




WASTE INCINERATORS

Changes shown by ⇒

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### Revision Memo

10/1995	Revision 1, Original Issue
10/1997	Revision 2 complete technical and editorial change in accordance with CCS 7-4-1.

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## SCOPE

- 1.1 This specification covers the requirements for the design, fabrication, inspection, testing and supply of Waste Incinerator system and its ancillary equipment.
- 1.2 The system will be located outdoors in an unclassified-hazardous area inside an oil and gas production facility. The system shall be capable of safely incinerating industrial waste, construction waste, medical waste and some municipal waste.
- 1.3 An asterisk (\*) indicates that additional information is provided by ESSO in an addendum to this specification.
- 1.4 A pound sign (#) indicates that ESSO review/approval is required before design is finalized or equipment is purchased.
- 1.5 The Waste Incinerator system shall be a complete package of Supplier's standard design suitable for the application as described in this specification and the Waste Incinerator Data Sheet, and shall include, but not necessarily be limited to, the following items:
  - a. Primary and secondary combustion chambers.
  - b. Blowers, drivers, coupling, guards, ducts and equipment shelter.
  - c. Trays or containers for solids or sludges.
  - d. Built-in stack.
  - e. Refractory lining.
  - f. Fuel handling equipment capable of firing diesel fuel and used motor oil.
  - g. Fuel control valve train.
  - h. Automatic ash removal facilities.
  - i. Burner management controls system.
  - j. Pollution control equipment, as required.
  - k. Waste pre-processing (e.g., shredding) and loading system.
  - l. Start-up and commissioning of the system.

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- 1.6 No chlorinated wastes will be fed to incinerator and waste feed mixture will have a minimum heat content of 14,000 kJ/kg (6000 BTU/LB.)
- 1.7 The incinerator should be designed to comply with US EPA regulations for municipal waste incineration (40CFR240), at a minimum, to insure long term quality of operation. Design shall also be appropriate for any solvents or hazardous wastes that may be incinerated as per Contractor's Waste Management Plan.

### SUMMARY OF ADDITIONAL REQUIREMENTS

- 2.1 Table 1 lists the specifications, codes and standards which shall be used as a part of this specification.
- 2.2 The equipment and materials used shall conform to the latest editions, revisions and addenda of the codes, standards and regulations listed in Table 1.

**TABLE 1**

<b>ESSO Chad Specifications</b>	
ECS 2-1-1	Equipment Noise Level Data Requirements
ECS 3-4-1	Piping for Fired Equipment
ECS 3-16-1	Flanges, Gaskets, Bolting and Fittings
ECS 3-18-1	Piping Fabrication Shop or Field
ECS 3-19-1	Piping Erection, Testing, Flushing and Cleaning
ECS 4-1-2	Structural Steel Design
ECS 4-1-3	Design Loads for Structures
ECS 4-1-5	Wind Design Loads
ECS 4-2-1	Auxiliary Structures for Operation and Maintenance
ECS 15-0-100	Instrumentation General Specification
ECS 15-1-200	Instrumentation for Small Oil Fired Heaters
ECS 15-2-1	Temperature Instruments
ECS 15-3-1	Pressure Instruments
ECS 15-6-2	Environmental protection for Electronic Devices
ECS 15-6-3	Programmable Logic Controllers
ECS 15-11-1	Instruments Control Panels

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**TABLE 1 (Cont'd)**


ECS 16-9-1	AC Motors
ECS 19-3-1	Gunite Linings
ECS 19-3-3	Linings for Fired Heaters
ECS 20-1-1	Inspection of Equipment and materials
ECS 20-1-3	Quality Programs and Quality Assurance Plans
ECS 26-1-5	Environmental Impact Mitigation
<b>ANSI Standards</b>	
B31.3	Chemical Plant and Petroleum Refinery Piping
B16.5	Steel Pipe Flanges and Flanged Fittings
B16.47	Large Diameter Steel Flanges NPS 26 through NPS 60

### DOCUMENTATION

- 3.1 Vendor shall supply drawings and data in sufficient detail to define interface requirements, describe all systems including accessories, define operational requirements and provide information to design and construct foundation and other related installation and support services for the waste incinerator system.

### DESIGN/CONSTRUCTION FEATURES

- 4.1 The incinerator design must address the following:
- Unit must provide a safe and low maintenance feed system. Feed door system must provide adequate seals.
  - System must provide excellent burn out of all organics. The destruction removal efficiency (DRE) for organics shall be >99% for a resulting ash organic content <1/0% carbon by wt.
  - Minimum combustion temperature 815°C (1500°F) in primary stage and 982°C (1800°F) in secondary stage.
  - Thermal NO<sub>x</sub> <45 ppm
  - Particulate loadings ≤ 0.10 grains/dSCF corrected to 12% CO<sub>2</sub>
  - Unit must have a minimum of two combustion stages.
  - Flue Gas residence time ≥ 1.5 seconds.
  - Unit will be operated 8 hours/day.
  - % opacity ≤ 5.
  - Input material density 1200 kg/m<sup>3</sup> (2000 lbs/yd<sup>3</sup>.)
  - A shredder shall be provided to reduce all waste feed to 75mm (3 in.) max. (widest dimension).
- 4.2 Incinerator will be provided with low fire system capable of maintaining a unit

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temperature of 105°C (220°F) minimum.

- 4.3 The incinerator instrumentation must be kept to a minimum for long term maintainability and ease of operation. The unit will be designed for manual operation to the extent possible.


#### **Waste Classification**

- 4.4 The classification of wastes to be incinerated shall be as per Table 2.

**TABLE 2**

<b>Waste Type</b>	<b>Description</b>	<b>Typical Analysis</b>	<b>Moisture wt. %</b>	<b>Density kg/m<sup>3</sup></b>	<b>Heat Content kJ/kg</b>
0	Dry industrial & commercial rubbish	Cardboard, wooden pallets, dry paper, floor sweepings, plastic bags	10	5	8500
1	General, industrial commercial & domestic rubbish	Cardboard, paper, floor sweepings, up to 20% kitchen waste	25	10	6500
2	Refuse	Kitchen & domestic wastes, wet paper, floor sweepings, garden waste	50	15	4300
3	Pathological materials	Hospital dressing, disposable beddings, gowns, etc.	10-30	5-15	4500-8000
4	Pathological remains	Dead animals, human tissue, etc.	85	25-75	1000
5	Industrial wastes/oil sludge	Industrial process wastes	-	850-960	40,000
6	Semi-solid and solid wastes	Combustibles requiring hearth, retort, or grate burning equipment	-	Variable according to waste survey	Variable according to waste survey

Note:

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1. Waste and classification based on *Handbook of Industrial Waste Disposal*, Tables 9-1 and 9-3, by Richard A. Connery and N.D. Ross, published by Van Nostrand Reinhold (1980).

### **Design Basis**

- 4.5 The design basis, waste production rate, required incinerator capacity, fuels supplied and operational features shall be specified in the Waste Incinerator Data Sheet.

### **Body Casing**

- 4.6.1 The incinerator assembly shall be made of carbon steel plate and adequately reinforced with structural steel members. When structural steel frame is involved it shall be designed in accordance with ECS 4-1-2, 4-1-3 and 4-1-5.
- 4.6.2 The primary and secondary chambers shall be seal welded complete to prevent the inclusion of incoming air.

### **Access for Inspection and Maintenance**


- 4.7.1 Both primary and secondary chambers shall be provided with adequate access doors for waste loading, inspection, maintenance and ash discharge.
- 4.7.2 Each door assembly shall include a sealing device adequate to stand the internal temperature of the chambers and to prevent air leakage from outside. The door assembly shall be designed to hold a minimum of 12.5 mm (0.5 inch) water negative pressure.
- 4.7.3 Vendor shall provide adequate ladder and platform for easy access to perform inspection and maintenance.

### **Sight Glasses**

- 4.8.1 Both primary and secondary chambers shall have sight ports or sight glasses permitting safe observation of the combustion process throughout the operation.

### **Refractories**

- 4.9.1 All refractory design and material shall meet the requirements as described in ECS 19-3-1 and ECS 19-3-3.
- 4.9.2 The calculated cold face temperature of the exterior surface of the casing shall not be more than 82°C (180°F) based on 42°C (108°F) ambient.
- 4.9.3 The castable refractory shall be secured to the inside of the steel casing with anchors

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made of stainless steel.

### **Waste Loading and Ash Removal Facilities**

4.10.1 Supplier shall propose a system with related facilities to ensure the operation can be carried out efficiently and safely with minimum involvement of the operators. Supplier shall provide design such that ash removal from the primary chamber will be initiated automatically at the end of the cool-down cycle.

### **Burner and Ignition System**

4.11.1 Vendor shall provide only designs that have been in service for at least 2 years.

4.11.2 The primary and secondary burners shall be flange mounted on the incinerator casing and piped to a single fuel supply line for ease of installation.

\* 4.11.3 All burners shall be capable of firing diesel fuel and used motor oil as specified on the data sheet. Electric ignition system shall be provided.

4.11.4 All burner combustion air shall be supplied by air blowers. These air blowers shall be mounted on the incinerator casing with ducting leading to the ports of the combustion chambers.

4.11.5 Blowers and motors shall be provided with external lubrication. Lubrication facilities shall be grouped together for easy access for maintenance.

4.11.6 Burners with high turndown ratio shall be used for the purpose of warming up combustion chambers and for good modulation of control and fuel efficiency.


4.11.7 Burners shall be of the low NO<sub>x</sub> type to meet the current emission standards as outlined in par. 4.13.1, Table 3.

### **Instrumentation and Controls**

4.12.1 Instrumentation shall follow the requirements outlined in ECS 15-1-200.

4.12.2 Vendor shall provide complete Burner Management Package (BMP) for fuels as outlined on data sheets. BMP shall monitor pilots, main burners, fans, fuel supplies, combustion chambers, stack and all other required control parameters. BMP shall also shutdown the incinerator upon a system failure and/or detection of a hazardous condition.

4.12.3 Temperature control shall be segmented per burner gallery. Temperature control of the stack shall be included in the control scheme, as required to meet waste incineration requirements including medical, municipal and industrial wastes.

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4.12.4 Other control parameters to be considered are:

- a. Flow rate of waste to be incinerated.
- b. Proper/complete incineration.
- c. Emission concentration and levels allowable of incinerated products including NO<sub>x</sub>, CO, CO<sub>2</sub>, O<sub>2</sub>, SO<sub>2</sub>, PM<sub>10</sub> and HCL.

4.12.5 Control shall be stand-alone, electronic programmable logic controller (PLC).

4.12.6 Local panels shall be suitable for outdoor and tropical use and meet the requirements of ECS 15-11-1.


4.12.7 Vendor shall advise ESSO of restrictions of controls/control panel and if control room environment is required.

4.12.8 Vendor shall supply control system completely coordinated, constructed, wired and checked out at the factory.

4.12.9 Vendor shall route/terminate locally mounted instruments through a skid edge junction box to the control panel. Local control panel may have the junction box integral.

4.12.10 Output and input signals shall be provided via a PLC Serial Communication Port for the following:

- a. Stack temperature.
- b. Stack temperature set point
- c. Incinerator common alarm.
- d. Incinerator/component running status.
- e. Incinerator shutdown.
- f. ESD input.

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- g. Input to low fire state.
- h. Input to permissive to start.
- i. Local ESD.
- j. Any other available PLC register information.

4.12.11 Vendor's standard package shall be accepted provided that it meets or exceeds ESSO standards.

4.12.12 All instruments shall appear on a Vendor P&ID in compliance with ISA Standards; tag numbers shall be assigned by ESSO.


4.12.13 All instruments shall have ISA type data sheets.

# 4.12.14 All control devices and systems shall be approved by ESSO prior to construction.

4.12.15 Instrument tagging for inline equipment and major components such as PLCs shall have a nameplate with the following information as applicable:

- a. Equipment identification number (instrument tag number).
- b. Pressure rating of pressure containing parts.
- c. Manufacturer's name.
- d. Model.
- e. Serial number.
- f. Operating range.
- g. Materials.
- h. Size of outer and inner components.
- i. Voltage appraisal class.
- j. Type.
- k. Range.

4.12.16 Information plates and nametags shall be securely attached by mechanical means with threaded fastener or fluted rivets. Adhesive fastening method is not acceptable. Only the instrument tag number may be fastened by stainless

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steelcable complete with stainless steel crush clamps or 18 gauge stainless steel wire.

- 4.12.17 PLC shall have a communications port using Allen Bradley Data Highway Plus for interfacing to the Pipeline Automation System.
- 4.12.18 All transmitters shall be Honeywell Smart Transmitters.
- 4.12.19 All electrical/electronic equipment and devices must be listed and labelled by a Cenelec recognized testing agency for their intended use.

#### **Noise Requirements**

- 4.13.1 The incinerator sound level the requirements of ECS 2-1-1.

#### **Emission Requirements**

- 4.14.1 The air quality standard given in ECS 26-1-5 shall be met.

#### **Area Classification**


- \* 4.15.1 Area classification for the location of the incineration system will be as specified in the data sheet.

### **MATERIALS**

- 5.1 Unless otherwise stated in this specification, the materials of construction shall be the Vendor's standards that are suitable for the process and environment and have proven successful in similar services.
- 5.2 All components of the pilot ignition panel shall be suitable for tropical and outdoor installation.
- 5.3 A certificate of material compliance is required where special alloys other than carbon steel are used.

### **FABRICATION**

- 6.1 The entire incineration system with its components shall be fabricated and packaged in Vendor's shop as much as possible to minimize field work.
- 6.2 Vendor shall fabricate and layout the whole system within the maximum dimensions permissible for transportation and be ready for start-up with minimal field assembly, except to interface with the required site facilities.


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### INSPECTION AND TESTING

- 7.1 The inspection and quality control program shall be carried out and executed in accordance with ECS 20-1-1.
- 7.2 Vendor shall furnish copies of all inspection and quality control documents in accordance with ECS 20-1-1 and ECS 20-1-3.
- 7.3 Instrument and control devices/systems shall be factory acceptance tested and approved prior to shipping.

### PERFORMANCE

- 8.1 Vendor shall guarantee that the system provided meets the requirements stated in this specification and the data sheets.

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**CHAD DOBA DEVELOPMENT  
 PROJECT ADDENDUM**

4.11.3 See the Waste Incinerator Data Sheet.

4.15.1 See other related documents for the waste incinerator.