[6450-01-P]

DEPARTMENT OF ENERGY

Office of Energy Efficiency and Renewable Energy

[Case No. BLR-006]

Notice of Petition for Waiver from Johnston Boiler Company from the Department of Energy Commercial Packaged Boiler Test Procedure

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Notice of petition for waiver and request for public comments.

SUMMARY: This notice announces receipt of a petition for waiver from Johnston Boiler Company (Johnston) seeking an exemption from specified portions of the U.S. Department of Energy (DOE) test procedure applicable to commercial packaged boilers. Johnston contends that some of their commercial packaged boilers cannot be accurately tested using the currently applicable DOE test procedure and, as a result, seeks to use an alternate test procedure to test these basic models. DOE solicits comments, data, and information concerning Johnston's petition and the suggested alternate test procedure.

DATES: DOE will accept comments, data, and information with respect to the Johnston petition until **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: You may submit comments, identified by case number "BLR-006," by any of the following methods:

- Federal eRulemaking Portal: http://www.regulations.gov. Follow the instructions for submitting comments.
- E-mail: AS_Waiver_Requests@ee.doe.gov Include the case number [Case No. BLR-006] in the subject line of the message.
- Mail: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, Mailstop EE-2B, 1000 Independence Avenue SW, Washington, DC 20585-0121. Telephone: (202) 586-2945. Please submit one signed original paper copy.
- Hand Delivery/Courier: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, 950 L'Enfant Plaza SW, Suite 600, Washington, DC 20024. Please submit one signed original paper copy.

Docket: For access to the docket to review the background documents relevant to this matter, you may visit http://www.regulations.gov. Available documents include the following items: (1) this notice; (2) public comments received; and (3) the petition for waiver.

FOR FURTHER INFORMATION CONTACT: Mr. Bryan Berringer, U.S. Department of Energy, Building Technologies Program, Mail Stop EE-2B, Forrestal

Building, 1000 Independence Avenue SW, Washington, DC 20585-0121. Telephone: (202) 586-0371. E-mail: Bryan.Berringer@ee.doe.gov.

Mr. Peter Cochran, U.S. Department of Energy, Office of the General Counsel, Mail Stop GC-33, Forrestal Building, 1000 Independence Avenue SW, Washington, DC 20585-0103. Telephone: (202) 586-9496. E-mail: Peter.Cochran@hq.doe.gov.

SUPPLEMENTARY INFORMATION: In a petition received July 21, 2015, Johnston requested that the U.S. Department of Energy ("DOE") grant a waiver to certain models of larger commercial package boilers that cannot be tested under the existing DOE test procedure. The models of commercial packaged boilers at issue are models with higher input capacities that typically require higher steam pressure and alternative instrumentation due to the large quantities of fluids being measured.

I. Background and Authority

Title III, Part C of the Energy Policy and Conservation Act of 1975 (EPCA), as amended (42 U.S.C. 6311 et seq.), established the Energy Conservation Program for certain industrial equipment, which includes commercial packaged boilers.[1] Part C specifically includes definitions (42 U.S.C. 6311), energy conservation standards (42 U.S.C 6313), test procedures (42 U.S.C. 6314), labeling provisions (42 U.S.C. 6315), and the authority to require information and reports from manufacturers (42 U.S.C. 6316). Part C authorizes the Secretary of Energy (the Secretary) to prescribe test procedures that are reasonably designed to produce results that measure energy efficiency, energy use,

[1] For editorial reasons, upon codification in the U.S. Code, Part C was re-designated Part A-1.

and estimated annual operating costs, and that are not unduly burdensome to conduct. (42 U.S.C. 6314(a)(2)) With respect to commercial packaged boilers, Part C requires DOE to use industry test procedures developed or recognized by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) or the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), as referenced in ASHRAE/IES[2] Standard 90.1, "Energy Standard for Buildings Except Low-Rise Residential Buildings." (42 U.S.C. 6314(a)(4)(A)) Further, if such an industry test procedure is amended, DOE is required to amend its test procedure to be consistent with the amended industry test procedure, unless it determines, by rule published in the Federal Register and supported by clear and convincing evidence, that the amended test procedure would be unduly burdensome to conduct or would not produce test results that reflect the energy efficiency, energy use, and estimated operating costs of that equipment during a representative average use cycle. (42 U.S.C. 6314(a)(4)(B)). The test procedure for commercial packaged boilers is contained in 10 CFR part 431, subpart E.

DOE's regulations for covered products and equipment permit a person to seek a waiver from the test procedure requirements for covered commercial equipment if at least one of the following conditions is met: (1) the petitioner's basic model contains one or more design characteristics that prevent testing according to the prescribed test procedures; or (2) the prescribed test procedures may evaluate the basic model in a manner so unrepresentative of its true energy consumption as to provide materially inaccurate comparative data. 10 CFR 431.401(a)(1). A petitioner must include in its

[2] Illuminating Engineering Society.

petition any alternate test procedures known to the petitioner to evaluate the basic model in a manner representative of its energy consumption. 10 CFR 431.401(b)(1)(iii).

DOE may grant a waiver subject to conditions, including adherence to alternate test procedures. 10 CFR 431.401(f)(2). As soon as practicable after the granting of any waiver, DOE will publish in the Federal Register a notice of proposed rulemaking to amend its regulations so as to eliminate any need for the continuation of such waiver. As soon thereafter as practicable, DOE will publish in the Federal Register a final rule. 10 CFR 431.401(l).

II. Petition for Waiver of Test Procedure

On July 21, 2015, Johnston submitted a petition for waiver from the DOE test procedure for certain basic models of its commercial packaged boilers. The DOE test procedure for commercial packaged boilers is set forth at 10 CFR 431.86 and incorporates by reference Hydronics Institute (HI) BTS-2000, "Method to Determine Efficiency of Commercial Space Heating Boilers" (BTS-2000).

According to Johnston, there are several issues that make BTS-2000 incompatible with larger commercial packaged boilers, including those identified in its petition for waiver. Johnston stated that the requirements to use test conditions specified in BTS-2000 and the instrumentation requirements are outdated. Specifically, Johnston indicated the following regarding the test conditions:

- The 0 to 2 psig test pressure for steam boilers may be adequate for residential and small commercial (cast iron) boilers sized [commercial packaged] boilers, however such steam pressures are not compatible with large [commercial packaged] boilers as it will cause water carryover in large quantities, and an inability to meet design water flow rates and firing rates;
- Typically test steam pressures in the range of 10 to 12 psig are required; and
- Test temperatures defined for hot water [commercial packaged] boilers cause thermal shock problems in large [commercial packaged] boilers.

Johnston also indicated the following regarding the instrumentation chart in Table 1 of section 6.0, "Instruments," of BTS-2000:

- Steam pressure cannot be measured by mercury manometer as the use of mercury in instruments and controls is banned; the correct instrument is a Bourdon Tube Gauge for pressures of 0 to 30 psig;
- Large boilers typically fire into a positive pressure combustion chamber, thus gas pressure, firebox pressure and vent/flue pressure instruments all need to reflect this;
- The use of scales to measure water/condensate/moisture flow rates is incompatible with the volume of these fluids being used or generated by large [commercial packaged] boilers; water flow meters should be used and in the case of moisture content, current practice is to use a throttling calorimeter;
- The measurement of carbon dioxide as a means of calculating excess air or oxygen is considered obsolete in the large [commercial packaged] boiler industry;

direct measurement of excess oxygen is the preferred method as modern oxygen meters can easily be calibrated against the oxygen in the ambient air;

- Carbon Monoxide levels are no longer measured as a percentage; the current preferred unit is parts per million (ppm).

To address these concerns, Johnston proposes to use the newly published American National Standards Institute (ANSI)/Air-Conditioning, Heating, and Refrigeration Institute (AHRI) 1500-2015, "Standard for Performance Rating of Commercial Space Heating Boilers" (ANSI/AHRI Standard 1500-2015) in place of BTS-2000. AHRI developed ANSI/AHRI Standard 1500-2015 as a replacement for BTS-2000 in order to make the test procedure suitable for use with larger commercial packaged boilers, as well as improve and clarify the test method. Johnston claims that use of this ANSI/AHRI Standard 1500-2015 is necessary as it is compatible with the size of commercial packaged boilers they manufacture.

Additionally, for the large commercial packaged boilers capable of supplying either steam or hot water identified in this petition, Johnston requests that, when determining the combustion efficiency in hot water mode based on testing in steam mode only, the combustion efficiency rating be determined based on an adjusted combustion efficiency. Johnston requests that an adjustment be made to the measured stack temperature to be used in calculating combustion efficiency based on the relative difference between the flue gas temperature and the bulk fluid temperature when operating in steam mode as opposed to hot water using the following relationship:

$$T_{stack,\ hw} = (T_{stack,\ steam} - T_{sat}) + T_{bulk,\ hw}$$

where $T_{stack,\ hw}$ is the stack temperature to be used to determine the combustion efficiency in hot water mode, $T_{stack,\ steam}$ is the measured stack temperature when testing on steam, T_{sat} is the saturation temperature of steam at the test pressure, and $T_{bulk,\ hw}$ is the temperature of the outlet water when testing in hot water mode and is equal to 180 ^{o}F. According to Johnston, using this adjusted stack temperature to calculate combustion efficiency is a more accurate representation of the actual efficiency when operating as a hot water commercial packaged boiler than simply using combustion efficiency value for steam mode.

Johnston also requests to use the vertical stack arrangement shown on their "Drawing #327A0040 Johnston Boiler General Arrangement D.O.E. Efficiency Test (attachment B)." DOE's existing test procedure incorporates section 7.0 "Apparatus" of BTS-2000 with respect to test setup including flue connection requirements. (DOE notes that the term "flue," not "stack," is used throughout its test procedure regulations as well as BTS-2000). The flue requirements differ depending on the characteristics of the commercial packaged boiler, including:

- Whether the unit is oil-fired or gas-fired, and if gas-fired;
- Whether the unit is direct vent;
- Whether the unit has an input rating of more than 400,000 Btu/h;
- Whether the unit is discharges vent gases horizontally or vertically; and

- Whether the unit is condensing.

According to Johnston, the large volume of flue gas in relation to the flue diameter results in relatively high velocities and therefore creates turbulence. Johnston indicates that this straight stack arrangement is shown in their operating manual and in the American Boiler Manufacturer Association's (ABMA) "Packaged Boiler Engineering Manual." DOE requests comment on how turbulence affects measured efficiency under the current test procedure, and how use of the vertical stack arrangement shown in the drawing provided by Johnston would prevent turbulence.

In addition, Johnston stated that ANSI/AHRI Standard 1500-2015 does not clarify whether there is an upper limit for fuel input rate to which the standard applies. However, the scope of ANSI/AHRI Standard 1500-2015 is identified as "commercial space heating boilers" in section 1.1. (Note: the term "commercial space heating boiler" is not defined in ANSI/AHRI Standard 1500-2015.) Johnston suggested that the upper fuel input rate limit be established at 12,500,000 Btu/hr. Johnston stated that the two major safety standards for the industry are American Society of Mechanical Engineers (ASME) CSD-1 Controls and Safety Devices for Automatically Fired Boilers (ASME CSD-1) and National Fire Protection Association (NFPA)-85-2015 Boiler and Combustion Systems Hazard Code (NFPA-85). Johnston further indicated that the scope of ASME CSD-1 is for commercial boilers with inputs from 400,000 to 12,500,000 Btu/hr and the scope for NFPA-85 is for industrial boilers over 12,500,000 Btu/hr. DOE notes that neither the existing DOE test procedure or energy standards establish an upper

limit in terms of fuel input rate for which they apply. Consequently, DOE is declining to consider Johnston's request for an upper limit for the fuel input rate which would limit the scope of applicability of the test procedure in this proceeding.

DOE notes that it has published a notice of proposed rulemaking (NOPR) to amend its test procedure for commercial packaged boilers prescribed in 10 CFR part 431 subpart E (March 2016 CPB TP NOPR). 81 FR 14641 (Mar. 17, 2016). The proposed amended test procedure addresses, among other changes, most of the issues raised in this waiver request by incorporating by reference ANSI/AHRI Standard 1500-2015 as a replacement for BTS-2000 in the DOE test procedure for commercial packaged boilers. In addition to adopting ANSI/AHRI Standard 1500-2015 as a replacement for BTS-2000, DOE further proposes several modifications to its test procedure that are not captured in ANSI/AHRI Standard 1500-2015 in order to improve repeatability, add clarification, and accommodate testing of some equipment that has experienced difficulty in testing to the existing DOE test procedure. Among these changes, DOE proposes to adopt the stack temperature adjustment described by Johnston when using the tested combustion efficiency of large steam commercial packaged boilers to represent the combustion efficiency of large commercial packaged boilers in hot water mode.

The following basic models are included in Johnston's petition:

509 Series 4-Pass Scotch Marine

PFT_50-4S	PFT_50-4W
PFT_75-4S	PFT_75-4W
PFT_80-4S	PFT_80-4W

PFT_100-4S	PFT_100-4W
PFT_125-4S	PFT_125-4W
PFT_150-4S	PFT_150-4W
PFT_200-4S	PFT_200-4W
PFT_250-4S	PFT_250-4W
PFT_300-4S	PFT_300-4W
PFT_350-4S	PFT_350-4W
PFT_400-4S	PFT_400-4W
PFT_500-4S	PFT_500-4W
PFT_600-4S	PFT_600-4W
PFT_750-4S	PFT_750-4W
PFT_800-4S	PFT_800-4W
PFT_900-4S	PFT_900-4W
PFT_1000-4S	PFT_1000-4W
PFT_1200-4S	PFT_1200-4W
PFT_1500-4S	PFT_1500-4W
PFT_1600-4S	PFT_1600-4W

509 Series 3-Pass Scotch Marine

PFT_50-3S	PFT_50-3W
PFT_75-3S	PFT_75-3W
PFT_80-3S	PFT_80-3W
PFT_100-3S	PFT_100-3W
PFT_125-3S	PFT_125-3W
PFT_150-3S	PFT_150-3W
PFT_200-3S	PFT_200-3W
PFT_250-3S	PFT_250-3W
PFT_300-3S	PFT_300-3W
PFT_350-3S	PFT_350-3W
PFT_400-3S	PFT_400-3W
PFT_500-3S	PFT_500-3W
PFT_600-3S	PFT_600-3W
PFT_750-3S	PFT_750-3W
PFT_800-3S	PFT_800-3W
PFT_900-3S	PFT_900-3W
PFT_1000-3S	PFT_1000-3W
PFT_1200-3S	PFT_1200-3W
PFT_1500-3S	PFT_1500-3W

PFT_1600-3S	PFT_1600-3W
PFT_1800-3S	PFT_1800-3W
PFT_2000-3S	PFT_2000-3W
PFT_2500-3S	PFT_2500-3W

XID Series 2-Pass Scotch Marine

PFX_100-2S	PFX_100-2W
PFX_150-2S	PFX_150-2W
PFX_200-2S	PFX_200-2W
PFX_250-2S	PFX_250-2W
PFX_300-2S	PFX_300-2W
PFX_350-2S	PFX_350-2W
PFX_400-2S	PFX_400-2W
PFX_500-2S	PFX_500-2W
PFX_600-2S	PFX_600-2W
PFX_700-2S	PFX_700-2W
PFX_800-2S	PFX_800-2W
PFX_900-2S	PFX_900-2W
PFX_1000-2S	PFX_1000-2W
PFX_1200-2S	PFX_1200-2W
PFX_1500-2S	PFX_1500-2W
PFX_1600-2S	PFX_1600-2W
PFX_1800-2S	PFX_1800-2W
PFX_2000-2S	PFX_2000-2W
PFX_2500-2S	PFX_2500-2W

309 Series 3-Pass Scotch Marine

PFB_100-3S	PFB_100-3W
PFB_125-3S	PFB_125-3W
PFB_150-3S	PFB_150-3W
PFB_200-3S	PFB_200-3W
PFB_250-3S	PFB_250-3W
PFB_300-3S	PFB_300-3W
PFB_350-3S	PFB_350-3W
PFB_400-3S	PFB_400-3W
PFB_500-3S	PFB_500-3W
PFB_600-3S	PFB_600-3W

PFB_750-3S PFB_750-3W

III. Summary and Request for Comments

Through this notice, DOE is publishing Johnston's petition for waiver pursuant to 10 CFR 431.401(b)(1)(iv). The petition contains no confidential information. The petition includes a suggested alternate test procedure applicable to measurement of energy efficiency of certain models of commercial packaged boilers manufactured by Johnston.

DOE solicits comments from interested parties on all aspects of the petition, including the suggested alternate test procedure. Pursuant to 10 CFR 431.401(d), any person submitting written comments to DOE must also send a copy of such comments to the petitioner. The contact information for the petitioner is: David C. Reinink, President, Johnston Boiler Company, 300 Pine Street, P.O. Box 300, Ferrysburg, MI 49409-0300. All submissions received must include the agency name and case number for this proceeding. Submit electronic comments in WordPerfect, Microsoft Word, Portable Document Format (PDF), or text (American Standard Code for Information Interchange (ASCII)) file format and avoid the use of special characters or any form of encryption. Wherever possible, include the electronic signature of the author. DOE does not accept telefacsimiles (faxes).

According to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit two copies: one copy of the document including all the information believed to be confidential, and one copy of the document with the information believed to be confidential deleted. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Issued in Washington, DC, on June 3, 2016.

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Kathleen B. Hogan
Deputy Assistant Secretary for Energy Efficiency
Energy Efficiency and Renewable Energy

Johnston Boiler Company
300 Pine Street
P.O. Box 300
Ferrysburg, MI 49409-0300

Application for Waiver for the Efficiency Rating of Commercial Space Heating Boilers

In accordance with the provisions of the Code of Federal Regulations Part 431, paragraph 431.401, Johnston Boiler Company is hereby petitioning for a waiver from the following test procedures specified for Commercial Packaged Boilers:

1. Paragraph 431.86 Uniform test method for the measurement of energy efficiency of commercial packaged boilers. This section requires the boilers be tested using the provisions of HI BTS-2000. We propose to use the newly published AHRI 1500, 2015 Standard for Performance Rating of Commercial Space Heating Boilers. There are several issues that make BTS 2000 incompatible with the larger boilers that were identified in previous waiver requests. AHRI has worked diligently over the past year to revise BTS-2000 in order to address those issues and make BTS-2000 suitable for use with larger boilers. AHRI Standard 1500 is the result of that work. Use of this new standard is required as it is compatible with the size boilers we manufacture.

2. Paragraph 431.86(c)(1)(iv) The requirement to use test conditions specified in BTS-2000 specifically the requirements for the test pressure for steam boilers, the required water temperatures for hot water boilers and instrumentation requirements seem to refer back to the middle of the last century rather than the present day, for example:

    - The 0 to 2 psig test pressure for steam boilers may be perfectly adequate for residential and small commercial (cast iron) boilers sized boilers, however is not compatible with large boilers as it will cause water carryover in large quantities, and an inability to meet design water flow rates and firing rates. Typically test pressures in range 10 to 12 psig are required.
    - Test temperatures defined for hot water boilers are guaranteed to cause thermal shock problems in large boilers.
    - The instrumentation chart, Table 1, has several problem areas, as follows:
        - Steam pressure cannot be measured by mercury manometer as the use of mercury in instruments and controls is banned. The correct instrument is a Bourdon Tube Gauge 0 to 30 psig
        - Large boilers typically fire into a positive pressure combustion chamber, thus gas pressure, firebox pressure and vent/flue pressure instruments all need to reflect this.

- The use of scales to measure water/condensate/moisture flow rates is incompatible with the sheer volume of these fluids being used or generated by large boilers. Water flow meters should be used and in the case of moisture content, current practice is to use a throttling calorimeter.
- The measurement of carbon dioxide as a means of calculating excess air or oxygen is considered obsolete in the large boiler industry. Direct measurement of excess oxygen is the preferred method as modern oxygen meters can easily be calibrated against the oxygen in the ambient air.
- Carbon Monoxide levels are no longer measured as a percentage. The current preferred unit is ppm.

AHRI 1500 has taken into account these changes.

3. Paragraph 431.86(c)(2)(iii)(B) Rating. This paragraph specifies that for boilers capable of supplying either steam or hot water, that they are tested on steam only, the hot water efficiency shall be based on the testing in the steam mode. We propose to use an adjusted steam efficiency for hot water when testing on steam only. The adjustment is made to the measured stack temperature to be used in calculating efficiency based on the relative difference between the flue gas temperature and the bulk fluid temperature when operating on steam v hot water using the following relationship:

   $Tstack_{hw} = (Tstack_{steam} - T_{sat}) + Tbulk_{hw}$

   Where:
   $Tstack_{hw}$ = Stack temperature to be used to determine the efficiency on hot water
   $Tstack_{steam}$ = Measured stack temperature when testing on steam
   T_{sat} = Saturation temperature of steam at the test pressure
   $Tbulk_{hw} = 180^{o}F$

The dominant heat transfer variable for both steam and hot water boilers is the gas side coefficient and there is very little difference in the overall heat transfer coefficient between steam and hot water boilers. It is possible therefore to determine what a hot water boiler stack temperature will be, based on a steam test and the bulk fluid temperature difference within the boiler. We believe that using this adjusted stack temperature to calculate efficiency is a more accurate representation of the actual efficiency when operating as a hot water boiler than simply using the steam efficiency value.

4. We will use the vertical stack arrangement shown on our Drawing #327A0040 Johnston Boiler General Arrangement D.O.E. Efficiency Test (attachment B). The large volume of our flue gas in relation to the flue diameter results in relatively high velocities with resulting turbulence. This straight stack

arrangement is shown in our operating manual and ABMA's *"Packaged Boiler Engineering Manual"*.

5. AHRI Standard 1500, Page 1, Section 2, Paragraph 1.1 and 2.2. It is not clear if there is an upper limit for input rating. However, the stated purpose of the AHRI standard 1500 is for Commercial Space Heating Boilers. We suggest that the upper input limit be established at 12,500,000 Btu/hr.

The two major safety standards for our industry are American Society of Mechanical Engineers (ASME CSD-1 Controls and Safety Devices for Automatically Fired Boilers) and National Fire Protection Association (2015 NFPA-85 Boiler and Combustion Systems Hazard Code). The scope of CSD-1 is for Commercial Boilers with inputs from 400,000 to 12,500,000 Btu/hr. The scope for NFPA-85 is for Industrial Boilers over 12,500,000 Btu/hr.

The basic models that this request is applicable to are as follows:

See attachment A

Other known Manufacturers of similar products are listed below. These manufacturers will be notified by Johnston Boiler Company of this waiver, if and when the deviation is granted, in accordance with paragraph 431.401(c).

AESYS Technologies, LLC
Bryan Steam
Burnham Commercial
Cleaver Brooks
Easco
Fulton Boiler Works
Hurst
Johnston Boiler Company
Lattner Boiler Company
Miura
Precision Boilers LLC
Superior Boiler Works
Unilux
Vapor Power International LLC
Victory Energy Operations LLC
Williams & Davis

Best Regards,

David C. Reinink
President
Johnston Boiler Company

Attachment A

Johnston Boiler Company -
Ferrysburg, Michigan –
Boiler Model Numbers

509 Series 4-Pass Scotch Marine

PFT_50-4S	PFT_50-4W
PFT_75-4S	PFT_75-4W
PFT_80-4S	PFT_80-4W
PFT_100-4S	PFT_100-4W
PFT_125-4S	PFT_125-4W
PFT_150-4S	PFT_150-4W
PFT_200-4S	PFT_200-4W
PFT_250-4S	PFT_250-4W
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PFT_600-4S	PFT_600-4W
PFT_750-4S	PFT_750-4W
PFT_800-4S	PFT_800-4W
PFT_900-4S	PFT_900-4W
PFT_1000-4S	PFT_1000-4W
PFT_1200-4S	PFT_1200-4W
PFT_1500-4S	PFT_1500-4W
PFT_1600-4S	PFT_1600-4W

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PFT_80-3S	PFT_80-3W
PFT_100-3S	PFT_100-3W
PFT_125-3S	PFT_125-3W
PFT_150-3S	PFT_150-3W
PFT_200-3S	PFT_200-3W
PFT_250-3S	PFT_250-3W
PFT_300-3S	PFT_300-3W
PFT_350-3S	PFT_350-3W

PFT_400-3S	PFT_400-3W
PFT_500-3S	PFT_500-3W
PFT_600-3S	PFT_600-3W
PFT_750-3S	PFT_750-3W
PFT_800-3S	PFT_800-3W
PFT_900-3S	PFT_900-3W
PFT_1000-3S	PFT_1000-3W
PFT_1200-3S	PFT_1200-3W
PFT_1500-3S	PFT_1500-3W
PFT_1600-3S	PFT_1600-3W
PFT_1800-3S	PFT_1800-3W
PFT_2000-3S	PFT_2000-3W
PFT_2500-3S	PFT_2500-3W

XID Series 2-Pass Scotch Marine

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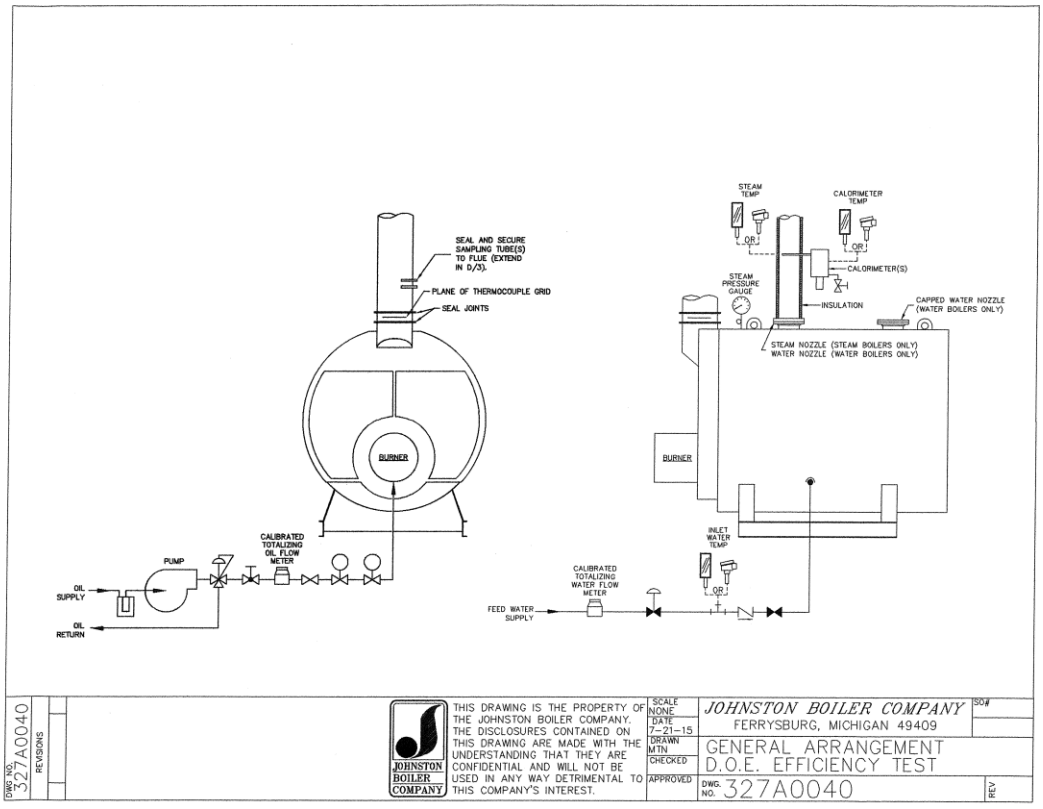
PFX_200-2S	PFX_200-2W
PFX_250-2S	PFX_250-2W
PFX_300-2S	PFX_300-2W
PFX_350-2S	PFX_350-2W
PFX_400-2S	PFX_400-2W
PFX_500-2S	PFX_500-2W
PFX_600-2S	PFX_600-2W
PFX_700-2S	PFX_700-2W
PFX_800-2S	PFX_800-2W
PFX_900-2S	PFX_900-2W
PFX_1000-2S	PFX_1000-2W
PFX_1200-2S	PFX_1200-2W
PFX_1500-2S	PFX_1500-2W
PFX_1600-2S	PFX_1600-2W
PFX_1800-2S	PFX_1800-2W
PFX_2000-2S	PFX_2000-2W
PFX_2500-2S	PFX_2500-2W

309 Series 3-Pass Scotch Marine

PFB_100-3S	PFB_100-3W

PFB_125-3S	PFB_125-3W
PFB_150-3S	PFB_150-3W
PFB_200-3S	PFB_200-3W
PFB_250-3S	PFB_250-3W
PFB_300-3S	PFB_300-3W
PFB_350-3S	PFB_350-3W
PFB_400-3S	PFB_400-3W
PFB_500-3S	PFB_500-3W
PFB_600-3S	PFB_600-3W
PFB_750-3S	PFB_750-3W

ATTACHMENT B



[FR Doc. 2016-13891 Filed: 6/10/2016 8:45 am; Publication Date: 6/13/2016]