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SIOUX FALL, SD DEPARTMENT OF VETERANS AFFAIRS MEDICAL CENTER BOILER PLANTS STATEMENT OF WORK Inspection of Boilers, Feedwater Deaerators

1. Introduction:

- A. Most Department of Veterans Affairs Medical Centers (VAMC) have a central high pressure 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. Boilers and feedwater deaerators are pressurized devices containing steam and hot water. They can fail catastrophically causing injuries and death and massive property damage. Regular inspections by experts are an essential part of a program to address these concerns.
- C. This "Statement of Work" describes the requirements for the boiler inspections and feedwater deaerator inspections to be performed by "Qualified Professional Inspectors" under contract.
- D. Work to be completed at the: SIOUX FALLS VA HEALTH CARE SYSTEM – BOILER PLANT (BLDG 11)
- E. "Qualified Professional Inspectors" as defined below shall perform internal and external inspections on high pressure (over 15 psig) steam boilers and internal inspections on feedwater deaerators and other pressure vessels.
- F. Non-destructive testing of feedwater deaerator pressure vessels shall be performed by certified non-destructive testing technicians as defined below under the guidance of the Qualified Professional Inspector.
- G. A separate "Statement of Work" covers the work of burner and instrument technicians inspecting, testing and calibrating burners, controls and instruments.

2. "Qualified Professional Inspector" is defined as any one or combination of:

- A. A boiler inspector who has a valid commission from the National Board of Boiler and Pressure Vessel Inspectors (NB).
- B. A boiler inspector who has qualified by passing a written examination under the laws, rules and regulations of a jurisdiction of a state.
- C. A boiler inspector who is regularly employed as a boiler inspector by a jurisdiction which has adopted and administers one or more sections of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code as a legal requirement, and has a representative serving as a member of the ASME Conference Committee.
- D. A boiler inspector who is regularly employed by an insurance company which has been licensed or registered by the appropriate authority of a State of the United States to write boiler or pressure vessel insurance.

3. Qualifications for Non-Destructive-Testing Technicians:

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The technicians shall be certified as being qualified Level II technicians in the non-destructive testing methods to be utilized. The certification shall be in accordance with the requirements of the American Society for Non-Destructive Testing (ASNT).

4. Reference Materials:

The "Qualified Professional Inspector" shall demonstrate familiarity with and ready access to the current versions of the following codes and manuals:

ASME Boiler and Pressure Vessel Code:

Section I - Power Boilers

Section IV - Heating Boilers

Section VI - Care and Operation of Heating Boilers

Section VII - Care of Power Boilers

ASME B31.1, Power Piping Code

ASME CSD-1, Controls and Safety Devices for Automatically Fired Boilers

ANSI/NB-23, National Board Inspection Code

NFPA 85, Boiler and Combustion Systems Hazards Code

VHA Boiler Plant Safety Device Testing Manual, 2nd Ed.

5. Inspection Requirements:

- A. Annual internal and external inspections are required for each boiler. Internal inspections of the feedwater deaerator pressure vessel are required every six years (or more frequently if welding repairs have been performed).
- B. At least two weeks notice to VAMC is required prior to an inspection. Also, the inspection must be scheduled for periods when VAMC determines that the boilers that will be inspected internally will not be needed for steam supply and when the Contracting Officer's Technical Representative (COTR) or his/her designate is available on site to monitor the inspections. To maintain steam service, typically only one boiler at a time will be scheduled for internal inspections per inspection visit. Thus, multiple visits per VAMC facility will be necessary every year to inspect all the boilers internally.
- C. Feedwater deaerator pressure vessel inspections must be scheduled during periods of low steam demand.
- D. Coordinate the inspection schedule with the COTR so that VAMC can prepare the boilers and feedwater deaerator for the inspections in advance and have personnel available to monitor the inspections.
- E. The COTR is: Todd Mergen, 605-336-3230 ext 5803
- F. Boilers scheduled for internal inspection will be prepared for the inspection by VAMC prior to the scheduled arrival of the inspector. This includes cooling the boilers to near ambient temperature and having all manways, handholes and furnace access doors open; the boilers cleaned of loose materials waterside and fireside; electrical "lock-out, tag-out" in place; connecting piping isolated; proper illumination provided; compliance with "confined space" access requirements including having safety personnel present in the boiler plant. Similar advance preparations will be made to the feedwater deaerator when it is scheduled for internal inspection.
- G. VAMC will comply with any other requirements of the inspector that are considered reasonable by VAMC and have been presented in writing at least two weeks prior to the scheduled inspection.

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- H. The boiler and feedwater deaerator inspections shall comply with the guidelines in the current issue of the *NATIONAL BOARD INSPECTION CODE, Part RB, Inservice Inspection of Pressure-Retaining Items*, and *ASME Boiler and Pressure Vessel Code, Section VI or VII* as applicable. In addition to those guidelines, the inspections shall comply with all VAMC requirements as listed in this document.
- I. The inspector must completely enter the internal spaces of the boiler or feedwater deaerator and visually inspect all internal surfaces that can be accessed.
- J. Methods for testing safety devices shall comply with *VHA Boiler Plant Safety Device Testing Manual, 3rd Edition*.
- K. Summary of the minimum inspection requirements for boilers:
 - 1) Review the boiler history including: operating conditions, date of last inspection, current inspection certificate, ASME stamping on boiler, National Board registration number, history of repairs and modifications. Review boiler logs, water test reports, and reports on tests performed on the burner controls and interlocks.
 - 2) Assess the external parts of the boilers and boiler accessories and piping and valves for safety, accessibility, proper maintenance and operation, cleanliness, and compliance with codes.
 - 3) Inspect for evidence of leakage of combustion gases or fluids, externally and internally, including all gaskets.
 - 4) Inspect foundations for signs of stress such as cracking or movement.
 - 5) Inspect boilers externally and internally for defects including bulges, blisters, cracks, wasted or eroded material, warping, general corrosion, grooving and pitting, damaged insulation.
 - 6) Inspect all accessible internal surfaces for waterside and fireside deposits, including scaling, sediment, debris, carbon deposits.
 - 7) Examine all stays and stayed plates.
 - 8) Inspect gas side baffles.
 - 9) Inspect internal drum surfaces and steam separating internals.
 - 10) Inspect soot blowers and verify proper alignment.
 - 11) Inspect tubes, tube ends and tube alignment. Check for sagging tubes.
 - 12) Verify that all nozzles of internal piping such as feedwater admission and bottom blowoff collection are clear with no obstructions.
 - 13) Inspect seating surfaces of manways and handholes.
 - 14) Check that boiler structure is plumb and level with no excessive deformations.
 - 15) Check for missing items such as bolts and nuts.
 - 16) Examine all valve and pipe connections to the pressure vessel.

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- 17) Inspect refractory including burner throat, expansion joint, bull ring, furnace seals, furnace walls and floor.
- 18) Verify proper alignment of burner assembly.
- 19) Inspect furnace for evidence of flame impingement.
- 20) Test operation of water level gage glass.
- 21) Perform mechanical and electrical inspection of disassembled low water cutouts (disassembly by VA). After reinstallation, test operation to the extent possible. Test low water cutouts on hot boilers by lowering water level gradually.
- 22) Verify that steam pressure gage is properly calibrated.
- 23) Test operation of high steam pressure cutouts on hot boilers by raising steam pressure.
- 24) Inspect safety valve installations and verify that the valves have proper capacity and set pressure and valves, drains and vents are properly installed. Verify that valve locking seals are not broken. On boilers that are hot, perform an operation test under pressure to confirm operation at proper set pressures. Operate boiler with burner at high fire to verify adequate steam flow capacity of the safety valves ("accumulation test").
- 25) Inspect piping connected to the boilers for evidence of leakage, provision for expansion, provision of adequate support, proper alignment, evidence of detrimental conditions.
- 26) Inspect piping to the water column, low water cutoffs and alarms, gage glass. Verify that interior of piping is clear of obstructions.
- 27) Inspect valves on boiler feedwater, blowdown, drain and steam systems.
- 28) Provide recommendations for non-destructive testing when the inspections indicate that this is necessary to assure continued safety and reliability under current operating conditions.

L. Summary of the minimum inspection requirements for feedwater deaerators:

- 1) Review the feedwater deaerator history including: operating conditions, date of last inspection, current inspection certificate, ASME stamping, National Board registration number, materials of construction, extent of postweld heat treatment, history of repairs and modifications.
- 2) Assess the external parts of the feedwater deaerator and accessories and piping for safety, accessibility, cleanliness, proper operation, and compliance with codes.
- 3) Inspect for evidence of leakage.
- 4) Note feedwater deaerator pressure gage and thermometer readings and verify gage and thermometer accuracy.

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- 5) Inspect safety valve installation and verify that the valves have proper set pressure and capacity and are properly installed. Perform an operation test under pressure to confirm operation at proper set pressures. Verify that the deaerator can safely withstand the test pressure prior to testing the valve(s) in-situ.
- 6) Verify that non-condensable gas vent line is open and proper orifice is provided to permit venting of gases.
- 7) Inspect support structures for proper integrity and allowance for thermal expansion.
- 8) Internal inspections (6 year intervals unless otherwise recommended because of welding repairs):
 - a. Visually inspect all visible pressure vessel surfaces for corrosion, material thinning, deposits, and weld cracking.
 - b. Inspect spray nozzles and trays.
 - c. Certified American Society for Non-Destructive Testing (ASNT) Level II technicians shall perform non-destructive tests using the wet fluorescent magnetic particle (WFMT), ultrasonic testing (UT), and any other necessary non-destructive tests.
 - Completely examine all accessible welds utilizing the WFMT test method. Properly prepare the surfaces before testing.
 - Determine pressure vessel material thickness by UT. Thickness measurement locations shall be selected by dividing the storage tank heads into quadrants and taking measurements at each quadrant on two imaginary rings in each head (eight measurements total). Measurement locations on the shell shall be on each of the quadrants, on four to six locations along the length of the shell (16 to 24 measurements total). The technician may recommend fewer or more tests to the owner, providing justification.
 - Typically, the pressure vessel section containing the deaerator trays and sprays is not accessible for non-destructive testing. The experience is that this section, which is mainly exposed to steam, is less vulnerable to weld failures and material thinning than the storage section which contains condensate and make-up water.
 - d. Calculate maximum allowable working pressure rating of vessel based on thickness measurements. Calculate depletion rate of material thickness.

6. Report Requirements:

1. Provide complete written report fully describing all inspections and tests performed, findings, and recommendations. The condition of all items inspected shall be stated whether acceptable or deficient. All deficiencies shall be fully described along with recommendations for methods of correction. Utilize National Board Forms NB-6 and NB-7, or other similar forms acceptable to owner.
2. Provide sketches and photographs as necessary and as requested by owner to show areas identified as not acceptable for continued service or requiring repair.

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3. Include test data and calculations. Show locations and extent of all non-destructive testing by sketches.
4. 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 in the attachment.
5. All safety-related deficiencies shall be immediately reported to the COTR during the inspection visit.
6. Provide recommendations on need for re-inspections after correction of deficiencies. Cost of re-inspections shall be extra cost negotiated with VA Contracting Officer.

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