Publication ICAC-COMS 1

April 2004

GUIDELINES
FOR
PREPARATION
OF
BID
SPECIFICATIONS
AND
BID EVALUATIONS
FOR
CONTINUOUS
OPACITY
MONITORING
SYSTEMS
(COMS)

INSTITUTE OF
CLEAN
AIR
COMPANIES

ICAC

The Institute of Clean Air Companies, the nonprofit national association of companies that supply stationary source air pollution monitoring and control systems, equipment, and services, was formed in 1960 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 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.

Guidelines for Preparing Bid Specifications and Bid Evaluations for Continuous Opacity Monitoring Systems (COMS)

Summary: This document provides guidelines for specifying and collecting information necessary to solicit bids from suppliers of continuous opacity monitoring systems (COMS). It includes an example bid specification, a bid evaluation form, and a proposal checklist, with supporting discussion. The emphasis of this document is on the COMS; it only addresses opacity analyzers (transmissometers). Issues dealing with COMS applications such as location, monitoring feasibility, and flue gas (sample) composition associated with the measurement process have been omitted, as they can be very complex, and require separate discussions.

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1.0 HISTORY

The ICAC Emissions Measuring Division prepared ICAC-COM-1 to ease the process of purchasing COMS, and to help customers specify and obtain systems that best meet their needs.

The members of the ICAC Emissions Measuring Division are companies that supply emissions and opacity monitoring and stack testing products and services. Members of the Division who made special contributions and provided oversight to the development of ICAC-COM-1 were Land Instruments, Spectrum Systems, and Thermo Electron Corporation.

2.0 OBJECT AND SCOPE

The object of ICAC-COM-1 is to help end users of continuous opacity monitoring systems to prepare a specification for the solicitation of bids from opacity monitor suppliers. The intent is to provide a foundation for development of a purchase specification that can be prepared directly by the buyer, if desired, to reduce acquisition costs by minimizing or eliminating the need for third party consultants.

ICAC-COM-1 does not recommend specific values, suppliers, or designs. The general specifications provided are based on accepted practices, and are offered for informational purposes. Specific site conditions, applications, and monitoring requirements will dictate the actual system specifications and performance criteria.

3.0 DEFINITIONS

3.1 Bid Specification - A document containing equipment specifications, performance criteria, and scope of work sought which is distributed to suppliers to describe the requirements of the COMS intended for purchase.

3.2 Calibration Standard – Optical Density Filters used to calibrate COM instruments, and include a three-filter set, consisting of a low, mid and high range value as defined in ASTM 6216-98 documents. For each application, an individual must determine the applicable regulatory requirements for standard values and analytical certification tolerances.

3.3 COMS - A continuous opacity monitoring system.

3.4 Certification Testing - Performance testing of the COM according to specific testing protocol approved by the applicable regulatory agency for the purposes of demonstrating compliance to regulatory monitoring requirements.

3.5 Construction Services - Electrical and mechanical labor required to physically mount, secure and install the system and its ancillary components at the site.

3.6 Enclosure - A cabinet, shelter or rack used to contain sampling components, system controls, and analyzers.

3.7 Supervision of Installation Services - Services provided by factory-trained or factory-authorized service personnel that involve checking or making final system mechanical and electrical terminations.

3.8 Moisture - Combination of particulate and condensate (as defined as a liquid of any nature).

3.9 Opacity – A unitless measure of dust/particulate using light extinction based on Beer-Lambert's Law

3.10 Start-up Services - Services performed to calibrate and verify system operation and functionality following installation at the site.

4.0 BUYER'S RESPONSIBILITY

Purchasing a COMS requires planning and foresight. The buyer must define specifications for the COMS, and these specifications influence the overall cost and performance of the system. A COMS specification extends beyond a simple list of instrument specifications. Development of a bid specification requires input from multiple disciplines, including mechanical, electrical, instrumentation, and environmental engineering. Installation requirements must be defined for components such as mounting and securing of Opacity monitor, air purge system enclosures and proper OSHA accessibility. Electrical engineering support may be required to review system load demands and the availability of circuits. Instrumentation engineers will define the performance requirements, the types of analyzers, and possibly the sample conditioning requirements. Environmental engineering input is needed to ensure that the system satisfies the applicable regulatory requirements.

Additionally, other disciplines may also be called upon for support. For example, civil engineering input may be required to review plant structural conditions to ensure the COMS can be installed at a specific location, or to determine the feasibility of making penetrations in the stack to mount the equipment.

If properly developed, the specification serves as the basis for buying an operational system configured to meet the monitoring application at the lowest possible cost.

The purpose of the COMS specification is to help the buyer not only to secure competitive bids from suppliers, but also to identify and define specific designs. It is important that the buyer develop a specification that is both informative to the supplier, and useful as an evaluation tool when selecting a supplier. A COMS specification should address the following topics:

4.1 Purpose

The purpose should be a brief statement defining the equipment and services sought, followed by a brief explanation of the application and the installation site. For example, *Acme, Inc.* will be installing a continuous opacity monitoring system (COMS) to monitor dust/opacity emissions from a combustion boiler (*Anywhere, USA*).

4.2 Scope of Supply

The scope-of-supply section should clearly identify the equipment and services that the supplier is to provide. Equipment lists should identify the number and type of systems, and ancillary equipment such as air purge (blower) systems. Expected services should identify any requirements for construction, installation, certification testing, training, and maintenance.

4.3 Plant Description

The plant description must give the supplier a thorough understanding of the conditions under which work must be performed and under which the COMS will function. This section should identify the ambient and process conditions in which the COMS equipment will operate. This plant description should also contain flue gas characteristics (moisture), particulate matter controls, and must include a description of the sample port location and general access to the system components requested.

4.4 Plant Permits - Title V Operating Permit, and All Applicable State and Local Permits

The specification should list all permits governing plant operating parameters, emission limits, and monitoring, recording, and reporting requirements. A copy of each permit should be provided with the specification.

4.5 Existing Services and Services to Be Provided by Others

The work scope should clearly note any work that the buyer will perform. Items to be identified include but are not limited to: access routes to installation locations such as platforms, elevators, and ladders, utility services such as plant air and electrical power, foundations, labor for construction, mechanical installation, and electrical wiring. The importance of this section is dependent

on the extent of turnkey services requested.

4.6 Design Parameters

This section details the system parameters. Instrument specifications, performance criteria, operational requirements, and materials of construction are necessary to define the COMS hardware. Specification requirements are critical to ensuring that the system meets the buyer's expectations. Simultaneously, however, the specification should provide enough latitude for the COMS suppliers to use their experience and proven system designs.

Care must be taken to ensure the requirements in the specification define a system that can be reasonably manufactured. Occasionally, buyers combine instrument specifications from various manufacturers into a single specification in the hope of creating the perfect system. Unfortunately, such a strictly defined COMS often cannot be built at a reasonable cost.

4.7 Documentation

The type, number, and quality of system documents to be provided should be clearly specified. For example, specifications for drawings and manuals should include the number of copies and the format. As an option, the specification may call for drawings and manuals on electronic media (e.g., floppy disks, CD ROM) using popular software to allow the buyer to later modify these documents with minimal labor. Typically, a COMS supplier will provide all documentation within the standard Operations and Maintenance Manual.

4.8 Supplier Services

Supplier services include items such as factory acceptance testing, training, commissioning services, and certification testing services. As these items may be subjective and open to interpretation, specificity is important. Requirements for these services should address items such as the type, extent, and duration of training, certification testing protocols, and if desired, project management functions, such as progress reports and project schedules.

4.9 Performance Requirements

Performance requirements include the applicable regulatory requirements, and any additional requirements imposed by the buyer. More specifically, system availability (up time) requirements, certification testing results, and maintenance requirements should be defined and assigned measurable performance criteria.

A specification developed according to the principles outlined above is provided as Appendix 1. This specification is offered only as a guideline. Site-specific conditions, regulations, and permit conditions will dictate the precise parameters and designs for a given application.

5.0 QUALIFYING COM VENDORS

Before writing a specification, the buyer must decide which companies to consider as qualified suppliers. Potential

sources of suppliers include the list of ICAC members, and various buyers' guides which list COMS manufacturers and system integrators. In selecting suppliers, the buyer should note the important distinction between manufacturers and system integrators:

> *COMS manufacturers* are specialized companies dedicated to manufacturing equipment and analyzers specifically designed for continuous opacity monitoring applications. These companies engage in system design and configure systems specific to application conditions.
>
> *System integrators* are firms that purchase analyzers (from instrument suppliers) and components, and then configure them into a functional system.

Which type of supplier is best? The answer to this question depends on the application, Buyer's preferences, COMS background, engineering expertise, and labor allocated for the COMS project. The intent herein is not to specify one type of COMS supplier, but to provide guidance for narrowing the supplier field to those suppliers of either kind best able to meet plant-specific needs.

The buyer should pre-qualify bidders before issuing a bid request. This practice will eventually make the final selection process easier by reducing the number of firms being considered. Reducing the field of suppliers will allot more time for the buyer to study and review proposals of interest from those suppliers most qualified to meet the specific requirements.

Criteria for pre-qualification of COMS suppliers include:

* experience, size, and resources of the supplier;
* end-user references;
* quality assurance aspects;
* technical competence, staffing, and inventory of spare parts;
* after-sales support and service; and,
* general comfort factors (e.g., rapport with the supplier's engineering personnel).
* technology;
* warranty.

Experience and company size are considerations when selecting a COMS supplier. Experience is critical and cannot be overlooked. Company size may provide an indication of the resources that are available and the ability to stand behind the system warranties and guarantees extended to customers.

While references are important, customers should avoid placing too much emphasis on them. Because no supplier would knowingly submit a bad reference to a potential customer, comments from references will usually endorse the supplier. When contacting references, questions relating to the *customer experience* when dealing with the prospective supplier may reveal important underlying information.

The number of references a supplier will have for COMS on units very similar to that of the prospective buyer will vary greatly by industry. In some industries, few plants have COMS, because the industry encompasses few plants, because of limited regulatory requirements to install COMS, or for other historical reasons. For example, the

number of chemical plants producing pigments is small, so references for installations at such plants may not be available.

The COMS supplier should follow a consistent, documented, quality program, such as ISO 9001 or an equivalent self-written program.

The remaining factors such, as inventory, staffing, and after-sales support, are also important in the qualification process. Unfortunately, improper evaluation of these factors may lead to incorrect conclusions about a supplier. For example, in the case of after-sales support, purchasers of COMS often ask the location of the closest service technician to their location. This is the wrong question, given that the availability of service technicians, and not their location, is the real concern.

Keeping these ideas in mind, COMS suppliers can be quickly pre-qualified. The pre-qualification process should give the buyer a short list (at least three) of suppliers that, in the buyer's confidence, can supply a COMS meeting the buyer's specifications and expectations. Exploring the capability and compliance to specifications is left to the evaluation process.

6.0 EVALUATING THE PROPOSAL

After soliciting bids from the group of pre-qualified bidders, the buyer then faces the most important task: evaluating the bids and selecting the COMS supplier. Each COMS supplier will have submitted a response to the bid specification: either a proposal, or a notification not to bid on the project. A carefully written specification will usually assure that bids will be received for services and hardware tailored to the buyer's needs.

Selection of the bidder based simply on instrument specifications and purchase price is insufficient. An exclusive focus on the lowest price may lead to omitting services or equipment that must be purchased later, usually at a higher cost, or to selecting a system with high maintenance requirements.

The complexity of bids received depends directly upon the types of services requested. Whenever options are requested, the evaluation process becomes more difficult. Bids for replacing an existing system will typically be less complicated and require a less complicated review process. To make the process easier, the buyer should develop a process that assists in and documents the results of the evaluation. During this process, a set of questions and/or data sheets should be created to summarize each bidder's offer. Appendix 2 provides an example bid evaluation form.

Before evaluating the proposal details, it is common practice to develop a checklist to ensure that each proposal has addressed the requests of the solicitation. This practice helps to identify those bidders that have omitted items, or that have not submitted complete information. Reviewing each proposal for completeness can explain major cost differences between vendors.

Evaluating any bid will require careful comparison of design features of the system, its components, and technology:

* type of light source,
* Control Room Unit required ,
* purge blower requirements,
* system tolerance to ambient conditions and vibration,

* signal output capabilities for data acquisition,
* serviceability and ease of calibration audits,
* NEMA rating,
* standard factory system performance specifications,
* system expansion capabilities,
* normal expected system maintenance.

Commercial terms, conditions, and turnkey services also require considerations when appropriate. These should include but not be limited to:

* system warranties and guarantees,
* Manufacturer's Certificate of Performance (MCOC),
* testing services,
* training.

6.1 Opacity Analyzers

The analytical system of any COMS consists of the optical analyzer used to measure the unitless concentration of smoke/dust in the flue gas. Analyzer designs vary between manufacturers, and their principles of operation may sometimes differ.

6.1.1 Opacity Analyzer Operating Range

Most analyzers have selectable ranges, or at least ranges that are adjustable to accommodate the levels of opacity to be measured as defined in the site-operating permit. Traditionally, the majority of site requirements are set with ranges of 0-100% opacity. However, facilities such as Waste Incinerators and Electric Arc Furnaces have levels set at 0-60% and 0-3%, respectfully.

Opacity monitors with site requirements having ranges above 10% limits must meet the performance criteria as set forth in 40CFRpart60, Appendix B, Performance Specification 1 (PS-1), in conjunction with ASTM6216-98. For applications at 10% and lower, the analyzer must also meet USEPA Conditional Performance Specification CPS-001.

6.1.2 Instrument Drift

The drift of an analyzer refers to the deviation of the measured value from the true value over time. Zero drift describes the drift that an analyzer exhibits during analysis of an optical filter with zero extinction/absorption. Span drift refers to the drift shown by the analyzer when subjected to an optical filter extinction/absorption.

Drift tolerances are defined in PS-1, ASTM6216-98, and CPS-001 for their respective applications.

6.1.3 Instrument Response Time

Response time is defined in PS-1, ASTM6216-98, and CPS-001 for their respective applications.

6.1.4 System Response Time

The time required for a system to detect and respond to a process change is known as the system response time. System response time is affected by the response time of the analyzer, as well as the time for the data to be recorded. System response time is defined by both Federal and State requirements and regulations.

* * *

APPENDIX 1 - *SAMPLE COMS SPECIFICATION*

1.0 Purpose

XYZ Corporation issues this specification to solicit proposals for a continuous opacity monitoring system (COMS). The COMS will be required to monitor visible emissions in combustion flue gases from a stack serving a gas-fired boiler, oil-fired boiler, coal-fired boiler, incinerator, etc.

2.0 Scope of Supply

This specification is for the purchase (and optionally delivery, installation, and commissioning) of a fully assembled, tested and operational continuous emissions monitoring system as described in this document.

2.1 Base Equipment

2.1.1 One set of stack mounting flanges.

2.1.2 One (1) PS-1/CPS-001 compliance opacity analyzer.

2.1.3 One (1) set safety shutters (if required).

2.1.4 One (1) blower purge system adequate for site environment.

2.1.5 One (1) set of three (3) calibration audit filters with mounting jig as required

2.2 Services to be supplied

2.2.1 Start-up and commissioning services as required to render the COMS operational for normal continuous monitoring.

2.2.2 Certification testing as required by local, state and federal regulatory requirements to demonstrate compliant system operation.

2.2.3 Training of plant technical personnel in the operation and maintenance of the COMS.

2.3 Documentation

2.3.1 Provide system documentation in the form of a COMS Operation and Maintenance Manual, as-built system drawings, bill of materials, recommended spare and consumable spare parts.

2.3.2 Prepare and submit certification testing reports to the customer in a format that can be submitted to the applicable regulatory agencies.

2.3.3 QA/QC Program for maintenance and system operation in accordance with applicable regulatory guidelines.

3.0 Plant Description

The XYZ Corporation Plant is located in Any City, Any State, approximately twenty miles southeast of Someplace. At this plant the COMS shall be installed and made operational on the No. 1 stack servicing the plant's domestic boiler. The installation shall consist of stack-mounted equipment rated for outdoor exposure. The intended location for the opacity analyzer is at the 75 ft. level of the metal stack. Access to the sampling platform is available from a catwalk on the boiler building roof or from ground level using the metal ladder attached to the stack.

3.1 External Ambient Conditions

3.1.1 Plant Elevation:___ft. above sea level

3.1.2 Maximum Wind Speed:___mph

3.1.3 Ambient External Temperature

* Extreme minimum Temperature:___°F

* Extreme maximum temperature: ___°F
* Annual average temperature: ___°F

3.1.4 Relative Humidity: ___%

3.1.5 Other Related Environmental Conditions
* Vibration of stack
* Dust loading of ambient atmosphere
* RF interference or proximity of microwave transmitters

3.2 Internal Ambient Conditions

3.2.1 Ambient temperature range between ___°F and ___°F

3.2.2 Clean, relatively dust free environment

3.2.3 Area is dry and vibration free

3.3 Process Conditions

3.3.1 Stack Conditions
* Stack Temperature
* Stack Pressure
* Flue Gas Velocity

3.3.2 Stack Gas Stream Expected Constituent Concentrations
* Moisture ___ %
* Dust Loading ___ mg/scfm

3.3.3 Boiler Specifications
C Unit Rating ___lbs./hr.
C Primary Fuel ___
C Alternate Fuel ___
C Fuel Flow Rate ___
C Exhaust Gas Flow Rate ___

4.0 Services to be provided by Others

4.1 All system utilities shall be provided by the buyer.

4.2 Utility services shall consist of electrical power and plant compressed air.

4.2.1 Electrical power shall be available as:
* 480 V ac, 60 Hz, 3 phase, 3 wire
* 220 V ac, 60 Hz, 3 phase, 3 wire
* 120 V ac, 60 Hz, 1 phase

4.2.2 Plant air shall be made available at:
* 80 psi
* Oil-free with a dew point of -40 °C.

4.3 The buyer shall be responsible for performing all tasks associated with construction labor. These tasks and services shall include:

4.3.1 Unloading and storage of all COMS equipment.

4.3.2 Mounting and installing COMS hardware.

4.3.3 Installing conduit and signal cables.

4.3.4 Installing hardware in the form of scaffolding, ladders, platforms and all necessary structural components necessary to install and service the COMS equipment.

4.3.5 Tie-ins to electrical supplies and calibration gas supplies shall be performed under the guidance of the COMS supplier.

4.3.6 Mounting and securing system components in accordance with approved COMS installation drawings.

4.3.7 Installing other associate support equipment as necessary for permanent support and operation of the COMS.

5.0 System Design Parameters

5.1 Opacity Analyzers

5.4.1 Analyzer Quality

1. Analyzers provided and integrated into the system shall incorporate only approved methods of detection as per 40CFRpart60, Appendix B, PS-1 and ASTM6216-98 as well as CPS-001 when applicable.
2. Analyzers shall be capable of satisfying EPA and/or local regulations as listed in the operating permit for relative accuracy.

5.4.2 Analyzer Sensitivity
1. Analyzers must meet all performance criteria of PS-1 and all other applicable state and federal regulations.

5.4.3 Analyzer Output Signals
1. Analyzers shall have the capability of communicating a signal directly to the plant control system or existing Data Acquisition System. The output signal shall be linearly proportional to the opacity value sensed for entire scale in use.
2. Analog output signals shall be 4-20 mA and isolated.
3. Digital output signals may be used in lieu of isolated analog output signals.

5.4.4 Discrete Output Signals of System Controller
1. Discrete output signals must be available. As a minimum, discrete outputs must be available for:
   A. Analyzer malfunction
   B. Analyzer is in calibration
   C. Measured concentration exceeds predefined limits

5.4.5 Analyzer Specifications
1. Analyzers shall be capable of satisfying applicable EPA and/or local agency specified performance criteria.
2. Analyzers shall be equipped with a direct readout display, or an independent output for a local panel display device.
3. Analyzer displays shall provide readings in accepted engineering units.

6.0 Documentation

6.1 Operation and Maintenance Manuals

6.1.1 A minimum of one operation and maintenance manual shall be supplied for the as built system.

6.1.2 Operation and Maintenance Manuals shall provide instructions for operation, system calibration, preventive maintenance, and troubleshooting each system analyzer in addition to the system as a whole.

6.1.3 The supplier shall have the capability to provide in the Operation and Maintenance Manual a Bill of Materials for the as built system.

6.1.4 The Operation and Maintenance Manual shall list the recommended spare and consumable components for the system with recommended quantity and part number.

6.2 System Drawings

6.2.1 One complete set of drawings for the as built system shall be supplied. These drawings shall be signed, dated and clearly labeled as an approved drawing. Approval can be denoted via signature, stamp, etc.

6.2.2 System drawings shall be provided on a 3.5-inch floppy diskette formatted using *AutoCad Lite-2000* software as a minimum, only when an integrated system is provided. Standard O&M manual drawings shall be satisfactory with the supply of an instrument only.

6.3 Test Reports

6.3.1 Test reports shall be supplied for testing performed on the system.

6.3.2 Manufacturer's Certificate of Performance (MCOC) must be completed and verified at the factory and included with the analyzer shipment.

6.3.3 When applicable, certification test reports for system analyzers, relative accuracy audits, factory acceptance tests, etc., shall be supplied. Test reports shall clearly state the type and purpose of the test, testing protocol, test data, and summary of the testing results as a minimum.

7.0 Supplier Services

7.1 Start-up Services

7.1.1 The COMS supplier shall provide start-up services of a trained field service engineer to perform initial system start up and commissioning services for the system following installation.

7.1.2 The COMS supplier shall provide all consumable items, special tools, calibration fixtures and support equipment necessary to start up and commission the COMS.

7.1.3 At a minimum, the COMS supplier shall provide at least one half day of on-site hands-on training in the operation and maintenance of the system to end user personnel.

8.0 Performance Requirements

8.1 System Certification

8.1.1 The COMS supplier shall warrant that the system installed will meet or exceed certification testing requirements, i.e., it will successfully pass certification tests.

8.2 System Up Time Guarantee

8.2.1 The COMS supplier shall guarantee system availability of at least 95% uptime excluding the time required for system

calibration, normal preventive maintenance as described in the owners manual, and process outages.

8.3 Equipment Warranty

The COMS supplier shall warrant the system to be free from defects and general failure as result of workmanship or component failure for a period of at least twelve months from start-up.

9.0 Codes and Standards

The equipment and services supplied by the COMS supplier shall be in accordance with the following applicable codes and requirements.

9.1 Title 40 *Code of Federal Regulations*, Part 60 (as required),

9.2 Title 40 *Code of Federal Regulations*, Part 63 (as required),

9.3 Title 40 *Code of Federal Regulations*, Part 75 (as required),

9.4 Title 40 *Code of Federal Regulations,* Conditional Performance and Test Methods,

9.5 The International Society for Measurement and Control (ISA),

9.6 The American National Standards Institute (ANSI),

9.7 The Scientific Apparatus Makers Association (SAMA),

9.8 The American Society of Mechanical Engineers (ASME),

9.9 The Institute of Electrical and Electronic Engineers (IEEE),

9.10 The National Electrical Manufacturers Association (NEMA),

9.11 The American Society for Testing and Materials (ASTM),

9.12 The National Institute of Standards and Technology (NIST),

9.13 The National Fire Protection Association (NFPA).

APPENDIX 2 - *COMS BID EVALUATION FORMS*

Note: Because these example forms encompass a variety of designs and situations, some of the items included may not be relevant in all cases.

System Enclosure	Supplier 1	Supplier 2	Supplier 3
What type of enclosure is provided?			
What is the NEMA rating of the enclosure?			

Analyzers	Supplier 1	Supplier 2	Supplier 3
Analyzer			
Manufacturer			
Model No.			
Source Technology			
Range(s)			
Zero Drift			
Span Drift			
Linearity			
Repeatability			
Response Time (T_{90})			
Process Conditions			
Minimum Temperature (°C/°F)			
Maximum Temperature (° C/°F)			
Minimum Pressure (inches W.C.) (Vacuum)			
Maximum Pressure (inches W.C.)			
Maximum Humidity (%R.H.)			
Ambient Conditions			
Minimum Temperature (° C/°F)			
Maximum Temperature (° C/°F)			
Minimum Pressure (inches W.C.)			
Maximum Pressure (inches W.C.)			
Maximum Humidity (%R.H.)			
Instrument Alarms			
Type			
Number			
Rating			
Instrument Outputs			
Serial Communications			
Signal Type			
rs-232/422/485			
Analog			
Signal Type			
Number			

Analyzers (cont.)	Supplier 1	Supplier 2	Supplier 3
Digital			
Type			
Number			
Are outputs isolated?			
Instrument Inputs			
Type			
Number			
Power Requirements			
Voltage/Frequency			
Power Consumption (VA)			
Physical Characteristics			
Dimensions (HxWxD -mm/inches)			
Weight (kg/lbs.)			

Installation and Commissioning Services	Supplier 1	Supplier 2	Supplier 3
Are installation services provided?			
Is mechanical and electrical installation provided?			
Are inter-connecting cables and piping supplied?			
Are installation services defined in terms of schedule or time?			
Are system start-up services offered?			
Do services offered ensure complete system start-up?			
Will a complete system functionality test be performed?			
Will system alarm set points be assigned?			
Are start-up services defined in terms of time or schedule?			
Will supplier=s personnel witness certification testing?			
Does system start-up include consumable parts?			
Are special installation tools or calibration fixtures included?			
Are start-up services provided by supplier personnel?			

Deleted: Vendor

System Documentation	Supplier 1	Supplier 2	Supplier 3
Which system documentation will be supplied?			
System Operations and Maintenance Manual			
Training Manual			
Instrument Manuals			
QA/QC Program			
Test Reports			
Certification Testing Reports (MCOC)			

System Documentation (cont.)	Supplier 1	Supplier 2	Supplier 3
As-built System drawings			
Instrument drawings			
How many copies of documentation will be provided?			
Will documentation be provided on electronic media?			

Audit Filters	Supplier 1	Supplier 2	Supplier 3
Will filters be supplied?			
Will filters be EPA certified?			
Filter Values?			
- Low Value			
- Mid Value			
- High Value			

Delivery	Supplier 1	Supplier 2	Supplier 3
Delivery Date (Meets needs - Yes/No)			
Best Delivery			

NOTES

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