SECTION 23 09 11
INSTRUMENTATION AND CONTROL FOR BOILER PLANT

PART 1 – GENERAL:

1.1 DESCRIPTION:

Automatic controls, instruments, monitoring and data management systems and accessories for the boilers, burners and other boiler plant mechanical equipment. The specification classifies the systems into automatic boiler and burner control systems, burner management systems (flame safeguard), and data management and instrumentation systems.

1.2 RELATED WORK:

B. Section 23 21 11, BOILER PLANT PIPING SYSTEMS: Piping for controls and instrumentation panel.

B. Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS. Requirements for commissioning, systems readiness checklists, and training

1.3 QUALITY ASSURANCE:

A. The boiler and burner control, monitoring, data gathering, instrumentation and associated systems specified in this section shall be provided by one company that has been in business at least three years engineering, designing and servicing industrial and institutional boiler control and instrumentation systems similar to those specified herein, as a primary business. That company shall furnish all components and provide complete calibration, programming, start-up, testing, demonstrations, instructions and training services.

B. Submit documented evidence, including start-up and acceptance test data, and references, that the company has performed satisfactory work on at least six systems similar to those specified. For instance, submit experience information on systems involving parallel positioning combustion control and on variable speed forced draft fan drives, if these systems are specified.

1. Parallel positioning combustion control systems shall comply with UL 1998.
2. Computer-based electronic equipment shall conform to the requirements of FCC Part 15, Subpart J, for Class A computing devices governing radio frequency electromagnetic interference (EMI) while continuing to operate normally.
3. All electrical wiring shall be in accordance with NFPA 70.

C. Personnel: All work shall be done by properly trained, skilled technicians who are regularly employed and qualified in the

installation, programming, start-up, calibration, and testing of the systems provided, and who will be directed by experienced engineers employed by the equipment supplier. Personnel must have three years minimum experience with industrial and institutional boiler plant controls and instruments similar to those being furnished for this project.

D. This campus has standardized service contractor for existing controls supported by Systems Service Crop for the Boiler Plant. This entity is referred to as the “Control System Integrator” in this section of the technical specification. The Control System Integrator is responsible for graphics and expansion for Boiler Controls. It also prescribes control system-specific verification procedures to the contractor administered by this section of the technical specification. It lastly provides limited assistance to the contractor administered by this section of technical specification in its verification work.

1. The General Contractor of this project shall directly hire the Control System Integrator in a contract separate from the contract procuring the controls contractor administered by this section of technical specifications.
2. The contractor administered by this Section of the technical specifications shall coordinate all work with the Control System Integrator. After installation is complete the Control System Integrator shall develop a report of the work installed and the General Contractor shall submit this report to the government for review. In this report it will state if work was perform as per specification and quality of install. It should also, note what deficiencies are outstanding and contain a punch list of work for COR to administer to General Contractor.
3. Contractor System Integrator shall be present during Preparatory Phase Meetings, Pre-Final, and Final Walk through. Also, at the request of the COR any site visit shall be the responsibility of the General Contractor.

1.4 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.

B. Certificates of compliance with Article, QUALITY ASSURANCE (Articles 1.3.A, B, D & F). In addition, submit past performance questionnaire

(Form VA-NEBC) for five (5) past projects of the same class (scope & complexity) as this project.

C. Submit information sufficient to verify compliance with all contract requirements as specified and shown on project drawings.

D. Automatic Boiler Control and Burner Management and Safety Interlock Systems:

1. Catalog cuts and specification sheets providing description and performance data on: Controllers, control and indicating stations, sensors and transmitters, signal conditioners, electric switches and relays, indicators and annunciators, safety interlock devices, drive units and actuators, control valves, mechanical linkage systems, compressed air filters and regulators.
2. Statement from controller manufacturer that the type and model submitted is the current generation and that the manufacturer will support the units with parts and service for at least ten years.
3. Information on all the specific systems that is sufficient to allow complete troubleshooting. As a minimum this should include explanation of the control logic, and wiring diagrams of equipment and systems.
4. Hardware systems schematics showing field and panel equipment interface block diagram.
5. Location of interlock devices on the burners, boilers, fuel trains and accessory equipment.

E. Boiler Plant Instrumentation:

1. Catalog cuts and specification sheets providing description and performance data on instruments and accessories.
2. Installation and troubleshooting instructions for all equipment in bound sets shipped with equipment.
3. List of ranges of recorder displays or charts. For paper chart recorders, submit ranges for charts that will be furnished.
4. Flow meter primary element design, size, performance, and sizing calculation. Steam flow performance data for flow meters verifying project performance requirements.
5. Complete wiring and piping diagrams for all equipment and systems.
6. Wiring and piping materials.

F. Computer Workstation and Programming:

1. Catalog data with pictures, description, and performance data on all hardware.

2. Hardware specifications.
3. Software model number and supplier. Include complete documentation on all software with shipment.
4. Confirmation that graphics to be provided complies with the specification.
5. Description of computer furniture.

G. As-built Logic and Wiring Diagrams: One set of reproducible prints and CAD disks delivered to COR prior to turning systems over to VA for operation. Supply revised drawings if changes are made during the startup and commissioning process.

H. Completed System Readiness Checklists provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion in accordance with the requirements of Section 23 08 00 COMMISSIONING OF HVAC SYSTEMS.

1.5 APPLICABLE PUBLICATIONS:

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

B. American National Standards Institute (ANSI):

INCITS 154-1988(R1999)..Office Machines and Supplies - Alphanumeric Machines - Keyboard Arrangements

C. American Society of Mechanical Engineers (ASME):

B16.36-2009.....Orifice Flanges
B31.1-2007.....Power Piping
B40.100-2005.....Pressure Gauges and Gauge Attachments
PTC 4-2008.....Fired Steam Generators

D. National Fire Protection Association (NFPA):

70-2011.....National Electrical Code
85-2007.....Boiler and Combustion Systems Hazards Code

E. National Electrical Manufacturers Association (NEMA):

ICS 6-93(R2001, R2006)..Industrial Control and Systems Enclosures
WC 63.2-1996(R2003).....Performance Standard for Coaxial Premise Data Communications Cables

F. Underwriters Laboratories Inc. (UL):

508-06.....Industrial Control Equipment
1449-09.....Transient Voltage Surge Suppressors, Second Edition
1998-09.....Software in Programmable Components

PART 2 – PRODUCTS:

2.1 AUTOMATIC BOILER/BURNER CONTROL SYSTEM, NOT INCLUDING BURNER MANAGEMENT (FLAME SAFEGUARD):

Siemens D400 Digital Video Display Recorder or equivalent.

Inputs	**-Up to 16 Analog (T/C, RTD, 4-20 ma, mv, V)**
Memory	**-70 mbytes (Weeks of Onboard Storage)**
Features	**-12.1” Diagonal Color Active Video Display**
	-Touch Screen
	-USB ports
	-Compact Flash Card
	-Ethernet connection
Front Dimensions	**-300 x 3000 mm**
Scanning Rate	**-200 ms of current & temperature inputs**
Connections	**-Ethernet, RS485, USB (rear Side)**
	-CF-Card, USB (Front Site)
Security	**-Minimum-4 Levels Password protection**
Enclosure	**-Zinc-Plated Steel Case**
Bezel	**-Gray Color-For Panel Mounting**

b. Manager Software

Advance data analysis/archiving software package

Provide full configuration of the recorder

Allowing archiving, graphs, printing, and data export

Export of comma separated variables (CVS) format

c. Field Service Start-up and Training shall be provided by the Prime Contractor’s control system integrator.

d. Siemens gauge pressure level transmitter

Output	**-4020mA output/hart protocol**

Power -24vdc (Loop Powered)

Span -0-9.14 psi to 0-914 psi (Field Adjustable)

Wetted Parts -Stainless Steel

Housing -Die-cast Aluminum material

Rating -NEMA 4X, General Purpose

Electrical -1/2 -14 FNPT connection

Indication -Standard (Digital Display)

Mounting -Female Thread 1.2 inch 14 NPT

e. RD Large Digit LED Display

Display -4 inch High 5-Digit Red LED

Input -4 to 20 MADC (From Above Transmitter)

f. Computer provided by VA, coordinates with COR.

g. 2D instruments analog process pressure gage.

Model -25504-26B71

Scale Size -4.5” DIAL

Range -300 psig + Code 26

Process Fitting-316 Stainless Steel (1/4” NPT)

Fitting -Bottom (Adjustable wi/4.5” Gauge)

MOUNTING -PIPE MOUNT

2.2 TESTING, BOILER PLANT INSTRUMENTATION, AUTOMATIC BOILER CONTROL SYSTEMS, BURNER MANAGEMENT SYSTEMS, COMPUTER WORKSTATION (IF PROVIDED):

A. Representatives of the designer of the system shall demonstrate proper operation and calibration of all components, computer programs, and entire systems to the COR If the project includes boiler/burner testing, the demonstration involving boiler/burner data shall be conducted during the boiler/burner tests. Furnish personnel, instrumentation, and equipment necessary to perform calibration and testing. All calibration work must be completed prior to the testing.

B. Burner Management (Safety Control) Systems: All test shall be based on the most recent edition of the “VHA Boiler Plant Safety Device Testing Manual”,
C. Steam Flow Measuring: Demonstrate proper calibration of each flow rate signal and indication and each totalizer signal and indication to COR or their representative prior to the start of the final boiler testing.
D. Pressure test all pneumatic control tubing at one and one-half times the normal operating pressure.
E. Testing shall demonstrate proper calibration of input and output devices, the proper operation of all equipment, proper execution of the sequence of operation, proper tuning of control loops and maintaining of all set points.
F. Document all tests with detailed report of test results. Explain in detail the nature of each failure and corrective action taken.
G. During and after completion of the pretests, and again after the final acceptance tests, identify, determine causes, replace, repair and calibrate equipment that fails to comply with contract requirements or the standards of the manufacturer. Provide written report to COR.
H. Demonstrate safety and operating interlocks.
I. Demonstrate that programming is not lost and that the control and instrumentation system performs the correct sequence of control and instrument functions after a loss of power.
J. Furnish to COR graphed trends of control loops to demonstrate that the control loops are stable and that set points are maintained. Trend data shall be instantaneous and the time between data points shall not be greater than one minute.
K. Signal Transmission System Equipment:
    1. Ground Rod Tests: Before any wire is connected to the ground rods, use a portable ground testing instrument to test each ground or group of grounds.
    2. Coaxial Cable Tests: Implement NEMA WC 63.2 as a minimum.
L. Computer Workstation Software Operation Test:
    1. Test ability to properly communicate with and operate the control systems.
    2. Demonstrate the ability to edit the programs off and on line.
    3. Demonstrate operation of all alarm points.
    4. Demonstrate the receipt, display, and saving of trend and status reports.

5. Demonstrate display and operation of all graphics.
6. Demonstrate all program calculating functions and report generation.
7. Demonstrate proper operation of all printers.

2.3 DEMONSTRATION AND TRAINING

A. Provide services of manufacturer’s technical representative for four hours to instruct VA personnel in operation and maintenance of units.

B. Submit training plans and instructor qualifications in accordance with the requirements of Section 23 08 00 – COMMISSIONING OF HVAC SYSTEMS.

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