

BOILER AND BOILER PLANT OPERATIONS

- 1. REASON FOR ISSUE:** This Veterans Health Administration (VHA) directive establishes the policy on the safe operation of boilers and boiler plants.
- 2. SUMMARY OF MAJOR CHANGES:** This updated directive adds responsibilities for the VHA Office of Capital Asset Management, Engineering and Support Director.
- 3. RELATED ISSUES:** VHA Directive 1028, VHA Directive 7701, VHA Handbook 7701.01.
- 4. RESPONSIBLE OFFICE:** The Director, Office of Capital Asset Management, Engineering and Support (10NA5), is responsible for the contents of this directive. Questions may be addressed to (202) 632-8571.
- 5. RESCISSIONS:** VHA Directive 2008-062, dated October 15, 2008, and VHA Directive 2010-031, dated June 22, 2010, are rescinded.
- 6. RECERTIFICATION.** This VHA directive is scheduled for recertification on or before the last working day of February 2022. The VHA directive will continue to serve as national VHA policy until it is recertified or rescinded.

David J. Shulkin, M.D.
Under Secretary for Health

DISTRIBUTION: Emailed to the VHA Publications Distribution List on February 13, 2017.

CONTENTS

BOILER AND BOILER PLANT OPERATIONS

| | |
|--|-----|
| 1. PURPOSE..... | 1 |
| 2. BACKGROUND..... | 1 |
| 3. POLICY | 1 |
| 4. DEFINITIONS..... | 1 |
| 5. RESPONSIBILITY | 3 |
| 6. REFERENCES..... | 7 |
| APPENDIX A..... | A-1 |
| GUIDELINES FOR BOILER PLANT OPERATIONS POLICIES AND PROCEDURES.. | |
| APPENDIX B..... | B-1 |
| INSPECTION AND TESTING FOR BOILER PLANT OPERATIONS..... | |

BOILER AND BOILER PLANT OPERATIONS

1. PURPOSE

This Veterans Health Administration (VHA) directive establishes the policy on the operation of high pressure boilers and boiler plants. **AUTHORITY:** 38 U.S.C. 7301(b).

2. BACKGROUND

a. Boilers and boiler plants are essential to the operation of a VA medical facility by providing steam, space heating and cooling, hot water (for sanitation, food production and preparation, infection control), heat for process equipment, and a healthful environment for the delivery of healthcare.

b. Boiler and boiler plant safety and reliable operation are dependent on: the presence of a qualified operator in the boiler plant 24 hours a day, 7 days a week and all other locations outside the boiler plant having decentralized boilers (operating at high pressure) for continuous monitoring and operation; supervision by a foreman or leader qualified in boiler plant operations; properly-functioning safety equipment; availability of equipment specific operational and maintenance procedures; well-maintained boilers and support equipment; and a commitment to continuous quality improvement.

c. Fuel and supply costs for the boilers are a significant portion of a VA medical facility's utility expenditures. Therefore, the proper maintenance, periodic operational assessment, and updating of equipment will ensure continued optimal efficiency of operations.

3. POLICY It is VHA policy that each boiler and boiler plant be operated in a safe and efficient manner in compliance with VA standard, directive and national codes, including but not limited to:

a. American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, latest edition;

b. National Fire Protection Association (NFPA) 85 Boiler and Combustion Systems Hazards Code, latest edition;

c. VHA Boiler Plant Safety Device Testing Manual, latest edition; and

d. NFPA 70E Standard for electrical safety in the workplace, latest edition.

4. DEFINITIONS

a. **Boiler Plant.** The boiler plant consists of all equipment and systems required to generate and distribute steam or other high temperature liquid, including equipment not housed in the boiler plant building, e.g., Sterile Processing Service (SPS) steam generators, system regulating stations, system condensate pumping equipment, safety

devices, process equipment, etc.

b. **High Pressure Boiler.** A high pressure boiler means a closed vessel in which water or other liquid is heated to generate steam or vapor, high temperature liquid, or any combination thereof, under pressure. Energy for heating can be produced by the direct application of thermal energy from the combustion of fuels, or from electric heating elements, etc. High pressure boilers are those equipped with safety relief valve(s) set at a pressure of 15 pounds per square inch gauge (psig) or greater. Also included are systems used for heating or vaporizing water and other liquids where the equipment is part of another piece of equipment or processing system.

c. **Low Pressure Boiler.**

(1) A low pressure boiler means a closed vessel in which water or other liquid is heated, steam or vapor is generated, or any combination thereof. Energy for heating can be produced by the direct application of thermal energy from the combustion of fuels, or from electric heating elements, etc. Low pressure boilers are those equipped with safety relief valve(s) set at a pressure less than 15 psig. Also included are systems used for heating water and other liquids where the equipment is part of another piece of equipment or processing system.

(2) If the temperature of the heated operating fluid is greater than 212 degrees Fahrenheit the boiler will be considered low pressure boiler regardless of the fact the boiler is not vaporizing the fluid.

d. **Decentralized Boiler.** A decentralized boiler means a boiler that is used for the reduction or supplementation of the capacity of centralized boiler plant or energy plant for localized use of steam generation, domestic hot water production, heating of and fluids used for environmental heating, and providing heated liquid for process equipment.

e. **Qualified Third Party Review.** A qualified third-party review means the utilization of a vendor that has documented knowledge and experience in the design and construction of boiler plants and VA's standards for construction and testing of safety devices, http://vaww.ceosh.med.va.gov/01HE/Pages/ST_Boiler.plants.shtml. In addition, the individual shall have demonstrated experience in conducting equipment assessments and performing testing in compliance with the VA safety device testing manual on at least 5 sites within the past 3 years.

f. **Qualified Boiler Operator.** A qualified boiler operator is an individual that has met the requirements as a Boiler Plant Operator, WG-5402 as described in the Office of Personnel Management (OPM) qualification standard, and can demonstrate knowledge and competency in boiler plant operations, systems, theory, safety devices, and safety topics (covered in this directive and in the referenced VA training, safety device and steam generation system publications). The operator shall be provided a minimum of 3 months continuous, full-time on-the-job training with high pressure steam generation

systems under the supervision of an experienced operator before being eligible for Qualified Boiler Operator designation.

g. **Qualified Boiler Attendant (Electric Boilers Only).** A boiler attendant means an individual that is:

- (1) Trained and proficient in performing the following (individual boiler specific):
 - (a) Startup, warmup and shutdown of boiler;
 - (b) Operation of all equipment and controls;
 - (c) Gradual warmup of piping system for placement into service;
 - (d) Maintaining water quality to protect the equipment from damage;
 - (e) Handling malfunctions and emergency situations;
 - (f) Collection and organization of plant performance records; and
 - (g) Routine equipment maintenance and testing. Maintenance and testing may be contracted or performed by a qualified VA employee; however, the attendant must be knowledgeable in the process to provide oversight.
- (2) Knowledgeable of the location, purpose and proper function of all safety devices, and must have documented formal and on the job training.
- (3) Able to provide documentation of successful completion of the required Steam Boiler Training (Safe Steaming 1 and 2) courses.
- (4) Able to provide documentation of a satisfactory annual competency assessment by a Qualified Boiler Operator.

5. RESPONSIBILITY

a. **VHA Office of Capital Asset Management, Engineering and Support (OCAMES) Director.** The VHA OCAMES Director is responsible for:

- (1) Developing and issuing requirements, guidance and standards for the safe and efficient operation of boilers, water heaters and other heating equipment.
- (2) Conducting assessments and surveys related to the implementation of this directive and associated requirements and standards.
- (3) Evaluating the reports submitted by each Veterans Integrated Service Network (VISN) and VA medical facility regarding implementation of this directive.
- (4) Providing consultative assistance to the VISNs and VA medical facilities, as

needed.

(5) Reviewing and approving all exceptions and/or waivers to this directive.

b. **VISN Director.** The VISN Director is responsible for:

(1) Ensuring all VA medical facilities within the VISN comply with this directive and any policy, requirement, or guidance from VHA OCAMES.

(2) Prioritizing resources and support for implementation and on-going execution of this directive for all VA medical facilities within the VISN.

(3) Ensuring completion of required notifications, VA medical facility compliance reporting, inspection and testing of safety devices, competent operator staffing, adequacy of reserve fuel supplies, and back-up emergency power.

(4) Regularly reviewing compliance and incident reporting; development and fulfillment of corrective action plans for non-compliance, and corrective action progress reporting to OCAMES.

c. **VA Medical Facility Director.** The VA medical facility Director or designee is responsible for the safe and efficient operation of all boilers, boiler plant(s) at the VA medical facility, and for ensuring that:

(1) There are written VA medical facility policies and procedures for boiler and boiler plant operations in compliance with this directive (see Appendix A).

(2) A qualified boiler operator is present in the boiler plant 24 hours a day, 7 days a week, and all other locations outside the boiler plant having decentralized boilers (operating at high pressure) for continuous monitoring and safe operation. Qualified boiler plant operators must not leave any high pressure boiler or boiler plant unattended at any time, nor can they be relieved by unqualified persons.

(3) A qualified boiler attendant is present at each electric high pressure boiler when operating at 15 psig or greater. This includes locations remote from the central boiler plant including, but not limited to: SPS, kitchen(s), research, and laundry plants.

(4) Low pressure boilers, low temperature low pressure (below 212 degrees Fahrenheit) hot water generators, and other similar equipment and systems not falling within the purview of this directive will be designed, operated and maintained as defined in standards, requirements and guidance as defined by OCAMES and OCFM <https://vaww.vha.vaco.portal.va.gov/sites/DUSHOM/10NA/10NA5/HealthcareEngineering/SitePages/Home.aspx>. **NOTE:** This is an internal VA Web site not available to the public.

(5) The VHA OCAMES is notified when:

(a) There are plans for the installation of new or replacement of high pressure boilers,

installation of new fuel burning equipment on existing boilers, or re-tubing 30 percent or more of a single boiler. Sufficient (determined by OCAMES) technical and operational information must be provided for plan evaluation and to obtain approval to proceed with design development. For approved plans, design development documents must be submitted for review by OCAMES and OCFM at the 30, 60, and 100 percent design stages.

(b) There are plans for changes in equipment sizing, implementation of new technologies, and decentralization (partial or total). These events must be evaluated and approved prior to completion of concept development as well as at 30, 60, and 100 percent design stages. These reviews include, but are not limited to:

1. Non-steam producing fluid filled (e.g.) boilers;
2. Low mass boilers;
3. Combined Heat and Power (CHP) Plants of any type or energy output capacity;
4. Biomass plants of any type or energy output capacity;
5. Any steam generating or boosting equipment that operates in excess of 15 psig. This includes equipment that uses alternative heating fluid, such as oil or other fluid;
6. Proposed decentralization of steam systems, process hot water systems, or domestic hot water systems. The proposed actions shall be reviewed for compliance to VA requirement and long-term sustainability and viability. If the requirements of these systems are not defined in other VA documents, the VA medical facility shall request clarification and guidance from OCAMES;
7. Any upgrades or replacement of boiler controls and safety systems; and
8. Incidents and Occurrences, such as:
 - a. A rupture or explosion of a boiler or pressure vessel;
 - b. A furnace explosion or extensive damage from overheating;
 - c. When boilers and equipment required to meet the VA medical facility redundancy requirements for the supply of the maximum steam demand, exclusive of load shedding, are out of service for more than 24 hours for maintenance or repairs, the N+1 requirement is compromised (N+1 requirement refers to the requirement for the availability and functionality of a redundant system or equipment);
 - d. Repeated maintenance issues with boilers, safeties, or ancillary equipment;
 - e. The acquisition and operation of rental boilers to meet any part of the N+1

requirement; or

- f. Any other unusual occurrence or activity.

NOTE: *Following the notification, a thorough investigation, including root cause analysis and risk evaluation, must be performed by the VA medical facility as soon as possible. A copy of the report is to be provided to OCAMES within thirty 30- calendar days from the date of the incident or occurrence.*

(6) On-Site Reserve Fuel Requirements are maintained.

(a) VA medical facilities, firing coal as fuel, shall store a sufficient supply of fuel to meet the normal demands of continuous operation for a period of 15 calendar days under weather conditions typical in the most extreme winter conditions. If the VA medical facility is equipped with an on-site (stored) backup source of fuel, such as natural gas, propane, or fuel oil, the coal supply can be reduced to 10 calendar days. The combination of on-site primary and backup fuel supply must be sufficient for 15 calendar days of continuous operation in the most extreme winter conditions. Plants that generate less than 50 percent of their annual steam demand by natural gas for 2 consecutive calendar years are considered to be coal-fired, and shall meet the supply requirements for coal-fired plants.

(b) VA medical facilities firing oil as fuel shall maintain a supply of fuel sufficient to meet the normal demands of continuous operation for a period of 15 calendar days under weather conditions typical in the most extreme winter conditions. If the VA medical facility is equipped with a backup source of fuel, such as natural gas, propane, or coal, the oil supply can be reduced to 10 calendar days. The combination of on-site primary and backup fuel supply must be sufficient for 15 calendar days of continuous operation in the most extreme winter conditions. Plants that generate less than 50 percent of their annual steam demand by natural gas for 2 consecutive years are considered to be oil-fired, and shall meet the supply requirements for oil-fired plants.

(c) VA medical facilities firing natural gas as the main fuel with fuel oil or propane back-up shall maintain a sufficient supply of back-up fuel to meet the normal demands of continuous operations for a period of 10 calendar days under weather conditions typical the most extreme winter conditions.

(d) Sites with electric steam generators must have those generators connected to either the VA medical facility's essential electrical system (emergency power system) or a standby power system(s). The decision as to what system will support the equipment shall be based on a VA medical facility's risk analysis, which shall be kept on record for review. On-site storage of generator fuel for boiler use must be sufficient for a minimum of 96 hours of continuous operation.

(e) Fuel storage requirements must be re-evaluated annually against actual total fuel/energy used in the current year during January in heating season. For additional requirements see Attachment B.

NOTE: *Where unusual conditions exist, the VA medical facility Director must request authorization from OCAMES to deviate from the above requirements.*

(7) Inspection and testing must be conducted and documented as defined in the VHA Boiler Plant Safety Device Testing Manual, http://vaww.ceosh.med.va.gov/01HE/02HE_SpecificTopics/03HE_BoilerPlants/04HE_Guidance/BoilerPlantSafetyDeviceTestingManualThirdEdition091712.pdf. All inspections and testing must be done by qualified individuals. Documentation of qualifications must be obtained and retained with the testing records for a minimum of 3 years. The VA medical facility shall utilize a qualified third-party review to perform the required annual testing at least once annually.

(8) Must ensure that there is a qualified third-party review during the design, inspection, startup, testing and commissioning of new plants, boilers and major equipment repair/replacement projects.

(9) Reporting. Compliance must be assessed and reported quarterly by each VA medical facility with equipment or systems subject to the requirements this directive. Reporting shall be accomplished through the use of the web-based survey/reporting tool available at: <http://vaww.ceosh.med.va.gov> no later than 2 weeks after the start of each fiscal quarter (October 1, January 1, April 1 and July 1). All reporting submissions require certification by the VA medical facility Director and the VA medical facility Chief Engineer (or equivalent).

6. REFERENCES

- a. VA Whole Building Commissioning Process Manual, latest edition;
- b. VHA Directive 2010-031, Boiler plant Safety Education, or subsequent policy issue;
- c. VHA Directive 1028, Electrical Power Distribution Systems;
- d. VHA Directive 7701, Occupational Safety and Health;
- e. VHA Handbook 7701.01, Occupational Safety and Health (OSH) Program Procedures;
- f. VHA Boiler Plant Safety Device Testing Manual, latest edition, http://vaww.ceosh.med.va.gov/01HE/Pages/ST_Boiler.plants.shtml. **NOTE:** *This is an internal VA Web site not available to the public;*
- g. VA Whole Building Commissioning Process Manual, latest edition, <http://www.cfm.va.gov/til/dManual.asp>;
- h. American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, latest edition;

- i. National Fire Protection Association (NFPA) 85: Boiler and Combustion Systems Hazards Code, latest edition;
- j. NFPA 70E: Standard for Electrical Safety in the Workplace;
- k. NFPA 85, Boiler and Combustion Systems Hazard Code, latest edition;
- l. NFPA 110, Standard for emergency and standby power;
- l. The Joint Commission, Management of the Environment of Care (EC) Standard 02.05.01, or current equivalent Standard; and
- m. Boiler Efficiency Improvement Operator Manual,
http://vaww.ceosh.med.va.gov/01HE/02HE_SpecificTopics/03HE_BoilerPlants/04HE_Guidance/BoilerEfficiencyImprovementManual.pdf, latest edition.

GUIDELINES FOR BOILER PLANT OPERATIONS POLICIES AND PROCEDURES

1. GENERAL: Subject to the responsibility outlined in paragraph 5.c.(1) of this directive, written policies and procedures must be established, which, at a minimum, must include:

a) A clear statement and definition of safety as the first priority for boiler and boiler plant operations. Boiler safety must not be compromised to maintain service.

b) A requirement that all safety devices installed in the boiler plant, or installed as part of the fuel systems, steam distribution systems and condensate return systems, must be periodically tested to ensure their proper function (see appendix B). (Itemize devices and their frequency)

c) A procedure for notification of the VA medical facility Director, VISN, etc. when any boiler safety device is non-functional regardless of the status of the boiler (i.e. spare, backup etc.).

d) A procedure for notification of the VA medical facility Director, VISN, etc., when one or more boilers is out of service and the redundancy required by policy (N+1 minimum) is compromised.

e) Site specific testing procedures that are in accordance with the VHA Boiler Plant Safety Devices Testing Manual (available from vaww.ceosh.med.va.gov). Qualified Boiler operators must be knowledgeable of the location, purpose, and proper function of all safety devices.

f) A policy requirement that ensures that there is a qualified boiler operator present in the boiler plant 24 hours a day, 7 days a week, and all other locations having distributed boilers (operating at high pressure) for continuous monitoring and safe operation. Boiler plant operators must not leave any high pressure boiler plant unattended at any time, unless they can be relieved by an experienced boiler operator.

g) A policy requirement that ensures that there is a qualified boiler attendant is present at each electric high pressure boiler when operating at 15 gauge psig or greater. Attendants must not leave any electric high pressure boiler unattended at any time when it is operating at a pressure of 15 gauge psig or greater, unless they can be relieved by an experienced attendant. A prohibition on the use of remote restarting of boilers. This includes the ability to start a boiler from an office within the boiler plant or adjacent area or by automation such as lead lag control.

h) A written program for ongoing training to develop, maintain, and regularly refresh qualified boiler operator proficiency in safe boiler and boiler plant operations. The training program must include the requirement for documentation of formal and on-the-job training (OJT) for every specific piece of equipment that the individual is to obtain and

maintain qualifications. OJT must be conducted by experienced instructors and be verified and signed off on by the boiler plant supervisor or Chief Engineer. The program must include the following:

(1) Steam Boilers training (Safe Steaming 1 and 2 in VA's Training Management System (TMS)) courses MUST be completed by all Boiler Plant Operators.

(2) The Boiler Plant Supervisor or lead and Contracting Officer Representative (COR) for the Third-Party Safety Device Inspection/Testing shall complete annual refreshers on the Safe Steamin'2 course in TMS.

(3) All boiler plant staff members must attend the VISN Boiler Safety Device Training provided via contract by CEOSH when scheduled at their VA medical facility (Supervisor shall use sound judgment in accomplishing this task, while maintaining boiler staffing for operation, which may mean 1 or 2 operators may not be able to attend every training).

(4) The Boiler Plant Supervisor, Lead and COR for the Safety Device Testing Contract must be knowledgeable of Safety Device Testing and the requirements of the VHA Safety Device Testing Manual, current edition.

(5) The Boiler Plant Supervisor, Lead and/or COR (2 persons are preferred) shall be designated as the Site Boiler Plant Boiler Safety Device Training Champions. The Champions shall be responsible for training other boiler plant staff members in safety device testing.

(6) Operators, Assistants, and testers/inspectors must be trained in the requirements of NFPA 70E and provided with the appropriate Personal Protective Equipment (PPE) to address work/maintenance requiring such PPE.

(7) Requirements to ensure that operators/attendants are well trained and proficient in properly performing the following on each type of boiler and/or system being utilized:

- (a) Lighting off, warming up, placing in service, and shutting down the boilers;
- (b) Firing on each of the available fuels;
- (c) Operating all plant equipment and controls, including start-up and shutdown;
- (d) Gradual warm-up of hot piping system and placing them into service;
- (e) Maintaining water quality to protect the equipment and piping from damage;
- (f) Handling malfunctions and emergency situations. To include emergency or backup generator operation in the central plant;
- (g) Collecting and organizing the equipment and plant performance records;

(h) Operation of boiler plant emergency generators within the central plant and associated electrical equipment;

(i) Routine equipment maintenance;

(j) Preparation of equipment for inspections;

(k) Operation and testing of all safety devices and control equipment;

(l) Facilitating and monitoring the receipt of fuels and supplies;

(m) Operation of all equipment at the highest cost-effectiveness and efficiency. This means maintaining pressures, temperatures, and fuel consumption at the minimum necessary for the proper operation of the equipment, plant, and connected loads.

j. A written steam conservation program focused particularly on maintaining steam traps, condensate pumps, and the integrity of piping systems and pipe insulation. Steam and condensate leaks and other necessary repairs must be reported to the boiler plant supervisor and given a high priority. This part of the written policy must include the following:

(1) The title and name of the person responsible for implementing and oversight of the program;

(2) The title and names of persons responsible for conducting the inspections; and

(3) An inspection report format that includes the frequency of inspections; method and date of inspection; location of devices; types of devices or equipment; discrepancy found; if any, and corrective action taken.

k. A written steam load-shedding plan for implementation during a boiler or boiler plant emergency that reduces steam-generating capability, and identifies the critical loads that must continue to be served to the greatest extent possible, without compromising boiler or boiler plant safety.

l. Provisions that the emergency electrical generator serving the boiler plant is included as part of the VA medical facility's essential electrical or stand-by system testing and maintenance program. Testing and maintenance on the generators shall comply with NFPA 110, Standard for Emergency and Standby Power Systems.

m. A written water treatment program that includes daily tests, records of the tests, the use of chemicals, and a monthly review by a technical representative of the chemical supplier by an independent water treatment consultant, or a qualified boiler operator. No chemical treatment systems are to be manual. **NOTE:** *Magnetic/Electronic water treatment systems are prohibited in VHA boiler plants.*

n. A utilities systems security program ensuring restricted access to the boiler or boiler plant, on site fuel facilities (including fuel storage), and distribution piping

systems.

o. A written procedure for checking on the condition of the boiler operator or attendant at a minimum of twice a shift to ensure that the ability to perform assigned duties has not been impaired due to an accident or other event; for example, radio or phone checks by security police officers or remote alarms that the operators must carry. **NOTE:** *One experienced boiler operator or attendant, as appropriate based on equipment, per shift is sufficient to attend, monitor and operate gas-fired, oil-fired, coal fired, or electric high-pressure boilers at each location under normal circumstances.*

p. VA Handbook 5019, Part II, Appendix A, paragraph 4 requires that each boiler plant operator have an annual physical and audiological examination to ensure physical fitness to perform assigned duties.

q. An organizational structure that promotes continuous quality improvement in safe boiler operations.

r. A procedure for boiler, support equipment, and distribution system components to be shut down for maintenance and repairs.

s. Requirements that repairs to boilers and pressure vessels comply with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. No welded repairs are permitted except by certified welders using Code-approved procedures. Repair and records of certification, and the qualification of welders must be retained for a minimum of 3 years from the date of completed work.

t. An equipment replacement program based on the following useful life expectancies.

NOTE: *Retention of equipment beyond the useful life expectancy must be based on an engineering evaluation of the reliability, efficiency, and cost effectiveness of continued operation.*

| <u>Equipment</u> | <u>Useful Life Expectancy (in years)</u> |
|------------------------------------|--|
| (1) Fire tube boilers and burners | 30 |
| (2) Water tube boilers and burners | 40 |
| (3) Feed water Deaerator | 30 |
| (4) Economizers | 15 |
| (5) Burner management controls | 20 |
| (6) Combustion controls | 20 |
| (7) Instrumentation | 20 |

| | |
|---|----|
| (8) Boiler feed and condensate pumps | 20 |
| (9) Condensate and blow-off tanks and heat recovery | 40 |
| (10) Fuel oil pumps | 40 |
| (11) Fuel oil tanks | 40 |
| (12) Valves, shut off and control | 20 |
| (13) Water treatment equipment | 20 |

2. DOCUMENTATION: The following documentation must be available to all operators and attendants in the boiler plant or accessible location for decentralized equipment.

a. **General.**

(1) One-line diagrams of boiler plant systems. High, Medium and Low Pressure Steam Systems, Make Up and Supply Water Systems, Condensate System, Primary and Alternate Fuel Systems, Control Systems, and the Electrical Distribution System;

(2) Manufacturer's literature of installed equipment;

(3) Boiler Efficiency Improvement Operator Manual;

(4) VHA Boiler Plant Safety Devices Testing Manual;

(5) Current VHA Boiler Plant Operations Directive;

(6) Current VA medical facility Boiler Operations Policy;

(7) Current normal and emergency operations procedures, including: start-up, operating, and shut down of all boiler plant equipment, fuel systems, and steam distribution systems;

(8) Current list of connected equipment and their pressure and quantity requirements;

(9) Lock-out tag-out procedures for all equipment in the boiler plant;

(10) Confined space entry procedures, as applicable; and

(11) Load shedding plan.

b. **Maintenance and Testing Records.** Maintenance and testing records must be retained for at least 3 years. All components of the utility system associated with the production and use of steam at the VA medical facility, including fuel, must be individually reviewed for inclusion in the preventive maintenance program. All safety devices must be

considered critical utility system components. Inspection, testing, and maintenance records are required for all critical components of the utility system. Records must include the following:

- (1) Date of test, inspection, or maintenance;
- (2) Results of the test, inspection, and maintenance procedures accomplished;
- (3) Parts installed;
- (4) Names of individuals performing testing, inspection, or maintenance;
- (5) Subsequent required notification of the VA medical facility Director is made regarding any device failures; and
- (6) Repairs or adjustments made to safety devices and the date of their return to service.

c. **Performance Data.** Performance data must be retained for at least 3 years and will include:

- (1) Total steam/production and fuel consumed (daily, monthly, and yearly);
- (2) Daily outside temperature range;
- (3) Make-up water quantity and the percent of make-up in relation to amount of steam generated;
- (4) Minimum and maximum steam demand per shift;
- (5) Boiler efficiency based on steam output or fuel input (daily);
- (6) Water treatment data, including all test reports and chemicals utilized; and
- (7) Boiler flue gas oxygen and stack temperature in relation to burner firing rate.

d. **Training Record.** Operator training records must be retained for at least 3 years. This includes all training required by this directive, as well as those developed at the local level as part of the written boiler/boiler plant training program.

INSPECTION AND TESTING FOR BOILER PLANT OPERATIONS**1. INSPECTIONS/TESTING MUST BE CONDUCTED IN ACCORDANCE WITH THE FOLLOWING:**

a. **Inspection/Testing.** Testing and inspection must be executed and documented by a qualified boiler operator, or the required services may be procured from a qualified inspector if required.

(1) Hydrostatic testing of boilers and pressure vessels must be conducted after a repair or a tube replacement, or when the boiler or pressure vessel integrity is in doubt. Hydrostatic pressure must be limited to 150 percent of normal operating pressure of the boiler or pressure vessel.

(2) Selections of contractors for plant services including boiler inspections, burner adjustments, testing of safety devices, calibration of instruments, and monitoring of water treatment must be based on quality of work and experience as the first priorities.

b. **A Qualified Professional Inspector (QPI).** A QPI is any one or combination of the following:

(1) A boiler inspector who has a valid and current certificate from the National Board of Boiler and Pressure Vessel Inspectors;

(2) A boiler inspector who has qualified for licensure by passing a written examination under the laws, rules, and regulations of a jurisdiction of the State and holds a current State license;

(3) A boiler inspector who is currently employed as a boiler inspector/testing by a jurisdiction that 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; or

(4) A boiler inspector who is currently employed by an insurance company that has been licensed or registered by the appropriate authority of a State to write boiler and pressure vessel insurance.

2. TABLE OF REQUIRED INSPECTIONS AND OPERATIONAL TESTS:

a. **Key to Frequency Abbreviations.**

(1) H = Hourly;

(2) D = Daily;

- (3) M = Once per month;
(4) 6M = Once every 6 months;
(5) Y = Once per year; and
(6) 6Y = Once every 6 years.

b. **Frequency Chart.**

| Number | Item | <u>Frequency</u> |
|--------|---|-------------------------|
| 1 | High pressure boilers (15 gauge psig or greater): Inspect furnace and other internal surfaces, closures and accessories | Y |
| 2 | High pressure boilers (15 gauge psig or greater): Inspect exterior of Unit, casing, supports, closures, accessories, valves, controls | Y |
| 3 | Deaerator: Inspection and wet magnetic particle testing of welds of pressure vessel interior | 6Y |
| 4 | All Boilers for fouling and combustion gas flow check | Y |
| 5 | Tube leak check on all boiler types | Y |
| | <i>NOTE: Items 1 through 5 in this table must be accomplished by a documented Qualified Professional Inspector. Items 6 through 12 must be accomplished by a qualified inspector as determined by local VA medical facility management staff. Such a determination must be carefully made for each item and each individual.</i> | |
| 6 | Deaerator: Interior cleaning and visual inspection | Y |
| 7 | Adjust burner combustion settings and calibrate oxygen trim | 6M |
| 8 | Check vibration of burner fans | 6M |
| 9 | Calibrate instrumentation, monitoring, and control systems | 6M |
| 10 | Calibrate pressure gages and thermometers | Y |
| 11 | Operational Testing of Boiler Safety Devices: | Y |
| 11a | Low-water cutoff (slow drain) | M |
| 11b | Fire each boiler and the pilot on the alternate fuel for 1 hour | M |
| 11c | Low-water cutoff shunt switch | M |
| 11d | Auxiliary low-water cut-off (slow drain) | M |
| 11e | Auxiliary low-water cut-off shunt switch | M |
| 11f | High-water alarm | M |
| 11g | Low-water alarm | M |
| 11h | High-steam pressure cut-out (recycle) | 6M |

| | | |
|------|---|----|
| 11i | High-steam pressure cut-out (non-recycle) | 6M |
| 11j | Steam safety valves (accumulation test at high fire) | Y |
| 11k | Flame scanner | M |
| 11l | Check gas vent for leaks | 6M |
| 11m | High-gas fuel pressure cut-off | 6M |
| 11n | Low-gas fuel pressure cut-off | 6M |
| 11o | Gas fuel safety shut off valves proof of closure | 6M |
| 11p | Leak test gas fuel safety shut off valves | 6M |
| 11q | High-fuel oil temperature cut-off (heated fuel) | 6M |
| 11r | Low-fuel oil temperature cut-off (heated fuel) | 6M |
| 11s | Low-atomizing pressure for fuel oil | 6M |
| 11t | High-fuel oil pressure cut-off | 6M |
| 11w | Fuel oil safety shut off valves proof of closure | 6M |
| 11x | Leak test fuel oil safety shut off valves | 6M |
| 11y | Check operation of Liquid Petroleum Gas pilot | 6M |
| 11z | Low-pilot gas pressure cut-out | 6M |
| 11aa | Forced draft fan motor interlock | 6M |
| 11bb | Forced draft fan damper wide open for purge | 6M |
| 11cc | Boiler outlet damper wide open for purge | 6M |
| 11dd | Purge air flow interlock | 6M |
| 11ee | Timing for pre-purge | 6M |
| 11ff | Timing for post-purge | 6M |
| 11gg | Igniter timing | 6M |
| 11hh | Low fire position interlock | 6M |
| 11ii | Combustion air interlock | 6M |
| 11jj | Main flame out; i.e., time to close valves | 6M |
| 11kk | Ignition flame out; i.e., time to close valves | 6M |
| 11ll | Minimum igniter flame test | 6M |
| 11mm | Scanner not sensing ignition spark | 6M |
| 11nn | Low-oxygen alarm and/or cut-out | 6M |
| 11oo | Pre-purge setting of flue gas recirculation damper | 6M |
| 11pp | Interlock of building outside air damper with burner controls | 6M |
| 11qq | Burner control | 6M |

| | | |
|---|---|----|
| ** | NOTE: The preceding safety devices are essential for ensuring the safest possible operation. Any boilers not so equipped must be immediately programmed for retrofit, with priority given to providing two low water cutoffs per boiler and two fuel safety shut off valves per fuel per boiler. | |
| | | |
| Boiler Plant Safety and Operational Duties | | |
| 12 | Overall plant operation (Logs must be taken by hand even if automatic logs or SCADA system is in place) | H |
| 12a | The equipment number of systems operating | H |
| 12b | Inlet and outlet temperature of all equipment, Condensate, DA, economizer, boiler etc. | H |
| 12c | Inlet and outlet pressure of all operating pumps | H |
| 12d | Plant temperature, outside air temperature, and exhaust gas temperature(before and after economizer if installed) | H |
| 12e | Fuel flow and firing rate for each boiler on line | H |
| 12f | Steam or hot water flow to the medical center | H |
| 12g | DA pressure and temperature | H |
| 12h | Make up water meters | H |
| 12i | Fuel train pressures and flows for each boiler that is on line | H |
| 12j | Boiler pressure or temperature | H |
| 12k | Note any leaks or system problems abnormal operating conditions etc. | H |
| 12l | Header pressure, temperature, and if branches pressure and temperature of each branch leaving the plant | H |
| 12m | Calculated boiler combustion efficiency | H |
| 12n | Other readings as required or determined by the VA medical facility | H |
| 13a | Blow down water columns | D |
| 13b | Testing and adjusting water treatment | D |
| 13c | Check furnace pressure | 6M |
| 13d | Check combustion gas leaks into boiler room | 6M |
| 13e | Clean waterside of boilers | Y |
| 13f | Clean fireside and repair refractory | Y |
| 13g | Operation of deaerator high and low water alarms | M |
| 13h | Operation of deaerator steam pressure or temperature control | M |
| 13i | Operation of condensate storage tank high and low water alarms | M |

DATE**VHA HANDBOOK 1810
APPENDIX B**

| | | |
|-----|---|----|
| 13j | Operation of all other alarm devices | M |
| 13k | Operation of boiler economizers; temperatures in or out | D |
| 13l | Review written procedures | 6M |