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BID SPECIFICATION INFORMATION REQUIREMENTS AND BID EVALUATION FORM FOR WET ELECTROSTATIC PRECIPITATORS

INSTITUTE OF
CLEAN
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ICAC

The Institute of Clean Air Companies, Inc. (ICAC) is the national association of companies that supply stationary source air pollution control and monitoring systems, equipment, and services. It was formed in 1960 (under the name IGCI) as a nonprofit corporation to promote the industry and encourage improvement of engineering and technical standards.

The Institute's mission is to assure a strong and workable air quality policy that promotes public health, environmental quality and industrial progress. As the primary representative of the air pollution control industry, the Institute seeks to evaluate and respond to regulatory initiatives and establish technical standards to the benefit of all citizens.

Bid Specification Information Requirements & Bid Evaluation Form for Wet Electrostatic Precipitators

Date Adopted: January 2008

SUMMARY:

This publication contains forms and accompanying text for collecting data necessary to solicit bids from vendors for wet electrostatic precipitators, preparing specifications and bid documents, and for collecting the elements of and evaluating the bids received. Explanations and commentary are also included to aid the purchaser in writing complete specifications and properly defining parameters needed for design.

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Table of Contents

1. HISTORY

This document incorporates the contents of *ICAC Bid Evaluation Form for Electrostatic Precipitators,* ICAC-EP-10, which was adopted in 1995, to reflect the requirements for wet electrostatic precipitator technology for both power sector and industrial sector applications. The Integrated Control Technology Division, which covers particulate and acid gas control topics, of the Institute of Clean Air Companies prepared this new document in order to assure that appropriate and consistent information for wet electrostatic precipitator design and selection is provided to both vendor and customer.

2. OBJECT AND SCOPE

The objectives of this publication are to help purchasers of wet electrostatic precipitators compile all information necessary for vendors to produce meaningful bids, and to enumerate those elements of the bids which the purchasers should consider in their evaluations of competing bids. It does not recommend specific values for these elements. The purchasers may wish to include some or all of the evaluation elements in their bid specifications.

3. ABBREVIATIONS

AAC	Amps, AC current
acf	Actual Cubic Feet
acfm	Actual Cubic Feet per Minute
am^3/hr	Actual Cubic Meters per Hour
Avg.	Average
C.E.	Collecting Electrode
Dist.	Distribution
D.E.	Discharge Electrode
DESP	Dry Electrostatic Precipitator
D.P.	Distribution Plate
dscf	Dry Standard Cubic Feet
dscfm	Dry Standard Cubic Feet per Minute
Eff.	Effective
ESP	Electrostatic Precipitator
°C	Degrees Celsius
°F	Degrees Fahrenheit
FGD	Flue Gas Desulfurization System
ft.	Feet
g	Grams
gr.	Grains
hrs.	Hours
H.V.	High Voltage
Insul.	Insulator
in.	Inches
kg	Kilograms
kV	Kilovolts
kVA	Kilovolt-Amperes
kW	Kilowatts

kWh	Kilowatt-hours
lb/mmBtu	Pounds per Million British Thermal Units Heat Input
m^3/hr	(Actual) Cubic Meters per Hour
mA	Milliamperes
mbar.	Millibar
Max.	Maximum
m	Meters
mg	milligrams
mm	Millimeters
ng/J	Nanograms per Joule Heat Input
Nm^3	Normal Cubic Meters (at 0°C and 1 atmosphere)
no.	Number
SCA	Specific Collecting Area
scfm	Standard Cubic Feet per Minute
sec.	Second
SI	System International Units (metric)
sq.	Square
Tot.	Total
T-R	Transformer-Rectifier
U.S. EPA	United States Environmental Protection Agency
VAC	Volts, AC current
Vol.	Volume
Volt.	Voltage
WESP	Wet Electrostatic Precipitator
w.c.	Water Column
Wt.	Weight

4. DEFINITIONS

Aerosol Particle of solid or liquid matter that can remain suspended in the air because of its small size. Particulates under 1 micron in diameter are generally called aerosols. A specific definition of aerosol may be needed for a particular specification.

Air Core Reactor (ACR) Protects the T-R diode bridge from high voltage transients that occur within the ESP.

Air Leakage Unwanted air entering into an exhaust system (holes in ducts, missing and ineffective seals, etc.).

Arc An electrical discharge of substantial magnitude from the high voltage system to the grounded system, of relatively long duration and not tending to be immediately self extinguishing.

Aspect Ratio The ratio obtained by dividing the length of the precipitator by the effective height.

Automatic Power Supply Automatic regulation of high voltage power for changes in precipitator operating conditions utilizing feedback signal(s). Sometimes referred to as AVC (automatic voltage control).

Automatic Voltage Control (AVC) Monitors secondary current and voltages to assist an operator in determining optimum power levels and spark rates of each field (Note: "optimum" settings need to account for process variables (e.g. fuel or temperature changes).

Back Corona A phenomenon that occurs when the gas within a high resistivity dust layer becomes ionized, which causes heavy positive ion backflow, which neutralizes negative ion current and reduces voltage levels. This impact on the dust layer can result in reentrainment of collected particles.

Bushing High voltage insulator where the high voltage lead passes through the insulator.

Bus Section The smallest subdivision of the wet electrostatic precipitator internal high voltage system that can be de-energized independently by sectionalization of the high voltage system.

Capture Velocity The air velocity at any point in front of a hood or at a hood opening necessary to overcome opposing air currents and to capture the contaminated air at the point by causing it to flow into the hood.

Carrying Velocity The gas velocity that is necessary to keep the dust airborne (usually 3500 to 4599 ft/min in ductwork depending upon the nature of the dust).

Chamber A gas-tight longitudinal division of an electrostatic precipitator. An electrostatic precipitator having a single gas tight dividing wall is referred to as a double chamber precipitator. Very wide electrostatic precipitator chambers frequently are equipped with non-gas-tight load-bearing walls for structural reasons as these ESPs are single chamber.

Cold Roof The casing section that serves as the penthouse ceiling/WESP roof walking surface.

Collecting System The portion of the electrostatic precipitator to which the charged dust particles and liquid droplets are collected and are washed off. There are no rappers utilized for wet electrostatic precipitators; instead, a liquid is used as a means of cleaning the collecting system.

Collecting Surface The individual elements that make up the collecting system and which collectively provide the total surface area of the electrostatic precipitator for the deposition of dust particles and liquid droplets. These elements could be plate type or tubular.

Collection Efficiency The weight of particulate collected per unit time divided by the weight of particulate entering the electrostatic precipitator during the same unit time expressed as a percentage. The computation is as follows: Efficiency = [(Part. In) − (Part. Out)]/(Part. In) × 100

Concentration The amount of dust or mist in a gas stream usually expressed in terms of particulate weight per volume of gas (grains per cubic foot, pounds per 1000 pounds of gas, parts per million or milligrams per cubic meter).

Current Density The amount of secondary current per unit of the electrostatic precipitator collecting surface or discharge electrode. Common units are mA/m2, mA/ft2, mA/cm2 for density on the collecting surfaces and mA/m, mA/ft, mA/cm for the discharge electrodes.

Collecting Surface Area The total flat projected area of collecting surface exposed to the active electrical field. For plate type WESP = effective length × effective height × 2 × number of gas passages. For tube type WESP = effective tube circumference × effective tube height × number of tubes.

Corona Power (KW) The product of secondary current and secondary voltage. Corona power density is generally expressed in terms of: (1) watts per square foot of collecting surface, or (2) watts per 1000 acfm of gas flow. A multiplier of approximately 1.07 can be applied to adjust for a ripple of high voltage.

Current Limiting Reactor (CLR) An impedance device used to protect T-R diode bridge by limiting the current during an arc/spark. It also provides a means of wave shaping voltage to provide higher average values.

Dew Point The temperature at which the equilibrium vapor pressure of a liquid is equal to the partial pressure of the respective vapor. For air containing water vapor, it is the temperature at which liquid water begins to condense for a given state of humidity and pressure. For flue gas containing water vapor and SO_3, it is the set of conditions at which liquid sulfuric acid begins to condense as the temperature is reduced.

Dielectric Fluid A substance used to keep the transformer operating at moderate temperature levels and as a dielectric where space is concerned.

Diode Assembly Converts high voltage AC output of the transformer to a DC signal.

Discharge Electrode The component that is installed in the high voltage system to perform the function of ionizing the gas and creating the electric field. Typical configurations are: Rigid Discharge Electrode (RDE), Rigid Frame (RF), and Weighted Wire (W/W).

Effective Length Total projected length of collecting surface measured in the direction of gas flow. Length between fields is to be excluded.

Electrical Field Arrangement of bus sections in the direction of gas flow that is energized by one or more high voltage power supplies.

Flow Modeling An investigative technique using computer, mathematical, or physical representation of a system that accounts for all or some of its known properties. Flow modeling is typically used to define flow characteristics and distribution.

Gas Flow Orientation Gas flow orientation in a WESP can be of horizontal-flow, up-flow, and down-flow (vertical flow) orientation.

Gas Flow Rate The volume of process gas at any point of the plant exhaust system measured in terms of time. Typical units of measurement are: acfm, am^3/hr, scfm, and dscfm.

Grain A unit of weight commonly used in air pollution control. One grain = 1/7000 lb.

Grain Loading The concentration of particles contained in the gas emitted from a pollution source. The measurement is specified as grains per volume of gas emitted.

Heat Jacket Second "skin" installed over ESP casing with heated air blown through the intermediate space. The heat jacket serves to replace insulation in preventing condensation or corrosion.

High Voltage Insulator Material (i.e. ceramic, alumina) used to separate high voltage components from grounded parts.

High Voltage Structure The structural elements necessary to support the high voltage discharge electrodes in relation to the grounded collecting surface. High voltage insulators are used to electrically isolate and support this system.

High Voltage System All parts of the electrostatic precipitator that are maintained at a high electrical potential under normal operating conditions.

High Voltage Power Supply An electrical supply unit that produces the high voltage DC required for the precipitation process to occur. The supply system consists of a transformer-rectifier (T-R) combination and associated controls.

Hot Roof The ESP top casing that separates the hot gas on one side and insulator compartment on the other.

Insulation Any method that will retard the flow of heat through a surface.

Manometer A u-shaped device for measuring the static pressure at a point relative to some other point; the pressure difference causes water to rise or fall. The difference in the level of the water columns is equivalent to the pressure differential.

Manual Power Supply Manual regulation of high voltage power based on electrostatic precipitator operating conditions as observed by plant operators.

Mechanical Field A sub-division of an electrostatic precipitator in the direction of the gas flow defined by collecting tube or plate length. A mechanical field may contain one or more electrical fields.

Nozzle Ductwork transition at WESP inlet or outlet.

Opacity The amount of light obscured by particles contained in the gas stream. Opacity is typically used as an indicator of emissions performance for a particulate control device.

Precipitator Gas Velocity Generally expressed in terms of ft/sec or m/sec and computed as follows: Velocity = Gas Volume (ft^3/sec) and ESP Effective Cross-Section Area (ft^2).

The effective cross-section is effective field height × width of gas passage × number of passages for plate type WESPs and cross-sectional area of a tube × number of tubes for tube type WESPs.

Particulate Concentration (Ash, Dust or Mist) The weight of particulate or mist contained in a unit of gas (grams per normal cubic meter, pounds per thousand pounds of gas, pounds per million Btu heat input, grains per actual cubic foot of gas or grains per standard dry cubic foot). Note: The temperature and pressure of the gas must be specified if stated as volume.

Penthouse A weatherproof, gas-tight enclosure over the wet electrostatic precipitator that shelters the high voltage insulators.

Pitot Tube A specially constructed probe for taking velocity pressure readings in a duct.

Plenum Pressure equalizing chamber.

Precipitator Current The rectified or unidirectional (DC) average charging current to the precipitator measured by an analog milliamp meter or signal conditioning circuit located in the ground leg of the rectifier that feeds a digital display or microprocessor control/display system. Average charging current is equal to average corona current.

Precipitator Voltage The rectified or unidirectional (DC) average voltage to the (high voltage) precipitator measured by an analog voltmeter or signal conditioning circuit located in the ground leg of the rectifier that feeds a digital display or microprocessor control/display system. Most modern controls distinguish between peak, average, and valley voltage.

Primary Current The current in the primary winding of a transformer as measured by an analog AC ammeter or signal conditioning circuit that feeds a digital display or microprocessor control/display system.

Primary Voltage The voltage across the primary winding of a transformer as measured by an analog AC voltmeter or signal conditioning circuit that feeds a digital display or microprocessor control/display system.

Pulsing "Intermittent Energization (IE)", "Semi-Pulsing", and "Pulse Blocking" are terms commonly used to define 60 Hertz pulsing of precipitator electrical sections. In these systems, some of the half-waves are blocked to create a more pronounced ripple. Charging ration (CR) is a term that normally gives the repetition rate of half cycles (e.g. CR 1:5 means one pulse out of five half waves are used for charging the ESP.)

PM_{10} Particulate matter with an aerodynamic diameter less than or equal to a nominal diameter of 10 microns.

$PM_{2.5}$ Particulate matter with an aerodynamic diameter less than or equal to a nominal diameter of 2.5 microns.

PPM (Parts per Million) The number of parts of a given pollutant in a million parts of air. Units are expressed by weight or volume.

Pressure Drop (ΔP) The differential pressure between two points in a system. The resistance to flow between the two points.

Pulsed Power Supply Superimposes high voltage pulses on base voltage to enhance performance in presence of high resistivity dust.

Resistivity Reciprocal of conductance. The primary electrical property used in evaluation of collection efficiency of ESPs (expressed in units of ohm-centimeter).

Spark A discharge from the high voltage system to the grounded system, self-extinguishing and of short duration.

Specific Collecting Area (SCA) A figure obtained by dividing total effective collecting surface of the electrostatic precipitator by gas volume, expressed in ft^2/1000 acfm or $m^2/m^3/s$. SCA should always relate to well defined plate spacing.

Stack Opacity Monitors U.S. EPA approved monitors utilized to measure the light obscured by particulate contained in the gas at the stack location.

System Gas Volume All gases flowing through the exhaust gas system including excess air, scavenger air and leakage air.

Transformer-Rectifier (T-R) A unit comprised of a transformer for stepping up normal service to voltages in the kilovolt range, and a full wave bridge rectifier operating at high voltage to convert alternating current (AC) to unidirectional current (DC).

Transition An aerodynamically designed inlet or outlet duct connection to the electrostatic precipitator. Transitions are normally included as part of the precipitator, sometimes referred to as inlet/outlet nozzles.

Traverse A method of sampling points in a duct where pressure readings will be taken to determine velocity. A traverse divides the duct into equal, evenly distributed areas that are each tested, compensating for errors caused by uneven gas flow in the duct.

Treatment Time A figure in seconds, obtained by dividing the length of an electrostatic precipitator's effective collecting length or height by the precipitator gas velocity.

Turbulent Flow Fluid flow in which the velocity of a given particle changes constantly both in magnitude and direction.

Weather Enclosure A non-gas tight enclosure over the roof of the wet electrostatic precipitator for protection of roof mounted equipment and personnel.

Voltage Divider A means for supplying a low voltage feedback signal that is proportional to the kV output of the T-R.

Refer to ICAC publication "Terminology for Electrostatic Precipitators", (ICAC-EP-1) for additional definitions of other terms.

5. INSTRUCTIONS FOR COMPLETING BID SPECIFICATION INFORMATION REQUIREMENTS

These Bid Specification Information Requirements outline the basic data required for wet electrostatic precipitator sizing and provide insight to aid in writing bid specifications. Complete and properly prepared specifications for wet precipitation equipment are essential to assure the purchaser that the equipment will be properly sized to satisfy control requirements, and to avoid the need for change orders and consequent added cost.

Enclosed are forms designed to ensure that all necessary data is provided with the bid specifications. These forms list pertinent data required for proper sizing of a wet precipitator or, should insufficient or incomplete data be supplied, identify sources that may be consulted to acquire the necessary information. Additional data pages ensure that other required information is included in the specification.

All data pages are identified by major headings and sub-headings. Beginning with the first of the data pages, explanations are provided for clarification of the data required for each sub-heading. Commentary is also included to aid the purchaser in developing a meaningful bid request that will result in bids that provide properly sized equipment and the complete desired scope of work.

In general, wet electrostatic precipitator industry experts and suppliers agree on the important parameters for precipitator sizing. However, supplier databases and sizing techniques may take into account different parameters, depending upon the individual supplier's experience and design basis. Purchasers may find a greater range of wet electrostatic precipitator design than is found for dry electrostatic precipitators. The forms and commentary provided with this publication seek to incorporate all data which might be expected to be used by wet electrostatic precipitator suppliers.

5.1 General Information

Information included under the heading "General Information" should be provided to help the bidder identify the location of the installation and the parties involved in specifying the equipment and evaluating the bids. Additional information regarding proposal requirements is also included in this section.

5.1.2 Purchaser. The purchaser of the equipment must be identified clearly. The purchaser may be different than the "User," or may be the same.

5.1.3 User. As with "Purchaser," the user should be clearly identified. The purchaser may provide financing for an installation, but not be the end user of the equipment specified.

5.1.4 Architect/Engineer. An architect/engineer, if used, will generally provide control over all technical aspects of the specification and subsequent installation. While information regarding the architect/engineer (address, contact name, and phone, etc.) is important, it is equally important that the purchaser or whoever is specifying the equipment point out to each bidder the contact or entity that will ultimately decide the technical requirements for the installation.

5.1.5 Site Location. The site location refers to the ultimate installation site for the equipment.

5.1.6 Schedules. Pertinent dates defining project scheduling requirements should always be supplied. These dates include:

- Proposal Submittal
- Award of Contract
- Engineering information such as loading diagrams, general arrangement/outline drawings, single line diagrams; P&IDs, and consumables
- Equipment Delivery
- Erection Start/Completion
- Plant, Boiler, or Other Process Equipment Outage
- Start-up
- Acceptance Testing

5.1.7 Equipment Type. The type of installation (new, replacement, or upgrade) must be identified. For example, a replacement unit or upgrade may require different labor or labor skills than a new installation. "Supplemental" refers to new units retrofit downstream of existing equipment.

5.1.8 Proposal Type. The type of proposal desired should be indicated. A specification for a firm priced proposal for purchase generally takes a great deal more time to develop than one for a budgetary proposal. Evaluation of firm bids for purchase will also take more time. Reasonable time periods for bidding and evaluation need to be allowed.

5.2 Bidder Scope of Supply

The overall scope of the project must be clearly identified to ensure that the bidder includes all necessary work in his proposal. Check blocks are provided for each item on the checklist to ease completion of the data forms. Specification information should include details of each item that is checked under "Bidder Scope of Supply."

5.3 Process Information

The process information requested is critical for proper sizing of electrostatic precipitation equipment.

5.3.1 Process Description. Process information describes the process from which exhaust gas emanates. Wet electrostatic precipitators that are to be installed to treat utility boiler exhaust gases may require different bidder-proprietary sizing criteria than will wet electrostatic precipitators to be installed on industrial applications. It is extremely important, therefore, to fully identify the process on which the wet electrostatic precipitator is to be installed, and to include all details important for wet electrostatic precipitator sizing and design.

The major process related factors affecting wet electrostatic precipitator sizing include volumetric and mass gas flow rates, gas temperature, gas moisture content, particulate size distribution, loading of solid particulate, organic and inorganic condensables, and droplet carryover from upstream devices.

5.3.2 Fuel Analysis. Unlike a dry electrostatic precipitator that treats hot flue gas directly from the combustion source, a wet electrostatic precipitator is necessarily preceded by a device to cool the flue gas to adiabatic moisture saturation temperature. Therefore, although the fuel analysis is essential to design the upstream saturator or gas absorber, the detailed flue gas analysis exiting the saturator must be known in order to properly size and design the wet electrostatic precipitator. While fuel analysis may be provided for informational purposes, it is rarely used to size or design the WESP.

5.3.3 Process/Flue Gas Analysis. In order to properly size and design a WESP, it is essential that the purchaser identify all of the expected pollutants in the flue gas entering the WESP and which of those pollutants are to be collected by the WESP. Typically, an existing stack test is available or can be performed to identify those pollutants to be removed in the WESP. Care should be taken to ensure that a process/flue gas analysis is provided that will not result in unreasonable wet electrostatic precipitator sizing, and that will ensure compliance with emission limits over the full range of system operation.

Providing only the minimum and maximum values will result in bidders selecting the "worst case" values that will affect the operation of the precipitator. Using a combination of all such "worst case" values simultaneously can result in the selection of a wet electrostatic precipitator that is oversized and more expensive. The purchaser should indicate "Design Values" for the process/flue gas that will ensure compliance with emission limits over the entire range of operation.

5.3.4 Particle Size Distribution. Suspended solid and/or aerosol particle size distribution directly affects wet electrostatic precipitator performance. In general, finer particles are more difficult to collect than are larger particles. Providing a particulate size analysis of the expected incoming process/flue gas will help ensure the proper sizing of the wet electrostatic precipitator. The reference test method and apparatus used for particle size determination should be identified. Also, a high loading of sulfuric acid (H_2SO_4) mist, or other ultra-fine particles, can result in current suppression during wet electrostatic precipitator operation, requiring special operating consideration and/or a larger wet electrostatic precipitator.

5.3.5 Special Considerations. The purchaser should fully identify the process that the WESP will be applied to, as well as all upstream equipment that will treat the flue gas prior to the WESP. Many applications have unique process conditions that will affect the sizing and design of the WESP and a complete “Process Flow Diagram” will assist the WESP designer in selecting the proper configuration for a particular application.

5.4 Wet Electrostatic Precipitator Sizing, Performance, and Structural Design Criteria

5.4.1 Sizing Criteria. Operating conditions specified by the purchaser play the largest role in the proper sizing and design of a wet electrostatic precipitator.

The sizing equations for selecting the appropriate wet electrostatic precipitator collecting area include variables for particulate removal efficiency, gas volume, power input and current suppression. Additionally, opacity requirements may override any particulate emission requirements if a higher precipitator efficiency is necessary to meet stack exhaust opacity limits than to meet particulate emission limits.

The volumetric and mass gas flow rate must be specified, in part to ensure a consistent basis for different vendors’ designs. The basis for determining the specified flow rate should be included, as should the basis for guarantee testing. These values are typically based on stoichiometric or other calculations, or measured by pitot tube. If calculations are used, the maximum gas flow rates under any process conditions must be specified, as well as margins added for conservatism. Inlet loading and required outlet emissions values should be presented in like units to ensure consistency and correctness in different bids.

5.4.2 Test Method. Reference test method and test equipment for measuring emission guarantee parameters should be included. No one test method can be used to measure the various pollutants the wet electrostatic precipitator may be required to remove.

5.4.3 Structural Design Criteria. Structural design is dictated by operating criteria that may differ significantly from criteria used for wet electrostatic precipitator sizing. The appropriate criteria dictating structural design must accompany any bid specification. Please refer to ICAC publication *Structural Design Criteria for Electrostatic Precipitator Casings* (ICAC-EP-8, revised 1993). For structural design purposes, the following definitions of temperature and pressure apply:

5.4.3.1 Normal Operating Gas Temperature (T_o) and Pressure (P_o), are specific to the normal continuous operation of the WESP. These are structurally analogous to live loads.

5.4.3.2 Maximum Temperature (T_{mx}) and Gas Pressure (P_{mx}) occur in accidental situations (rare occurrence, short duration). These are structurally analogous to wind or seismic loads. The Maximum Gas Pressure P_{mx} shall be the test block capability of the forced draft fan or the induced draft fan at ambient temperature less the actual pressure drop incurred in the ducting system from fans to the WESP.

5.4.3.3 Excursion Temperature (T_{ex}) is a surge of temperature for a maximum of one hour, and is considered for calculating maximum linear expansion and the selection of materials used in the WESP.

5.5 Additional Specification Information

Specification documents may need to include more information than is shown on the attached forms. Sections may be included discussing various wet electrostatic precipitator parts and auxiliaries which the purchaser wishes to include in the specification. The following partial list should be considered:

- Approved Sub-Vender List
- Complete Water Analysis
- Configuration: Horizontal or Vertical
- Degree of Erection
- Materials of Construction, Including Thickness
- Method of Wash: Spray, Irrigation or Condensing; Intermittent or Continuous
- Model Study
- Safety Interlocks

- Type and Material of Collecting Electrode: Tubular or Plate
- Type and Material of Discharge Electrode
- Type of High Voltage Power Supply: Conventional T-R or High Frequency Power Supply
- Water Usage: Once Through or a Recycle System

Some of these items are listed on the bid evaluation forms, which can be used as a checklist when writing the specifications.

Layout drawings, indicating real estate restrictions, lay down areas, the arrangement of existing equipment, and the location and general layout of the new equipment, should be supplied by the purchaser. Restrictions in space available for the equipment are very important as they can impact the configuration selected for the WESP.

6. INSTRUCTIONS FOR USING THE BID EVALUATION FORM

Five columns are included on the bid evaluation form. The first column lists typical parameters or items that may be of interest during bid evaluation. Some of the items listed in the first column of the bid evaluation form may be "required" by the purchaser. By including a column marked "Required," the purchaser may use the evaluation form as a checklist to ensure that all requirements are included in the specification and that such requirements are addressed by the bidders.

The final three columns are provided for bid evaluation. Values provided by each bidder can be entered for each item in the first column for side-by-side comparison of each bidder's offering.

6.1 Additional Bid Information

Additional information, not included on the attached data sheets, may also be required by the purchaser. For example, should guarantees or expected operation require reporting at "standard" or "normal" conditions, the purchaser must identify what defines those conditions.

IMPORTANT

On the form "Bid Specification Information Requirements" and "Bid Evaluation Form" you will be asked to choose either English Units or System International (SI) Units for some measurements. To help quickly identify the SI unit designation it will be preceded by the symbol ▲. The following heading also appears at the top of pages 14 and 16 as a reminder to choose only one.

NOTE - Choose Either: English unites
▲ SI units

FORM 1: BID SPECIFICATION INFORMATION REQUIREMENTS – Sheet 1 of 4

GENERAL INFORMATION

■ **PURCHASER**

Name: ______________________________

Address: ______________________________

City/State/Zip: ______________________________

Contact ____________________ Phone: ______ - ____________ Fax: ______ - ____________

Email: ______________________________

■ **USER**

Name: ______________________________

Address: ______________________________

City/State/Zip: ______________________________

Contact ____________________ Phone: ______ - ____________ Fax: ______ - ____________

Email: ______________________________

■ **ARCHITECT/ ENGINEER**

Name: ______________________________

Address: ______________________________

City/State/Zip: ______________________________

Contact ____________________ Phone: ______ - ____________ Fax: ______ - ____________

Email: ______________________________

■ **PLANT SITE LOCATION**

Plant Name: ______________________________

Address: ______________________________

City/State/Zip: ______________________________

Contact: ____________________ Phone: ______ - ____________ Fax: ______ - ____________

Email: ______________________________

■ **EQUIPMENT TYPE**

❑ New ❑ Replacement

❑ Upgrade ❑ Supplemental

■ **PROPOSAL TYPE**

❑ Firm ❑ Budget

■ **FREIGHT TERMS:**

____

■ **SCHEDULE DATES**

Pre-Bid Meeting: ____________ Bid Due: ____________ Contract Award: ____________ Kick-Off Meeting: ____________ Engineering Completion: ____________ Material Delivery Start: ____________

Material Delivery Completion: ____________ Installation Start: ____________ Installation Completion: ____________ Unit Start-Up: ____________ Performance Test "A": ____________ Performance Test "B": ____________

SCOPE OF SUPPLY

BIDDER REQUIRED	OWNER/ OTHER	
❑	❑	Access Doors
❑	❑	Access Platforms - Casing
❑	❑	Access Platforms- Inlet Transition
❑	❑	Access platforms - Outlet Transition
❑	❑	Auxiliaries (details to be provided by Purchaser)
❑	❑	Baffles
❑	❑	Casing
❑	❑	Collecting Electrodes
❑	❑	Construction Advisor
❑	❑	Control Logic Design
❑	❑	Control Room
❑	❑	Controls
❑	❑	Demolition
❑	❑	Discharge Electrodes
❑	❑	Duct Transitions
❑	❑	Duct Work
❑	❑	Low Voltage Wiring
❑	❑	Model Study
❑	❑	Painting - Priming of Steel Surfaces
❑	❑	Painting - Finish Painting
❑	❑	Performance Testing
❑	❑	Performance Testing Supervision
❑	❑	Pipe Heat Tracing

BIDDER REQUIRED	OWNER/ OTHER	
❑	❑	Elevator
❑	❑	Engineering
❑	❑	Erection
❑	❑	Erection Supervision
❑	❑	Expansion Joints
❑	❑	Foundations
❑	❑	Freight Grounding
❑	❑	Instrumentation
❑	❑	Insulation & Lagging - Supply Only
❑	❑	Insulation & Lagging - Supply & Install
❑	❑	Insulator Heater System
❑	❑	Insulator Purge Blowers
❑	❑	Insulator Compartments or Penthouse for Insulators
❑	❑	Interface w/Plant DCS
❑	❑	I.D. Fans
❑	❑	Lighting
❑	❑	Tool Trailer
❑	❑	T-R Weather Enclosure
❑	❑	T-R Hoist System
❑	❑	Transition Inlet
❑	❑	Transition Outlet
❑	❑	Wash pumps
❑	❑	Weather Enclosure HVAC System

FORM 1: BID SPECIFICATION INFORMATION REQUIREMENTS – Sheet 2 of 4

SCOPE OF SUPPLY *(continued)*

BIDDER REQUIRED	OWNER/ OTHER		BIDDER REQUIRED	OWNER/ OTHER	
❑	❑	Piping	❑	❑	Weather Enclosure Framing
❑	❑	Power Distribution	❑	❑	Weather Enclosure Siding
❑	❑	Slide Plates	❑	❑	Water Recycle System
❑	❑	Stack/Stub Stack	❑	❑	Other
❑	❑	Start-Up Services	❑	❑	___________
❑	❑	Supervisory Controls	❑	❑	___________
❑	❑	Support Steel	❑	❑	___________
❑	❑	Stair Tower	❑	❑	___________
❑	❑	Switch Gear/Substation	❑	❑	___________
❑	❑	Test Ports	❑	❑	___________
❑	❑	Test Port access platforms	❑	❑	___________
❑	❑	Testing Services	❑	❑	___________

PROCESS INFORMATION: NON-FOSSIL FUEL APPLICATIONS (Must be provided by owner or architect/engineer.)

■ **PROCESS DESCRIPTION**

Industry ___________________________

Application/Process ___________________________

Combustion Equipment ______________ Manufacturer & Model ______________ Number of Units ________

Material Type & Feed Rate ______________________ Heat Input ______________________

Process Output - Continuous or Batch (circle one) - Peak Output ______________ - Design Output ______________

Upstream Air Pollution Control Devices (Include Details) ___________________________

____

____

■ **FUEL DESCRIPTION**

Fuel Type	Feed Rate
___________	___________
___________	___________
___________	___________

Other Information

____

____

■ **WATER SOURCE**

Quantity Available (gpm)

____

Quality Available - Chloride Concentration (ppm) ___________ - Suspended Solids ___________ - pH ___________ - Other ___________

■ **PARTICULATE AND AEROSOL DESCRIPTION**

Particulate Type

____

____

Particulate Chemical Composition/Analysis

Constituent	% By Weight
___________	___________
___________	___________
___________	___________
___________	___________
___________	___________

Reference Test Method Used for Particle Size Determination:

____

■ **PARTICLE SIZE DISTRIBUTION (Suspended Solids and Aerosols)**

Diameter (Microns)	% Undersize (% of Total)	Reference Test Method
≤ 0.5 micron	________	________
≤ 1.0 micron	________	________
≤ 2.5 microns	________	________
≤ 10 microns	________	________
> 10 microns	________	________

■ **GAS ANALYSIS**

Constituent	% By Volume	Lb/Hr
H_2O	________	________
O_2	________	________
N_2	________	________
SO_2	________	________
CO_2	________	________
Other (specify) CO, NO_x, HCL, HF, HBr, etc.		
	________	________
Other (specify)	________	________
Other (specify)	________	________
Other (specify)	________	________
Other (specify)	________	________

FORM 1: BID SPECIFICATION INFORMATION REQUIREMENTS – Sheet 3 of 4

PROCESS INFORMATION: FOSSIL FUEL APPLICATIONS (Must be provided by the owner or architect/engineer.)

■ PROCESS DESCRIPTION

Process Description ____________________

Boiler Type ____________________ Boiler Manufacturer & Model ____________________ Number of Units ____________

Boiler Rating (MW-net) ____________________ Boiler Rating (MW-gross) ____________________

Fuel Type & Feed Rate ____________________ Heat Input (mmBtu/Hr) ____________________

Process Output - Continuous or Batch (circle one) - Peak Output ____________________ - Design Output ____________________

Upstream Air Pollution Control Devices (Include Details) ____________________

____

____

■ WATER SOURCE

Quantity Available (gpm)

____

Quality Available - Chloride Concentration (ppm) ____________ - Suspended Solids ____________ - pH ____________ - Other ____________

■ GAS ANALYSIS

Constituent	% By Volume	Lb/Hr
H_2O	________	________
N_2	________	________
CO_2	________	________
O_2	________	________
SO_2	________	________
Other (specify) CO, NO_x, HCL, HF, HBr	________	________
Other (specify)	________	________
Other (specify)	________	________
Other (specify)	________	________
Other (specify)	________	________

■ POLLUTANT ANALYSIS

Constituent	Max. Value (% by Wt.)	Min. Value (% by Wt.)	Design Value (% by Wt.)
Ash	________	________	________
Carbon	________	________	________
Salt (describe)	________	________	________
H_2SO_4	________	________	________
FGD Mist Carryover	________	________	________
Other (describe)	________	________	________

■ PARTICLE SIZE DISTRIBUTION (Suspended Solids and Aerosols)

Diameter (Microns)	% Undersize (% of Total)	Reference Test Method
≤ 0.5 micron	________	________
≤ 1.0 micron	________	________
≤ 2.5 microns	________	________
≤ 10 microns	________	________
> 10 microns	________	________

WET ELECTROSTATIC PRECIPITATOR SIZING & STRUCTURAL DESIGN CRITERIA (Choose either English Units or System International Units)

■ SIZING CRITERIA (English Units)

Gas Volume (acfm) ____________ Mass Flow (lb/hr) ____________ Gas (Temp. °F) ____________

Gas Pressure (in. w.g.)

- Normal Operating - positive ____________
- Normal Operating - negative ____________
- Surge Pressure - negative ____________
- Surge Pressure - positive ____________

PM Inlet Loading (gr/acf) ____________ PM Inlet Loading (gr/dscf) ____________ PM Inlet Loading (lb/mmBtu) ____________ PM Inlet Loading (lb/hr) ____________

PM Outlet Emissions (gr/acf) ____________ PM Outlet Emissions (gr/dscf) ____________ PM Outlet Emissions (lb/mmBtu) ____________ PM Outlet Emissions (lb/hr) ____________

SO_3 (equiv) Inlet Loading (ppmv) ____________ SO_3 (equiv) Inlet loading (ppmvd) ____________ SO_3 (equiv) Inlet loading (lb/mmBtu) ____________ SO_3 (equiv) Inlet loading (lb/hr) ____________

SO_3 (equiv) Outlet Emissions (ppmv) ____________ SO_3 (equiv) Outlet Emissions (ppmvd) ____________ SO_3 (equiv) Outlet Emissions (lb/mmBtu) ____________ SO_3 (equiv) Outlet Emission (lb/hr) ____________

Droplet Carryover (lb/hr) ____________ Droplet Carryover (lb/mmBtu) ____________ Droplet Carryover (gr/dscf) ____________ Droplet Carryover (gr/acf) ____________

Opacity @ ____________ Stack Exit Diameter (ft.) ____________

FORM 1: BID SPECIFICATION INFORMATION REQUIREMENTS – Sheet 4 of 4

WET ELECTROSTATIC PRECIPITATOR SIZING & STRUCTURAL DESIGN CRITERIA *(continued)*

■ STRUCTURAL DESIGN CRITERIA (English Units)

Gas Temperature (°F) - Normal Operating ____________ - Excursion (1 Hr) ____________

Gas Pressure (in. w.c., static)
- Normal Operating - positive ____________ - Normal Operating - negative ____________ - Surge Pressure - negative ____________ - Surge Pressure - positive ____________

Casing Design - positive ____________ Casing Design - negative ____________ Casing Material Type ____________

Site elevation (ft. above sea level) ____________ Standard Barometric Pressure (in. Hg) ____________ Standard Temperature (°F) ____________

Design ambient temperature - Max (°F) ____________ Design ambient temperature - Min (°F) ____________

■ BUILDING CODE

Access Live Load (lb/ft^2) ____________ Roof Load (lb/ft^2) ____________ Seismic Design Criteria ____________

Snow Load (lb/ft^2) ____________ Wind Load (lb/ft^2) ____________ ____________

■ SIZING CRITERIA (System International Units) ▲

Gas Volume (m^3/hr) ____________ Mass Flow (kg/hr) ____________ Gas Temperature – (°C) - Normal ____________ - Excursion (1 hr) ____________

Gas Pressure (mm w.c., static)
- Normal Operating - positive ____________ - Normal Operating - negative ____________ - Surge Pressure - negative ____________ - Surge Pressure - positive ____________

PM Inlet Loading (mg/Nm^3, wet) ____________ PM Inlet Loading (mg/Nm^3, dry) ____________ PM Inlet Loading (kg/hr) ____________

PM Outlet Emissions (mg/Nm^3, wet) ____________ PM Outlet Emissions (mg/Nm^3, dry) ____________ PM Outlet Emissions (kg/hr) ____________

SO_3 (equiv) Inlet Loading (ppmv) ____________ SO_3 (equiv) Inlet loading (ppmvd) ____________ SO_3 (equiv) Inlet loading (kg/hr) ____________

SO_3 (equiv) Outlet Emissions (ppmv) ____________ SO_3 (equiv) Outlet Emissions (ppmvd) ____________ SO_3 (equiv) Outlet Emissions (kg/hr) ____________

Droplet Carryover (mg/Nm^3, wet) ____________ Droplet Carryover (mg/Nm^3, dry) ____________

Opacity @ ____________ Stack Exit Diameter (meters) ____________

■ STRUCTURAL DESIGN CRITERIA (System International Units) ▲

Gas Temperature (°C) - Normal Operating ____________ - Excursion (1 Hr) ____________

Gas Pressure (mm w.c., static)
- Normal Operating - positive ____________ - Normal Operating - negative ____________ - Surge Pressure - negative ____________ - Surge Pressure - positive ____________

Casing Design - positive ____________ Casing Design - negative ____________ Casing Material Type ____________

Site elevation (m above sea level) ____________ Standard Barometric Pressure (mbar, mm Hg) ____________ Standard Temperature (°C) ____________

Design ambient temperature - Max (°C) ____________ Design ambient temperature - Min (°C) ____________

■ BUILDING CODE

Access Live Load (kg/m^2) ____________ Roof Load (kg/m^2) ____________ Seismic Design Criteria ____________

Snow Load (kg/m^2) ____________ Wind Load (kg/m^2) ____________ ____________

FORM 2: BID EVALUATION INFORMATION – Sheet 1 of 9

Bidder #1: ______________________ Bidder #2: ______________________

Bidder #3: ______________________

■ OPERATING & PERFORMANCE DATA

	Required	Bidder #1	Bidder #2	Bidder #3
Design Basis - *English Units*				
Gas Volume (acfm)	☐			
Mass Flow (lb/hr)	☐			
Gas Temperature (°F)	☐			
Gas Pressure (in w.c.)	☐			
PM Inlet Dust Loading (lb/hr, lb/mmBtu, gr/dscf, gr/acf)	☐			
H_2SO_4 / SO_3 Inlet Loading (lb/hr, ppmv, ppmvd, lb/mmBtu)	☐			
Other	☐			
Other	☐			
Other	☐			
Performance Data - *English Units*				
PM Outlet Emissions (lb/hr, lb/mmBtu, gr/dscf, gr/acf)	☐			
H_2SO_4 / SO_3 Outlet Emissions (lb/hr, lb/mmBtu, ppmv, ppmvd)	☐			
Other	☐			
Other	☐			
Other	☐			
Guaranteed Opacity % (stack diameter)	☐			
Treatment Time (sec)	☐			
Pressure Drop – WESP only (in w.c.)	☐			
Pressure Drop – WESP + Duct (in w.c.)	☐			
Make-Up Water (gpm)	☐			
Blow-Down Liquid (gpm)	☐			
Power Consumption (kW)	☐			
Other Consumables	☐			
Reference Test Methods	☐			
Design Basis - *SI Units* ▲				
Gas Volume (m^3/hr)	☐			
Mass Flow (kg/hr)	☐			
Gas Temperature (°C)	☐			
Gas Pressure (mm w.c.)	☐			
PM Inlet Dust Loading (mg/Nm^3, wet; mg/Nm^3, dry; kg/hr)	☐			
H_2SO_4 / SO_3 Inlet Loading (ppmv, ppmvd, kg/hr)	☐			
Other	☐			
Other	☐			
Other	☐			

FORM 2: BID EVALUATION INFORMATION – Sheet 2 of 9

■ **OPERATING & PERFORMANCE DATA *(continued)***

	Required	Bidder #1	Bidder #2	Bidder #3
Performance Data - *SI Units* ▲				
PM Outlet Emissions (mg/Nm^3-wet, mg/Nm^3-dry, kg/hr)	☐			
H_2SO_4 / SO_3 Outlet Emissions (ppmv, ppmvd, kg/hr)	☐			
Other	☐			
Other	☐			
Other	☐			
Inlet gas velocity	☐			
Guaranteed Opacity, % (stack dia.)	☐			
Treatment Time (sec)	☐			
Pressure Drop – WESP only (mm w.c.)	☐			
Pressure Drop – WESP + Duct (mm w.c.)	☐			
Make-Up Water (lpm)	☐			
Blow-Down Liquid (lpm)	☐			
Power Consumption (kW)	☐			
Other Consumables	☐			

■ **PRECIPITATOR ARRANGEMENT**

	Required	Bidder #1	Bidder #2	Bidder #3
No. of Precipitators	☐			
Bottom /Pan				
No. / Configuration per Chamber (L × W)	☐			
No. / Mechanical Field	☐			
Material / Plate Thickness	☐			
No. of drains	☐			
Diameter of Drains (inches)	☐			
Horizontal Precipitators				
No. of Chambers/Precipitator	☐			
No. of Mechanical Fields/Precipitator	☐			
No. of Electrical Fields/Precipitator	☐			
No. of Bus Sections/Precipitator	☐			
No. of Gas Passages/Chamber	☐			
Width of Gas Passages (inches or meters)				
Field 1	☐			
Field 2	☐			
Field 3	☐			
Field 4	☐			
Height of Collecting Electrode/Mech. Field	☐			

■ **PRECIPITATOR ARRANGEMENT *(continued)***

	Required	Bidder #1	Bidder #2	Bidder #3
Length of Collecting Electrode/Mech. Field				
Field 1	☐			
Field 2	☐			
Field 3	☐			
Field 4	☐			
Width of Precipitator (column centers)	☐			
Length of Precipitator (column centers excluding transition nozzles)	☐			
Height of Precipitator (excluding weather enclosure)	☐			
Specific Collecting Area (SCA) – ft^2/1000 acfm	☐			
Current Density (mA/ft^2)	☐			
Tubular Precipitators				
No. of Tubes	☐			
Shape of Tube – (square, round, hexagonal)	☐			
Tube dimensions				
Field 1	☐			
Field 2	☐			
Field 3	☐			
Field 4	☐			
Up-flow or Down-flow	☐			
No. of Mechanical Fields in Series /Precipitator	☐			
Length of Collecting Field / Mechanical field				
Field 1	☐			
Field 2	☐			
Field 3	☐			
Field 4	☐			
No. of Electrical Fields in Series/Precipitator	☐			
No. of Bus Sections	☐			
Width of Precipitator (Column Centers)	☐			
Height of Precipitator ExcludingTransitions	☐			
Height of Precipitator with Transitions	☐			
Depth of Precipitator (Column Centers)	☐			
Specific Collection Area (SCA) – ft^2/1000 acfm	☐			
Current Density (mA/ft^2)	☐			

■ **PRECIPITATOR DESIGN**

	Required	Bidder #1	Bidder #2	Bidder #3
Casing / Transitions (Nozzles)				
Casing Material / Plate Thickness	☐			
Transition Nozzle Material / Plate Thickness	☐			

18

FORM 2: BID EVALUATION INFORMATION – Sheet 4 of 9

■ **PRECIPITATOR DESIGN *(continued)***

	Required	Bidder #1	Bidder #2	Bidder #3
Gas Distribution Device Type	☐			
Inlet transition – quantity	☐			
– type	☐			
– material	☐			
Outlet transition – quanity	☐			
– type	☐			
– material	☐			
Casing (Hot) Roof				
Roof Material / Plate Thickness	☐			
No. of Insulator Compartments	☐			
Insulator Compt. Material / Plate Thickness	☐			
Insulator Compt. Design	☐			
Penthouse				
Penthouse Wall Material / Plate Thickness (ft)	☐			
Penthouse Wall Material / Plate Thickness (m)	☐			
Penthouse Roof Material / Plate Thickness (ft)	☐			
Penthouse Roof Material / Plate Thickness (m)	☐			
Penthouse. Height (ft)	☐			
Penthouse. Height (m)	☐			
Insulated Yes / No	☐			
Weather Enclosure				
Weather Enclosure Wall Material / Thickness (ft)	☐			
Weather Enclosure Wall Material / Thickness (m)	☐			
Weather Enclosure Roof Material / Thickness (ft)	☐			
Weather Enclosure Roof Material / Thickness (m)	☐			
Weather Enclosure Height (ft)	☐			
Weather Enclosure Height (m)	☐			
Insulated Yes / No	☐			

■ **COLLECTING SYSTEM**

	Required	Bidder #1	Bidder #2	Bidder #3
Type of Collecting Electrode- Plate or Tubular	☐			
No. of Collecting Electrode Plates/Tubes	☐			
Material / Thickness (ft)	☐			
Material / Thickness (m)	☐			
Effective Height (ft) × Effective Length (ft)	☐			
Effective Height (m) × Effective Length (m)	☐			
Effective Length (ft) × Diameter (in)	☐			
Effective Length (m) × Diameter (m)	☐			

FORM 2: BID EVALUATION INFORMATION – Sheet 5 of 9

■ COLLECTING SYSTEM *(continued)*

	Required	Bidder #1	Bidder #2	Bidder #3
Total Surface Area (ft^2 or m^2)	☐			
Method of Wash (spray, irrigation, condensing)	☐			

■ DISCHARGE ELECTRODES

		Required	Bidder #1	Bidder #2	Bidder #3
No. of Discharge Electrodes		☐			
Discharge Electrode Type & Shape		☐			
Discharge Electrode Material / Diameter (ft)		☐			
Discharge Electrode Material / Diameter (m)		☐			
Length of Discharge Electrode		☐			
Total Length of Discharge Electrodes		☐			
Distance between Discharge Electrodes		☐			
No. Suspension Insulators / H.V. Frame		☐			
H.V. Frame	Total/Field	☐			
	Total Precipitator	☐			
Method of H.V. System Stabilization		☐			
Support Insulator Material		☐			

■ EXTERNAL HIGH VOLTAGE SYSTEM

		Required	Bidder #1	Bidder #2	Bidder #3
H.V. Bus	Material Description / Type	☐			
	Thickness or Size	☐			
Bus Duct	Material / Thickness (ft)	☐			
	Diameter (ft)	☐			
Bus Duct	Material / Thickness (m)	☐			
	Diameter (m)	☐			
Disconnect Switch Type / No. Per T-R		☐			

■ HIGH VOLTAGE SYSTEM

		Required	Bidder #1	Bidder #2	Bidder #3
Transformer-Rectifiers (T-R)					
Manufacturer		☐			
No. of Phases		☐			
Number	No. in Direction of Gas Flow	☐			
	No. across Gas flow	☐			
	Total / Precipitator	☐			
Number of Bus Sections		☐			
Rating (kV avg./ mA avg./ AAC)	Field 1	☐			
	Field 2	☐			
	Field 3	☐			
	Field 4	☐			
T-R Primary Voltage (VAC)		☐			
Current Form Factor		☐			
Voltage Form Factor		☐			

FORM 2: BID EVALUATION INFORMATION – Sheet 6 of 9

■ HIGH VOLTAGE SYSTEM *(continued)*

	Required	Bidder #1	Bidder #2	Bidder #3
Total Surface Area (ft^2 or m^2)	☐			
Wave Form Frequency (Hz)	☐			
Impedance (Ohms)	☐			
Type Insulating Fluid	☐			
Qty. Insulating Fluid	☐			
Max. Operating Temperature	☐			
Containment Tank Capacity	☐			
High Frequency Power Supply	☐			
Current Limiting Reactors (CLR)				
Manufacturer	☐			
No. of Current Limiting Reactors	☐			
Size of CLR Cabinets	☐			
CLR Design Percent Impedance, %	☐			
CLR Primary Voltage, VAC	☐			
CLR Primary Current , AAC	☐			
Automatic Voltage Controllers (AVC)				
Manufacturer	☐			
No. of Automatic Voltage Controllers	☐			
Controller Cabinet Size	☐			
Controller Primary Voltage, VAC	☐			

■ POWER

	Required	Bidder #1	Bidder #2	Bidder #3
Connected Power Load				
High Voltage System Connected Power, kVA	☐			
Total Connected Power, kVA	☐			
Operating Power Consumption				
High Voltage System (kW)	☐			
HVAC (kW)	☐			
Insulator Purge Blowers (kW)	☐			
Insulator Heaters (kW)	☐			
Lighting (kW)	☐			
Pumps (kW)	☐			
Miscellaneous (kW)	☐			
Total Operating Power Consumption (kW)	☐			

■ POWER DISTRIBUTION

	Required	Bidder #1	Bidder #2	Bidder #3
Power Dist. Panels				
Manufacturer	☐			
Panels / Precipitator	☐			

FORM 2: BID EVALUATION INFORMATION – Sheet 7 of 9

■ POWER DISTRIBUTION *(continued)*

	Required	Bidder #1	Bidder #2	Bidder #3
Max. Rated Current	☐			
Short Circuit Withstand Current	☐			
Interrupt Rating of Breakers	☐			
Voltage Rating	☐			
NEMA Rating of Enclosure	☐			
Motor Control Centers				
Manufacturer	☐			
No. Sections, Total	☐			
Max. Rated Current	☐			
Short Circuit Withstand Current	☐			
Interrupt Rating of Breakers	☐			
Voltage Rating	☐			
NEMA Rating of Enclosure	☐			

■ INSULATOR HEATING & PURGE AIR

		Required	Bidder #1	Bidder #2	Bidder #3
Heater	No. / Precipitator	☐			
	No. / Operating / No. Space	☐			
	Type	☐			
	Size Each (kW)	☐			
	Voltage/Current	☐			
Blower / Motor	No. / Precipitator	☐			
Rated Flow (cfm) @ Max. RPM		☐			
Rated Flow (m^3/hr) @ Max. RPM		☐			
Air Flow per Insulator		☐			
Max. Static Press. (in. H_20 or mbar)		☐			
Voltage / Current / Phase		☐			
Horsepower		☐			
Filter Type		☐			

■ PRECIPITATOR ACCESS

			Required	Bidder #1	Bidder #2	Bidder #3
Access Doors	Penthouse (Cold) Roof	No.	☐			
		Size	☐			
	Casing (Hot) Roof	No.	☐			
		Size	☐			
	Casing	No.	☐			
		Size	☐			
	Bottom Pans	No./Pan	☐			
		Size	☐			
	Inlet Transition (Nozzle)	No.	☐			
		Size	☐			
	Outlet Transition (Nozzle)	No.	☐			
		Size	☐			

FORM 2: BID EVALUATION INFORMATION – Sheet 8 of 9

■ **PRECIPITATOR ACCESS *(continued)***

		Required	Bidder #1	Bidder #2	Bidder #3
Key Interlocks Manufacturer		☐			
Access Door Locks	Yes / No	☐			
Control Circ. Brkr. Disconnect	Yes / No	☐			
T-R Ground Switch Locks	Yes / No	☐			

■ **HEAT INSULATION & LAGGING**

		Required	Bidder #1	Bidder #2	Bidder #3
Piping	Yes / No	☐			
Casing	Yes / No	☐			
Penthouse	Yes / No	☐			
Weather / Enclosure	Yes / No	☐			
Purge Air Duct	Yes / No	☐			
Other	Yes / No	☐			

■ **AUXILIARY EQUIPMENT**

	Required	Bidder #1	Bidder #2	Bidder #3
Ductwork				
Material / Thickness	☐			
Turning Vane Material / Thickness	☐			
Expansion Joints				
Quantity	☐			
Material	☐			
Description	☐			
Slide Plate				
Quantity	☐			
Type	☐			
Manufacturer	☐			
T-R Removal System				
Type	☐			
Type Trolley Operator	☐			
No. Hoists	☐			
Type Hoists	☐			
Hoist Horsepower	☐			
Voltage / Current	☐			
Capacity (tons)	☐			
Capacity (kg)	☐			
Vent Fans				
No. / Precipitator	☐			
Type	☐			
Manufacturer	☐			
Motor Horsepower	☐			
Voltage / Current	☐			

FORM 2: BID EVALUATION INFORMATION – Sheet 9 of 9

■ WASH SYSTEM

	Required	Bidder #1	Bidder #2	Bidder #3
Wash Pumps				
No. / Precipitator.	☐			
Material	☐			
Wash Tanks				
No. / Precipitator	☐			
Material	☐			
Wash Piping				
Material	☐			
Location of wash headers	☐			
Irrigation System Type				
Continuous / Intermittent / Condensing	☐			
Single Pass / Recycle	☐			
pH Control / Treatment	☐			
Other	☐			
Other	☐			

■ EQUIPMENT WEIGHT (TONS)

	Required	Bidder #1	Bidder #2	Bidder #3
Structural Steel, Platforms, Ladders etc.	☐			
Casings / Bottom Pans / Insulator Compartments or Penthouse /Weather Enclosure	☐			
Inlet & Outlet Transition Nozzles	☐			
Internals	☐			
Auxiliaries	☐			
Other	☐			
TOTAL	☐			

24 NOTES AND ADDITIONAL INFORMATION

INSTITUTE OF CLEAN AIR COMPANIES

Members

ADA Environmental Solutions, LLC
ALSTOM Power
Ametek Process Instruments
Anguil Environmental Systems, Inc.
Argillon LLC
Babcock & Wilcox
Babcock Power Inc.
BASF
Belco Technologies Corporation
Black & Veatch
Burns & McDonnell
Chemical Lime Company
Cormetech, Inc.
CRI Catalyst Company
CSM Worldwide, Inc.
Dürr Environmental & Energy Systems
Envirolutions Systems
Epcon Industrial Systems
Forney Corporation
Fuel Tech
GE Energy Services
Haldor Topsoe, Inc.
Hamon Research-Cottrell, Inc.
Hitachi Power Systems America, Ltd.
Horiba Instruments, Inc.
Johnson Matthey Stationary Source Emissions Control
Lodge-Cottrell, Inc.
Marsulex Environmental Technologies
Mitsubishi Heavy Industries, America, Inc., Environmental Systems Division
Mitsubishi Power Systems, Inc.
Mobotec USA, Inc.
NORIT Americas Inc.
Ohio Lumex
Powerspan Corporation
Sargent & Lundy, LLC
SICK Maihak, Inc.
Siemens Environmental Systems and Services
Spectrum Systems, Inc.
Stone & Webster Engineering Corporation
Süd-Chemie, Inc.
Tekran Instruments Corp.
Teledyne Monitor Labs
Thermo Electron Corporation
Washington Group International, Inc.
WorleyParsons

Associate Members

Advanced Electron Beams
Airflow Sciences Corporation
Airgas, Inc.
Andover Technology Partners
Applied Ceramics, Inc.
Aspectrics
Avogadro Environmental Corporation
Baldwin Environmental, Inc.
Beta Analytic Inc.
Cabot Superior MicroPowders
California Analytical Instruments
Carmeuse North America
Casey Industrial, Inc.
CEM Service Group, Inc.
Chemco Systems LP
Corning, Incorporated
Dekoron/Unitherm, Inc.
ECOM America Ltd.
Energy Services Consultants
Environmental Systems Corporation
Evergreen Energy
FFE Minerals
Graymont Inc.
GT&S, Inc.
Krishnan & Associates
Linde Gas, LLC
M&C Products Analysis Technology, Inc.
Matheson Trigas, Inc.
McIlvaine Company
Midwesco Filter Resources, Inc.
Millennium Chemicals, A Lyondell Company
MKS Instruments
National Specialty Gases
NWL Transformers
Parker Hannifin, Parflex Division
Perma Pure
Philadelphia Mixing Solutions
Potash Corporation of Saskatchewan, Inc.
Praxair, Inc.
PSP Industries
Red Ball Technical Gas Services
Restek Corporation
Scott Specialty Gases, Inc.
SCR-Tech
Solvay Chemicals, Inc.
Spectra Gases, Inc.
Structural Steel Services, Inc.
Terra Environmental Technologies
Testo, Inc.
Thermon Manufacturing Co.
TLT Babcock Inc.
Universal Analyzers, Inc.
VIG Industries, Inc.
VIM Technologies, Inc.
Zachry Construction Corporation

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