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USACE / NAVFAC / AFCEC / NASA **UFGS-23 52 46.00 20 (May 2015)**
Change 3 - 08/18

Preparing Activity: NAVFAC **Superseding**
UFGS-23 52 46.00 20 (April 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
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DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

SECTION 23 52 46.00 20

LOW PRESSURE WATER HEATING BOILERS (OVER 800,000 BTU/HR OUTPUT)

05/15, CHG 3: 08/18

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SECTION 23 52 46.00 20

LOW PRESSURE WATER HEATING BOILERS (OVER 800,000 BTU/HR OUTPUT)
05/15, CHG 3: 08/18

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NOTE: This guide specification covers the requirements for low pressure hot water heating boilers over 235 kilowatt 800,000 BTU/hr output.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

****

PART 1 GENERAL

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
****

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.13/CSA 4.9	(2017; Errata 2018) Gas-Fired Low Pressure Steam and Hot Water Boilers

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME BPVC SEC IV	(2017) BPVC Section IV-Rules for Construction of Heating Boilers
ASME CSD-1	(2016) Control and Safety Devices for Automatically Fired Boilers

ASTM INTERNATIONAL (ASTM)

ASTM A53/A53M	(2020) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM C592	(2016) Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)

NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS (NBBI)

NBBI NB-23 PART 1	(2013) National Board Inspection Code - Part 1 Installation

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 31	(2020) Standard for the Installation of Oil-Burning Equipment
NFPA 54	(2021) National Fuel Gas Code
NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code
NFPA 85	(2019) Boiler and Combustion Systems Hazards Code
NFPA 211	(2019) Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances

UNDERWRITERS LABORATORIES (UL)

UL 296	(2017; Reprint Sep 2020) UL Standard for Safety Oil Burners
UL 726	(1995; Reprint Oct 2013) Oil-Fired Boiler Assemblies
UL 795	(2016; Reprint Sep 2020) UL Standard for Safety Commercial-Industrial Gas Heating Equipment

1.2 RELATED REQUIREMENTS

Section 23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS, applies to this section, with the additions and modifications specified herein.

1.3 DESIGN REQUIREMENTS

****
NOTE: Insert boiler output capacity or indicate in boiler schedule. Select boiler design working pressure, operating pressure, operating temperature, and return water temperature and indicate in boiler schedule.
****

Boiler must be suitable for installation in the space shown with ample room for opening doors and cleaning and removal and replacement of tubes. Boiler must have an output of [_____] kW BTU per hour with an efficiency of not less than required by the applicable military specification. Boiler must be designed and tested in accordance with ASME BPVC SEC IV, ASME CSD-1, NFPA 70, NFPA 54, NFPA 31, and ANSI Z21.13/CSA 4.9. Install boiler in accordance with NBBI NB-23 PART 1. Boiler shall be complete with an explosion-relief door, located in accordance with manufacturer's recommendations. Paint boiler in accordance with manufacturer's standard requirements. Boiler design parameters must be as follows: working pressure of [207 kPa (gage)] [30 psig] [_____]; operating pressure of [83 kPa (gage)] [12 psig] [_____]; operating temperature of [82 degrees C] [180 degrees F] [_____]; and return water temperature of [71 degrees C] [160 degrees F] [_____]. Provide a thermostatically controlled three-way mixing valve on the water supply to the boiler suitable for operating conditions of the boiler.

1.3.1 Boiler Installation Requirements

1.3.1.1 Location

Install Boiler(s) and associated hot water pumps in a mechanical room inside the facility in accordance with NBBI NB-23 PART 1. Provide ample clearance around boilers to allow access for inspection, maintenance and repair. Passageways around all sides of boilers must have an unobstructed minimum width of 36 inches or the clearances recommended by the boiler manufacturer whichever is greater.

1.3.1.2 Combustion Air

Provide supply of air for combustion and ventilation. In accordance with NFPA 54, NFPA 211 and manufacturer's installation manual, calculate the

amount of combustion air necessary to operate the boiler. Install and locate properly sized combustion air dampers and louvers.

1.3.1.3 Sequence of Operation

Local, manual starting of boilers is required. Remote starting and stopping of the boiler by the HVAC control system is not permitted. This is to ensure that an operator witness the initial firing of the boiler at the beginning of each heating season to verify proper operation of the boiler and to promote proper maintenance.

1.3.2 Detail Drawings

1.3.2.1 Drawings

Show boiler hot water isolation valves, emergency disconnect switch, and complete boiler gas train on the contract drawings.

1.3.2.2 Fuel Train / Wiring Diagram

Submit fuel train and wiring diagram.

1.3.3 Water Analysis

Provide test reports of water analysis. Follow UFC 3-240-13FN Industrial Water Treatment for all boiler installations.

1.3.4 Safety Standards

Hot water boilers, burners, and any supplementary control devices, safety interlocks, or limit controls required under this specification must meet requirements of the following standards as applicable:

a. Oil-Fired Units: UL 726 or NFPA 70, NFPA 31, ASME CSD-1.

b. Gas-Fired Units: ASME CSD-1, NFPA 70, NFPA 54, ANSI Z21.13/CSA 4.9 or UL 795.

c. Combination Gas and Oil-Fired Units: ASME CSD-1, NFPA 54, NFPA 31, NFPA 70, UL 726, ANSI Z21.13/CSA 4.9, UL 795 or UL 296..

d. All Units: ASME BPVC SEC IV, NFPA 70 and ASME CSD-1.

Controls not covered by the above must have a UL label, UL listing mark, or be listed in the Factory Mutual Approval Guide.

1.4 SUBMITTALS

****

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item

if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force, and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

[Deliver submittals for this section to the project Contracting Officer, who will forward two complete sets of copies to the appropriate approving official for review and approval.

]

SD-02 Shop Drawings

Fuel Train

Wiring Diagram

SD-03 Product Data

Boilers: power output, efficiency, ASME certification, allowable working pressure, model number

Boiler Trim and Control Equipment

Burners and Control Equipment

Stack, Breeching, and Supports

SD-06 Test Reports

Operational Tests

SD-07 Certificates

Boilers

Burners and Control Equipment

Boiler Trim and Control Equipment

Water Analysis

Boiler manufacturer's certificate of boiler performance including evidence that the burners provided are a make, model, and type certified and approved by the manufacturer of the boiler being provided.

SD-08 Manufacturer's Instructions

Boilers

Feedwater Treatment System

SD-10 Operation and Maintenance Data

Boilers, Data Package 4

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

SD-11 Closeout Submittals

Posted Operating Instructions for Heating Water Boilers

PART 2 PRODUCTS

2.1 BOILERS

****
NOTE: Select boiler size required.
****

Conform to the applicable requirements of ASME BPVC SEC IV and ASME CSD-1. Hot-water boilers must be horizontal firetube, multipass, modified scotch-type of the dry or wet-back type, packaged units mounted on a skid-type structural steel base. Provide each boiler complete burner and fuel system, a forced or induced draft fan, an automatic electronic control system complete with combustion and flame safeguard controls, firing sequence programmer, safety interlocks, limit controls and central control panel, and such trim and appurtenances as are peculiar to water units as specified herein. Units must be factory-wired and assembled except for such readily installed appurtenances as safety valves, water columns, and pressure gages. Units must be complete and ready for operation when connected to water, fuel, and electrical supplies.

2.2 BURNERS AND CONTROL EQUIPMENT

****
NOTE: Indicate fuel trains on the drawings. Conform to the requirements of ASME CSD-1 and ANSI Z21.13/CSA 4.9.
****

[2.2.1 Gas-Fired Power Burner

Automatic recycling burner. Interrupted pilot type ignition system, and pilot must be electrode-ignited natural gas type. The combustion control system must be the [high-low-off] [positioning] [metering] type. Design burner and combustion-control equipment for firing natural gas having a specific gravity of [0.6] [_____] and a heating value of approximately [_____] [37,300] kJ per cubic meter [_____] [1000] BTU per cubic foot and be an integral part of the boiler. Burner controls and safety equipment must conform to the applicable requirements of ASME CSD-1, NFPA 54, ANSI Z21.13/CSA 4.9 and UL 795. Mount controls; including operating switches, indicating lights, gages, alarms, motor starters, fuses, and circuit elements of control systems on a single control panel or cabinet designed for separate mounting not on the burner. Locate flame scanner such that testing and cleaning of scanner can be accomplished without disassembly of burner. Provide fuel train as indicated. Gas pressure available: [[_____] Pa in. wc] [[_____] kPa (gage) psig].

][2.2.2 Oil-Fired Power Burner

****
NOTE: Due to limited manufacturer and boiler size options for FEMP stated efficiency requirements, this document includes boiler efficiency requirements in conformance with ASHRAE 90.1.
****

Automatic recycling burner. [Pressure-atomizing] [Air-atomizing; compressor or pump furnished with the burner] type burner. The combustion control system must be the [high-low-off][positioning] [metering] type. Ignition system must be [direct electric-spark-ignited type] [interrupted pilot type, and pilot must be [electrode-ignited [natural] [propane] gas type] [light oil spark-ignition type]]. Design burner and combustion control equipment for firing commercial grade no. 2 fuel oil and be an integral part of boiler. Burner controls and safety equipment must conform to applicable requirements of ASME CSD-1, NFPA 31 and UL 726. Mount controls; including operating switches, indicating lights, gages, alarms, motor starters, fuses, and circuit elements of control systems on a single control panel or cabinet designed for separate mounting not on burner. Locate flame scanner such that testing and cleaning of scanner can be accomplished without disassembly of burner. [Provide fuel train as indicated.] Oil fired boilers with inputs less than 732 kW 2,500,000 Btuh must have a thermal efficiency of at least 82 percent and oil fired boilers with inputs greater than 732 kW 2,500,000 Btuh must have a minimum steady state combustion efficiency of at least 84 percent.

][2.2.3 Combination Gas and Light Oil-Fired Power Burner

Automatic recycling burner. The combustion control system must be the [high-low-off] [positioning] [metering] type. Partial pre-mix type gas burner, complete with primary air fan. [Pressure-atomizing] [Air-atomizing; compressor or pump furnished with burner] type oil burner. Ignition system for firing natural gas must be interrupted pilot type, and pilot be electrode-ignited natural gas type. Ignition system for firing light oil must be the [direct electric-spark-ignited type] [interrupted pilot type, and pilot must be [electrode-ignited [propane]

[natural] gas type] [light oil spark-ignition type]]. Design burner and combustion control equipment for firing commercial grade number 2 fuel oil and natural gas having a specific gravity of [0.6] [_____] and a heating value of approximately [_____] [37,300] kJ per cubic meter [_____] [1000] BTU per cubic foot and be an integral part of boiler. Burner controls and safety equipment must conform to applicable requirements of ASME CSD-1, NFPA 31, UL 726, NFPA 54, ANSI Z21.13/CSA 4.9 and UL 795 . Mount controls; including operating switches, indicating light, gages, alarms, motor starters, fuses, and circuit elements of control systems on a single control panel or cabinet designed for separate mounting not on the burner. Locate flame scanner such that testing and cleaning of scanner can be accomplished without disassembly of burner. Provide fuel train as indicated. Gas pressure available: [[_____] Pa in. WC] [[_____] kPa (gage) psig].

]2.3 BOILER TRIM AND CONTROL EQUIPMENT

Provide in accordance with ASME CSD-1 and ASME BPVC SEC IV. Boiler trim must comply with ASME BPVC SEC IV and additional appurtenances specified below. Non-recycling control interlocks must have the reset located on control interlock.

2.3.1 Emergency Disconnect Switch

****
NOTE: Indicate location of emergency disconnect switch on drawings. Insert emergency switch amperage required.
****

Provide and locate on wall outside boiler room entrance or just inside door, when boiler room door is on the building exterior to allow rapid and complete shutdown of the boiler in the event of an emergency as required by ASME CSD-1. Emergency switch must be a [_____]-amp. fuse-type safety switch. Switch must be red and furnished with a label indicating function of switch.

2.3.2 Relief Valves

Provide relieving capacity for the full output of boiler installed. Safety relief-valve piping must conform to ASTM A53/A53M, schedule 40 steel pipe and be piped full size [to a floor drain] [to 150 mm 6 inches above floor].

2.3.3 Pressure Gage

Provide with a scale equivalent to 1.5 time outlet water pressure with a 150 mm 6 inch diameter. Locate one on supply water piping and one on the return water piping.

2.3.4 Thermometers

Provide thermometers with a scale equivalent to 1.5 times the outlet water temperature. Provide one located on supply water piping and one on return water piping.

2.3.5 Drain Tapping

Provide drain valve and piping [to a floor drain] [to 150 mm 6 inches

above floor].

2.3.6 Make-up Water Station

2.3.6.1 Pressure Reducing Station

****
NOTE: Select operating pressure required.
****

Provide a water pressure-reducing valve and relief valve, or a combination of the two in the makeup water line to the boiler to maintain a water pressure of [_____] [83] kPa (gage) [_____] [12] psig in the hot water system. Provide a 20 mm 3/4 inch globe valve by-pass around this valve.

2.3.6.2 Backflow Preventers

Section 22 00 00 PLUMBING, GENERAL PURPOSE. Locate upstream of by-pass.

2.3.7 Stack Thermometer

Provide flue gas-dial type thermometer with scale calibrated from 66 to 399 degrees C 150 to 750 degrees F and mount in flue gas outlet.

2.3.8 Air Vent Valve

Provide with screwed connections, stainless steel disk, and stainless steel seats to vent entrapped air from boiler.

2.3.9 Feedwater Treatment System

Provide floor mounted Type II - shot-type feeder (manual, intermittent feed), Style A - as indicated with pressure up to 1379 kPa (gage) 200 psig maximum.

2.3.10 Combustion Regulator

Provide adjustable temperature, thermostatic immersion type that limits boiler water temperature to a maximum of 121 degrees C 250 degrees F. Control must actuate burner through an electric relay system to maintain boiler water temperature within normal prescribed limits at loads within rated capacity of boiler.

2.3.11 High Temperature Limit Switch

Provide adjustable immersible aquastat type with a temperature setting above that of the combustion regulator and below that of the lowest relief valve setting. Aquastat will function to cause a safety shutdown by closing fuel valves, shutting down burner equipment, activating a red indicating light, and sounding an alarm in the event that boiler water temperature rises to the high temperature limit setting. A safety shutdown due to high temperature will require manual reset before operation can resume and prevent recycling of the burner equipment. Pre-set high temperature limit devices that cannot be easily tested are not allowed.

2.3.12 Low Water Level Cutoff Switch

Provide float actuated type. Low water level cutoff must cause a safety

shutdown by closing fuel valves, shutting down burner equipment, activating a red indicating light, and sounding an alarm in the event that water level drops below the lowest safe permissible water level established by the boiler manufacturer and ASME BPVC SEC IV. A safety shutdown due to low water level will require manual reset before operation can resume and prevent recycling of burner equipment.

2.3.13 Boiler Safety Control Circuits

Provide boiler safety control circuits, including control circuits for burner and draft fan, that are single-phase, two-wire one-side grounded, and not over 120 volts. Provide safety control switching in ungrounded conductors. Provide overcurrent protection. In addition to circuit grounds, ground metal parts which do not carry current to a grounding conductor.

2.3.14 Indicating Lights

****

NOTE: Include indicating lights for low gas pressure and high gas pressure on all but size 1 burners.

****

Each safety interlock requiring a manual reset must have an individually labeled red indicating light. Non-recycling control interlocks must have the reset located on the control itself. Red indicating lights on the control panel may be omitted if the burner combustion control system has a Keyboard Display Module installed that will identify the lockout information required in Item c. below. Indicating light colors are as follows
:

a. Amber: Ignition on

b. Blue: Draft

c. Green: Main fuel safety shut-off valves open

d. Red (One for Each): Safety lockout, flame failure, low water level, and high temperature.

2.3.15 Alarm Bell

Provide alarm bell, electrically operated, with a manual disconnect switch. Disconnect switch must be type and wired so that switching off alarm following a safety shutdown will not prevent alarm from sounding again upon recurrence of a subsequent safety shutdown condition.

2.3.16 Post-Combustion Purge

****

NOTE: Select four-air-change purge for Size 1, Size 2, and Size 3 burners. Select eight-air-change purge for Size 4 burners.

****

Provide a post-combustion purge in accordance with ASME CSD-1. Provide controls and wiring necessary to assure operation of draft fan for a

period of not less than 15 seconds or of sufficient duration to provide [four] [eight] complete air changes in the boiler combustion chamber (whichever is greater) following shutdown of burner upon satisfaction of heat demand. Upon completion of post-combustion purge period, draft fan must automatically shutdown until next restart.

2.3.17 Draft

Comply with boiler manufacturer's recommendations.

2.3.18 Stack, Breeching, and Supports

****
NOTE: Boiler stacks must conform to the boiler manufacturer's installation and operational manual.
****

Provide boiler stack constructed of sheet steel having a thickness of not less than 2.47 mm 0.0972 inches with welded joints. Insulate stack located inside the building with 38 mm 1 1/2 inches of mineral wool conforming to applicable requirements of ASTM C592, Class II - for use up to 649 degrees C 1200 degrees F. Insulation must receive a finish coat of finishing cement not less than 19 mm 3/4 inch thick, trowelled to a smooth finish. Provide stack supports, umbrella collar and cap, and flue transition piece. Stack diameter and height must be in accordance with manufacturer's recommendation and conform to NFPA 211.

2.3.19 Hot-Water Coils

****
NOTE: Delete entire paragraph unless hot-water coils are required to instantaneously heat domestic water.
****

Provide coils capable of heating [_____] L/s GPM of water with [_____] degrees C F rise conforming to ASME BPVC SEC IV.

2.3.20 Smoke Density Indicator

****
NOTE: Select ASME CSD-1 for input less than 3663 kW 12,500,000 Btuh. Select NFPA 85 for input greater than 3663 kW 12,500,000 Btuh.
****

2.3.21 Annunciator

****
NOTE: Specify only if input exceeds 1465 kW 5,000,000 BTU/hr.
****

Provide in accordance with ASME CSD-1 or NFPA 85.

2.4 ELECTRIC MOTORS

****
NOTE: Select standard efficiency for motors used

less than 750 hours per year and high efficiency for motors used over 750 hours per year. Packaged boilers should utilize the manufacturer's standard efficiency motor.
****

Motors which are not an integral part of a packaged boiler must be rated for [standard] [high] efficiency service per Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Motors which are an integral part of the packaged boiler system must be the highest efficiency available by the manufacturer of the packaged boiler.

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION

Install equipment in accordance with the manufacturer's installation instructions and NBBI NB-23 PART 1. Grout equipment mounted on concrete foundations before installing piping. Install piping in such a manner as not to place a strain on equipment. Do not bolt flanged joints tight unless they match. Grade, anchor, guide, and support piping without low pockets. Mount feedwater treatment feeders so that the top of the feeder is not higher than 1219 mm 48 inches above the finished floor.

3.2 EQUIPMENT FOUNDATIONS

Locate equipment foundations as indicated, designed, and made of sufficient size and weight to preclude shifting of equipment under operating conditions or under any abnormal conditions that could be imposed upon the equipment. Foundations must meet requirements of the equipment manufacturer. Concrete and grout must conform to Section 03 30 00 CAST-IN-PLACE CONCRETE.

3.3 MANUFACTURER'S FIELD SERVICES

Furnish the services of an engineer or technician approved by the boiler manufacture for installation inspection, startup, and tests of equipment as specified below. After installation of equipment the engineer or technician must provide a signed certificate or certified written statement that the equipment is installed in accordance with the manufacturer's recommendations. Services of more than one engineer or technician may be required based on types of specific equipment. One engineer or technician as appointed by the Contractor must supervise and be responsible for the overall installation, start-up, test, and check out of systems. This person must remain on the job until each unit has been in successful operation for 3 days and accepted.

3.4 BOILER CLEANING

Before being placed in service, boiler must be boiled out for a period of 24 hours at a pressure not exceeding 83 kPa (gage) 12 psig. Solution to be used in the boiler for the boiling out process will consist of two pounds of trisodium phosphate per 379 liters 100 gallons of water. Upon completion of boiling out, flush out boiler with potable water, drain, and charge with chemically treated water. Protect boiler and appurtenances against internal corrosion until testing is completed and boiler is accepted. Professional services are required for cleaning/treatment process.

3.5 FIELD QUALITY CONTROL

Perform and furnish everything required for inspections and tests as specified herein to demonstrate that boiler and auxiliary equipment, as installed, are in compliance with contract requirements. Start up and operate the system. During this time, clean strainers until no further accumulation of foreign material occurs. Exercise care to minimum loss of water occurs when strainers are cleaned. Adjust safety and automatic control instruments as necessary to place them in proper operation and sequence. During startup and during tests, factory-trained engineers or technicians employed by individual suppliers of such components as the burner, flame safeguard and combustion controls, and other auxiliary equipment must be present as required, to insure proper functioning, adjustment, and testing of individual components and systems. Test instrumentation must be calibrated and have full scale reading from 1.5 to 2 times test values.

3.5.1 Operational Tests

Furnish the services of an engineer or technician approved by the boiler manufacturer of installation, startup, operational and safety testing. This person must remain on the job until each boiler has been successfully operated. Furnish and perform everything required for inspections and tests of the boiler and auxiliary equipment. Test instrumentation must be calibrated and have full-scale reading from 1.5 to 2 times test values. Demonstrate proper operability of combustion control, flame safeguard control and safety interlocks. Provide a detailed description of all boiler startup and operational tests in the Commissioning Plan.

3.5.1.1 Preliminary Operational Test

Operate boilers continuously for a period of at least 8 hours to demonstrate proper operability of the combustion control, flame safeguard control, and safety interlocks.

3.5.1.2 Acceptance Operational Test and Inspection

****

NOTE: Insert the appropriate Facility Engineering Command.

****

Prior to requesting an acceptance test, conduct a satisfactory operational test for at least 8 hours, and provide a certified statement that the equipment is installed per all requirements of this guide. The Contracting Officer, upon receipt of the notice from the Contractor, will request a boiler be inspected by a Naval Facilities Engineering and Expeditionary Warfare Center (EXWC) NAVFAC boiler inspector. Fifteen days advance notice is required for scheduling inspector to conduct acceptance operational test and inspection.

3.6 SCHEDULE

Some metric measurements in this section are based on mathematical

conversion of inch-pound measurements, and not on metric measurements commonly agreed on by the manufacturers or other parties. The inch-pound and metric measurements shown are as follows:

Products	Inch-Pound	Metric
a. Pressure Gage Diameter	= 6 inches	= 150 mm
b. Stack Thermometer Scale Range	= 150-750 degrees F	= 66-399 degrees C
c. Alarm Bell Diameter	= 4 inches	= 100 mm

-- End of Section --