****
USACE / NAVFAC / AFCESA **UFGS-11182 (August 2004)**

Preparing Activity: USACE **Superseding UFGS-11182A (August 2001)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 23 June 2005

Latest change indicated by CHG tags
****

SECTION TABLE OF CONTENTS

DIVISION 11 - EQUIPMENT

SECTION 11182

INCINERATORS, MEDICAL WASTE

08/04

2.1.10 Thermometers
2.1.11 Valves
2.1.11.1 Angle
2.1.11.2 Check
2.1.11.3 Gate
2.1.11.4 Globe
2.1.12 Refractory for Castings
2.1.13 Charging Ram
2.1.14 Pyrometer
2.1.15 Thermocouple
2.2 ELECTRICAL WORK
2.3 INCINERATOR
2.3.1 Type of Waste
2.3.2 Capacity
2.3.3 Volume
2.3.4 System Components
2.4 OPERATING AND PERFORMANCE REQUIREMENTS
2.4.1 Weight Reduction
2.4.2 Stack Discharge
2.4.3 Noise
2.5 FURNACE CONSTRUCTION
2.5.1 Primary Chamber
2.5.2 Secondary Chamber
2.5.3 Insulation
2.5.4 Refractory
2.5.5 Exterior Walls
2.5.6 Hearth
2.5.7 Doors
2.5.7.1 Stoking and Cleanout Doors
2.5.7.2 Mechanical-Charging Doors
2.5.8 Observation Ports
2.5.9 Damper
2.5.10 Bypass Dampers
2.5.11 Test Holes (Instrument Test Group)
2.6 FLUE GAS CLEANING SYSTEM
2.6.1 System Components
2.6.2 Product Storage Capacity
2.6.3 Adsorbers
2.6.3.1 Access
2.6.3.2 Construction
2.6.3.3 Gas Flow
2.6.4 Product Handling and Preparation System
2.6.5 Powdered Activated Carbon
2.6.6 Pebble Quick Lime Analysis
2.6.7 Service and Process Water Analysis
2.7 HEAT RECOVERY BOILER
2.8 STRUCTURAL DESIGN CRITERIA
2.8.1 Site Work
2.8.2 Roof Loads
2.8.3 Floor Loads
2.8.4 Lateral Loads
2.9 Noise Limitations
2.10 AUXILIARY EQUIPMENT
2.10.1 Charging Method
2.10.2 Burners
2.10.3 Fuel Oil Storage Tank
2.10.4 Stack
2.10.5 Breeching
2.10.6 Draft Equipment

-- End of Section Table of Contents --

****

USACE / NAVFAC / AFCESA | **UFGS-11182 (August 2004)**

Preparing Activity: USACE | **Superseding UFGS-11182A (August 2001)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 23 June 2005

Latest change indicated by CHG tags

****

SECTION 11182

INCINERATORS, MEDICAL WASTE
08/04

****

NOTE: This guide specification covers the requirements for medical waste incinerators having a capacity ranging from 34 to 567 kg (75 to 1250 pounds) per hour.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

****

PART 1 GENERAL

1.1 REFERENCES

****

NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest guide specification. Use of SpecsIntact automated reference checking is recommended for projects based on older guide specifications.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL(AMCA)

AMCA 210	(1999) Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
AMCA 99	(1999; R 2003) Standards Handbook

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2002) Minimum Design Loads for Buildings and Other Structures

AMERICAN WELDING SOCIETY (AWS)

AWS B2.1	(2000) Welding Procedure and Performance Qualification
AWS D1.1/D1.1M	(2004) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B1.20.1	(1983; R 2001) Pipe Threads, General Purpose, Inch
ASME B16.1	(1998) Cast Iron Pipe Flanges and Flanged Fittings
ASME B16.11	(2002) Forged Fittings, Socket-Welding and Threaded
ASME B16.15	(1985; R 2004) Cast Bronze Threaded Fittings Classes 125 and 250
ASME B16.21	(1992) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.3	(1998) Malleable Iron Threaded Fittings
ASME B16.39	(1998) Malleable Iron Threaded Pipe Unions
ASME B16.4	(1998) Gray Iron Threaded Fittings
ASME B16.5	(2003) Pipe Flanges and Flanged Fittings
ASME B16.9	(2003) Factory-Made Wrought Steel Buttwelding Fittings
ASME B40.100	(2000) Pressure Gauges and Gauge Attachments
ASME BPVC SEC IX	(2001) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications
ASME PTC 19.3	(1974; R 2004) Temperature Measurement

ASTM INTERNATIONAL (ASTM)

ASTM A 1008/A 1008M	(2004b) Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
ASTM A 1011/A 1011M	(2004a) Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High Strength Low-Alloy and High-Strength Low-Alloy With Improved Formability
ASTM A 283/A 283M	(2003) Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A 319	(1971; R 2001) Gray Iron Castings for Elevated Temperatures for Non-Pressure Containing Parts
ASTM A 36/A 36M	(2004) Carbon Structural Steel
ASTM A 48/A 48M	(2003) Gray Iron Castings
ASTM A 53/A 53M	(2004a) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 653/A 653M	(2004a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 733	(2003) Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
ASTM B 42	(2002e1) Seamless Copper Pipe, Standard Sizes
ASTM B 88	(2003) Seamless Copper Water Tube
ASTM B 88M	(2003) Seamless Copper Water Tube (Metric)
ASTM C 155	(1997; R 2002) Insulating Firebrick
ASTM C 195	(2000) Mineral Fiber Thermal Insulating Cement
ASTM C 196	(2000) Expanded or Exfoliated Vermiculite Thermal Insulating Cement
ASTM C 27	(1998; R 2002) Fireclay and High-Alumina Refractory Brick
ASTM C 270	(2004a) Mortar for Unit Masonry
ASTM C 401	(1991; R 2000) Alumina and Alumina-Silicate Castable Refractories
ASTM C 612	(2004) Mineral Fiber Block and Board Thermal Insulation

ASTM F 1097 (1991; R 2001) Mortar, Refractory (High-Temperature, Air-Setting)

FM GLOBAL (FM)

FM P7825b (2003) Approval Guide Electrical Equipment

ISA - THE INSTRUMENTATION, SYSTEMS AND AUTOMATION SOCIETY (ISA)

ISA MC96.1 (1982) Temperature Measurement Thermocouples

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-70 (1998) Cast Iron Gate Valves, Flanged and Threaded Ends

MSS SP-80 (2003) Bronze Gate, Globe, Angle and Check Valves

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (2003; R 2004) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 211 (2003) Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances

NFPA 31 (2001) Installation of Oil Burning Equipment

NFPA 54 (2002) National Fuel Gas Code

NFPA 82 (2004) Incinerators and Waste and Linen Handling Systems and Equipment

UNDERWRITERS LABORATORIES (UL)

UL 50 (1995; Rev thru Sep 2003) Enclosures for Electrical Equipment

1.2 SUBMITTALS

****

NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in

context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation

Detail drawings for the incinerator, foundation, stack, waste feed system, [heat recovery boiler,] [acid gas scrubber,] [mercury and dioxin control equipment,] fuel burning equipment, ash removal system, flue gas cleaning system, and controls. Detail drawings shall include equipment settings and connections, complete electrical wiring, controls, and connection diagrams and shall indicate clearances required for maintenance and operation.

SD-03 Product Data

Incinerator

Manufacturer's product data, catalog cuts, illustrations, schedules, performance charts, instructions, brochures, diagrams, sound level data, calculations for gas retention times, combustion and air emissions data, and other information to verify compliance with requirements of the contract documents. Spare parts data for each different item of material and equipment specified, after approval of detail drawings, and not later than [_____] months prior to date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of the spare parts recommended by the manufacturer to be replaced after [1] [and] [3] years of service.

Proposed diagrams, instructions, and other sheets, prior to posting. Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout

of the entire system, including equipment, piping, valves, and control sequence, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal, safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams, and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the system.

SD-06 Test Reports

Adjusting and Testing

Certified test reports in booklet form showing field tests performed to adjust each component, and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall indicate the final position of controls.

SD-10 Operation and Maintenance Data

Operating and Maintenance Instructions

[Six] [_____] complete copies of operating instructions outlining the step-by-step procedures required for system startup, operation and shutdown. The instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. [Six] [_____] complete copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions shall include simplified schematic diagrams for the system as installed.

1.3 GENERAL REQUIREMENTS

1.3.1 Standard Products

Material and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use at least 2 years prior to bid opening.

1.3.2 Nameplates

Each major component of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment.

1.3.3 Equipment Guards and Access

****
NOTE: Catwalk, ladder, and guardrail, if required, will be indicated on drawings.
****

Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts located where any person may come in close proximity

thereto shall be enclosed or guarded. High-temperature equipment and piping located where they could endanger personnel or create a fire hazard shall be guarded or covered with insulation of type specified for service. Items such as [catwalk,] [stair,] [ladder,] [and guardrail] shall be provided where shown and shall be in accordance with Section 05500A MISCELLANEOUS METAL.

1.3.4 Asbestos Prohibition

Asbestos and asbestos-containing products shall not be used.

1.3.5 Verification of Dimensions

After becoming familiar with details of the work, the Contractor shall verify dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

1.3.6 Welding

Welding shall be performed in accordance with ASME BPVC SEC IX and AWS D1.1/D1.1M by welders certified to have passed qualification tests using procedures covered in AWS B2.1.

1.4 MANUFACTURER'S SERVICES

The Contractor shall obtain the services of the manufacturer's representative experienced in the installation, adjustment, and operation of the equipment specified. The representative shall supervise the installing, adjusting, and commissioning and compliance testing of the equipment.

1.5 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be protected from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall conform to the following:

2.1.1 Mortar

ASTM C 270.

2.1.2 Brick

2.1.2.1 Firebrick

ASTM C 27. Firebrick shall be interpreted to include straight, radial, wedge, and skew-type brick, cupola blocks, and other similar shapes.

2.1.2.2 Insulating Firebrick

ASTM C 155.

2.1.3 Castings, Gray Iron

ASTM A 48/A 48M.

2.1.4 Tubing, Copper, and Fittings

ASTM B 88M ASTM B 88, Type K; fittings shall be flare type, cast brass, or wrought copper.

2.1.5 Mortar, Firebrick

ASTM F 1097.

2.1.6 Pipe and Fittings

2.1.6.1 Gaskets

Gaskets shall be nonasbestos compressed material in accordance with ASME B16.21, 2 mm 1/16 inch thickness, full face or self-centering flat ring type. The gaskets shall contain aramid fibers bonded with styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR). NBR shall be used for hydrocarbon service.

2.1.6.2 Cast-Iron Flanges and Flanged Fittings

ASME B16.1, Class 125 or 250 as required to match adjacent piping.

2.1.6.3 Nipples

ASTM A 733, standard weight.

2.1.6.4 Pipe

ASTM A 53/A 53M, Type S, Grade A, standard weight; or copper pipe, ASTM B 42.

2.1.6.5 Pipe Fittings

a. Steel: Buttwelding fittings shall conform to ASME B16.9; socket welding fittings shall conform to ASME B16.11; and flanged fittings shall conform to ASME B16.5.

b. Brass or Bronze: ASME B16.15, Class A, 862 kPa (125 psi).125 psi.

c. Cast-Iron: ASME B16.4, 862 kPa (125 psi), 125 psi,type to match adjacent piping.

d. Malleable-Iron: ASME B16.3, type to match adjacent piping.

2.1.6.6 Unions

ASME B16.39, Malleable Iron threaded pipe unions, Class 150, 250, or 300 as indicated or required for service.

2.1.7 Pipe Threads

ASME B1.20.1.

2.1.8 Galvanized Steel Sheets

ASTM A 653/A 653M for incinerator casings, housing, and components. Gauges specified are United States Standard Sheet and Plate Gauge.

2.1.9 Steel Sheets and Strips

ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, for incinerator casings, housings, and components.

2.1.10 Thermometers

ASME PTC 19.3, with wells and temperature range suitable for the use encountered.

2.1.11 Valves

2.1.11.1 Angle

MSS SP-80, Type 1, 2, or 3, Class 125 as required. Iron-body valves in sizes above 75 mm 3 inches shall have brass or bronze standard trim and shall have glands or followers in the stuffing boxes. Valves shall have nonmetallic renewable composition discs and raised flat seats designed for 862 kPa (125 psi) 125 psi steam. Iron wheels shall be secured with hexagonal nuts.

2.1.11.2 Check

MSS SP-80, Type 1, 2, 3, or 4, Class 125, as required. Iron-body check valves in sizes above 75 mm) 3 inches shall be the swing type designed for 862 kPa (125 psi) 125 psi steam. Check valves shall have renewable composition discs or shall have metallic discs of the regrinding type to permit regrinding without removing valve from the line.

2.1.11.3 Gate

Sizes of 40 mm 1-1/2 inches or less, MSS SP-80, Class 125, Type 1 and 2; 50 mm 2 inch size and over, MSS SP-70, Class 125 or 250, design OT or OF, as required.

2.1.11.4 Globe

MSS SP-80, Type 1, 2, or 3, Class as required. Iron-body globe valves in sizes above 75 mm 3 inches shall have brass or bronze standard trim and shall have glands or followers in the stuffing boxes. Valves shall have nonmetallic renewable composition discs and raised flat seats designed for 862 kPa (125 psi) 125 psi steam. Iron wheels shall be secured to the stems with hexagonal nuts.

2.1.12 Refractory for Castings

ASTM C 401, Class R. Refractory shall be hydraulic setting of a type especially suitable for incinerators required to burn wet material.

2.1.13 Charging Ram

The ram shall be a hydraulically operated, self-contained mechanism with directional control. The unit shall inject small loads of refuse at frequent intervals to ensure relatively uniform burning rates in addition

to limiting the amount of air entering the primary chamber with each charge. Ram shall [continuously] [intermittently] move the burning waste toward the cleanout area.

2.1.14 Pyrometer

Indicating recording pyrometer shall be provided for measuring incinerator temperature. Instrument shall have a temperature range from minus 18 to plus 1315 degrees C 0 to 2400 degrees F and shall be accurate to within plus or minus 1 percent of the range.

2.1.15 Thermocouple

Thermocouples shall indicate gas passage temperatures and shall control burner operation. Thermocouples shall be suitable for operation up to 1260 degrees C, 2300 degrees F, and shall be accurate within 0.5 percent of the operating and indicating temperature range.

2.2 ELECTRICAL WORK

****

NOTE: Indicate the type and class of motor enclosure depending on the environment in which the motor is to be used.

****

Electrical motor-driven equipment specified shall be provided complete with motors, motor starters, and controls. Motors shall conform to NEMA MG 1, with enclosures as indicated. Electrical equipment, including motors and wiring, shall be in accordance with Section 16402 INTERIOR DISTRIBUTION SYSTEM. Electrical characteristics shall be as indicated or specified. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary for the motor control specified. Each motor shall be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Manual or automatic control, protective or signal devices required for the operation specified, and any control wiring required for controls and devices specified but not shown, shall be provided.

2.3 INCINERATOR

****

NOTE: The incinerators are capable of burning medical waste. The composition of Type 4 waste is indicated in the following table:

WASTE VS. CONTENT

Type	Noncombustible Solids (Max % by Weight)	Moisture Content (Max %)	Heating Value J/kg (BTU Per Pound)
(Highly Combustible)	5	10	19,771,000 (8,500)
(Pathological)	5	85	2,326,000 (1,000)

The medical waste to be disposed of in the incinerator is a mixture of paper, plastics, Type 4

waste, etc., and is of a widely varying nature with a Btu content which may well exceed the usually reported value of 2,326,000 J/kg (1000 Btu per pound). Prior to developing final design of the incinerator, detailed waste classification should be made in consultation with U.S. Army Center For Health Promotion & Preventive Medicine, Aberdeen Proving Ground, Maryland. The design should include ranges of amounts of glass, metal, paper, plastics, organic, rubber, cloth, wood, moisture, etc., in the waste and the variable joule (Btu) content. The waste stream at each installation must be analyzed and the information should be utilized for the final design.

****

The incinerator shall consist of a solid hearth in the primary combustion chamber where partial burning and conversion of the combustible organic matter occurs, and a secondary combustion chamber that shall consume the combustible gases and entrained combustible particles. Shells of the incinerator shall be of gas-tight construction. Incinerator shall be suitable for [indoor installation] [outdoor installation, including totally enclosed electric motors, and corrosion and moisture protection,] and shall be equipped for [manual] [mechanical] [automatic] charging and operation. Incinerator shall operate under negative air pressure and shall be a complete package-type unit, factory fabricated and assembled; unit shall be ready for attachment of all utility connections.

2.3.1 Type of Waste

The incinerator shall be capable of burning typical medical waste including paper, plastics of various kinds, and a small fraction of Type 4 (pathological) waste.

2.3.2 Capacity

Capacity shall be not less than [_____] kg pounds per hour, based on [operating the incinerator no more than 6 to 8 hours continuously per day.] [burning medical waste parts which have a water content as high as 85 percent by weight.] [Ash clean-out shall be performed daily for systems designed to operate no more than 6 to 8 hours continuously.]

2.3.3 Volume

****

NOTE: The blanks will be filled to indicate minimum volumes. Manufacturers of medical waste incinerators should be consulted for furnace and chamber volumes to satisfy the capacity specified.

****

The inside volume of the furnace, exclusive of the space occupied by the refractory hearths and walls, shall be not less than [_____] cubic meters. feet. The volume of the primary combustion chamber above the burning hearth shall be not less than [_____] cubic meters,feet, and the volume of the final combustion settling chamber shall be not less than [_____] cubic meters. feet.

2.3.4 System Components

****
NOTE: The component list contains items of equipment designed to reduce emissions which must be evaluated against federal, state, and local regulatory requirements. Other items of equipment must be evaluated for cost effectiveness.
****

A complete waste burning system shall include combustion air fan, primary and secondary burners, air distribution and burner controls, ducts, breeching, stack, [bottom ash conveyor and collection,] [feed rams,] [[fire tube] [water tube] heat recovery boiler and emergency bypass stack,] [[venturi] [packed tower] wet scrubber,] [dry scrubber,] [dry powdered activated carbon injection system,] [[urea] [ammonia] injection system,] [acid gas reagent storage vessels,] [carbon storage vessels,] [combined acid gas reagent and carbon storage vessels,] [air compressors,] [slurry pumps,] [water pumps,] [baghouse,] [[vacuum type] [enclosed mechanical type] fly ash collection system,] control and emission monitoring equipment.

2.4 OPERATING AND PERFORMANCE REQUIREMENTS

2.4.1 Weight Reduction

****
NOTE: Indicate the effectiveness and burnout capability of the incinerator to be provided (15 percent ash is a reasonably accepted figure).
****

Incinerator shall reduce waste to an ash not to exceed [_____] percent of the total combustible charges when tested as specified.

2.4.2 Stack Discharge

****
NOTE: Review all applicable federal, regional and local emission regulations and utilize the most stringent requirements. Typical values are as follows (all emission limits will be corrected to 7 percent oxygen, dry basis):

Carbon Monoxide (CO): 50 ppmv, 12-hour average as measured by a Continuous Emissions Monitoring System (CEMS);

Particulate Matter: 0.013 gr/dscf (30 mg/dscm) as measured by EPA Reference Method 5;

Opacity: 5 percent, 3-minute average as measured by a CEMS;

Sulphur Dioxide (SO2): 45 ppmv, 12-hour average as measured by a CEMS;

Nitrogen Oxides (NOx): 210 ppmv, 12-hour average as measured by EPA Reference Method 7;

Hydrogen Chloride (HCL): 42 ppmv, or 97 percent reduction, 9-hour average as measured by EPA Reference Method 26;

Total Hydrocarbons: 70 ppmv, 1-hour average as measured by EPA Reference Method 25;

Mercury: 210 gr/106dscf (0.47 mg/dscm) or 85 percent reduction, 12-hour average as measured by EPA Reference Method 29;

Lead: 44 gr/106dscf (0.10 mg/dscm), 12-hour average as measured by EPA Reference Method 29;

Cadmium: 22 gr/106dscf (0.05 mg/dscm), 12-hour average as measured by EPA Reference Method 29;

Dioxin/Furans: 35 gr/109dscf (1.9 ng/dscm) toxic equivalency of 2, 3, 7, 8-TCDD, 12-hour average as measured by EPA Reference Method 23.
****

The pollution control equipment shall meet or provide lower emission values than those specified for the following:

a. Carbon Monoxide (CO): [_____] ppmv, 12-hour average as measured by a Continuous Emissions Monitoring System (CEMS);

b. Particulate Matter: [_____] gr/dscf ([_____] mg/dscm) as measured by EPA Reference Method 5;

c. Opacity: [_____] percent, 3-minute average as measured by a CEMS;

d. Sulphur Dioxide (SO2): [_____] ppmv, 12-hour average as measured by [a CEMS] [EPA Reference Method [_____]];

e. Nitrogen Oxides (NOx): [_____] ppmv, 12-hour average as measured by EPA Reference Method 7;

f. Hydrogen Chloride (HCL): [_____] ppmv, or [_____] percent reduction, 9-hour average as measured by EPA Reference Method 26;

g. Total Hydrocarbons: [_____] ppmv, 1-hour average as measured by EPA Reference Method 25;

h. Mercury: [_____] gr/106dscf ([_____] mg/dscm) or [_____] percent reduction, 12-hour average as measured by EPA Reference Method 29;

i. Lead: [_____] gr/106dscf ([_____] mg/dscm), 12-hour average as measured by EPA Reference Method 29;

j. Cadmium: [_____] gr/106dscf ([_____] mg/dscm), 12-hour average as measured by EPA Reference Method 29;

k. Dioxin/Furans: [_____] gr/109dscf ([_____] ng/dscm) toxic equivalency of 2, 3, 7, 8-TCDD, 12-hour average as measured by EPA Reference Method 23;

All emission limits shall be corrected to 7 percent oxygen, dry basis. The

following definitions were used above: Parts per million by volume (ppmv); dry standard cubic feet (dscf); dry standard cubic meters (dscm); grams (gr); milligrams (mg); and nanograms (ng).

2.4.3 Noise

Noise level at 305 mm 1 foot from any incinerator component shall not exceed 85 dBA. Equipment shall be supplied with sound dampening devices as required.

2.5 FURNACE CONSTRUCTION

2.5.1 Primary Chamber

The primary chamber shall be constructed of a steel casing supported by a steel frame and provided with insulation and refractory. The casing shall be not less than 2.66 mm (12-gauge) 12-gauge sheet steel conforming to ASTM A 1011/A 1011M and reinforced to withstand internal pressures without deflection or damage to refractory or other components of the incinerator. The frame and all reinforcing members shall be constructed of steel conforming to ASTM A 36/A 36M. The frame shall be free-standing and shall support the weight of all components of the incinerator, including doors, burners, breeching, stack connections, and appurtenant assemblies without binding or warping. The frame and casing shall be all welded construction and shall be completed and erected prior to installation of the refractory and insulation. Welding shall be in accordance with ASME BPVC SEC IX and AWS D1.1/D1.1M. All access doors and parts shall be provided with seals to prevent emission of smoke or admission of significant amounts of air during incinerator operation. Primary chamber shall have no openings which would permit leakage of waste fluids.

2.5.2 Secondary Chamber

The secondary chamber shall have an exterior casing not less than 2.66 mm (12-gauge) 12-gauge sheet steel conforming to ASTM A 1011/A 1011M. The insulation and refractory lining shall be of the same class, type, and thickness required for walls in the primary chamber. A minimum dwell time of [0.5] [0.8] [1.0] seconds shall be allowed for any condition within normal operating limits.

2.5.3 Insulation

The insulation shall conform to ASTM C 612, Class 5 and shall be designed to be used with masonry or reinforced concrete or noncombustible material, with a fire resistant rating of not less than 3 hours, to prevent damage to the foundation from excessive heat. The minimum thickness of insulation shall limit the temperature of the outer casing to 66 degrees C 150 degrees F maximum in an ambient temperature of 21 degrees C70 degrees F when the unit is operating at full-rated capacity. Insulating cement shall conform to ASTM C 195 or ASTM C 196.

2.5.4 Refractory

Refractory shall be heat-resistant plastic super-duty fireclay conforming to ASTM C 27. The minimum thickness of plastic or castable refractory shall be 110 mm 4-1/4 inches for walls and [110] [64] mm [4-1/4] [2-1/2] inches for hearths. Refractory walls shall be attached to the casing with alloy steel or refractory anchors to form a monolithic structure which will resist heat and support the walls with a safety factor of 4. Bulging and

destruction of refractory due to heat stress shall be prevented by reinforcing, expansion joints, ties, and anchors.

2.5.5 Exterior Walls

Walls shall be of 2.66 mm (12-gauge) 12-gauge sheet steel reinforced with steel framing and provided with door frames [and mounted on structural steel skids].

2.5.6 Hearth

An abrasion resistant refractory hearth shall be constructed of heat-resistant, thermal-insulating clay conforming to ASTM C 401, Class R plastic or castable type, high-duty class. Hearth shall support not less than twice the hourly burning rate and shall not permit leakage of waste fluids.

2.5.7 Doors

****
NOTE: Select door material to be employed (many manufacturers recommend steel).
****

Doors shall be provided for stoking, cleanout, and charging areas. Door frames shall be securely attached. Doors and frames shall be constructed of [cast iron conforming to ASTM A 319] [steel conforming to ASTM A 1011/A 1011M or ASTM A 36/A 36M]. Doors exposed to flame or direct heat of combustion gases shall be lined with the same type and thickness of refractory and insulation used in the combustion chamber. Refractory shall be secured to the doors and shall not sag. Refractory shall have tapered edges to clear door frames during movement of swinging doors. Alloy steel hooked bars shall be welded to door cover to anchor the refractory. Doors shall be safely operable by one person. Temperature of door handles shall permit operation of doors without gloves or other protective devices. Charging doors shall be interlocked with primary burners and air supply so that burner ignition shuts off and underfire air dampers close when doors open. Door closure shall be gasketed with nonasbestos packing. [Vertically operated doors shall be counter-weighted to require a manual operating force of 133 N (30 pounds) 30 pounds maximum.] [Guillotine-type doors shall lift completely off the seals to effect opening.] [Full-swing-type doors shall be provided with an integral smaller feed door having a minimum rectangular clear opening of 610 by 610 mm24 by 24 inches or a minimum circular clear opening of 762 mm 30 inches diameter.] Doors shall be provided with hasps or brackets to permit locking.

2.5.7.1 Stoking and Cleanout Doors

Doors shall be tight fitting. Cleanout doors shall provide access for total cleanout and visual inspection of the entire interior of the incinerator and shall not permit leakage of waste fluids.

2.5.7.2 Mechanical-Charging Doors

Doors shall be of [guillotine] [swing] [automatic sliding] type. Inner and outer doors shall be provided. The inner or charging door shall open with operation of the charger. The inner and outer doors shall be interlocked to prevent simultaneous opening during incinerator operation. Combustion chamber door shall be insulated and lined with refractory material; the

outer door shall be constructed of the same materials as the exterior casing of the incinerator. Doors shall be provided with means for manual operation.

2.5.8 Observation Ports

Two observation ports, 75 mm 3 inches in diameter, shall be provided on the charging door for viewing the primary combustion chamber during operation. Observation ports shall be black steel or cast-iron tube or duct having a minimum thickness of 3.42 mm (10 gauge) 10 gaugeand provided with heat-resistant glass cover, or an angular steel frame and closure plate with handle, for operation without gloves or other protective devices. The tube or duct shall extend from the exterior of the casing to not less than one-half the thickness of the refractory lining. The frame shall be welded to the casing. The refractory opening shall be gas-tight.

2.5.9 Damper

A controller actuated refractory lined damper shall regulate secondary, underfire, and overfire air. The damper shall be constructed of steel conforming to ASTM A 1011/A 1011M, and shall be not less than 1.52 mm (16 gauge) 16-gauge thick. The damper shall operate without noise or flutter. Actuators shall be [pneumatically operated] [electric motor operated at [_____] volt ac].

2.5.10 Bypass Dampers

****

NOTE: A maximum leakage rate of 1.0 percent should be used. Review all applicable emission requirements and percent reductions to determine an acceptable leakage rate.

****

Bypass dampers shall be constructed to provide a leakage rate of less than [_____] percent at 1.5 times the maximum operating pressure.

2.5.11 Test Holes (Instrument Test Group)

****

NOTE: An instrument test group should be indicated near every thermocouple well to connect portable equipment to verify installed equipment.

****

Test holes shall be provided as indicated and shall be fitted with standard weight, 50 mm 2 inch diameter, black steel pipe welded to the casing. The sleeve shall extend from the exterior of the casing to not less than one-half the thickness of the refractory lining. The refractory opening shall be formed from the end of the pipe sleeve to the interior wall surface to shield the end of the sleeve from reflected heat. The sleeve shall be fitted with a brass screw cap.

2.6 FLUE GAS CLEANING SYSTEM

****

NOTE: Where particulate control is required at the levels specified in paragraph: STACK DISCHARGE, dry type adsorber should be specified.

****

A complete flue gas cleaning system (FGC) shall be provided. System shall consist of a [[dry] [semi-dry/semi-wet] [wet] powdered activated carbon injection system, and a [dry] [semi-dry/semi-wet] [wet] acid gas scrubber system] [combination [dry] [semi-dry/semi-wet] [wet] powdered activated carbon and acid gas scrubbing system] [and [baghouse] [precipitator] for particulate control]. Each FGC system shall be capable of [continuous operation] [operation compatible with the incineration capacity and schedule specified].

2.6.1 System Components

Each scrubber system shall be provided with bulk storage silos, unloading facilities for trucks, dust control filters, mixing equipment, slurry tanks, pumps, compressors, induced draft fans, and all piping and valves necessary to provide a complete and operating system.

2.6.2 Product Storage Capacity

Bulk storage capacity for all required products shall provide a minimum operating period of [two] [_____] weeks between deliveries.

2.6.3 Adsorbers

2.6.3.1 Access

Access openings shall be provided at strategic locations for inspection, cleaning, and maintenance. All access doors shall be gas tight and of the quick opening type. The adsorbers shall be elevated to permit 2130 mm7 feet access under the lowest point which would collect particulates. An access door shall be located at this lowest point to permit removal of accumulated particulate. The door shall be designed to open with an accumulation of material above it.

2.6.3.2 Construction

Adsorber shall be constructed of at least 4.76 mm 3/16 inch thick steel plate, ASTM A 36/A 36M or ASTM A 283/A 283M, grades B, C, or D. External stiffeners shall be spaced as required to provide support for the vessel skin. All structurally welded seams shall be seal welded. Joints shall be designed to be assembled air and water tight. The adsorber shall be designed for a gas pressure of plus or minus 635 mm 25 inch water gage, or as required by the system operation, whichever is greater. Maximum deflection of any panel shall not exceed L/240.

2.6.3.3 Gas Flow

The gas inlet to each module shall be provided with internal deflector plates designed to provide uniform gas distribution and velocities through the unit.

2.6.4 Product Handling and Preparation System

A complete system to receive, store, and supply [product] [lime] to the spray-dry adsorbers shall be provided. System shall be capable of supplying sufficient [product] [lime] for the incinerator operating at 120 percent of full load. System shall include, but not be limited to, [product] [lime] storage silo complete with vibrating bin discharger,

flexible connections, gravimetric feeders, attrition slaker, [product] [lime] slurry and water pumps, slaked [product] [lime] storage tank, and agitators.

2.6.5 Powdered Activated Carbon

Powdered activated carbons (PAC) shall be specifically made for the removal of mercury, dioxins, and furans with a high percentage of pore sizes in the 20 to 50 angstrom range. The PAC shall be completely devolatilized.

2.6.6 Pebble Quick Lime Analysis

Flue gas cleaning equipment shall be capable of meeting emission requirements specified using lime with the following composition:

SiO2	2.6 percent
Al203	0.5 percent
Fe2O3	0.4 percent
MgO	5.7 percent
S	0.03 percent
CaO	90.8 percent
Available CaO	85.0 percent
Fineness	19 mm 3/4 inch x 0 Weight
Density	7853 N/cubic meter 50 lb/cubic foot
Mass Density	800 kg/cubic meter 1.55 slugs/cubic foot

2.6.7 Service and Process Water Analysis

The service and process water analysis will vary; however, the following characteristics shall be considered to be typical:

Calcium	[_____] ppm
Magnesium	[_____] ppm
Sodium	[_____] ppm
Bicarbonate	[_____] ppm
Sulfate	[_____] ppm
Chloride	[_____] ppm
Silicon	[_____] ppm
Iron (as Fe3)	[_____] ppm
Manganese (as Mn)	[_____] ppm
Hardness (CaCO3)	[_____] ppm
pH [ranges between	[_____] and [_____]] [is [_____]]

2.7 HEAT RECOVERY BOILER

Heat recovery boilers shall be in accordance with Section 15846A HEAT RECOVERY BOILERS.

2.8 STRUCTURAL DESIGN CRITERIA

2.8.1 Site Work

Site work, structural foundations, and floor slabs shall be provided as required.

2.8.2 Roof Loads

Roof purlins and beams shall be designed for dead load plus an additional 0.24 kPa (5 psf) 5 psf uniformly distributed load and an additional 22.4 kN

(5000 lb) 5000 lb roving concentrated load. Snow load shall be [_____] kPa psf plus drift factor where applicable. Wind uplift forces shall be determined in accordance with ASCE 7 Section 6 using a 100-year recurrence interval and conditions.

2.8.3 Floor Loads

Operating floors, stairs and access platforms for operation and maintenance shall be provided. Floors, stairs, and access platforms shall be designed for 4.79 kPa (100 psf) 100 psf live load plus dead load. Equipment platforms shall be designed for 7.18 kPa (150 psf) 150 psf live load plus a concentrated load of equipment weight at installed location, plus dead load.

2.8.4 Lateral Loads

****

NOTE: Provide seismic requirements for stack and equipment, if a Government designer (either Corps office or A/E) is the Engineer of Record, and show on the drawings. Delete the bracketed phrase if seismic details are not provided. Sections 13080 and 15070, properly edited, must be included in the contract documents.

****

Design shall include wind and seismic loading. Design wind pressure shall be based on a wind speed of [_____] km/h, mph,exposure per ASCE 7. Seismic design shall be in accordance with Sections 13080 SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT and 15070A SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT [as indicated].

2.9 Noise Limitations

Equipment furnished under this contract shall meet the noise criteria specified herein through equipment design, acoustic insulation, use of inlet silencers, or other means provided under this contract. Sound pressure levels shall be limited as follows when measured 1525 mm (5 ft) 5 ft from any item of equipment furnished under this contract.

Band Number	Center Band Frequency Hz	Maximum Sound Pressure Level dB, Re 0.0002 Microbars
1	63	100
2	125	91
3	250	84
4	500	78
5	1000	78
6	2000	78
7	4000	78
8	8000	78

2.10 AUXILIARY EQUIPMENT

2.10.1 Charging Method

Unit shall be [mechanically] [manually] charged. [A mechanical charger, including an inner door to the combustion chamber, and an outer door shall

be provided to discharge the contents of the loading and holding chamber into the combustion chamber. Charger shall have a manual control, and an adjustable timer to permit semiautomatic charging at not less than 10-minute intervals. An interlock shall be provided to prevent operation of the charger when a predetermined safe operating temperature is exceeded. The charger shall be located on the [end] [side] [top] of the incinerator.] [The manual charger shall include a front loading door with minimum dimensions of 610 by 610 mm. 24 by 24 inches. The combustion chamber shall operate at negative pressure when the loading door is open to prevent injury to the operator and the escape of smoke and gases.] [A hopper-type chamber shall be provided for top loading chargers.] Charging chambers shall have capacity of not less than [0.4] [0.8] [_____] cubic meters. [0.5] [1.0] [_____] cubic yards.

2.10.2 Burners

****

NOTE: Values of minimum burner input capacity shall be as indicated in the following table and applicable data inserted within the brackets.

Size of Burners, kW (1000 Btuh)		
Capacity of Incinerator kg/hr (lb/hr)	**Type 4 Refuse**	**All Types Refuse**
11.3 (25)	**87.9 (300)**	**29.3 (100)**
22.7 (50)	**131.9 (450)**	**58.6 (200)**
34.0 (75)	**190.5 (650)**	**73.3 (250)**
45.4 (100)	**249.1 (850)**	**87.9 (300)**

****

[Gas] [Oil] [Combination gas and oil] [LPG] burners shall be provided for the primary and secondary combustion chambers. Each burner shall be a complete assembly including fuel and control systems, and accessories. The primary burner shall have an input capacity of not less than [_____] W.Btuh. The secondary burner shall have a minimum capacity of [_____] W Btuh and shall be able to maintain a minimum continuous temperature in the secondary chamber of 871 degrees C. 1600 degrees F. A minimum continuous temperature of 760 degrees C 1400 degrees F shall be maintained at the roof near the exit of the primary chamber. The burners shall be electrically spark-ignited and regulated by a variable set point indicator-controller adjustable from minus 18 to 1371 degrees C minus 27 to 2500 degrees F to operate within the temperature limits recommended by the manufacturer. The controllers shall be actuated by a thermocouple or shielded bimetallic sensor. The mounting, flame shape, and characteristics of each burner shall be suitable for the incinerator chamber in which the burner is installed. Flame impingement on the incinerator wall will not be permitted. Each burner shall be provided with FM P7825b listed and approved flame failure protection. The flame safeguard sensor shall be sighted to detect only the burner flame for which it is designed. Burners shall be easily moved out of firing position for inspection, cleaning, adjustment, and maintenance. Thermocouples shall be located in the primary and secondary chamber and shall be suitable for a maximum temperature of 1260 degrees C. 2300 degrees F. A continuous secondary burner shall be provided. This burner shall modulate from high to low fire, based on the temperature of the secondary chamber. An on/off firing burner shall be

provided in the primary chamber.

2.10.3 Fuel Oil Storage Tank

Fuel oil storage tank shall be in accordance with Section 13202 FUEL STORAGE SYSTEMS.

2.10.4 Stack

****
NOTE: Depending on requirements at location and personnel involved, temperature of the casing can be 66 to 93 degrees C (150 to 200 degrees F). The casing temperature should be limited to 49 degrees C (120 degrees F) maximum when personnel safety is involved.

Designer must consider the effect of stack location on adjacent occupied buildings and fresh air intakes. EPA has guidance on stack heights.
****

A sectional, circular cross section exhaust stack shall be provided. The type, size, and number of sections shall be in accordance with the requirements of the stack and refractory manufacturer to adequately support the refractory lining, permit expansion, and prevent cracking of the refractory. The stack shall conform to NFPA 211. The refractory shall be secured to the casing by steel anchors. A corrosion-resistant steel spark arrestor fabricated of 1.21 mm (18 gauge), 18-gauge, 13 mm 1/2 inch mesh wire screen shall be attached to the top of the stack. A corrosion-resistant steel weather cap shall be provided. The temperature of the casing shall not exceed [_____] degrees C degrees F in an ambient temperature of 21 degrees C. 70 degrees F.Adequate support, without placing any of the load on the refractory walls of the incinerator, shall be provided for any stack installed on top of the incinerator.

2.10.5 Breeching

Connectors shall be provided to connect the incinerator to the stack unless the stack is attached directly to the incinerator. Connectors shall be in accordance with NFPA 211. The connector shall be located at a minimum clear vertical distance of 2450 mm 8 feet above the floor.

2.10.6 Draft Equipment

Equipment shall provide the correct amount of air to permit complete controlled combustion. Equipment shall include forced draft fans, draft gauges, dampers, damper actuators, linkage, and appurtenances necessary to maintain a negative draft in primary chamber in order to provide optimum performance at all operating rates.

2.10.6.1 Air Ducts

Combustion underfire air shall be introduced to the primary chamber below the waste material through [perforated air pipes] [ducts] [slots located along the side of the hearth]. Overfire air shall be controlled with [manually] [automatically] controlled air intake ports in the back wall, for completing combustion of combustible materials into gases, or for reducing operating temperatures. Dampers shall be provided to set the air

for the proper burning of the waste materials. Ducts shall be sized to minimize pressure drops and be constructed of sheet steel conforming to ASTM A 1011/A 1011M. All seams and connections shall be air tight.

2.10.6.2 Fan

The fan shall be capable of delivering [_____] cubic meters feet of air against a static head of [_____] mm inches of water at an atmospheric temperature of 16 degrees C 60 degrees F and a barometric pressure of 101 kPa (14.7 psi). 14.7 psi. Fan shall be centrifugal with [backward-curved] [forward-curved] [radial-tip] blades. Fan wheels shall be statically and dynamically balanced. The fan shall comply with the standards of AMCA 99, applicable to centrifugal furnace fans, and shall be rated for flow rate, pressure, power, speed of rotation, and efficiency in accordance with AMCA 210. Induced draft fans, where required, shall be designed for handling hot flue gas at the maximum outlet temperature of the incinerator. Induced draft fan housings shall be provided with drain holes to accommodate the drainage of condensation. Induced draft fan bearings shall be [air-cooled] [water cooled]. Induced draft fan scroll sheets and rotor blades shall have protective liners.

2.10.7 Ash Removal

Unit shall have provision for [manual] [automatic] removal of the ash through the cleanout door upon completion of the burnout and cool-down cycles. Ash removal shall be as indicated for use with portable containers.

2.11 CONTROLS AND INSTRUMENTATION

Control equipment and instruments shall include burners and fan controls, time clocks, relays, operating switches, indicating lights, gauges, motor starters, fuses, alarms, and circuit elements of the control system, and other controls and instruments necessary for unit operation. Control system shall be in accordance with the FM P7825b. The controls and instruments shall be mounted on one or more free-standing control panels conveniently located to the incinerator, and placed to allow operating personnel effectively monitor incinerator operations. Control system shall provide [on-off control] [proportioning control of the primary air supply and fuel supply to the secondary burner]. Temperature indicator controllers or other indicators shall provide a visual indication for safe loading of the incinerator and excessive high temperature conditions which may require control by the operator. Automatic control circuit systems and manual switches shall be interlocked to prevent hazardous conditions or the discharge of excessive amounts of air pollutants.

2.11.1 Control Panel

Panel shall be sheet steel, weathertight, and shall conform to UL 50. [A heater to prevent condensation shall be provided.] [Control panels installed outdoors shall be NEMA 4 and be provided with electric strip heaters for condensation control.] All controls, instruments, and other equipment shall be flush mounted at the factory and the assembly tested prior to shipment. A lock and 2 keys shall be furnished. All controls and instruments shall be identified with nameplates.

2.11.2 Draft Gauges

Gauges shall conform to ASME B40.100 with a diaphragm or bellows actuating system and a circular scale. The gauges shall have a zero adjustment

screw. Suitable shutoff cocks shall be provided.

2.11.3 Pressure Gauges

Gauges shall conform to ASME B40.100 and be of pressure detecting class, single Bourdon tube style, and suitable for detecting air pressure.

2.11.4 Thermocouples

Sensors shall conform to ISA MC96.1, Type K, and shall be provided in the combustion chamber or as otherwise directed. The thermocouple shall be suitable for continuous operation and control at temperatures up to 1260 degrees C, 2300 degrees F, accurate to 0.75 percent, and shall be long enough to be inserted 150 mm 6 inches into the furnace. The thermocouple shall be provided with an adjustable flange and with a high-temperature metal alloy, closed-end, protecting tube suitable for insertion into the furnace without support of the projecting end. Thirty meters One hundred feet of 1.52 mm (16-gauge) 16-gaugecompensating lead wire with a weatherproof braid shall be supplied for connecting the thermocouple to the instrument. The installed unit shall indicate gas passage temperatures and shall control burner operation.

2.12 OPERATING TOOLS

Operating and firing tools, such as shovel or coal scoop, hoe, rake, slice bar with metal handles, regularly used for firing and cleaning incinerators, and a firing tool rack shall be provided and located as indicated. The rack shall be steel and shall include hooks and other appropriate means for storing the tools in a neat manner.

2.13 PAINTING AND FINISHING

2.13.1 Treatment

The inner surfaces of the outer casing of the incinerator, the exterior surfaces of the outer casing, the control panel, and piping, except corrosion-resistant steel, shall be cleaned to base metal for removal of oil and rust before primer is applied at the factory.

2.13.2 Factory Painting

Equipment and component items shall be factory painted with the manufacturer's standard finish. Items located outside the building shall have weather-resistant finish.

PART 3 EXECUTION

3.1 INSTALLATION

Equipment and material shall be installed as indicated and in accordance with manufacturer's written instructions and NFPA 82. Combustion air supply and ventilation shall be in accordance with NFPA 31 or NFPA 54 as applicable.

3.1.1 Foundation

Incinerator foundation shall be constructed of [21] [_____] Mpa ([3000] [_____] psi) [3000] [_____] psi concrete as specified in Section 03300A CAST-IN-PLACE STRUCTURAL CONCRETE. The foundation shall extend not less

than 1 m 3 feet beyond the incinerator on 3 sides and not less than 2.5 m 8 feet on the side where the ashes are removed. Incinerator shall be installed in accordance with manufacturer's written instructions. Proper provision shall be made for expansion and contraction between incinerator foundation and floor; the joint shall be packed with suitable nanasbestos rope and filled with suitable compound that will not become soft at a temperature of 40 degrees C. 100 degrees F.Incinerator supports shall permit free expansion and contraction of each portion of the incinerator without placing undue stress on any part of the incinerator or setting. Anchor bolts shall be set accurately and shall be of adequate length to install the incinerator. When embedded in concrete, anchor bolts shall be provided with plates welded on the head and shall be protected against damage until the equipment is installed.

3.1.2 Stack Support

****

NOTE: Indicate design wind force that the stack will have to withstand. Structural design will also include seismic resistance, coordinate with subparagraph Lateral Loads under paragraph STRUCTURAL DESIGN CRITERIA.

****

Stack support shall be in accordance with NFPA 82 and NFPA 211, as applicable. Vertical and lateral supports for exterior chimneys shall withstand wind forces of [_____] km/hour. mph.

3.2 FIELD PAINTING

Painting required for surfaces not otherwise specified, and finish painting of items only primed at the factory, shall be as specified in Section 09900 PAINTS AND COATINGS.

3.3 ADJUSTING AND TESTING

3.3.1 Performance Test

Upon completion of all related work and prior to acceptance, the Contractor shall subject the incinerator and associated equipment and instrumentation to the tests required to demonstrate specified performance. The Contractor shall notify the Contracting Officer [_____] days prior to conducting the test. The Contractor shall furnish all instruments and personnel required for the tests. All equipment, apparatus, and materials, except waste materials, used for testing shall be furnished by the Contractor. The Government will supply [fuel,] [water,] [electric power,] [and] waste materials. Two instruction manuals shall be available at all times during the tests. The Contracting Officer shall be present at all tests.

3.3.2 Fuel Systems

Fuel system tests shall be in accordance with Section 13202 FUEL STORAGE SYSTEMS.

3.3.3 Performance

Incinerator shall be preheated for [4] [_____] hours to reach the firing temperature of [982] [_____] degrees C. [1800] [_____] degrees F.The waste charges shall be weighted and a record of the total charge weight shall be

provided. The incinerator shall be charged at the rated burning capacity in kg pounds per hour for a period of [4] [_____] hours and shall be operated in accordance with the manufacturer's written instructions. The performance testing shall include the operation of the mechanical charging facilities, the incinerator, [the heat recovery boiler,] the air pollution control equipment, the ash handling equipment, and the operation monitoring facilities. The testing shall be full scale for a full-operation cycle, and performance shall be monitored to verify compliance with the contract requirements. The waste shall be reduced to a fine ash residue. Normal burnout procedure shall be followed. After the incinerator has cooled, the residue shall be weighed. The weight of the residue shall not exceed [5.0] [_____] percent combustible material of the total charge weight. After clean-out, the incinerator shall show no evidence of deterioration such as slagged or spalling refractory, warping of parts, and discolored exterior paint.

3.3.4 Control

Incinerator shall be tested under actual firing conditions. The test shall verify that all controls function within the maximum and minimum limits for temperature or timing. Actual unsafe conditions such as high temperatures and flame failure shall be simulated by reducing the settings for the activation of limit and safety controls.

3.3.5 Shell Temperature

Incinerator shall be operated under normal load conditions for not less than [4] [_____] hours. After [4] [_____] hours, temperature readings of the outer shell, taken at not less than 5 random locations, shall not exceed the temperature limitation of paragraph FURNACE CONSTRUCTION.

3.4 FIELD TRAINING

****
NOTE: Consult equipment manufacturer for recommended time required to train personnel for the proper operation of the unit, and insert number of hours.
****

The Contractor shall conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist of a total [_____] hours of normal working time and shall start after the system is functionally completed but prior to final acceptance tests. The field instructions shall cover all of the items contained in the operating and maintenance instructions, as well as demonstrations of routine maintenance operations. The Contracting Officer shall be notified at least 14 days prior to starting date of the training course.

-- End of Section --