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SIOUX FALLS, SD DEPARTMENT OF VETERANS AFFAIRS MEDICAL CENTERS BOILER PLANTS

STATEMENT OF WORK Inspection, Safety Device Testing and Calibration Boiler Plant Burners, Controls, Instruments, and Data Management

1. Introduction:

- A. Most Department of Veterans Affairs Medical Centers (VAMC) have a central boiler plant to provide steam for heating and air conditioning, domestic hot water, kitchens and sterilization. Some medical centers have laundries that utilize steam.
- B. Boiler plant safety, reliability, efficiency and equipment longevity are paramount concerns of VAMC management. Malfunctioning burners or controls can cause catastrophic events resulting in injuries and death and massive property damage. Inaccurate or inadequate data management and monitoring systems can fail to warn of unsafe or inefficient performance. Regular inspections, testing and calibration by expert technicians are an essential part of a program to address these concerns.
- C. This "Statement of Work" describes the requirements for the inspection, testing and calibration of the boiler plant burners, controls and instruments by qualified technicians.
- D. Work to be completed at the: SIOUX FALLS VA HEALTH CARE SYSTEM – BOILER PLANT (BLDG 11)
- E. A separate "Statement of Work" document covers the inspections of the boilers and boiler plant equipment by Qualified Professional Inspectors.

2. Technician Qualifications:

- A. Technicians shall have completed at least a one-year trade school and have five years successful experience in this field. The experience shall be largely with institutional and industrial boiler plants similar in design to the VAMC plant. The VAMC facility manager/engineer may define and accept equivalent qualifications.
- B. Technicians shall demonstrate familiarity with and ready access to the current versions of the following references:
 - NFPA 85, Boiler and Combustion Systems Hazards Code.
 - VHA Boiler Plant Safety Device Testing Manual, 3rd Edition.
- C. Technicians shall be equipped with portable electronic flue gas analyzers and other test instruments necessary for the required tests and calibrations, all calibrated within one month of the site visits. At facilities with programmable digital controls, the technicians must be capable of programming the controls and have the appropriate hardware and software for this.

3. Inspection, Testing and Calibration Requirements:

- A. Technicians shall provide all tools and labor necessary to perform inspection, tuning, testing, calibrating, and adjustments of burners and boiler and boiler plant controls as specified below. This shall be done every six months in accordance with a schedule provided by VAMC. VAMC may extend the schedule for burners in limited service.

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- B. Instrumentation, monitoring and data management systems as listed below shall be calibrated every six months.
- C. Provide at least two weeks notice to the Contracting Officer's Technical Representative (COTR) prior to performing the work. Work cannot be scheduled during heavy steam load periods. Only one boiler at a time can be out of service for the inspection, testing and calibration procedures. Work must be conducted when the COTR or his/her designate is available on site to monitor the work.

The COTR is: Todd Mergen 605-336-3230 ext 5803

- D. VAMC will have the boilers that are to be serviced prepared for the technicians upon their scheduled arrival. This includes having the boilers clean of soot and loose scale; fully warmed and at normal steam pressure; steam exhaust silencer system operable; all boiler, burner and fuel train pressure gages and thermometers calibrated; fuel meters in accurate operation (pressure/temperature correction factors provided, if applicable); boiler steam flow, stack temperature and flue gas oxygen instruments operating.
- E. VAMC will comply with any other requirements of the test personnel that are considered reasonable by VAMC and have been presented in writing at least two weeks prior to the scheduled testing.
- F. The inspections, testing and calibrations shall comply with:

- 1) The recommendations and requirements of *VHA Boiler Plant Safety Devices Testing Manual, 3rd Edition*.



BPSafetyDeviceTest
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- 2) The written recommendations of the equipment manufacturers.
 - 3) The requirements and recommendations of NFPA 85 *Boiler and Combustion Systems Hazards Code* including applicable appendices.
 - 4) Burner performance requirements in this document.
- G. A summary of the work is as follows:
 - 1) Review boiler plant log sheets and alarm and trouble reports.
 - 2) Review records that show combustion performance (flue gas oxygen and carbon monoxide).
 - 3) Perform overall visual inspection of systems. Verify that systems comply with referenced codes and VAMC requirements stated in this contract.
 - 4) Test and record the operation and set points of all burner/boiler safety interlock devices. Refer to list below. Verify that the set points and operating points are within approximately 20% of normal operating parameters. Make adjustments as necessary and record the new settings. The operation of a device must result in burner shutdown and/or proper alarm operation.
 - 5) Operate burner(s) on each fuel from low fire to high fire and back to low fire in at least six increments and record combustion performance (flue gas oxygen, carbon

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monoxide, NOx where applicable), fuel train pressures, atomizing train pressures, burner pressures, stack temperatures, boiler steam output.

- 6) Compare the combustion performance data with VAMC requirements (see below) and previous readings. If necessary, make adjustments to the fuel flow and combustion air controllers, control valves and dampers to obtain the required performance. Record the new performance data.
 - 7) Verify accuracy of instrumentation listed below. Verify that all devices are properly selected for the application in terms of type, size, set point range, performance, code approval. Calibrate all instruments that are not within manufacturer's specifications for accuracy.
 - 8) Immediately inform COTR of any recommended repairs or modifications.
- H. All of interlocks and safety devices to be inspected and tested on each boiler/burner/equipment, are contained in the *VHA Boiler Plant Safety Devices Testing Manual, 3rd Edition*, along with testing procedures.
- I. Required burner performance (natural gas and fuel oil):
- 1) Turndown (ratio of maximum and minimum firing rates): 10/1 8/1 5/1 4/1 (Refer to original burner specification).
 - 2) Achieve, but do not exceed, boiler maximum steam flow output rating. Measure fuel input at minimum and maximum firing rates.
 - 3) Maximum carbon monoxide: 200 parts per million (ppm)
 - 4) Maximum NOx: _____ (Refer to original burner specification).
 - 5) Flue gas oxygen: 2.5 – 4.2% (Up to 5.2% at loads below 40% of maximum steam output; no upper limit at minimum firing rate; oxygen can be one percentage point higher on oil firing on single-point positioning systems).
 - 6) Flue gas oxygen (low excess air burners): 1.0 – 2.0% (Up to 2.5% at loads below 40% of maximum steam output; no upper limit at minimum firing rate; oxygen can be one percentage point higher on oil firing on single point positioning systems).
 - 7) No visible smoke, except on heavy oil fuel maximum opacity is 20%. Comply with local emissions regulations.
 - 8) *Editors Note: Copies of the applicable emissions regulations must be available in the boiler plant office.*
 - 9) Flames shall be stable with no pulsations, shall be retained near burner, no blowoff or flashbacks, no constant flame impingement on refractory or waterwalls.
- J. List of instrumentation and controls to be inspected and calibrated:
- 1) Steam flow transmitters (all).
 - 2) Steam flow recorders/computer readout.
 - 3) Flue gas oxygen sampling, analyzing and recorder/computer readout.

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- 4) Boiler and economizer stack temperature transmitters and recorder/computer readout.
- 5) Master steam pressure and combustion controllers.
- 6) Boiler outlet draft controllers.
- 7) Boiler water level controllers.
- 8) Feedwater deaerator and condensate storage tank water level controllers including overflow.
- 9) All pressure and temperature sensors and transmitters.
- 10) All signal processing and readout devices.

4. Report Requirements:

- A. Provide complete written report of the inspection fully describing all tests performed, all findings, and recommendations. The report shall have two sections the first section will be in a table form that with four columns:
 - a. The first column labeled "FUNCTION" did the device pass or fail.
 - b. The second column labeled "Device" list the device number and description in accordance with the *VHA Boiler Plant Safety Devices Testing Manual, 3rd Edition*.
 - c. The third labeled "Deficiencies-Recommendations"
 - d. The fourth column labeled "corrective actions" list any corrective actions taken during the inspection.

The next section shall be in paragraph/bulleted form and list each device individual in accordance to the *VHA Boiler Plant Safety Devices Testing Manual, 3rd Edition*. Plus the section must reference the correct Master Specification and Standard Detail for that device. See sample below.

5.1. Condensate Storage Tank High Water Alarm

Purpose: High water level may be an indication of condensate transfer pump failure that could lead to low water condition in the feedwater deaerator and in the boilers. There may be a failure of make-up water controls.

Recommended set point: 4 inches below overflow level and 2/3 of tank height.

Potential hazards due to failure of high water alarm: Feedwater deaerator running dry and, consequently, boiler feed pumps running dry will cause overheating and damage to pumps and potential for plant shut down. Failure of make-up water controls (in open position) could lead to significant cost from waste of water and condensate from the tank overflow if this occurs over a long time period.

Recommended type of device: Conductivity probe type switch. Float type switches have high failure rate in this application where they are exposed to flash steam that causes seals to harden and prevent float movement.

VA Master Specification section: 23 50 11 (old 15625).

www.va.gov/facmgt/standard/

VA Standard Detail: SD232111-05.pdf www.va.gov/facmgt/standard/

Failure rate of float types: 48% (BEI study of VA boiler plants).

Make and Model: Mercoid Float

Did it function properly: No

Category & Action Time Limit: Upon Failure or Within 5 Years

Comments: Float type switches are not allowed for high water alarms. The VA recommended switch type is a conductivity probe type switch. Install the VA recommended switch and set to alarm at 2/3 of the tank height. There are valves that can isolate this alarm. These valves must be made lockable only in the

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operating position.

- B. Furnish report within one week of each facility inspection in "Microsoft Word" format by email to the COTR and to the VA Headquarters office designated. Provide hard copies of data sheets and flue gas analyzer "strip" printouts to the COTR within one week of visit.
- C. All safety-related deficiencies shall be immediately reported to the COTR, Boiler Plant Supervisor and/or Chief Engineer during the inspection visit.

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