity meter as described in *11 91 01 Incinerators and Crematories* and the installation of a stack cooler as part of the Incinerator package in order to adequately cool stack gases to a temperature range coordinated with the opacity meter product limitations. Any remaining allowance balance is to be returned by the owner at project conclusion by credit change order. Bidders are to note \$40,000 for Add Alternate No. 3. No revised bid form is issued to reflect this change.

**Changes to Drawings:**

1. *Drawing M101 Mechanical Plans* – Existing guy wires are to be demolished and removed with anchors cut below grade. No sketch or revised drawing is issued to reflect this change.

**Attachments:**

1. DNREC Permit for Construction of Pennram Model 225.
2. Specification *11 91 01 incinerators and Crematories*.

END



STATE OF DELAWARE  
DEPARTMENT OF NATURAL RESOURCES  
& ENVIRONMENTAL CONTROL  
DIVISION OF AIR QUALITY  
State Street Commons  
100 W. Water Street, Suite 6A  
DOVER, DELAWARE 19904

Telephone: (302) 739 - 9402  
Fax No.: (302) 739 - 3106

August 5, 2019

**Permit: APC-2019/0087-CONSTRUCTION**

Delaware Department of Agriculture  
Noninfectious Waste Incinerator  
Animal Crematory  
2320 South Dupont Highway  
Dover, DE 19901

ATTENTION: Dan Shurina, P.E.  
Associate, Studio JAED

Dear Mr. Shurina:

Pursuant to 7 **DE Admin. Code** 1102, Section 2, approval of the Department of Natural Resources and Environmental Control (the Department) is hereby granted for the construction of a Pennram Model 225 Incinerator with a charging rate of 225 pounds per hour and equipped with primary and secondary natural gas fired burners, located at the Delaware Department of Agriculture Animal Crematory at 2320 South Dupont Highway in Dover, Delaware, in accordance with the application submitted on Form Nos. AQM-1, AQM-2, AQM-3.11 and AQM-5 dated May 7, 2019 signed by Heather L. Hirst, State Veterinarian, and letter dated May 6, 2019 signed by Dan Shurina P.E., Associate, Studio JAED.

This permit is issued subject to the following conditions:

**1. General Provisions**

- 1.1 This permit expires on August 5, 2020. If the equipment covered by this permit will not be constructed by August 5, 2020, a request to extend this construction permit must be submitted by June 21, 2020.
- 1.2 The project shall be constructed in accordance with the application described above. If any changes are necessary, revised plans must be submitted and supplemental approval issued prior to actual construction.
- 1.3 Representatives of the Department may, at any reasonable time, inspect this facility.
- 1.4 This permit may not be transferred to another location or to another piece of equipment or process.

*Delaware's good nature depends on you!*

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- 1.5 This permit may not be transferred to another person, owner, or operator unless the transfer has been approved in advance by the Department. Approval (or disapproval) of the permit transfer will be provided by the Department in writing. A request for a permit transfer shall be received by the Department at least thirty (30) days before the date of the requested permit transfer. This request shall include:
  - 1.5.1 Signed letters from each person stating the permit transfer is agreeable to each person; and
  - 1.5.2 An Applicant Background Information Questionnaire pursuant to 7 Del C, Chapter 79 if the person receiving the permit has not been issued any permits by the Department in the previous five (5) years.
- 1.6 The applicant shall, upon completion of the construction, installation, or alteration, request that the Department grant approval to operate.
  - 1.6.1 A separate application to operate pursuant to 7 **DE Admin. Code** 1102 does not need to be submitted to the Department for the equipment or process covered by this construction permit. Upon a satisfactory demonstration by an on-site inspection that the equipment or process complies with all of the terms and conditions of this permit, the Department shall issue a 7 **DE Admin. Code** 1102 Operating Permit for this equipment or process.
  - 1.6.2 The applicant shall notify the Department sufficiently in advance of the demonstration and shall obtain the Department's prior concurrence of the operating factors, time period, and other pertinent details relating to the demonstration.
  - 1.6.3 The provisions of 7 **DE Admin. Code** 1102 Sections 2.1 and 11.3 shall not apply to the operation of equipment or processes for the purposes of initially demonstrating satisfactory performance to the Department following construction, installation, modification, or alteration of the equipment or processes.
- 1.7 The owner or operator shall not initiate construction, install, or alter any equipment or facility or air contaminant control device which will emit or prevent the emission of an air contaminant prior to submitting an application to the Department pursuant to 7 **DE Admin. Code** 1102, and, when applicable 7 **DE Admin. Code** 1125, and receiving approval of such application from the Department; except as exempted in 7 **DE Admin. Code** 1102 Section 2.2.

**2. Emission Limitations**

- 2.1 Air contaminant emission levels shall not exceed those specified in 7 **DE Admin. Code** 1100 and the following:
  - 2.1.1 Particulate Matter (PM) Emissions  
PM emissions shall not exceed 0.130 pounds per hour and 0.14 tons per twelve (12) month rolling period.

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- 2.1.2 Sulfur Oxide (SO<sub>x</sub>) Emissions  
SO<sub>x</sub> emissions shall not exceed 0.217 pounds per hour and 0.23 tons per twelve (12) month rolling period.
- 2.1.3 Nitrogen Oxide (NO<sub>x</sub>) Emissions  
NO<sub>x</sub> emissions shall not exceed 0.356 pounds per hour and 0.37 tons per twelve (12) month rolling period.
- 2.1.4 Carbon Monoxide (CO) Emissions  
CO emissions shall not exceed 0.295 pounds per hour and 0.31 tons per twelve (12) month rolling period.
- 2.1.5 Volatile Organic Compound (VOC) Emissions  
VOC emissions shall not exceed 0.030 pounds per hour and 62.4 pounds per twelve (12) month rolling period.
- 2.2 No person shall cause or allow the emission of visible air contaminants and/or smoke from a stationary or mobile source, the shade or appearance of which is greater than twenty (20%) percent opacity for an aggregate of more than three (3) minutes in any one (1) hour or more than fifteen (15) minutes in any twenty-four (24) hour period.
- 2.3 Odors from this source shall not be detectable beyond the plant property line in sufficient quantities such as to cause a condition of air pollution.

**3. Operational Limitations**

- 3.1 The owner or operator shall comply with the following operational limits:
  - 3.1.1 No person shall cause or allow the construction of any new incinerator or the reconstruction of any existing incinerator except for the disposal of:
    - 3.1.1.1 Human remains by cremation;
    - 3.1.1.2 Remains of animals not regulated by 7 **DE Admin. Code** 1129;
    - 3.1.1.3 Industrial waste or sludge in specific instances where no other method of disposal is acceptable to the Department;
    - 3.1.1.4 Composted refuse or sludge from sewage treatment plants specifically prepared for incineration;
    - 3.1.1.5 Refuse regulated by the U.S. Department of Agriculture.
  - 3.1.2 Operation of this equipment shall be restricted to the hours between sunrise and sunset, not to exceed 2,080 hours in any twelve (12) month period.
  - 3.1.3 Operation of this equipment shall be conducted only when the primary and secondary natural gas fired auxiliary burners are in proper operating condition and in the firing mode.

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- 3.1.4 Operation of this equipment shall be conducted only when the secondary chamber temperature is 1400°F or higher. The secondary chamber temperature shall be maintained at a temperature greater than 1400°F for the duration of the cremation.
- 3.1.5 The thermocouple temperature control device shall be installed in such a manner as to accurately determine the secondary chamber temperature.
- 3.2 At all times, including periods of startup, shutdown, and malfunction, the owner or operator shall, to the extent practicable, maintain and operate the facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating procedures are being used will be based on information available to the Department which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source.
- 3.3 All structural and mechanical components of the equipment or process covered by this Permit shall be maintained in proper operating condition.

**4. Testing and Monitoring Requirements**

- 4.1 The Department reserves the right to require that the owner or operator perform emission tests using methods approved in advance by the Department.
  - 4.1.1 One (1) original and one (1) copy of the test protocol shall be submitted a minimum of forty-five (45) days in advance of the tentative test date to the address in Condition 6.3. The tests shall be conducted in accordance with the State of Delaware and Federal requirements.
  - 4.1.2 The test protocol shall be approved by the Department prior to initiating any testing. Upon approval of the test protocol, the Company shall schedule the compliance demonstration with the Source Testing Engineer. The Department must observe the test for the results to be considered for acceptance.
  - 4.1.3 The final results of the testing shall be submitted to the Department within sixty (60) days of the test completion. One (1) original and one (1) copy of the test report shall be submitted to the addresses below:

Original to:

Engineering & Compliance Branch  
Attn: Permitting Engineer  
State Street Commons  
100 W. Water Street, Suite 6A  
Dover, DE 19904

One (1) Copy to:

Engineering & Compliance Branch  
Attn: Source Testing Engineer  
715 Grantham Lane  
New Castle, DE 19720

- 4.1.4 The final report of the results must meet the following requirements to be considered valid:

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4.1.4.1 The full report shall include the emissions test report (including raw data from the test) as well as a summary of the results and a statement of compliance or non-compliance with permit conditions;

4.1.4.2 Summary of Results and Statement of Compliance or Non-Compliance

The owner or operator shall supplement the report from the emissions testing firm with a summary of results that includes the following information:

4.1.4.2.1 A statement that the owner or operator has reviewed the report from the emissions testing firm and agrees with the findings.

4.1.4.2.2 Permit number(s) and condition(s) which are the basis for the compliance evaluation.

4.1.4.2.3 Summary of results with respect to each permit condition.

4.1.4.2.4 Statement of compliance or non-compliance with each permit condition.

4.1.5 The results must demonstrate to the Department's satisfaction that the emission unit is operating in compliance with the applicable regulations and conditions of this permit; if the final report of the test results shows non-compliance the owner or operator shall propose corrective action(s). Failure to demonstrate compliance through the test may result in enforcement action.

4.2 The operator shall monitor:

4.2.1 The time the cremation began and the temperature of the secondary chamber at the beginning of, and for the duration of each cremation;

4.2.2 The hourly charging rate;

4.2.3 The hours of operation each day;

4.2.4 The presence of any visible emissions during each cremation;

4.2.5 Any equipment malfunctions;

4.2.6 All routine and non-routine maintenance performed on the equipment.

**5. Record Keeping Requirements**

5.1 The owner or operator shall maintain all records necessary for determining compliance with this permit in a readily accessible location for five (5) years and shall make these records available to the Department upon written or verbal request.

5.2 The following information shall be recorded, initialed and maintained in a log:

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- 5.2.1 The temperature of the secondary chamber at the beginning of each cremation, and at any time that the temperature drops below 1400°F during a cremation.
- 5.2.2 The hourly charging rate;
- 5.2.3 The hours of operation of the crematory on a daily, monthly, and cumulative twelve (12) month rolling basis.
- 5.2.4 The operator shall visually observe the stack during each cremation and record the presence of visible emissions and the corrective action taken;
- 5.2.5 The Facility shall maintain records of any equipment malfunction and corrective action taken;
- 5.2.6 The Facility shall maintain documentation of all routine and non-routine maintenance performed on the equipment.
- 5.3 The rolling twelve (12) month total emissions shall be calculated and recorded each month in a log for each of the following pollutants:
  - 5.3.1 Particulate Matter (PM) Emissions
  - 5.3.2 Sulfur Oxide (SO<sub>x</sub>) Emissions
  - 5.3.3 Nitrogen Oxide (NO<sub>x</sub>) Emissions
  - 5.3.4 Carbon Monoxide (CO) Emissions
  - 5.3.5 Volatile Organic Compound (VOC) Emissions

**6. Reporting Requirements**

- 6.1 Emissions in excess of any permit condition or emissions which create a condition of air pollution shall be reported to the Department immediately upon discovery by calling the Environmental Emergency Notification and Complaint number, (800) 662-8802.
- 6.2 In addition to complying with Condition 6.1 of this permit, any reporting required by 7 **DE Admin. Code 1203 "Reporting of a Discharge of a Pollutant or an Air Contaminant"**, and any other reporting requirements mandated by the State of Delaware, the owner or operator shall, for each occurrence of excess emissions, within thirty (30) calendar days of becoming aware of such occurrence, supply the Department in writing with the following information:
  - 6.2.1 The name and location of the facility;
  - 6.2.2 The subject source(s) that caused the excess emissions;
  - 6.2.3 The time and date of the first observation of the excess emissions;
  - 6.2.4 The cause and expected duration of the excess emissions;

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- 6.2.5 For sources subject to numerical emission limitations, the estimated rate of emissions (expressed in the units of the applicable emission limitation) and the operating data and calculations used in determining the magnitude of the excess emissions; and
- 6.2.6 The proposed corrective actions and schedule to correct the conditions causing the excess emissions.
- 6.3 One original and one copy of all required reports shall be sent to the address below:
- Division of Air Quality  
State Street Commons  
100 W. Water Street, Suite 6A  
Dover, DE 19904

**7. Administrative Conditions**

- 7.1 This permit shall be made available on the premises.
- 7.2 Failure to comply with the provisions of this permit may be grounds for suspension or revocation.

Sincerely,

Redacted - Original on File

Angela D. Marconi, P.E., BCEE  
Program Manager  
Engineering & Compliance Branch

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pc: Dover File  
Joanna French  
Richard Walford

**SECTION 11 91 01**  
**INCINERATORS AND CREMATORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Incinerators (Crematories).
  - 1. Controls accessories and controllers.
  - 2. Exhaust stack.
  - 3. Combustion chambers.
  - 4. Warranty
  - 5. Control sequence and operation.
  - 6. Startup services.

**1.02 REFERENCE STANDARDS**

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. NFPA 70 - National Electrical Code.
- C. UL (DIR) - Online Certifications Directory.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the installation of incinerator with size, location and installation of service utilities.
- B. Preinstallation Meeting: Conduct a preinstallation meeting two weeks prior to the start of the work of this section; require attendance by all affected installers.
- C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include operating capabilities, fuel consumption rates, and cooling, combustion air, and exhaust requirements.
- C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.
  - 1. Equipment elevations for crematory system.
  - 2. Equipment plan for crematory system.
  - 3. Foundation elevation, equipment footprint, and foundation loads.
  - 4. Piping and instrumentation.
  - 5. System schematic.
  - 6. Control panel switch and lamp arrangement.
- D. Equipment Warranty: Submit sample of manufacturer's warranty.
- E. Evidence of qualifications for installer: Company specializing in the construction and installation of crematories with minimum 5 years experience.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
- G. Manufacturer's certification that products meet or exceed specified requirements.

- H. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
  - 1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.
- I. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.
- J. Maintenance contracts.
- K. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.
- L. Test Reports: Indicate results of performance testing.
- M. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- N. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- O. Manufacturer's Field Reports: Indicate procedures and findings.
- P. Operation Data: Include instructions for normal operation.
- Q. Maintenance Data: Include instructions for routine maintenance requirements, service manuals for engine and day tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.
- C. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- D. Provide three (3) sets of operator and maintenance manuals.

#### **1.06 WARRANTY**

- A. Seller warrants and represents that the Equipment will (a) perform in conformance with the specifications set forth herein, (b) shall be suitable for the incineration of waste in the capacities set forth in the specifications, (c) while handled and operated in accordance to manufacturer's specifications will meet or exceed the environmental, safety laws and regulations and emissions parameters presented herein, (d) be free of material defects for a period of two (2) years from startup date and (e) not violate the intellectual property rights of any third party. Defects in workmanship must be documented to the factory within thirty calendar days of arrival of equipment. Defects in workmanship are repaired by the factory or factory subcontractor at the expense of the factory. Replacement of defective parts is limited to replacement of the part itself excluding the costs of transportation and installation of the part. Consumables (thermocouples and exposed burner components) are not covered under this warranty. Routine wear & tear of refractory liner and moving parts, are not a part of this warranty.
- B. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Basis of Design Incinerator: Pennram Diversified Manufacturing Corporation ([www.pennram.com](http://www.pennram.com)).

- B. Substitutions: See Section 01 60 00 - Product Requirements. Submit substitution request at least 10 days prior to bid opening. Substitution request shall include entire submittal package as described in this section with explicit notations from vendor identifying all deviations from basis of design. Failure to comply will result in disqualification of substitution request.
- C. See Product Requirements 01 60 00.
- D. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.
- E. Burners shall be Eclipse or Hauck brand, with full modulation of fuel and combustion air. Sheet metal constructed burners are not permitted. Fuel trains shall be equipped for proof of closure, proven low fire start, air proving interlock, as well as high and low pressure switches.
- F. Basis of Design System Components:
  - 1. Refractory Liner: Harbison Walker Refractories
  - 2. Fuel Valves: Honeywell
  - 3. Pilot Solenoid Valves: Asco
  - 4. Air Solenoid Valves: Asco
  - 5. Combustion Air Damper Motors: Honeywell
  - 6. Temperature Controls: Honeywell
  - 7. Programmable Logic Controller (PLC): IDEC
  - 8. Burner Supervision: Honeywell
  - 9. Flame Monitor: Honeywell
  - 10. Control Panel (NEMA 4X): Hoffman Engineering
  - 11. Power Distribution / Circuit Breakers: Square D
  - 12. Motor Starters: Square D
  - 13. Panel Switches and Lamps: Square D
  - 14. Proximity Sensors: Square D
  - 15. Limit Sensors: Square D
  - 16. Combustion Air Blower: Cincinnati Blower or Chicago Blower
  - 17. Gas Pressure Regulator: Fisher Regulator Controls

## **2.02 INCINERATOR (CREMATORY) - BASE BID**

- A. The basis of design incinerator is the Pennram™ model LLC-225 crematory rated at a nominal 225 lbs/hr of animal remains. The natural gas fired crematory may be operated up to 2-3 cycles per day/ 16 hours per day. The system is equipped for manual feed and manual ash removal. The control system is fully automatic and safety interlocked. A provision is provided for placing padlocks on both access doors. The system start switch and primary and secondary burner switches require a key to operate. The crematory doors are equipped with an electrical interlock that will prevent the crematory from starting unless both doors are closed. This interlock device will immediately shut off the crematory if either door is opened during the cycle. The crematory may be bulk loaded up to 675-900 lbs. Burners are modulating for maximum fuel efficiency and stable operation. Waste reduction efficiency is 95% minimum.
  - 1. Maximum Load Capacity: 300-900 lbs
  - 2. Nominal Crematory Capacity: 225 lbs/hr
  - 3. Secondary Chamber Residence Time: One (1) Second + at 1800°F.
  - 4. Exhaust Stack Height: Approximately 20 ft (Discharge 33.25 ft Minimum Above Grade)
  - 5. Electronic monitor for primary temperature and secondary temperature.
  - 6. Fully automatic, pushbutton, touch screen control system.

### 2.03 INCINERATOR (CREMATORY) - ADD ALTERNATE NO. 4

- A. The basis of design incinerator is the Pennram™ model LLC-300 crematory rated at a nominal 300 lbs/hr of animal remains. The natural gas fired crematory may be operated up to 2-3 cycles per day/ 16 hours per day. The system is equipped for manual feed and manual ash removal. The control system is fully automatic and safety interlocked. A provision is provided for placing padlocks on both access doors. The system start switch and primary and secondary burner switches require a key to operate. The crematory doors are equipped with an electrical interlock that will prevent the crematory from starting unless both doors are closed. This interlock device will immediately shut off the crematory if either door is opened during the cycle. The crematory may be bulk loaded up to 900-1200 lbs. Burners are modulating for maximum fuel efficiency and stable operation. Waste reduction efficiency is 95% minimum.
1. Maximum Load Capacity: 300-1800 lbs
  2. Nominal Crematory Capacity: 300 lbs/hr
  3. Secondary Chamber Residence Time: One (1) Second + at 1800°F.
  4. Exhaust Stack Height: Approximately 20 ft (Discharge 33.25 ft Minimum Above Grade)
  5. Electronic monitor for primary temperature and secondary temperature.
  6. Fully automatic, pushbutton, touch screen control system.

### 2.04 CREMATORY PRIMARY COMBUSTION CHAMBER - BASE BID

- A. Two (2) 100,000-750,000 btu/hr natural gas burner with full modulation. Burner fuel train equipped with gas valves with proof of closure (POC) switches and proven low fire start (LFS). The gas manifold is equipped with high and low pressure gas switches coming to all three burners and air proving modulation to maintain an exhaust temperature of up to 1800 deg. F or other desired temperature range.
1. Honeywell™ electronic flame supervision with spark ignited pilot flame prior to main flame.
  2. Maximum/minimum firing rates are adjustable. Firing rate is automatically modulated to maintain an exhaust temperature of up to 1800 deg. F or other desired temperature range.
  3. Primary Burner Interlocks:
    - a. System on.
    - b. Primary temperature burner operating limits.
    - c. Primary chamber unload door proven closed.
    - d. Primary chamber load door proven closed.
    - e. Primary burner off-on-auto switch in on or auto position.
    - f. Remote burner switch in on position.
    - g. Start up pre-purge interlock.
- B. Chamber heat release shall not exceed 15,000 btu/ cubic foot/ hour
- C. Approximately 98 cu ft primary chamber volume. Primary chamber is liquid tight to 9" depth.
- D. 54" ID load/unload opening in end of chamber, opening is approximately 12" from grade.
- E. 64.5" diameter x 6.25" thick refractory (2550 deg. F) lined load/unload door is hinged on roller bearings, safety interlocked to burners, and provided with padlocking provisions. Door is sealed with high temperature rope gasket material. Two inches of block insulation is provided between refractory and steel shell of door.
- F. Carbon steel/ Refractory dam allow liquids up to 9" depth to collect in the primary chamber without leakage.
- G. 25 sq. ft. overall hearth area.
- H. Approximate overall chamber shell dimensions: 66.75" diameter (inner shell) x 94" length. The outer shell diameter is 73".
- I. Chamber lined with 5" 2550°F fire clay refractory and 1" insulation.
- J. Shell constructed of 0.250", 0.375", and 0.750" ASTM A-36 plate steel with 0.125" outer shell.

- K. Sandblast and finish with high (750°F) temperature industrial coating, factory standard gray.
- L. Refractory fastened to shell with 310 stainless steel anchors.
- M. Constructed of 1/8" (outer energy shell) and 3/8" (inner main structural shell) ASTM A-36 plate steel used to reduce shell temperature and preheat combustion air as well as combustion air distribution.
- N. A 36"x36" feed door and full size throat shall be extended into the facility as shown on the drawings, shall be of same construction as primary combustion chamber, and shall have an inclined throat. The feed door shall have end switches and safety controls connected to control panel.
- O. The primary chamber shall have a double wall shell aspirated with combustion air to promote cooler outer shell temperature as well as improve efficiency through preheat of combustion air.

**2.05 CREMATORY PRIMARY COMBUSTION CHAMBER - ADD ALTERNATE NO. 4**

- A. Two (2) 100,000-1,000,000 btu/hr natural gas burner with full modulation. Burner fuel train equipped with gas valves with proof of closure (POC) switches and proven low fire start (LFS). The gas manifold is equipped with high and low pressure gas switches coming to all three burners and air proving modulation to maintain an exhaust temperature of up to 1800 deg. F or other desired temperature range.
  - 1. Honeywell™ electronic flame supervision with spark ignited pilot flame prior to main flame.
  - 2. Maximum/minimum firing rates are adjustable. Firing rate is automatically modulated to maintain an exhaust temperature of up to 1800 deg. F or other desired temperature range.
  - 3. Primary Burner Interlocks:
    - a. System on.
    - b. Primary temperature burner operating limits.
    - c. Primary chamber unload door proven closed.
    - d. Primary chamber load door proven closed.
    - e. Primary burner off-on-auto switch in on or auto position.
    - f. Remote burner switch in on position.
    - g. Start up pre-purge interlock.
- B. Chamber heat release shall not exceed 15,000 btu/ cubic foot/ hour
- C. Approximately 128 cu ft primary chamber volume. Primary chamber is liquid tight to 9" depth.
- D. 58" ID load/unload opening in end of chamber, opening is approximately 12" from grade.
- E. 68.5" diameter x 6.25" thick refractory lined load/unload door is hinged on roller bearings, safety interlocked to burners, and provided with padlocking provisions. Door is sealed with high temperature rope gasket material. Two inches of block insulation is provided between refractory and steel shell of door.
- F. Carbon steel/ Refractory dam allow liquids up to 9" depth to collect in the primary chamber without leakage.
- G. 30 sq. ft. overall hearth area.
- H. Approximate overall chamber shell dimensions: 70.75" diameter (inner shell) x 102" length. The outer shell diameter is 77".
- I. Chamber lined with 5" 2550°F fire clay refractory and 1" insulation.
- J. Shell constructed of 0.250", 0.375", and 0.750" ASTM A-36 plate steel, 0.125" outer shell.
- K. Sandblast and finish with high (750°F) temperature industrial coating, factory standard gray.
- L. Refractory fastened to shell with 310 stainless steel anchors.

- M. Constructed of 1/8" (outer energy shell) and 3/8" (inner main structural shell) ASTM A-36 plate steel used to reduce shell temperature and preheat combustion air as well as combustion air distribution.
- N. A 36"x36" feed door and full size throat shall be extended into the facility as shown on the drawings, shall be of same construction as primary combustion chamber, and shall have an inclined throat. The feed door shall have end switches and safety controls connected to control panel.
- O. The primary chamber shall have a double wall shell aspirated with combustion air to promote cooler outer shell temperature as well as improve efficiency through preheat of combustion air.

## **2.06 CREMATORY SECONDARY COMBUSTION CHAMBER - BASE BID**

- A. One (1) 160,000 - 1,250,000 btu/hr natural gas burner with full modulation. Burner fuel train equipped with gas valves with proof of closure (POC) switches and proven low fire start (LFS). The gas manifold is equipped with high and low pressure gas switches coming to all three burners and air proving modulation to maintain an exhaust temperature of up to 1800 deg. F or other desired temperature range.
  - 1. Honeywell™ electronic flame supervision with spark ignited pilot flame prior to main flame.
  - 2. Maximum / minimum firing rates are adjustable. Firing rate is automatically modulated to maintain minimum exhaust temperature of up to 1800 deg. F or other desired temperature range.
  - 3. Secondary burner interlocks:
    - a. System on.
    - b. Secondary temperature burner operating limit.
    - c. Secondary burner off-on-auto switch in on or auto position.
    - d. Remote burner switch in on position.
    - e. Start up pre-purge interlock.
- B. 5 HP backward inclined combustion air blower direct driven to generate a modulated 470 scfm combustion air at 4" w.c. static pressure to supply low pressure air to the secondary chamber combustion air manifold and primary combustion air manifold; And to generate a modulated 490 scfm combustion air at 12" w.c. static pressure to supply higher pressure air to the secondary burner and the primary burners; And equipped with five (5) modulating butterfly dampers which are actuated by five (5) Honeywell™ modulating motors to provide modulated combustion air to the secondary combustion chamber air manifold, the secondary burner, and the primary burners. Air is modulated for maximum fuel efficiency. Backward incline selection is for purposes of lower noise level and reduced electrical consumption.
- C. Internal combustion air manifold with nominal total 24 combustion air input jets. Combustion air manifold and air jets shall be embedded in the refractory lining of the secondary chamber. The combustion air manifold is a minimum of 32 square feet of heating surface and employs wasted energy lost through the secondary chamber shell to preheat secondary combustion air. The combustion air manifold shall be fabricated of 1/4" minimum A36 steel plate. Air jets shall be arranged for optimum combustion air turbulence. Air jets shall be fabricated of 1" schedule 80 pipe minimum.
- D. 44 cu. ft. secondary chamber volume.
- E. 1.0+ second secondary chamber residence time @ 1800°F.
- F. Dimension: 50.5" O.D. x 80" L.
- G. Chamber lined with 4" 2550°F refractory & 1" insulation.
- H. Shell constructed of 0.250" ASTM A-36 plate steel. Double end shell.
- I. Sandblast and finish with high (750°F.) temperature industrial coating, factory standard gray.
- J. Refractory fastened to shell with 310 stainless steel anchors.

## 2.07 CREMATORY SECONDARY COMBUSTION CHAMBER - ADD ALTERNATE NO. 4

- A. One (1) 160,000 - 1,600,000 btu/hr natural gas burner with full modulation. Burner fuel train equipped with gas valves with proof of closure (POC) switches and proven low fire start (LFS). The gas manifold is equipped with high and low pressure gas switches coming to all three burners and air proving modulation to maintain an exhaust temperature of up to 1800 deg. F or other desired temperature range.
  - 1. Honeywell™ electronic flame supervision with spark ignited pilot flame prior to main flame.
  - 2. Maximum / minimum firing rates are adjustable. Firing rate is automatically modulated to maintain minimum exhaust temperature of up to 1800 deg. F or other desired temperature range.
  - 3. Secondary burner interlocks:
    - a. System on.
    - b. Secondary temperature burner operating limit.
    - c. Secondary burner off-on-auto switch in on or auto position.
    - d. Remote burner switch in on position.
    - e. Start up pre-purge interlock.
- B. 7.5 HP backward inclined combustion air blower direct driven to generate a modulated 625 scfm combustion air at 4" w.c. static pressure to supply low pressure air to the secondary chamber combustion air manifold and primary combustion air manifold; And to generate a modulated 583 scfm combustion air at 12" w.c. static pressure to supply higher pressure air to the secondary burner and the primary burners; And equipped with five (5) modulating butterfly dampers which are actuated by five (5) Honeywell™ modulating motors to provide modulated combustion air to the secondary combustion chamber air manifold, the secondary burner, and the primary burners. Air is modulated for maximum fuel efficiency. Backward incline selection is for purposes of lower noise level and reduced electrical consumption.
- C. Internal combustion air manifold with nominal total 24 combustion air input jets. Combustion air manifold and air jets shall be embedded in the refractory lining of the secondary chamber. The combustion air manifold is a minimum of 32 square feet of heating surface and employs wasted energy lost through the secondary chamber shell to preheat secondary combustion air. The combustion air manifold shall be fabricated of 1/4" minimum A36 steel plate. Air jets shall be arranged for optimum combustion air turbulence. Air jets shall be fabricated of 1" schedule 80 pipe minimum.
- D. 58 cu. ft. secondary chamber volume.
- E. 1.0+ second secondary chamber residence time @ 1800°F.
- F. Dimension: 54.5" O.D. x 86" L.
- G. Chamber lined with 4" 2550°F refractory & 1" insulation.
- H. Shell constructed of 0.250" ASTM A-36 plate steel. Double end shell.
- I. Sandblast and finish with high (750°F.) temperature industrial coating, factory standard gray.
- J. Refractory fastened to shell with 310 stainless steel anchors.

## 2.08 CREMATORY STACK - BASE BID

- A. Dimensions: 20" I.D. x 26" O.D. x 33.25 ft. height to outlet above grade.
- B. Lined with nominal 2.75" 2500°F insulating refractory.
- C. Shell constructed of 0.250" ASTM A-36 plate steel and flanged on 48" intervals.
- D. Flanges bolted by (20) 1/2-13 x 1-1/4 XH A325 structural bolts.
- E. Sandblast and finish with high (750°F.) temperature industrial coating, factory standard gray finish.

- F. The exhaust stack shall be free-standing, capable of withstanding 100+ MPH winds without the use of guy wires or external support.

**2.09 CREMATORY STACK - ADD ALTERNATE NO. 4**

- A. Dimensions: 24" I.D. x 30" O.D. x 33.25 ft. height to outlet above grade.
- B. Lined with nominal 2.75" 2500°F insulating refractory.
- C. Shell constructed of 0.250" ASTM A-36 plate steel and flanged on 48" intervals.
- D. Flanges bolted by (20) 1/2-13 x 1-1/4 XH A325 structural bolts.
- E. Sandblast and finish with high (750°F.) temperature industrial coating, factory standard gray finish.
- F. The exhaust stack shall be free-standing, capable of withstanding 100+ MPH winds without the use of guy wires or external support.

**2.10 CREMATORY CONTROL SYSTEM**

- A. NEMA 12 enclosure.
- B. PLC control system with touch screen.
- C. Control of secondary burner, primary burners, Honeywell flame controls, on screen digital temperature controls, combustion air blower, and safety and operating interlocks.
- D. Panel includes power distribution breakers, motor starters, display modules, and visual burner failure alarm.
- E. 208/3/60 power supply
- F. Control Cabinet Switches:
  - 1. System Start (key lock switch)
  - 2. System Emergency Stop
  - 3. Primary Burner #1 on/off/auto (key lock switch)
  - 4. Primary Burner #2 on/off/auto (key lock switch)
  - 5. Secondary Burner on/off/auto (key lock switch)
  - 6. Primary Burner #1 Reset
  - 7. Primary Burner #2 Reset
  - 8. Secondary Burner Reset
- G. Control Cabinet Pilot Lamps: (on screen)
  - 1. Primary Burner #1 Fail - alarm
  - 2. Primary Burner #2 Fail - alarm
  - 3. Secondary Burner Fail - alarm
  - 4. Purge Cycle
  - 5. Preheat Cycle / Low Temperature Lockout
  - 6. Cremation Cycle
  - 7. Cooling Cycle
  - 8. Load
  - 9. Do Not Load
  - 10. Primary Burner #1 Demand
  - 11. Primary Burner #1 Main Fuel Valve
  - 12. Primary Burner #2 Demand
  - 13. Primary Burner #2 Main Fuel Valve
  - 14. Secondary Burner Demand
  - 15. Secondary Burner Main Fuel Valve
- H. Control Cabinet Digitally Displayed Data:
  - 1. Primary Temperature

2. Secondary Temperature
  3. Cycle Time
- I. Honeywell electronic flame monitoring equipment.
  - J. IEC rated motor controls.
  - K. Circuit breakers for each motor and control circuit.
  - L. All control system components shall employ non-volatile memory. Memory shall be retained for one year minimum with electrical power shut off.
  - M. The memory of the computer (if equipped) and temperature controls is non-volatile. There is no need for a battery back-up. The memory is retained without power or batteries for 7-10 years.
  - N. The fuel burners automatically adjust the fuel consumption rate to maintain the exhaust temperature and to conserve fuel. The fuel burners are electronically monitored for safety.
  - O. The controls are fully automatic and safety interlocked to protect the operator.
  - P. The control panel lamps and switches will be engraved in English.

#### **2.11 CREMATORY CONTROL SYSTEM SEQUENCE**

- A. PURGE cycle is initiated when the SYSTEM START button is pressed, during the purge cycle the combustion air blower runs for approximately three minutes prior to lighting the crematory burners. The preheat cycle immediately follows the purge cycle.
- B. PREHEAT cycle is temperature controlled and is maintained until the secondary chamber temperature reaches 1400°F. (or other user adjustable set point). At this time the crematory chamber burner will ignite and begin the cycle.
- C. COMBUSTION AIR BLOWER provides combustion air to the secondary chamber. The combustion air blower cycles on during the purge cycle, off during the preheat cycle, on again after the preheat cycle, and cycles off at the end of the time cycle as controlled by the panel mounted cycle timer.
- D. SECONDARY COMBUSTION AIR The secondary combustion air is controlled with a motorized damper. The motorized damper is proportionate to the secondary temperature. The damper fully opens during the purge cycle and closes during the preheat cycle.

#### **2.12 EMISSION PERFORMANCE**

- A. Emissions to contain 7% O<sub>2</sub>; no smoke.
- B. CO emissions shall be equal or less than 40 ppm<sub>dv</sub>.
- C. Particulate emissions shall be equal or less than 0.06 gr/dscf.
- D. Visible emission average shall be less than 2% opacity (not visible).
- E. The system as installed shall meet all EPA and State of Delaware Environmental Regulations.

#### **2.13 ACCESSORIES TO BE PROVIDED**

- A. UPS Package to protect 24VDC power to PLC and HMI screen, 9 hour battery with separate enclosure to house UPS.
- B. Exhaust temperature recording device with connection to control panel.
- C. ADD ALTERNATE NO. 3 - Electronic particulate monitor (PCME Model QAL 181 or approved equal) with high temperature electrodynamic sensor operable up to 1832 deg. F (PCME DT990 or approved equal).
  1. Number of sensors / channels: 1-32.
  2. Display: High-contrast, anti-glare 7" (viewable) TFT LCD.
  3. Multiple Data Viewing: PC/RS-485/Ethernet simultaneously.
  4. Features:
    - a. Icon-driven, multilingual menus.

- b. Sensor system setup and configuration options.
- c. Configurable emission alarm levels.
- d. Sensor calibration screens.
- e. Seamless integration with existing PCME control units and sensors.
- 5. Data Logging:
  - a. Long-term log: 48 months @ 15 minutes.
  - b. Short-term log: 28 days @ 1 minute.
  - c. Pulse log: 32 hours @ 1 second.
  - d. Alarm log: 500 entries.
- 6. System Outputs:
  - a. Ethernet (RJ45) - Connection type: 100Base-T/Tx 100 Mb/s.
  - b. USB 2.0 - Suitable for connecting to a local PC or laptop.
  - c. Relays: 4 (programmable, 4-20mA).
  - d. RS-485.
- 7. Four (4) digital system inputs.
- 8. Interface Module:
  - a. Display: Two-tone grey, backlit graphical LCD.
  - b. Multiple data viewing: PC or RS-485.
  - c. Features and Functions:
    - 1) Navigation keys (up, down, left, right, enter)
    - 2) Sensor system setup and configuration options.
    - 3) Configurable emission alarm levels.
    - 4) Sensor calibration screens.
    - 5) Seamless integration with existing PCME control units and sensors.
    - 6) Data Logging:
      - (a) Long-term log: 12 months @ 15 minutes.
      - (b) Short-term log: 7 days @ 1 minute.
      - (c) Pulse log: 8 hours @ 1 second.
      - (d) Alarm log: 500 entries.
    - 7) System Outputs:
      - (a) 2 x programmable digital relays.
      - (b) 1 x programmable 4-20mA relays.
      - (c) 1 x RS-485 system output.
    - 8) One (1) digital system input.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Installation and startup of the incinerator shall be performed by the factory or by a factory-authorized representative.
- B. The incinerator installer is to provide all wiring and programming as needed to meet the requirements of this specification, sequence of operations, and project requirements. All wiring shall be provided in rigid metal conduit.

#### **3.02 SYSTEM STARTUP**

- A. Provide manufacturer's field representative to perform systems startup.
- B. Prepare and start equipment and systems in accordance with manufacturers' instructions and recommendations.
- C. Installation of equipment, start up, refractory curing, controls set up and testing, and operator training is to be by factory engineer.
- D. Test Procedure:

1. Check for correct connected voltage before powering crematory.
2. Check program temperature controls.
3. Check for correct fuel pressure at both gas burners.
4. Check motor rotations.
5. Check operation of electrical door interlocks.
6. Calibrate combustion air pressure mins/maxs. and correct operation of combustion air controls per factory start up data.
7. Check for correct operation of burner modulation controls.
8. Check for correct operation of opacity control/alarm/automatic corrective action.
9. Calibrate gas burners per factory start up data.
10. Calibrate recorder and check operation.
11. Start crematory for refractory curing:
  - a. Operate crematory at 200°-250° for four hours.
  - b. Elevate operating temperature of the chambers 100°F. per hour to 1600°F. and/or maximum operating temperature.
12. Run crematory for normal operation.
13. Weigh untreated waste stream.
14. Check stack throughout the cycle and fine tune combustion air settings as required.
15. Monitor operation of crematory.
16. Weigh resulting ashes.
17. Record all operation set points & combustion air settings.

### **3.03 CLOSEOUT ACTIVITIES**

- A. Complete permitting and coordinate inspection by DNREC.
  1. The factory will complete the technical portions of the Permit application as they pertain to the crematory.
  2. Drawings required for the permit application will be supplied by the factory.
  3. Test results, by an independent laboratory, of similar installations, for the permit application, will be provided by the factory.
  4. Engineering data required for the permit application will be supplied by the factory.
- B. Demonstrate proper operation of equipment to Owner's designated representative.
- C. Demonstration: Demonstrate operation of system to Owner's personnel.
  1. Use operation and maintenance data as reference during demonstration.
  2. Conduct walking tour of project.
  3. Briefly describe function, operation, and maintenance of each component.
- D. Training: Train Owner's personnel on operation and maintenance of system.
  1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
  2. Provide minimum of 8 hours of training.
  3. Instructor: Manufacturer's training personnel.
  4. Location: At project site.

### **3.04 CREMATORY LOADING**

- A. Load the crematory with up to 600-900 lbs. animal remains. Large animals should be loaded while the crematory is cool for safety purposes.
- B. Load the animal remains as close to the burner (in the back of the crematory) as possible without totally blocking the burner.
- C. Animals may be loaded into the crematory when the LOAD lamp is illuminated.
- D. Do not load the crematory when the DO NOT LOAD lamp is illuminated.

- E. CAUTION - Avoid opening the loading door while the crematory is on line (running). If it is necessary to open the crematory during operation use appropriate safety clothing and observe caution. The operator should stand behind the door while opening the door very slowly. This will allow the primary chamber combustion components to shut off before the door is fully open.

### **3.05 CREMATORY OPERATION**

#### **A. PANEL CONTROLS**

1. SYSTEM START KEY SWITCH
  - a. Twisting the spring loaded switch engages the control system and initiates the purge cycle. The ash door and fire door must be proven closed before the system will start.
2. SYSTEM STOP PUSH BUTTON
  - a. Pressing of button will disengage the crematory control system. This button is normally not used.
3. PRIMARY BURNER ON/OFF/AUTO SWITCH AND SECONDARY BURNER ON/OFF/AUTO SWITCH
  - a. Normally left in the AUTO position; in the OFF position the burner will not run; in the ON position the burner will run continuously. In the AUTO position the burner will operate according to control system limits.

### **3.06 CREMATORY OPERATION CHECKLIST**

#### **A. START UP:**

1. Remove ashes from the crematory if necessary.
2. Load 300-900 lbs of animal remains.
3. Check that the load door is proven closed.
4. Set timer TD2 on the panel door for 1 hour per 225 lbs loaded into the crematory
5. Insert the key into the start switch and rotate SYSTEM START key momentarily clockwise.
6. The crematory will PURGE for five minutes.
7. Following PURGE, the crematory will preheat the secondary chamber to 1400-1800°F.
8. The crematory chamber burner will ignite after the preheat period.

#### **B. DAILY SHUTDOWN:**

1. The crematory will shut off automatically at the end of the preset time on the cooling cycle timer.

#### **C. POWER OUTAGE RESTART:**

1. Use same procedure as START UP.

**END OF SECTION**