WX - HIGH EFFICIENCY SERIES

MIURA BOILER WEST, INC.

* IN OUR CONTINUING EFFORT TO IMPROVE OUR PRODUCT, INFORMATION IN THIS MANUAL MAY BE CHANGED WITHOUT NOTICE

OWNER SHALL MAINTAIN THIS MANUAL IN LEGIBLE CONDITION FOR FUTURE REFERENCE

PUBLICATION REVISED MARCH 2000

ENGINEERING REVISED FEBRUARY 2000
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1 SECTION ONE - INTRODUCTION

Muira Boiler Co., Ltd., began North American activities in 1988 when the manufacturing plant in Brantford, Ontario, was established. Their engineering department developed procedures to meet ASME codes and listing approval from IRI/FM and UL. The United States corporate sales office, Miura Boiler West, Inc., was established and has developed relationships with national, state, and city inspectors and agencies.

The North American network consists of branches in Chicago, Los Angeles, Mississauga, and Brantford, Ontario. The parent company, Miura Boiler, Ltd., in Japan, is the leading manufacturer of boilers and other thermal equipment in the Pacific Rim holding more than 55% of the market. With factories in five countries, production now exceeds 14,000 units per year.

As a result of design necessities in Japan, such as limited space and total dependence on foreign energy, the MIURA STEAM BOILER has been engineered as a highly efficient, vertical water tube, once-through forced-flow design. The MIURA Boiler features a compact unit with a low-water content and is designed to run with a minimum amount of maintenance with simple push button controls. Operation is quiet, radiant heat losses are minimal, and steam quality is second to none. Miura Boilers are often installed in a multiple boiler network. MIURA Boilers, along with the patented MIURA Multiple Installation panel, allow appropriate horsepower to be brought on and off line quickly to meet sophisticated production needs with maximum economy. The 35-year, field-proven ‘Miura Advantage’ is the ability to reach full output steam from cold start in less than 10 minutes using the least amount of energy and having the lowest environmental impact. The high efficiency Miura Boiler has won numerous awards from engineering societies and gas associations because it is a compact, safe, cost-effective boiler.

1.1 CODE AND REGULATORY AGENCIES

There are a number of codes, standards, laws, and regulations covering boilers and related equipment that should be considered when designing a system. Regulatory requirements are dictated by a variety of sources and are all focused primarily on safety. The equipment shall be installed in accordance with the current regulations, codes, and specifications of the applicable city, county, state, and federal agencies. Authorities having jurisdiction should be consulted before installations are made. For more information on how the various rules affect boiler selection and operation, you may want to contact your local MIURA authorized representative or the engineering firm designing the boiler installation. Here are some essential rules to consider:

- The boiler industry is tightly regulated by the American Society of Mechanical Engineers (ASME) and the ASME codes, which control boiler design, inspection, and quality assurance. The boiler’s pressure vessel must have an ASME stamp. (Deaerators, economizers, and other pressure vessels must also be ASME stamped.)
- The insurance company insuring the facility or boiler may dictate additional requirements. Boiler manufacturers provide special boiler trim according to the requirements of the major insurance companies. Special boiler trim items usually pertain to added safety controls. Some industries, such as food processing, brewing, or pharmaceuticals, may also have additional regulations that have an impact on the boiler and the boiler room.
- UL and/or ASME-CSD1 specifications may be required. State or local authorities may require additional data on the boiler controls or basic design criteria.
- Most areas have established a maximum temperature at which water can be discharged to the sewer. In this case, a blow down separator after cooler is required.
- Most state, local, or provincial authorities require a permit to install and/or operate a boiler. Additional restrictions may apply in non-attainment areas where air quality does not meet the national ambient air quality standards, and emission regulations are more stringent. Be sure to investigate this before buying a boiler.
- For all new boilers with inputs over 10 Million Btu/Hr, U.S. Federal emission standards apply, including permitting and reporting procedures.
• A full-time boiler operator may be required. Operator requirement depends on the boiler’s size, pressure, heating surface area, and volume of water. Boilers can be selected which minimize the requirements, either by falling under the requirements and being exempt, or with special equipment that gives the operator more freedom in the facility. Contact the local boiler inspector for details.
• Most states or provinces require an annual boiler inspection. There may be other requirements on piping as well.

A partial list of agencies having jurisdiction over boiler installation and operation is given below. This list is comprehensive but by no means all-inclusive.

United States Environmental Protection Agency
A.S.M.E. Codes and Standards
National Board Licensing Requirements
American Gas Association Standards
Underwriters Laboratories, Inc.
Factory Mutual Insurers
Industrial Risk Insurers
Occupational Safety and Health Administration
Food and Drug Administration
Local, City, and State Fire Marshall
State Boiler Inspection Division
Division of Labor and Industry for the Local State or City
Local Building and Construction Code Inspectors

MIURA Boiler recommends contacting your actual insurance provider as well as the utility companies for assistance in identifying and complying with codes.

1.2 NATIONAL REGULATORY ORGANIZATIONS

A.S.M.E.  
345 East 47th Street 
New York, NY 10017 
PHONE: (212) 705-7800

NATIONAL BOARD  
1055 Crupper Avenue 
Columbus, OH 43229 
PHONE: (614) 888-8320

ASME - C.S.D.1  
345 East 47th Street 
New York, NY 10017 
PHONE: (212) 705-7800

N.F.P.A.  
P.O. Box 9146 
Quincy, MA 02169 
PHONE: (800) 344-3555

NATIONAL UNDERWRITERS  
505 Gest Street 
Cincinnati, OH 45203

UNDERWRITERS LABORATORIES  
333 Pfingsten Road 
Northbrook, IL 60062 
PHONE: (847) 272-8800
1.2.1 MIURA BOILER Inspector Briefing

The Miura Boiler is an unfamiliar design to most inspectors in the field. The purpose of this section is to address common questions and familiarize the inspector with the MIURA Boiler through a general overview of the design and operational characteristics.

The Miura WX boiler design consists of straight water tubes between upper and lower annular headers. Both headers are encased in a castable refractory leaving only the tubes exposed to combustion gases. There is very little water and consequently very little energy stored in the boiler. Water volume is mainly in the tubes with a small percentage of water in the upper header. The WX series boiler is classified as a water tube boiler.

Water is forced in to the bottom header and tubes by means of a feed water pump. The water rises through the tubes, collecting heat which flashes to the upper header with the inner row of tubes acting as the risers and the outer row of tubes as the downcomer. Steam is accumulated in the upper header and has no external separator.

The water control system relies on a more conventional, electrical conductance system. When water contacts a probe, a circuit is formed. One probe controls the boiler feed, with the short probe as pump on/off when the boiler is in the High Fire rate, the medium length probe as pump on/off in the Low Fire rate, and the two longer probes as low water cutout. The shorter of the two low water level probes acts as a secondary low water cutout by stopping combustion when water level uncovers the probe. This secondary probe is called a bubble rod and is inserted into the top of a boiler tube on most models. The longest probe, located in the water volume control column, is the primary low water cutoff, which requires manual reset of the boiler control. This dynamic system is controlled only by the two shorter probes to maintain a constant volume of water in the boiler at the two different firing rates. Water level as indicated in the sight-glass will be slightly higher when the boiler is operating at the high fire rate than when operating on low fire. The level indicated is the level in the boiler; and oscillates - especially with load swings on the system. This oscillation is normal and is directly proportional to the volume of water in the boiler tubes.

Either of these feed water control systems can operate without the other for proper feed water control, however, the combination of these two systems provides for double low water safety and is called the “two-way water volume control system.”

Thirdly, thermocouples are attached directly to the tubes. The thermocouples measure the temperature of the tube and will shut the boiler down if a low water volume condition is detected due to insufficient bubbling or dry fire or if scale build-up is detected. Scale formation is monitored directly by the rise in tube surface temperature because of lower heat transfer rates. This temperature sensing method can detect a formation of scale of less than 1/64” and will shut down the boiler. The early detection of scale formation is an important factor in maintaining a high efficiency boiler. According to the US National Bureau of standards, ¼” of scale build up on heating units requires up to 55% more energy to attain the same temperature. Other methods of detecting scale, such as a pressure gage on the discharge of the feed water pump, are much less sensitive.

The boiler will not operate should any of these low water safeties fail. Only through tampering could the boiler operate without these safeties and develop a dry fire condition. Even in the unlikely event this condition should ever be created, by the time the tubes superheat enough to destroy the tensile strength of the metal, the amount of energy contained in the remaining water is so small that the possibility of a pressure explosion is negligible.

The Miura Steam Boiler design has been used for more than thirty-five years with over 200,000 units presently in operation worldwide. There is no record of ANY pressure vessel explosions.

Steam is produced within ten minutes from cold start-up and selected tubes can be visually inspected through two-inch openings located on the top and bottom headers. A complete inspection is typically accomplished in a thirty-minute period.
All Miura steam boilers are registered with the National Board. The complete packaged steam generator is listed with UL as a standard and can be built to IRI, FM, and/or ASME-CSD1 at customer request.

Please note all flanges and fittings identified in this manual as 150# ASA comply with ASME/ANSI standard B16.5. The 150# stamping refers to a standard classification not Maximum Allowable Working Pressure (MAWP). As specified in Table A-361 of ASME codes, Section I, 1995 edition, the MAWP for 150# flanges is 205 psig for saturated steam service and 170 psig for Boiler Feed and Blow-off service. This specification matches the 170 psi MAWP rating of the MIURA boiler.

MIURA is dedicated to reliable and safe operation of its steam boilers through sound engineering principles and years of in the field experience. Please contact us at our Chicago office at (847) 465-0001 for the continental United States outside California. The Los Angeles office at (626) 305-6622 covers California.
1.3 STANDARD EQUIPMENT

A fully packaged forced draft steam boiler, the WX series receives complete operational testing at our factory to insure trouble free installation. (Service parts are non-proprietary.) The WX has the following items as standard equipment:

- Boiler design is UL listed and labeled.
- A.S.M.E. “S” stamped - A.S.M.E-1, IRI, or FM available
- Mounted Control Panel - wired with all necessary components  (No main disconnect included)
- Microprocessor based integrated burner controller records five most recent faults for recall.
- Remote computer interface capability (Requires optional equipment)
- Thirty-day history of operation retained by microcomputer for remote monitoring and troubleshooting (Requires optional equipment)
- Service parts are non proprietary
- Centrifugal forced draft blower and mower
- Combustion air proving switch
- Automatic combustion air damper and motor
- Flame safeguard control with UV flame sensor
- Thermocouples on water tubes prevent over heat condition caused by low water volume or scale build up
- Two independent water volume controls and low water cut off safety devices, plus manual reset
- Water level control column and bottom blowdown valves with test cocks
- Steam pressure switches, plus and independent high-pressure safety requiring manual reset
- Gas regulator with threaded connections for main burner and pilot flame
- High and low gas pressure switches
- Dual pilot gas solenoid valves for natural gas
- Dual main gas valves and plugged leak test port (vent valve optional)
- Internal steam separator
- Ports for direct visual inspection of internals
- A.S.M.E. approved safety relief valves for boiler and optional economizer (if installed)
- Automatic temperature compensated conductivity control blowdown system with strainer and manual shut off valve (optional)
- Boiler status display with total boiler system status
- Heavy duty galvanized economizer (“S” series)
- Completely enclosed heavy gauge casing
- Steam (and oil on “O” series) pressure gages installed
- Oil pump and motor (“GO” or “SGO” series)
- Triplex, high-low-off, main oil valves (“GO” or “SGO” series)
1.4 GUARANTEE

- Refer to warranty documents for specific details.
- SIX-MONTH labor warranty from boiler start up may be available, contact Local Sales and Service representatives for details. This labor warranty covers routine inspection and repairs at the job site. Travel and lodging expenses are not covered except within local representative service area.
- ONE YEAR Standard warranty for parts from boiler commissioning date or 18 months from shipping date, whichever occurs first. Express shipping cost for overnight or next day delivery of parts is not included. Damage to the boiler or parts of the boiler after leaving the factory is not covered. Parts replaced under this warranty must be returned to MIURA. If the failed part is not returned, the customer will be charged for the new item.
- SEVEN-YEAR limited factory warranty on pressure vessel against material or workmanship defects.

1.5 DEFINITIONS AND SYMBOLS

“Note,” “Caution,” and “Danger” are used throughout this manual with the following definitions and symbols.

**NOTE:**

*Note* indicates an area or subject of special merit, emphasizing either the product capabilities or common errors in operation or maintenance.

**CAUTION:**

*Caution* indicates possible damage to equipment. It also indicates any condition or practice, which, if not observed or remedied, could result in damage or destruction of the equipment.

**DANGER:**

*Danger* indicates any condition or practice, which, if not observed, could result in personal injury or possible death.

**CAUTION:** All steam engines require proper water treatment. This treatment is mandatory from the time the MIURA BOILER is started. Failure to follow the recommended water treatment and maintenance procedures could shorten the life (as well as the efficiency) of the boiler and is not covered under any warranties.
1.6 ABOUT THIS MANUAL

This manual is written to support engineering and mechanical contractor firms. Some basic information is given for the operator and maintenance personnel. More specific information on operation and maintenance of the unit is given in the MIURA OPERATION AND MAINTENANCE MANUAL.

If a question about boiler installation is not contained in the text of this manual and is not answered by one of the drawings, please call the MIURA representative or the company offices in Chicago or Los Angeles. We will be glad to help.

This manual is available on disk for Microsoft Word 2000 and Word 95/97. In addition, detailed drawings are available on disk in Auto CAD 14 files. If computer copies are desired, please contact the Chicago Office of MIURA Boiler. A small fee is required for shipping and handling.

1.7 OFFICES

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PHONE: (847) 465-0001
FAX: (847) 465-0011
e-mail: Chicago@miuraboiler.com

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Monrovia, CA 91016-4854
PHONE: (626) 305-6622
FAX: (626) 305-6624
e-mail: LA@miuraboiler.com
# SECTION TWO - SPECIFICATIONS

## Table 1 WX Series Specifications (without Economizer)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>WX(L)-50 G(0)</th>
<th>WX(L)-65 G(0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilization Horsepower</td>
<td>47 HP</td>
<td>65 HP</td>
</tr>
<tr>
<td>Maximum Pressure</td>
<td>170 PSIG Design, 15/150 PSIG Maximum Operating</td>
<td>170 PSIG Design, 15/150 PSIG Maximum Operating</td>
</tr>
<tr>
<td>Equivalent Output</td>
<td>1,621 LB/HR</td>
<td>2,240 LB/HR</td>
</tr>
<tr>
<td>Fuel Heat Input</td>
<td>1,967,000 BTU/HR</td>
<td>2,720,000 BTU/HR</td>
</tr>
<tr>
<td>Steam Heat Output</td>
<td>1,574,000 BTU/HR</td>
<td>2,176,000 BTU/HR</td>
</tr>
<tr>
<td>Efficiency (Fuel to Steam)</td>
<td>80% Gas Fired, 82% Oil Fired</td>
<td>80% Gas Fired, 82% Oil Fired</td>
</tr>
<tr>
<td>Heating Surface Area</td>
<td>199 FT²</td>
<td>199 FT²</td>
</tr>
<tr>
<td>Full Water Content</td>
<td>164 GAL</td>
<td>164 GAL</td>
</tr>
<tr>
<td>Operational Water Content</td>
<td>75 GAL</td>
<td>75 GAL</td>
</tr>
<tr>
<td>Operational Weight</td>
<td>4,300 LBS</td>
<td>4,300 LBS</td>
</tr>
<tr>
<td>Shipping Weight</td>
<td>3,950 LBS</td>
<td>3,950 LBS</td>
</tr>
<tr>
<td>Combustion Control</td>
<td>3 Position Step Burner HIGH-LOW-OFF</td>
<td>3 Position Step Burner HIGH-LOW-OFF</td>
</tr>
<tr>
<td>Combustion System</td>
<td>Proprietary Forced Draft</td>
<td>Proprietary Forced Draft</td>
</tr>
<tr>
<td>Ignition System</td>
<td>Electric Spark Ignited, Interrupted Gas Pilot</td>
<td>Electric Spark Ignited, Interrupted Gas Pilot</td>
</tr>
<tr>
<td>Spark System</td>
<td>15,000 V</td>
<td>15,000 V</td>
</tr>
<tr>
<td>Power Supply</td>
<td>230 or 460 V, 3 PHASE, 60 HZ</td>
<td>230 or 460 V, 3 PHASE, 60 HZ</td>
</tr>
<tr>
<td>Max. Electrical Consumption</td>
<td>7.0 KVA (8.0 for Oil)</td>
<td>7.0 KVA (8.0 for Oil)</td>
</tr>
<tr>
<td>Blower Motor Output</td>
<td>3.0 HP</td>
<td>3.0 HP</td>
</tr>
<tr>
<td>Gas Consumption</td>
<td>1,960 SCFH</td>
<td>2,710 SCFH</td>
</tr>
<tr>
<td>No. 2 Oil</td>
<td>13.7 GAL/HR</td>
<td>19.0 GAL/HR</td>
</tr>
<tr>
<td>Gas Supply Pressure</td>
<td>1-5 PSIG Natural (Gas or Propane)</td>
<td>1-5 PSIG Natural (Gas or Propane)</td>
</tr>
<tr>
<td>Flue Gas Volume (Wet)</td>
<td>26,300 SCFH Gas</td>
<td>36,300 SCFH Gas</td>
</tr>
<tr>
<td></td>
<td>25,600 SCFH Oil</td>
<td>36,600 SCFH Oil</td>
</tr>
<tr>
<td>Flue Gas Volume (Dry)</td>
<td>22,400 SCFH Gas</td>
<td>31,000 SCFH Gas</td>
</tr>
<tr>
<td></td>
<td>23,300 SCFH Oil</td>
<td>32,300 SCFH Oil</td>
</tr>
<tr>
<td>Flue Gas Velocity</td>
<td>12.2 FT/Sec Gas</td>
<td>16.9 FT/Sec Gas</td>
</tr>
<tr>
<td></td>
<td>11.9 FT/Sec Oil</td>
<td>16.5 FT/Sec Oil</td>
</tr>
<tr>
<td>Flue Gas Temperature</td>
<td>470°F</td>
<td>470°F</td>
</tr>
<tr>
<td>Emissions, Oil Fired</td>
<td>Smoke=&lt;2 on Bacharach Scale, &lt;300 PPM CO</td>
<td>Smoke=&lt;2 on Bacharach Scale, &lt;300 PPM CO</td>
</tr>
<tr>
<td></td>
<td>Max. 100 PPM NOx, Max. 20 PPM SOx</td>
<td>Max. 100 PPM CO, Max. 30 PPM NOx</td>
</tr>
<tr>
<td>Main Steam Outlet Valve</td>
<td>1 1/2” (4” on WXL)</td>
<td>1 1/2” (4” on WXL)</td>
</tr>
<tr>
<td>Safety Valve Outlet</td>
<td>One 1 1/2”</td>
<td>One 1 1/2”</td>
</tr>
<tr>
<td>Main Water Inlet</td>
<td>1”</td>
<td>4”</td>
</tr>
<tr>
<td>Fuel Gas Inlet</td>
<td>2”</td>
<td>2”</td>
</tr>
<tr>
<td>Fuel Oil Inlet</td>
<td>3/4”</td>
<td>3/4”</td>
</tr>
<tr>
<td>Automatic Surface Blow Down</td>
<td>One 3/8”</td>
<td>One 3/8”</td>
</tr>
<tr>
<td>Manual Blow Down</td>
<td>Two 1”</td>
<td>Two 1”</td>
</tr>
<tr>
<td>Stack Diameter (ID)</td>
<td>14”</td>
<td>14”</td>
</tr>
<tr>
<td>Flame Detector</td>
<td>Ultraviolet Sensor</td>
<td></td>
</tr>
<tr>
<td>Pressure Control</td>
<td>Adjustable Pressure Switches and Transducer</td>
<td>Electrolytic Conductive Type</td>
</tr>
<tr>
<td>Liquid Volume Control</td>
<td>Electrolytic Conductive Type</td>
<td>Electrolytic Conductive Type</td>
</tr>
<tr>
<td>Overheat Protection</td>
<td>Low Water Cut-Off &amp; Thermocouple</td>
<td>Low Water Cut-Off &amp; Thermocouple</td>
</tr>
</tbody>
</table>

### NOTE:

i) Equivalent output calculated from and at 212°F (100°C) feed water at 212°F (100°C) steam.

ii) Gas consumption based on Natural Gas with high heating 1004 BTU/SCF when operating at 70 psig.

iii) Thermal efficiencies are based on high heating values of fuels.

iv) Flue gas temperature & velocity are calculated for Natural Gas with 68°F (20°C) feed water.

### Table 2 WX Series Specifications (without Economizer)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>WX(L)-50 SG(0)</th>
<th>WX(L)-65 SG(0)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Utilization Horsepower</strong></td>
<td>50 HP</td>
<td>65 HP</td>
</tr>
<tr>
<td><strong>Maximum Pressure</strong></td>
<td>170 PSIG Design, 15/150 PSIG Maximum Operating</td>
<td></td>
</tr>
<tr>
<td><strong>Equivalent Output</strong></td>
<td>1,725 LB/HR</td>
<td>2,240 LB/HR</td>
</tr>
<tr>
<td><strong>Fuel Heat Input</strong></td>
<td>1,969,000 BTU/HR</td>
<td>2,560,000 BTU/HR</td>
</tr>
<tr>
<td><strong>Steam Heat Output</strong></td>
<td>1,674,000 BTU/HR</td>
<td>2,176,000 BTU/HR</td>
</tr>
<tr>
<td><strong>Efficiency (Fuel to Steam)</strong></td>
<td>85% Gas Fired, 87% Oil Fired</td>
<td></td>
</tr>
<tr>
<td><strong>Heating Surface Area</strong></td>
<td>199 FT²</td>
<td>199 FT²</td>
</tr>
<tr>
<td><strong>Full Water Content</strong></td>
<td>169 GAL</td>
<td>169 GAL</td>
</tr>
<tr>
<td><strong>Operational Water Content</strong></td>
<td>80 GAL</td>
<td>80 GAL</td>
</tr>
<tr>
<td><strong>Operational Weight</strong></td>
<td>4,750 LBS</td>
<td>4,750 LBS</td>
</tr>
<tr>
<td><strong>Shipping Weight</strong></td>
<td>4,400 LBS</td>
<td>4,400 LBS</td>
</tr>
<tr>
<td><strong>Combustion Control</strong></td>
<td>3 Position Step Burner HIGH-LOW-OFF</td>
<td></td>
</tr>
<tr>
<td><strong>Combustion System</strong></td>
<td>Proprietary Forced Draft</td>
<td></td>
</tr>
<tr>
<td><strong>Ignition System</strong></td>
<td>Electric Spark Ignited, Interrupted Gas Pilot</td>
<td></td>
</tr>
<tr>
<td><strong>Spark System</strong></td>
<td>15,000 V</td>
<td></td>
</tr>
<tr>
<td><strong>Power Supply</strong></td>
<td>230 or 460 V, 3 PHASE, 60 HZ</td>
<td></td>
</tr>
<tr>
<td><strong>Max. Electrical Consumption</strong></td>
<td>7.0 KVA (8.0 for Oil)</td>
<td>7.0 KVA (8.0 for Oil)</td>
</tr>
<tr>
<td><strong>Blower Motor Output</strong></td>
<td>3.0 HP</td>
<td>3.0 HP</td>
</tr>
<tr>
<td><strong>Gas Consumption</strong></td>
<td>1,960 SCFH</td>
<td>2,250 SCFH</td>
</tr>
<tr>
<td><strong>No. 2 Oil</strong></td>
<td>13.7 GAL/HR</td>
<td>17.9 GAL/HR</td>
</tr>
<tr>
<td><strong>Gas Supply Pressure</strong></td>
<td>1-5 PSIG Natural (Gas or Propane)</td>
<td></td>
</tr>
<tr>
<td><strong>Flue Gas Volume (Wet)</strong></td>
<td>26,300 SCFH Gas</td>
<td>34,160 SCFH Gas</td>
</tr>
<tr>
<td></td>
<td>25,600 SCFH Oil</td>
<td>33,500 SCFH Oil</td>
</tr>
<tr>
<td><strong>Flue Gas Volume (Dry)</strong></td>
<td>22,400 SCFH Gas</td>
<td>29,200 SCFH Gas</td>
</tr>
<tr>
<td></td>
<td>23,300 SCFH Oil</td>
<td>30,450 SCFH Oil</td>
</tr>
<tr>
<td><strong>Flue Gas Velocity</strong></td>
<td>9.6 FT/Sec Gas</td>
<td>12.5 FT/Sec Gas</td>
</tr>
<tr>
<td></td>
<td>9.3 FT/Sec Oil</td>
<td>12.2 FT/Sec Oil</td>
</tr>
<tr>
<td><strong>Flue Gas Temperature</strong></td>
<td>270°F</td>
<td>270°F</td>
</tr>
<tr>
<td><strong>Emissions, Oil Fired</strong></td>
<td>Smoke=&lt;2 on Bacharach Scale, &lt;300 PPM CO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Max. 100 PPM NOx, Max. 20 PPM SOx</td>
<td></td>
</tr>
<tr>
<td><strong>Emissions, Gas Fired</strong></td>
<td>Max. 100 PPM CO, Max. 30 PPM NOx</td>
<td></td>
</tr>
<tr>
<td><strong>Main Steam Outlet Valve</strong></td>
<td>1 1/2” (4” on WXL)</td>
<td>1 1/2” (4” on WXL)</td>
</tr>
<tr>
<td><strong>Safety Valve Outlet</strong></td>
<td>One 1” &amp; 1 1/2”</td>
<td>One 1” &amp; 1 1/2”</td>
</tr>
<tr>
<td><strong>Main Water Inlet</strong></td>
<td>1”</td>
<td>1”</td>
</tr>
<tr>
<td><strong>Fuel Gas Inlet</strong></td>
<td>2”</td>
<td>2”</td>
</tr>
<tr>
<td><strong>Fuel Oil Inlet</strong></td>
<td>3/4”</td>
<td>3/4”</td>
</tr>
<tr>
<td><strong>Automatic Surface Blow Down</strong></td>
<td>One 3/8”</td>
<td>One 3/8”</td>
</tr>
<tr>
<td><strong>Manual Blow Down</strong></td>
<td>Two 1”</td>
<td>Two 1”</td>
</tr>
<tr>
<td><strong>Stack Diameter (ID)</strong></td>
<td>14”</td>
<td>14”</td>
</tr>
<tr>
<td><strong>Flame Detector</strong></td>
<td>Ultraviolet Sensor</td>
<td></td>
</tr>
<tr>
<td><strong>Pressure Control</strong></td>
<td>Adjustable Pressure Switches and Transducer</td>
<td></td>
</tr>
<tr>
<td><strong>Liquid Volume Control</strong></td>
<td>Electrolytic Conductive Type</td>
<td></td>
</tr>
<tr>
<td><strong>Overheat Protection</strong></td>
<td>Low Water Cut-Off &amp; Thermocouple</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**

i) Equivalent output calculated from and at 212°F (100°C) feed water at 212°F (100°C) steam.

ii) Gas consumption based on Natural Gas with high heating 1004 BTU/SCF when operating at 70 psig.

iii) Thermal efficiencies are based on high heating values of fuels.

iv) Flue gas temperature & velocity are calculated for Natural Gas with 68°F (20°C) feed water.

3 SECTION THREE - INSTALLATION

DANGER: INSTALLER AND OPERATOR MUST IDENTIFY EMERGENCY SHUT-OFF DEVICES - INCLUDING POWER SWITCH, MAIN GAS (AND OIL) AND WATER COCK.

3.1 UNLOADING

For transportation the WX boiler will be disassembled and shipped in separate crates as follows:

- Boiler proper
- Optional Economizer (S series)
- Automatic Blowdown sensor electrode (shipped inside electrical cabinet door for safety) (Optional)

NOTE: Electric parts may be packaged in a separate container as warranted by their nature or options selected by the customer. Some small parts, such as bolts for economizer to boiler flange, steam separator flange bolts, etc., will be shipped inside the associated control panel for the boiler.

The boiler proper and economizer have lifting lugs as shown in Figure 1.

Shipping weights are as listed on specification tables.

CAUTION: All boiler prices are F.O.B. the factory at Brantford, Ontario. This means that MIURA Boiler West, Inc., is not responsible for damage to the boiler during shipping. We strongly recommend a complete inspection of all boiler shipments at place of delivery. This inspection should include photographs of the boiler and ancillary equipment packing crates. If any damage is found, do not release the driver or unload the equipment until a satisfactory arrangement is made with the shipping company to cover the damage. MIURA Boiler makes reasonable effort to ensure that no vibration or shock damage will occur. However, if such damage occurs and is not discovered and noted at the time of delivery, MIURA Boiler is not responsible to pay for the cost of repairs and any damaged parts will not be under warranty.
3.2 ASSEMBLING

3.2.1 Feed Water Pump
(OPTIONAL EQUIPMENT)

All Feed Water Pump foundations, if used, should have four (4) 5/8” holes for 1/2” anchor bolts. See Figure 2. These pump foundations are not supplied by MIURA.

Place the Feed Water Pump on a foundation and tighten mounting bolts. Note that the pump should be located under or close to the feed water tank. See Figure 3 and Table 3 for details.
### Table 3 WX Series Feed Pump Foundation Dimensions

<table>
<thead>
<tr>
<th>MODEL</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>OVERALL HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>WX-50</td>
<td>9</td>
<td>7 1/2</td>
<td>12 1/2</td>
<td>14</td>
<td>6</td>
<td>36 1/8</td>
</tr>
<tr>
<td>WX-65</td>
<td>9</td>
<td>7 1/2</td>
<td>12 1/2</td>
<td>14</td>
<td>6</td>
<td>36 1/8</td>
</tr>
</tbody>
</table>

#### 3.2.2 Feed Water Control Valves

In the application where the customer does not want to operate the feed pump in frequent start/stop cycles, other options are available. Again, the feed system operates in a simple On-Off manner. If control valves are used, they MUST be quick acting (within 5 seconds). MIURA Boiler recommends Ball Valves with pneumatic actuators (preferred) or electric actuators (acceptable). Note that the pneumatic actuators operate in 1 second, open to shut, and the electric actuators are 5 seconds open to shut. Refer to sections 3.5 and 3.6 for detailed discussion and suggestions. Electric feed water control valves are available as an option on all boiler models.

#### 3.3 BOILER POSITIONING AND ANCHORING

**3.3.1 Boiler Proper**

Mark boiler center line and boiler foundation corners of foundation. Recommended foundation is 6” concrete slab. Re-enforcement of slab is not necessary if floor is solid. Details of the boiler foundation and clearance dimensions are given on BOILER ASSEMBLY OUTSIDE VIEW drawing. Clearances are listed in Table 11.

All WX model boilers have four (4) anchor bolt holes for 5/8” anchor bolts. After positioning, anchor the boiler to the foundation. See Figure 4.

**Figure 4 WX Series Boiler Base Plate**

**3.3.2 Economizer Installation**  
(OPTIONAL EQUIPMENT)

This section does not apply to WX-G or WX-GO boilers. These models do not include an economizer.

Flue gas flanges must be sealed. Adjust the economizer as necessary to match the boiler flange by using the four adjusting bolts mounted on economizer base plate.

Adjustment of the economizer to the boiler may result in loss of vertical alignment of the economizer outlet flue. This will be compensated by flue gas stack.
Install and tighten bolts for flange between boiler and economizer. When boiler to economizer joint is tight, place shims under economizer base and bolt to foundation slab. See Figure 5. All economizers have a 2” drain hole on the bottom. This drain can be piped to a floor drain if desired.

3.4 STEAM PIPING

Table 4 Main Steam Outlet Connection Size

<table>
<thead>
<tr>
<th>WX-50</th>
<th>WX-65</th>
<th>WXL-50</th>
<th>WXL-65</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/2” NPT</td>
<td>1 1/2” NPT</td>
<td>4” NPT</td>
<td>4” NPT</td>
</tr>
</tbody>
</table>

MIURA Boiler recommends a check valve between the boiler outlet valve and the header isolation valve. Install the main steam check valve horizontally to prevent condensate build up above the check valve.

MIURA Boilers do not have a manhole. All openings into the waterside of the pressure vessel are 2” standard pipe plugs. Consequently, most jurisdictions do not require a “NON RETURN VALVE” in multiple boiler installations. Therefore, less expensive standard globe valves may be used instead of the Non-Return stop-check type.

Install the horizontal piping with sufficient slope and condensate drainage to prevent water accumulation in process steam supply piping. Recommended slope is 1” for every 200” to 300” horizontal pipe run. The piping should slope so that water drains away from the boiler and toward the steam condensate trap. For piping runs of more than 50 feet, consideration should be given to expansion joints in the steam piping to minimize piping stress on the boiler and process equipment as a result of thermal expansion of the steam piping.

When the amount of condensate return is insufficient to maintain feed water tank or hotwell tank temperature, a pre-heater steam system may be installed if desired. A feed water pre-heat system is NOT required for the MIURA boiler. However, a pre-heat of the feed water will reduce the amount of oxygen in the feedwater, and therefore, the amount of oxygen scavenging chemicals required.
Install a steam condensate drain trap on the main steam header to remove condensate prior to distribution to process steam lines. All low points in the steam piping should also have a condensate removal trap installed. This will minimize the chances of damage caused by water hammer or poor temperature control of the process due to water slugs in the steam system. Standard steam system practice is to install a steam trap every 75 feet of piping run.

See Figure 6 for system diagram and Table 4 for outlet valve connections.

![Figure 6 Steam Line and Trap Arrangement](image)

### 3.5 FEED WATER SYSTEM PIPING

Table 5 Feed Water Pump Suction Strainer Size

<table>
<thead>
<tr>
<th>ITEM</th>
<th>WX-50</th>
<th>WX-65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Inlet pipe size (nominal)</td>
<td>1” NPT</td>
<td>1” NPT</td>
</tr>
<tr>
<td>Feed water pump strainer size (nominal)</td>
<td>1 1/4” NPT</td>
<td>1 1/4” NPT</td>
</tr>
</tbody>
</table>

![Figure 7 Recommended Feed Water Piping Arrangement](image)
NOTE: Prior to installing pump, softener and other equipment, review applicable instruction books.

For the recommended system, refer to Table 5 and Figure 7 for the following discussion.

- Zero PPM hardness and daily sampling are required at the Feed Water tank. Do not connect the hard water line to the condensate return line.
- Install softener in series. Dual units are recommended. If water softeners are not installed in series, a full-size polishing unit is recommended. Do not use a float-actuated make-up water control valve. Such a system may result in low flow rates through softener resulting in channeling of ion exchange medium. Use a make-up water control system that will only allow specified flow through the Softener. The rule of thumb is ½ gpm minimum flow for each 1 cubic foot of resin in the softener tank. Consult chemical treatment company for specifics.
- Test cocks for individual softener and Feed Water Tank water quality testing are strongly recommended.

NOTE: To properly size the water softener, raw water hardness and conductivity, make-up water volume, boiler operating hours and water iron content are important factors. For details and assistance please contact your nearest MIURA representative or Boiler Water Treatment Chemical company.

- Collect condensate from process as feasible. Return condensate to Feed Water tank. Do not connect any piping that would allow hardness or product to enter Feed Water tank. Thermal insulation is recommended for all piping between Feed Water Tank and Boiler to conserve heat.
- Install the Feed Water Pump under or near the Feed Water Tank. The suction pipe should be adequately sized and configured to minimize friction losses. MIURA requires at least six feet of water above the suction of the pump to prevent cavitation.
- Use a gate valve in the Feed Water Pump suction line, followed by the specified strainer.
- Ensure the height of the water level in the feed water tank is sufficient to prevent cavitation of the Feed Water Pump under normal operating conditions. As an example, the WX-50 boiler using the GRUNDFOS model CR2-100U pump will require at least 6 feet of water height above the pump suction connection if the feed water temperature is at the boiling point. In general, MIURA Boiler recommends installing the Feed Water Supply Tank as high as possible in the boiler room to prevent any possibility of Feed Water Pump damage due to cavitation. Specifically, MIURA requests that the tank water level be at least 6 feet above the pump suction.
- In some cases, a flow restricting plate on the discharge side may be necessary to prevent cavitation of the Feed Pump when re-filling the boiler after a bottom blow down. If the boiler will not be operated over about 100 psi, the plate may also be necessary. If the tank supplying water to the boiler is not more than 6 feet above the pump suction.
- Avoid high points in the pump suction piping that would allow air to collect and result in loss of pump priming.
- Run all drains and overflows to floor level or well with inspection capability.

CAUTION: DO NOT ALLOW THE PUMP TO RUN DRY. DO NOT ALLOW THE PUMP TO VAPOR LOCK. SEVERE AND IMMEDIATE DAMAGE TO THE PUMP WILL RESULT.

Chemical feed can be made to feed tank and/or Feedwater line. MIURA Boilers can be provided with a set of “DRY” contacts through terminal strip strip connections 30 and 34. If the boiler is not ordered with this option, the chemical pump can be wired to terminals 13 and 14 of motor contactor 88W. These wires connect a Normally Open contact on the Feedwater pump magnetic contactor. MIURA recommends wiring the chemical injection pumps through this contact. This allows the chemical injection pumps to operate only when the feed pump is running. This type of operation allows the chemical company to adjust chemical usage directly to the boiler water usage. Due to the very small water content of the boiler, any difference between chemical injection rate and
steaming rate will result in erratic chemistry control. Operating the chemical pumps concurrently with the feed pump will provide a more consistent use of chemicals.

- Chemical Treatment procedures should be based on recommendations of a reputable boiler water chemical treatment company. NONE of the MIURA Boiler Warranties covers damage to the pressure vessel due to corrosion or formation of scale.
- Dual Pump Feed Water Systems are available as an additional option.
- Insulation of the Feed Water piping is recommended between the condensate return tank and the boiler.
- Some jurisdictions require a pressure gage on the discharge of the pump.
- Follow all local regulations.

### 3.6 FEEDWATER PUMP
(NOT INCLUDED WITH BOILER UNLESS ORDERED FROM MIURA)

**CAUTION:** The Feed Water Pump is vital to satisfactory operation of your new MIURA boiler. Review this section carefully for pump selection criteria if the customer has chosen to purchase a pump from other than MIURA. All pumps, regardless of the manufacturer, require a positive pressure on the pump suction to prevent cavitation damage to the pump. Any damage to the pump resulting from installation errors or cavitation is NOT covered by MIURA.

Improper sizing of the feed water pump will severely impact the performance of the MIURA Boiler. Under-sizing of the pump either by flow or by pressure will result in frequent Low Water Alarms and Boiler Lockouts. If this condition is allowed to continue, the Manufacturers Warranty on the pressure vessel DOES NOT COVER any tube damage that may result. Review and FOLLOW the pump sizing criteria given below and this condition will not occur.

**NOTE:** The MIURA Boiler is a unique design. Common pump sizing criteria do not apply.

**NOTE:** Ensure the height of the water level in the Feed Water Tank is sufficient to prevent cavitation of the Feed Water Pump under normal operating conditions. As an example, the WX-65 boiler using the GRUNDFOS model CR2-100U pump will require at least 6 feet of water height above the pump suction connection if the Feed Water Temperature is at the boiling point. In general, MIURA boiler recommends installing the Feed Water supply tank as high as possible in the boiler room to prevent any possibility of Feed Water Pump Damage due to cavitation. Specifically, MIURA boiler requests that the water level in the pump supply tank be AT LEAST 6 feet vertically ABOVE the pump suction flange. If necessary to achieve six-foot vertical height, the pump may be installed in a pit and piping arranged as necessary.

MIURA Boiler recommends that a pump be purchased with the boiler rather than using an existing pump. The reason for this is that MIURA Boilers run with intermittent feed water pump operation. MIURA Boilers start the feed pump on call for water and turn it off when call for water stops. This is due in part to the boiler having different water levels to maintain based on firing rate and in part due to a side benefit of the pressure vessel design. Some boilers use a modulating feed water control system such as McDonnell Miller float valves and operate the pump continuously. This is done partly because of a fixed steam/water level and mostly to reduce thermal stresses on the boiler shell that result from the introduction of relatively cold water to the hot boiler. The MIURA Design Advantage eliminates the need for this type of system. MIURA simply turns the pump on and off as needed based on actual boiler steam demand. This allows the pump to always run at optimum efficiency and prevents pump-overheating problems. The MIURA Boiler is designed, tested, and CERTIFIED to operate this way. Experience has shown there is no advantage to operating a MIURA Boiler with a modulating feed water control system.
Therefore, if a pump other than that provided by MIURA is used, the following selection criteria are provided:

Size the pump to deliver Twice (2X) or preferably three times (3X) the steady state evaporation rate of the boiler. This flow MUST be delivered to the boiler at a pressure AT LEAST 10-psi ABOVE the Boiler operating pressure. Also, ensure that the pump motor is able to handle frequent start/stop cycles without overheating the motor windings.

For example, a WX-65SG operating at 100% capacity for one hour will evaporate 2,242 pounds of water (at 0 psig) each hour. This is the steady state evaporation rate. Converting this evaporation rate to gallons per minute gives 4.5 gpm. As a result, MIURA recommends a pump capable of providing at least 9.0 gpm. If the boiler is operating at 150 psi, the pump should deliver between 9.0 and 13.5 gpm at 160psi. The GRUNDFOS CR2-100U, which is the pump recommended, will provide 10.0 gpm under these conditions.

MIURA recommends a pump equivalent to the GRUNDFOS pumps listed below for each Boiler model.

<table>
<thead>
<tr>
<th>MIURA BOILER MODEL</th>
<th>GRUNDFOS PUMP MODEL</th>
<th>MOTOR HORSE POWER</th>
<th>PUMP CAPACITY DESIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>WX-65SG (O)</td>
<td>CR2-100U</td>
<td>3 hp</td>
<td>10 GPM</td>
</tr>
<tr>
<td>WX-65G(O)</td>
<td>CR2-100U</td>
<td>3 hp</td>
<td>10 GPM</td>
</tr>
<tr>
<td>WX-50SG(O)</td>
<td>CR2-100U</td>
<td>3 hp</td>
<td>7.0 GPM</td>
</tr>
<tr>
<td>WX-50G(O)</td>
<td>CR2-100U</td>
<td>3 hp</td>
<td>6.6 GPM</td>
</tr>
</tbody>
</table>

These pumps are available through MIURA and if purchased with the boiler, they may be provided with an optional mounting foundation as described in Figure 3. MIURA strongly recommends that the pump be installed under the water supply tank. This will minimize the possibility of cavitation due to long suction piping runs.

MIURA recommends installing a feed water suction strainer of at least 20 mesh. Install a strainer one size larger than pump suction piping. Pump flange kits are available from MIURA as an option. Also, install an isolation valve on the supply side of the strainer to allow cleaning the strainer without draining the feed water supply tank. The suction side isolation valve and feed water strainer are NOT provided by MIURA and must be installed in order to include the pump in the One-Year Parts Warranty. The One-Year Warranty applies to the pump ONLY if it is purchased through MIURA. Water is automatically fed to the boiler from the feed tank by traveling through a manual shut off valve, “Y” type strainer, pump, economizer (if equipped), then through two (2) check valves to the bottom header to the internal water distribution tube.

GRUNDFOS series C Multi-Stage centrifugal pumps installed in accordance with the manufacturers instruction booklet will operate efficiently and provide years of service. The pumps are water lubricated and do not require any external lubrication or inspection. The motors will require periodic lubrication as noted in the maintenance schedule section. The pump is a close coupled, multistage high-pressure centrifugal type.

**CAUTION: UNDER NO CIRCUMSTANCES SHOULD THE PUMP BE OPERATED FOR ANY PROLONGED PERIOD OF TIME WITHOUT FLOW THROUGH THE PUMP.**

Dry operation of the pump will result in motor and pump damage due to overheating. A properly sized recirculation flow fitting may be obtained from GRUNDFOS and installed to prevent this damage if the pump is run with an isolation valve shut. On a boiler equipped with an economizer, the economizer safety relief will open to provide flow if the boiler feed isolation valve is shut during pump operation.
GRUNDFOS installation and operating instructions specify the number of start/stop cycles for the pumps. MIURA Boiler operations exceed these values. The number of start/stop cycles in conjunction with the short running times in our application is approved by GRUNDFOS and MIURA Boiler engineering sections and will not result in motor overheating problems.

For detailed installation data, refer to “GRUNDFOS” installation and operating instructions that were supplied with the pump. The pump is in a separate crate from the boiler. Before starting the pump after initial installation or maintenance, please check the following:

• All piping connections are tight and the pipes are adequately supported.
• Any isolation valves on the suction of the pump are open.
• Pump is primed and vented through the vent fitting located at the top of the pump.
• Open main power disconnect. Remove the coupling guard and rotate the pump shaft to be certain it turns freely. Replace the coupling guard.
• Insure that all feed water isolation valves are open.
• Shut the main power disconnect to the boiler.
• While observing the top of the pump, cycle the boiler “ON-OFF” switch located on the front of the boiler. This will start the pump and allow verification of the direction of rotation. Direction of rotation is counterclockwise when viewed from the top. The pump will not run if the control switch is in the “OFF” position.

3.6.1 Feed Water Control Valves

In the application where the customer does not want to operate the feed water pump in frequent start/stop cycles, other options are available. Again, the feed system operates in a simple On-Off manner. If control valves are used, they MUST be quick acting. MIURA Boiler recommends pneumatic actuated ball valves or electric actuators on the ball valves. Note that the pneumatic actuators operate in less than 1 second open to shut and the electric actuators MUST operate in less than 5 seconds open to shut. Refer to sections 3.5 and 3.6 for detailed discussion and suggestions.
3.6.2 Piping Flushing

After installation is completed but before the boiler is fired, flush all water piping. MIURA is not responsible for damage to stuck open check valves that result from debris in the piping. The boiler is factory tested and does not require a “Boil Out.” However, flush all steam and water piping to avoid debris from damaging check valves and other piping components.

3.7 SAFETY RELIEF VALVES, INSTALLATION

<table>
<thead>
<tr>
<th>ITEM</th>
<th>WX-50</th>
<th>WX-65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiler Safety Valve Outlet</td>
<td>1 1/2” NPT</td>
<td>1 1/2” NPT</td>
</tr>
<tr>
<td>Economizer Safety Valve Outlet (S models only)</td>
<td>1” NPT</td>
<td></td>
</tr>
</tbody>
</table>

Drip panels should be used for boiler safety valves. Water that collects in the elbow and valve body after the valve lifts, any rain water or valve leakage should be drained off and not allowed to stagnate. Failure to drain the water may result in valve corrosion or water hammer if the valve lifts. This arrangement is shown in Figure 8.

The optional economizer is also equipped from the factory with a safety valve. The installation is illustrated in Figure 9. The economizer safety valve may not be required to be piped to the roof depending on local codes. Piping of economizer safety valve should be directed to a floor drain or other collection points as specified by the local codes concerning boiler wastewater. If a de-aerator is used, the water discharged by this safety may be near the boiling point and could cause a potential for personnel injury. Arrange the piping accordingly.

Figure 8 Boiler Safety Valve Installation

Figure 9 Economizer Safety Relief Valve Installation
3.8 BLOWDOWN PIPING

Table 7 Blowdown piping sizes

<table>
<thead>
<tr>
<th>ITEM</th>
<th>WX-50</th>
<th>WX-65</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVC blow off outlet</td>
<td>1” NPT</td>
<td>1” NPT</td>
</tr>
<tr>
<td>Bottom blow off outlets</td>
<td>1” NPT</td>
<td>1” NPT</td>
</tr>
<tr>
<td>Automatic blow down outlet</td>
<td>3/8” NPT</td>
<td>3/8” NPT</td>
</tr>
</tbody>
</table>

DANGER: Be sure to install blow down piping separately from overflow and drainage piping. Piping shall be arranged to prevent any possibility of boiler water splashing and causing personnel injury.

All piping subject to pressure from the boiler during blow down must be securely anchored to prevent piping vibration and shock during blow down of the boiler. Due to the large number of different piping arrangements possible, MIURA recommends a maximum pressure for manual bottom blow down of 30psi. Information on piping sizes is given in Table 7.

- Note that the Automatic Surface Blow Down Line operates automatically when the boiler is at high pressure and temperature. Therefore, the 3/8” pipeline must be piped to the blow down tank to avoid personnel hazards.
- Do not allow siphoning back into the boiler from wastewater drains.
- Standard equipment includes one (1) “quick operation” type globe valve for blow down isolation. Double blow down isolation valves may be installed at customer request and as required by local regulations (See Figure 11.)
- Install an additional check valve between the automatic blow down solenoid valve and the blow down separator. (See Figure 12.) Check valve is not included with boiler.
- Blow down separator after cooler for boiler water may be supplied by MIURA Boiler at customer request. Insure local regulations for disposal of boiler wastewater are followed.
- In an installation where multiple boilers share a common blow down separator, install a check valve in the piping between each automatic and manual blow down isolation valve and the blow down separator. See Figure 10 as an example.
- In a situation where all blow down water is collected in a sump, size the sump for at least five times the operational water content of the boiler. This will allow collecting the boiler water and the cooling water used by the blow down separator. The operational water content is provided in the general specification tables.
- Follow all local regulations.
If an Automatic Temperature Control Valve is used instead of a Manual Valve, install a Strainer upstream of the Control Valve.

**Figure 12 Automatic Blow Down System Check Valve**
NOTE: Maintain stamped gas supply pressure during operation. This pressure must be at the regulator supplied with the WX-Series boiler gas piping. If necessary, use larger pipe for long piping runs. Failure to maintain required gas flow rate and pressure will result in frequent boiler misfires!

3.9 FUEL SUPPLY ARRANGEMENTS

3.9.1 Gas Piping

FUEL TYPE: Natural & Propane Gas

SUPPLY PRESSURE STEADY: 1-5 PSIG required at boiler regulator inlet at full firing rate and when boiler combustion is stopped. Installation of a pressure gage to monitor gas supply pressure is recommended. If the boiler is operated with propane fuel, MIURA Boiler STRONGLY recommends use of a vaporizer. Collecting the propane gas from the top of the tank is possible but not recommended due to variations in vapor space pressure depending on ambient air temperature. Also, ensure the vaporizer is sized for full boiler capacity even if the normal load is less than the maximum capacity of the boiler. This recommendation is based on the boiler operating at full rated fuel flow during the start up period.

Use an approved reducing valve to meet the required specifications if the supply gas pressure is above 5 PSIG. Use an approved booster pump if necessary to meet the required minimum pressure specifications of 1 PSIG. 1 PSIG minimum is required at the inlet to the gas regulator supplied with the boiler to ensure an adequate volume of fuel is available to support combustion during firing rate changes. Specifically, a change from burner “Off” to “Low Fire,” which is approximately 40% of rated fuel usage, occurs over a 10 - 15 second period. The fuel usage then goes from 40% to 100% rated consumption when the boiler goes to high fire. This change occurs in less than one second. Fuel consumption then changes from 100% to zero in less than one second when the boiler turns off. The Utility Gas regulator must maintain at least 1 PSIG and not exceed 5 PSIG under these conditions, and should be placed as far away from the boiler gas regulator as possible. The maximum pressure of 5 PSIG is determined by Underwriter’s Laboratory approval of the MIURA Gas train.

Table 8 WX Gas Piping Sizes

<table>
<thead>
<tr>
<th>ITEM</th>
<th>WX-50</th>
<th>WX-65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Inlet</td>
<td>2” NPT</td>
<td>2” NPT</td>
</tr>
<tr>
<td>Main Regulator Vent</td>
<td>3/4” NPT</td>
<td>3/4” NPT</td>
</tr>
<tr>
<td>Pilot Regulator Vent</td>
<td>1/4” NPT</td>
<td>1/4” NPT</td>
</tr>
<tr>
<td>Pressure Switch Vents</td>
<td>1/8” NPT (2 switches)</td>
<td>1/8” NPT (2 switches)</td>
</tr>
<tr>
<td>Automatic Vent Valve (IRI Option)</td>
<td>3/4” NPT</td>
<td>3/4” NPT</td>
</tr>
</tbody>
</table>

- Install a dirt pocket on main gas inlet piping immediately up stream of boiler.
- All main gas train piping to the burner is included, (except for individual regulator and pressure switch vents). Do not attempt to change any part of this gas train without first consulting the nearest authorized MIURA representative.
- See Specification Tables for fuel consumption. See Table 8 for pipe connection sizes.
- Three pressure switches, HIGH and LOW gas pressure and the AIR FLOW pressure switch may require venting to atmosphere outside the boiler room in some jurisdictions. Contact your local insurance provider and the Gas Company for specific requirements. See Figure 13 for a typical vent line arrangement and Figure 14.
• See Figure 15 and Figure 16 for connection points
• Typically, gas vent lines, when manifold, shall be connected to a common vent line. The vent line having a cross-sectional area not less than the area of the largest vent line plus 50 percent of the areas of all the additional vent lines.
• An automatic solenoid operated automatic vent valve located between the main gas blocking valves may be required for insurance purposes and is an additional cost option to meet IRI specifications.
• Follow all local regulations.

![Figure 13 Typical WX Series Gas Train and Vent Points](image)

![Figure 14 Main Gas Regulator Vent Piping](image)
3.9.2 Oil Piping

FUEL TYPE: No. 2 Oil

Table 9 Oil Inlet Pipe Sizing

<table>
<thead>
<tr>
<th>ITEM</th>
<th>WX-50</th>
<th>WX-65</th>
</tr>
</thead>
<tbody>
<tr>
<td>OIL INLET</td>
<td>3/4” NPT - UNION</td>
<td></td>
</tr>
</tbody>
</table>

1. All oil piping to the burner is included. Do not attempt to change any part of this oil train without first consulting the nearest authorized MIURA dealer. See Table 9 and Figure 17.
2. See specification tables for fuel consumption.
3. Fuel pump suction pressure should not exceed 3 psig in order to comply with National Fire Protection Code.
4. Fuel pressure at pump suction must NOT be at a vacuum. Do not use the MIURA supplied oil pump to draw oil up from the tank, through the overhead, and down to the boiler. This arrangement usually allows air to leak into the pump suction connection and results in very poor combustion.
5. Install a manual fuel oil shut off valve at the boiler.
6. Avoid high points in the pump suction piping that would allow air to collect and result in loss of pump priming.
7. If necessary to prevent loss of oil pump priming, install a re-circulation pump.
8. Vent all air from the piping to prevent damage to the oil pump seal before running the pump.
9. Follow all local regulations.
3.10 ELECTRICAL INSTALLATION

3.10.1 ELECTRICAL TABLE

NOTE: MIURA recommends that an additional alarm and warning light be installed in control room if possible.

Table 10 Electrical Specifications

<table>
<thead>
<tr>
<th></th>
<th>WX-50</th>
<th>WX-65</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOLTAGE</td>
<td>460</td>
<td>230</td>
</tr>
<tr>
<td>Amperage</td>
<td>9.2</td>
<td>18.4</td>
</tr>
<tr>
<td>Power Usage (KVA)</td>
<td>7.0 (8.0 for oil fired)</td>
<td>9.2</td>
</tr>
<tr>
<td>Wire Size (AWG)</td>
<td>#14 x 3c + #14(G)</td>
<td>#10 x 3c + #12(G)</td>
</tr>
<tr>
<td>Disconnect Amps</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

1. Voltages of 575 and 208 are available by special order.
2. Specifications for FGR option are not covered by this table. Contact MIURA for details.
3. Optional equipment such as the remote communications module for the MIURA Micro-Computer burner control system or the MIURA Multiple Installation (MI) system must be wired as specified in the individual instruction books.
4. After installation of the feedwater pump the motor must be wired to the boiler power distribution box using provided cables. If the pump is located some distance from the boiler, an emergency stop/start or disconnect switch may be required near the motors.
5. For details of wiring, see individual wiring diagrams.
6. Comply with local building electrical codes.
7. See Figure 18 and Table 10 for terminal connections and supply wire sizes.
All WX series boilers include as optional equipment a GRUNDFOS feed water pump. This pump is shipped in a separate crate from the boiler. All boilers include a conduit and wire bundle pre-wired into the power box for the pump. If the pump is located at a distance from the boiler, use a connection box and comply with local wiring codes to extend the wiring to the pump. Some installations, for example a pump located in a different room from the boiler, may require a local disconnect/emergency stop switch at the pump. In this situation it is not necessary to provide an interlock between the pump and the boiler to ensure that the local disconnect is shut. The boiler starts and stops the pump automatically as necessary to maintain the required water volume. If the pump does not start, the boiler safety circuits will shut down the boiler on low water volume and prevent damage. If desired, an indicating lamp may be installed near the boiler control panel to indicate that the local disconnect/emergency stop switch at the remote feed pump location is shut.

### 3.11 CLEARANCE

The WX-Series was designed for use on non-combustible floors with minimum clearances from the unit and flue connections to flammable materials of:

**Table 11 Boiler Minimum Clearance Requirements**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOILER TOP</td>
<td>40”</td>
</tr>
<tr>
<td>BOILER SIDE</td>
<td>18”</td>
</tr>
<tr>
<td>BOILER REAR</td>
<td>18”</td>
</tr>
<tr>
<td>BOILER FRONT</td>
<td>48”</td>
</tr>
</tbody>
</table>

Follow local regulations.
3.11.1 Panel Layout

- Display Window: Current Status and Information.
- Boiler Combustion START/STOP
- Data Change/Set Button
- Menu/Setting Scroll Buttons
- Alarm Reset
- CAUTION/WARNING Information Button (Push to read message before resetting Alarm)
- Boiler Steam Pressure
- Boiler Operation Switch/Circuit Breaker (to left of panel)

Figure 19 Boiler Control Panel with MIURA XJ1 Intelligent Steam Manager

3.11.2 Boiler Interface Capabilities

The Miura boiler has several options for remote monitoring. The standard equipment supplied with the boiler is a Honeywell S7896D Burner Control.

The Honeywell 7800 series is a microprocessor based integrated burner control for automatically fired gas or oil fired single burner applications. Functions provided by the S7800 series include automatic burner sequencing, flame supervision, system status indication and system or self-diagnostics and troubleshooting. The 7800 series as installed on the MIURA boiler consists of a Relay Module, Flamed Amplifier, Universal mounting sub-base, Plug-In Purge Timer, and Keyboard Display Module. A Communications interface for integrating personal computer networking for burner status is available through Honeywell. The optional interface is the Q7700 Communications system.

Relay Module, Flamed Amplifier, Universal mounting sub-base, Plug-In Purge Timer, and Keyboard Display Module. A Communications interface for integrating personal computer networking for burner status is available through Honeywell. The optional interface is the Q7700 Communications system.
Also included as standard equipment on the MIURA Boiler, is a MIURA XJ1 Intelligent Steam Management Micro-Computer. The XJ1 is a microprocessor-based device designed to monitor the status of a series string of limit, control, and interlock contacts for the MIURA Boiler. The XJ1 acts as a system monitor and enhances fault and status messages of the S7800 series Burner Control. The SJ1 is included as standard equipment, and can provide detailed status on the boiler. Remote communication between the boiler and MIURA Factory Level Service Department is standard equipment. This allows MIURA Factory Level Service, monitoring, and troubleshooting via modem. A monthly report detailing operating hours, start/stop cycles, actual boiler evaporation (requires optional gas meter), feed water pump performance and the number of times any alarm occurred is available for a small fee. This remote monitoring program is not equaled by ANY boiler control system. Contact your local MIURA Representative for more details.

The MIURA Boiler is capable of providing status information such as burner operating or burner off, steam pressure above or below set value, feed water pump energized or off. This information is provided by the addition of 120VAC control circuits inside the control cabinet. The additional circuits are available as an option from MIURA or may be field installed. The MIURA XJ1 system is not compatible with standard building automation/monitoring systems. Individual customer needs vary as well as the information required. Analog information, such as steam pressure or feed water temperature requires separate sensors not included with the MIURA Boiler. For specific information and wiring connections please contact your nearest MIURA Boiler representative.

3.12 VENTILATION

Ventilation of space occupied by the boiler shall be provided by an opening(s) for exhaust air at the highest practical point connecting to the outside of the building. The total cross-sectional area of the opening(s) shall be at least equal to the dimensions of Table 12 below.

When air supply is provided by a natural flow from outdoors for the boiler, in addition to the opening for exhaust air required, there shall be a permanent inlet air supply opening(s) having a total cross-sectional area not less than required from the table below and the location of the opening(s) shall not interfere with the intended purpose of the opening(s) for the exhaust air. This opening(s) shall be either located at, or ducted to, a point not more than 18 inches or less than 6 inches above the floor level.

<table>
<thead>
<tr>
<th>WX-50</th>
<th>INLET AIR AREA (EACH BOILER)</th>
<th>99 SQ. IN.</th>
<th>EXHAUST AIR AREA (EACH BOILER)</th>
<th>10 SQ. IN.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WX-65</td>
<td>INLET AIR AREA (EACH BOILER)</td>
<td>91 SQ. IN.</td>
<td>EXHAUST AIR AREA (EACH BOILER)</td>
<td>10 SQ. IN.</td>
</tr>
</tbody>
</table>

This table above gives factory recommended minimums for each boiler. The recommendation is based on Canadian Gas Association standards. Boiler room ventilation requirements vary by significant amounts depending on local building and safety codes. For multiple boiler installations, multiply the above areas by the number of boilers installed in the boiler room.

Follow all local regulations
NOTE: Consultation with your Engineering Company, Exhaust Stack Provider or MIURA Representative will ensure a long lasting, trouble free stack design. The stack MUST be designed to maintain available draft at the outlet of the boiler between ZERO or MINUS 0.05 inches of water at all fire rates. Failure to maintain these values will adversely affect boiler performance and is not the responsibility of MIURA.

3.13 STACKS AND BREACHING

Proper installation of the stack is required for high boiler efficiency and safe operation. The following principles should be followed at all times when designing stacks.

1. Chimneys should be straight. Bends or offsets have a greater resistance to flow with consequent adverse affects on burner performance and should be avoided whenever possible.

2. A stack should be higher than nearby structures to avoid downdrafts or eddy currents. If this is not possible, a stack hood designed to prevent downdrafts should be considered. See Figure 21.

3. The stack should project at least:
   a) Two feet above the horizontal plane, drawn from a point at least 10 feet away from the stack
   b) Three feet above the lower side of the roof slope.
   c) Figure 20 provides examples.

4. Include a rain hood for all stacks. Also, be sure to add a rain shield for straight stacks through the roof.

5. Do not make the stack diameter smaller than the flue gas outlet on the boiler.

6. Provide supports if the stack exceeds 100 lbs. Also, clamp the stack firmly to the flue gas outlet.

7. Install the stack away from any combustible material and utilize insulation at the opening in the wall or roof.

8. Follow all local regulations. Check your building, fire, and mechanical codes as a minimum guideline.

9. Flue gas sample fittings are provided from the factory on boilers ordered with economizers. In addition, flue drain connections are provided on the exhaust elbow and economizer. Ensure these connections are plugged or piped into drains. Please do not cover these fittings when insulating the exhaust stack.

10. One ½” drain plug fitting is installed on the optional MIURA flue elbow, and one 2” drain plug is provided on the optional economizer. The 2” drain plug is intended to allow piping of condensation to a floor drain through a “J” type water trap. If drain piping is not used, please install a 2” plug to prevent flue gas escape to the boiler room.

11. When the boiler is installed in regions where temperatures fall to the freezing point, a stack damper should be installed to prevent down drafts from freezing the boiler tubes when it is not in operation.

12. All boilers are equipped with a flange on the flue gas outlet. Dimensions and bolt patterns are given in Figure 22.

13. A chimney down draft will have a direct effect on main burner ignition reliability.
NOTE: The relationship between a stack draft and pressure drop of flue gas is given in the following equation. Miura boilers require a draft of zero inches w.c. to a maximum of -0.05 inches w.c. for proper operation. Operation outside these values will seriously impact boiler performance.

\[ 0.82H > 0.49L + 1.5N + 1.5 \]

H: Height of chimney rain cap (FT)
L: Total length of chimney (FT)
N: Quantity of knuckle points

Insure that the above equation is satisfied, in order to obtain full boiler capacity.
Figure 22 Stack and Economizer Bolting Dimensions
### 4.1 SAFETY FEATURES AND OPERATING CONTROLS

#### 4.1.1 Low Water Volume Cut-Off

If the water volume, for any reason, falls below the pre-determined water volume, combustion will immediately be stopped, a warning alarm will be activated, and the display will read, “Low WATER LEVEL.”

After complete BLOW DOWN of the boiler, all the red lights on the Floatless Switch(es) will be off. With the main power turned on at the boiler and the “ON-OFF” switch “ON,” the Feed Water Pump will start. After a few minutes, the red LED of Floatless Switch #33WL1 will then come on, and the red LED of Floatless Switch #33WL2 will come on. The Feed Water Pump will continue running until the required water volume is reached. At this point, the Feed Water Pump will stop. If The red LED of any of the floatless switches does not come on in the above sequence, please check the electrodes and the wiring to the electrodes.

The labels 33WL1 and 33WL2 refer to the physical switch. The wiring schematics list the probes as follows:

<table>
<thead>
<tr>
<th>PROBE</th>
<th>WIRE</th>
<th>SWITCH CONTACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>E 5</td>
<td>33WH (option)</td>
</tr>
<tr>
<td>B</td>
<td>E 4</td>
<td>33WL2 (option)</td>
</tr>
<tr>
<td>C</td>
<td>E 3</td>
<td>BGI-200-CPU (7)</td>
</tr>
<tr>
<td>D</td>
<td>E 2</td>
<td>BGI-200-CPU (5)</td>
</tr>
<tr>
<td>E</td>
<td>E 1</td>
<td>33WL1</td>
</tr>
</tbody>
</table>

**Table 13 Floatless Switches and Probes**

Please note that probe “B” (E 4) is optional on some models.
4.1.2 Overheat Monitor Temperature

If temperature at the overheat thermocouple on the water tubes should, for any reason, rise above the pre-set temperature (660°F), the overheat protection will be activated, thus shutting down the boiler and activating the alarm. The display will also show “HIGH W TUBE TEMP.”

For testing this function, use the “Set Clock” menu. Set the temperature to lower than the factory value. It will shut down the boiler when the tube temperature reaches the new set value. After testing, do not forget to return to original setting. We suggest changing only the “hundred’s” value. An example would be to reset the temperature controller from 475°F down to 275°F. After the boiler shuts down, the “Set Clock” menu item must be reset to the factory shop test value, or the boiler will not run.

4.1.3 Scale Monitor Temperature

If temperature at the scale monitor thermocouple on the water tubes should, for any reason, rise above the pre-set temperature (maximum 660°F, typically around 450°F), the overheat protection will be activated, thus shutting down the boiler and activating the alarm. The display will also show “HIGH W TUBE TEMP.” Note that there are two different settings for the scale monitor alarm. One setting is used during High Fire and the other during Low Fire. The computer waits 40 seconds after a change in firing rate to evaluate the current temperature against the alarm set point. The XJ1 also adjusts the alarm set point internally based on boiler steam pressure. Therefore, it is not necessary to set the alarm point at boiler start up. DO NOT CHANGE THESE SETTINGS FROM THE FACTORY NUMBERS.

For testing these functions, use the “Set Clock” menu. Set the temperature to lower than the factory value. It will shut down the boiler when the tube temperature reaches the new set value. After testing, do not forget to return to original setting. We suggest changing only the “hundred’s” value. An example would be to reset the temperature controller from 475°F down to 275°F. After the boiler shuts down, the “Set Clock” menu item must be reset to the factory shop test value, or the boiler will not run.

4.1.4 High Pressure Limit Cut-Off

If the boiler pressure should, for any reason, rise above the pre-set pressure (Max. 170 PSIG), the High Pressure Limit protection will be activated, shutting down the boiler, activating the alarm. The display will show “EMERGENCY STOP.”

If the boiler shuts down because of high pressure and you need to press the reset on the pressure switch to restart, please check the Control Pressure settings of the XJ1 for any incorrect setting. The Control Pressure should have a lower setting than the Limit Pressure switch.

For testing High Pressure Limit, set it lower than the Control Pressure. It will shut down the boiler when the boiler pressure reaches the set pressure. After testing, do not forget to set it Back to the original setting and reset the High Pressure Limit Switch.
4.1.5 Misfire

If ignition is not achieved after the ignition period, burner operation will immediately be stopped. After a purge cycle, the safety switch of the Flame Safeguard will be activated, and a warning alarm will sound. The display will indicate “FLAME FAILURE.”

For testing the Flame Safeguard, close the pilot gas valve, then start the boiler. Mis-fire will occur after the first or second attempt for pilot. After testing, do not forget to open the pilot valve and reset the Flame Safeguard.

4.1.6 False Signals

Should there be any false signals emitted during ignition, pre-purge, or should pre-purge timing be off, the safety switch of the Flame Safeguard will be activated, the boiler will be shut down, a warning alarm will sound, and the INTERLOCK lamp will be illuminated. The display will show the reason for interlock.

For testing during pre-purge, take the flame eye out and point it to a flame (of a cigarette lighter, for example). The boiler will continue to purge and pilot will not come on. After testing, do not forget to put the flame eye back to its original position and reset the Flame Safeguard.

4.1.7 Power Overload

Overload or short-circuiting of the blower motor will result in boiler shutdown and sounding of the warning alarm. Most blower motors have a stator winding thermal overload feature. If the thermal overload, (49°F) has not tripped in the boiler control panel, operation will not resume until the blower motor has cooled down.

Thermal overload of the blower motor, both internal stator winding and 49°F, will be indicated as “AIR PRESS FAULT” on the XJ1.

4.1.8 Air Pressure

If the air pressure in the air duct, for any reason, falls below the predetermined pressure, combustion will be immediately stopped and a warning alarm will sound. The display will show “AIR PRESS FAULT.”

For testing, turn the setting of overload protector #88 to “TEST.” During combustion press and hold the reset button of overload protector #88F. The blower will slow down to a stop; there will not be enough airflow, and the boiler will shut down. Release the reset button, set overload protection #88F back to manual, and reset the boiler. Also test the airflow by noting the setting of the air pressure switch and then adjusting it to a higher setting. After the alarm sounds, reset the switch to the original value.
4.1.9 Fuel Gas Pressure

When the “START” button is pushed prior to combustion when there is not enough gas pressure, the burner cannot ignite and the warning alarm will sound. If, during the process of boiler operation, the gas pressure falls below the required range, combustion will stop, and the alarm will sound. In addition, the display will show “LOW GAS PRESS.” or “HIGH GAS PRESS.”

For testing the Low Gas Pressure alarm, close the main gas valve up-stream of the gas train during combustion. The boiler will shut off because of low gas pressure. After resetting the Flame Safeguard, the boiler still cannot restart because of low gas pressure, until the main gas valve is opened again.

For testing the High Gas Pressure alarm, close the main gas burner inlet valve down-stream of the gas train during combustion. The boiler will shut off because of high gas pressure. After resetting the Flame Safeguard, the boiler still cannot restart because of main flame ignition failure. Open the burner inlet gas valve.

4.2 ROUTINE BOILER OPERATION

**DANGER:** All cover plates, enclosures, and guards must be in place at all times, except during maintenance and servicing.

**NOTE:** This is a shop-tested, assembled, and fully packaged boiler. Each unit and assembly have been well adjusted in the factory. It is very important not to make any adjustments without first consulting your nearest authorized MIURA dealer.

Daily, or every shift, water analysis should be performed to see if additional treatment is needed. Use a tester of 1ppm or less sensitivity.

4.2.1 Preparation Before Start-up

Check the following **every day** before boiler start-up:

- Make sure all gauges are operating correctly.
- Make sure there is water in the feed water tank (hotwell or deaerator).
- Make sure the boiler water is conditioned (for instructions on checking for soft water, refer to your water softener instruction manual). Use a water tester sensitive to less than 1 ppm CaO_3_.
- Make sure there are chemicals in the chemical feed tank.

4.2.1.1 Start-Up

**CAUTION:** The following start-up routine must be followed in sequence (1-7).

1. Open feedwater inlet valves.
2. Open the main fuel valve (gas or oil) and check that the required gas pressure (1 - 5 PSIG) on gas firing, or oil level on oil firing, is available. Then select fuel switch in control box.
3. Turn the power source on. The lamp in the “ON-OFF” switch on the control panel should illuminate.
4. Make sure the manual blow down valves are closed.
5. Turn the “On-Off” switch to “ON” and the display on the panel will read, “ENABLE.” The feedwater pump
will start automatically if the water volume is low.
6. Once the feed water pump has stopped and the display shows normal water level on the bar graph, push the
“COMBUSTION” button. The display will indicate all steps in the boiler start sequence.
7. When desired steam pressure is reached, open the steam outlet valve.
8. Combustion sequence to full fire for all WX boilers is as follows:
   a) Pre-purge
   b) Pilot gas ignition
   c) Pilot flame confirmation
   d) Main burner ignition
   e) Main burner confirmation
9. Pilot gas shut-off
10. Low fire confirmation
11. High fire operation if required.

4.2.1.2 Blow Down

BOTTOM BLOW DOWN

**CAUTION: During Blow Down:**

Be sure that the main steam valve is closed before beginning Blow Down.  Do not perform blow down with a steam pressure greater than 30 PSIG unless the blow down piping was specifically designed for a higher pressure.  Blow down the boiler upon start-up rather than just after shutdown whenever possible.  This will maintain boiler chemicals and pH in the boiler while it is shutdown.  DO NOT MANUALLY BLOW DOWN DURING OPERATION.  Manual blow down during operation will result in boiler shut down due to low water content.

It is recommended that blow down be performed just after daily start-up:

a) Close the main steam valve, raise the steam pressure to 20-30 PSIG, and push the “COMBUSTION” button.  Wait for the post purge cycle to finish and the blower to stop.  Then flip the “ON-OFF” switch to “OFF” (Water pump will not run).
b) Open the blow down Valves slowly and begin blow down.
c) Since the frequency of full blow down is dependent upon running hours and water quality in your area, please follow the advice of the water treatment representative.  The default setting for the blow down WARNING timer is 10 hours of combustion.
d) Once blow down is complete (should take only 5 to 15 minutes depending on the blow down piping arrangements), continue the blow down until the boiler is completely dry.  This will ensure all sludge is removed.  Complete draining of the Miura boiler is not dangerous to the boiler.
e) When the boiler is completely drained, shut the blow down valves.
f) Open the control cabinet door and locate the water level control floatless switches.
g) Turn on the power switch.  The feed water pump should start, and all floatless switch LED’s should be out, indicating a low water condition.  The display will indicate “STANDBY.”
h) Wait for the boiler to fill to normal levels.  During the fill process, observe the red LED’s on the floatless switches.  They should turn on before the display indicates “DISABLE” and all bars on the bar graph are on.
i) Push the COMBUSTION button.
j) When required steam pressure is reached, slowly open the main steam valve.
4.2.1.3 Automatic Bottom Blowdown (Option)

This is optional equipment that is only recommended when the boiler feed water has no hardness and the silica is treated by chemicals. Some jurisdictions do not allow automatic bottom blowdown systems. The water must also be free of any thick sludge and a non-precipitation hardness modifier is used. Phosphate treatment is not recommended. This can be further discussed with your water treatment supplier of chemicals.

a) The optional automatic bottom blowdown valve will reduce the manual full blowdown sequence of the boiler to about once every two weeks.

b) Bottom blowdown valve automatically opens for 30 seconds after 10 hours of combustion. (This is adjustable, according to the accumulated time of combustion.) The frequency of blowdown is determined by the quality of the feedwater. The feedwater quality to be maintained must be less than 0.5 PPM of hardness. In addition, the boiler water quality must be maintained, so that the boiler water conductivity is kept below 4000 mhos.

c) The optional automatic bottom blowdown valve and piping arrangement must be secured properly as this line will be under full operating steam pressure.

d) A full manual blowdown must be conducted at least once every 2 weeks, to prevent scale build up.

CAUTION: The following shutdown routine must be followed in sequence.

Shutdown:

a) Push the “COMBUSTION” button. Combustion will stop and post-purge will begin.

b) Once post-purge has finished, turn the “ON-OFF” switch to “OFF” position.

c) Close all water inlet and steam outlet valves.

d) Close the fuel valves.

e) Turn off the main power supply to the boiler.

f) After prolonged shutdown, follow the correct start-up procedure to restart the boiler.

4.2.2 Cautions During Operation

a) Always open the main fuel and water inlet valves before running the boiler.

b) If there is a mis-fire or flame failure, locate the cause of the problem, (as discussed in Section 5.2, Trouble Shooting) fix it, push the reset button on the panel and re-fire the boiler. If the same problem persists, shut the boiler down and call the nearest MIURA representative or distributor.

c) If the circuit breaker tripped, check then reset it.

d) Proper balance of gas and airflow is needed to insure complete combustion and optimum efficiency. Contact your nearest MIURA representative or distributor to adjust air flow.

e) Do not change the setting on the high temperature limits.

f) When unsure of any boiler trouble, shut down the boiler, turn the power source off, and contact your nearest MIURA representative or distributor.

g) If you smell gas, immediately shut down the boiler and turn off all power sources and contact nearest gas and MIURA representative or distributor.

h) Be careful when you take a sample of water from the boiler. Please be sure to open the valve very slowly.

i) Do not re-light the pilot or start the burner with the combustion chamber full of gas or with a very hot combustion chamber.

j) In an emergency, push the “COMBUSTION” button and close the GAS VALVE first, then cut out the main power supply to the boiler.
4.2.3 Extended Shutdown

To prevent internal corrosion during periods of extended shutdown (7 days or more), one of the following must be done:

a) Raise the boiler water pH level to between 11-12 to reduce corrosion.

b) Drain the water and dry the boiler completely. Add inert gas or deoxidizing agent.

Since the WX is a low water content boiler, keeping the water in the boiler and raising the pH may be preferred. However, in places where freezing may occur and shutdown may be more than 7 days, use alternative (b) above.

4.2.4 Carry Over

The Miura Boiler is tested and produces steam with less than 0.25% moisture. This steam quality can be adversely affected by several factors.

1. Poor water quality can produce “carry over.” The indications are foaming, priming, and misting. Energy loss, fouling blockage of components, and corrosion will result. The WX-Series steam boiler has automatic surface blow down equipment to minimize the concentration of solids during operation. However, daily manual blow down is necessary. Follow the recommendations of a reputable water treatment company to limit conductivity.

2. Over steam demand: Exceeding the steam production rating of the boiler can overwhelm the moisture separator and allow boiler water carry over.

3. Over firing. Exceeding design heat input rate would result in steam production exceeding the capacity of the boiler and result in boiler water carry over. This condition will also shorten the life of the boiler and could cause tube damage that would not be covered by warranty.

4. Steam demand surges. This is the normal cause of boiler water carry over for all types of boilers. This situation occurs when there is a sudden demand for steam that can be caused by types of equipment that use an on-off steam control system. A steam load that normally draws 25% boiler capacity and then “steps up” to 100% boiler capacity very quickly can illustrate this situation. This results in “flashing” of the water in the boiler, as steam pressure drops, and a momentary steam production rate that is above nominal capacity. This “flashing” can carry boiler water with it. This type of carry over is easily corrected by shutting the steam outlet valve and then opening it 1½ turns. This does not affect the steam production capacity of the boiler. The effect is to restrict the rate of change of the steam flow and will stop carry over caused by “Surging.”

5. Water level control system faults. Water level control system faults, such as an open circuit on the water level probes, is extremely rare.
4.2.5 Make-Up Water

Following is a typical example of a good operating discipline. This will prevent expensive repairs.

**CAUTION:** Proper water treatment MUST be used from the time the boiler is first operated. Any damage caused by lack of correct treatment is not covered by Warranty.

4.2.5.1 Make up water maintenance check

Be sure to perform the following daily:

a) CHEMICAL FEED PUMP
   i) Proper chemical feed
   ii) Sufficient liquid to properly dissolve chemicals
   iii) No air in the chemical feed pump or lines

b) WATER SOFTENER
   i) Boiler make-up water is completely soft.
   ii) Make sure the water softener timer is working.
   iii) Make sure there is no hardening of the salt. In case of salt hardening or “bridging,” break the salt into small pieces.
   iv) Make sure the by-pass valve is closed and inlet and outlet valves are open.

4.2.5.2 Water Specifications

The chemistry values given in Table 14 are specific guidelines established by MIURA Boiler. Analysis is to be performed by the customer or a boiler water treatment company. Failure to maintain these specifications will affect the boiler warranty. MIURA Boiler recommends Polymer type treatment. Phosphate type treatment results in soft sludge that is not water-soluble. This results in higher solids and more frequent bottom blowdowns.

**Table 14 Boiler Water Chemistry Specifications**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNITS</th>
<th>BOILER WATER STANDARD RANGE</th>
<th>MAKE UP WATER STANDARD RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (AT 25.)</td>
<td></td>
<td>11.0 - 11.8</td>
<td>7 - 9</td>
</tr>
<tr>
<td>HARDNESS</td>
<td>CaCO₃ mg/L</td>
<td>-0.0-</td>
<td>-0.0-</td>
</tr>
<tr>
<td>OXYGEN</td>
<td>ppm</td>
<td>Below 0.5</td>
<td></td>
</tr>
<tr>
<td>P ALKALINITY</td>
<td>CaCO₃ mg/L</td>
<td>150 - 600</td>
<td></td>
</tr>
<tr>
<td>M ALKALINITY</td>
<td>CaCO₃ mg/L</td>
<td>250 - 800</td>
<td></td>
</tr>
<tr>
<td>SULFITES</td>
<td>ppm</td>
<td>DETECTABLE</td>
<td>DETECTABLE</td>
</tr>
<tr>
<td>CONDUCTIVITY (AT 25°C)</td>
<td>µS/cm</td>
<td>1,500 - 4,000</td>
<td></td>
</tr>
<tr>
<td>CHLORIDE</td>
<td>Cl- mg/L</td>
<td>BELOW 400</td>
<td>BELOW 30</td>
</tr>
<tr>
<td>SILICA</td>
<td>SiO₂ mg/L</td>
<td>BELOW 250</td>
<td>BELOW 30</td>
</tr>
<tr>
<td>IRON AND MANGANESE</td>
<td>Fe &amp; Mn mg/L</td>
<td>BELOW 1.0</td>
<td>TOTAL BELOW 0.5</td>
</tr>
</tbody>
</table>
In order to maintain the high efficiency and to prevent costly breakdowns, perform the following maintenance and cleaning at the intervals shown below:

**Table 15 Recommended Periodic Maintenance Schedule**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DAILY</th>
<th>3-4 MONTHS</th>
<th>AS NEEDED</th>
<th>CHECK POINTS</th>
<th>REMARKS ON OPERATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHECK SOFTENER</td>
<td>X</td>
<td></td>
<td></td>
<td>IS WATER SOFT?</td>
<td>SCALE PREVENTION</td>
</tr>
<tr>
<td>FULL BLOW DOWN</td>
<td>X</td>
<td></td>
<td></td>
<td>REFER TO BLOW DOWN SECTION</td>
<td>CARRY OVER, SLUDGE, SCALE</td>
</tr>
<tr>
<td>COMBUSTION CONDITIONS</td>
<td>X</td>
<td>Tune Combustion</td>
<td></td>
<td>CHECK COMBUSTION, SOUND AND FLAME COLOR</td>
<td>MIS-FIRE AND ABNORMAL CONDITIONS</td>
</tr>
<tr>
<td>LOW WATER CUT-OFF</td>
<td>X</td>
<td></td>
<td></td>
<td>REFER TO BLOW DOWN SECTION</td>
<td>OVERHEAT PROTECTION</td>
</tr>
<tr>
<td>FAN COVER</td>
<td></td>
<td></td>
<td>X</td>
<td>CLEAN FAN COVER</td>
<td>POOR COMBUSTION</td>
</tr>
<tr>
<td>CLEAN BURNER</td>
<td>OIL</td>
<td>GAS</td>
<td></td>
<td>SOOT AND DIRT</td>
<td>POOR COMBUSTION</td>
</tr>
<tr>
<td>BOILER SOOT BLOW</td>
<td>X</td>
<td></td>
<td></td>
<td>HIGH STACK TEMP. EFFICIENCY</td>
<td></td>
</tr>
<tr>
<td>GAS PRESSURE</td>
<td>X</td>
<td></td>
<td></td>
<td>READ GAS PRESSURE</td>
<td>POOR COMBUSTION</td>
</tr>
<tr>
<td>INTERNAL INSPECTION (UPPER AND LOWER PORT)</td>
<td></td>
<td>ANNUAL</td>
<td></td>
<td>OVERHEATING, (DIS-COLORATION) FITTING, BURNT FORMATION, SCALE</td>
<td>WATER TREATMENT EFFECTIVENESS</td>
</tr>
<tr>
<td>WATER CONTROLLER RODS</td>
<td>X</td>
<td>X</td>
<td></td>
<td>CLEAN WITH SANDPAPER</td>
<td>LOW WATER CUTOUT ALARMS</td>
</tr>
<tr>
<td>FEED WATER TANK</td>
<td></td>
<td></td>
<td>X</td>
<td>CLEAN INSIDE</td>
<td>BLOCKED PIPING</td>
</tr>
<tr>
<td>STRAINER</td>
<td>MONTHLY</td>
<td></td>
<td></td>
<td>CLEAN INSIDE</td>
<td>LOW WATER FLOW</td>
</tr>
<tr>
<td>ELECTRICAL WIRING</td>
<td>X</td>
<td></td>
<td></td>
<td>LOOSE WIRES</td>
<td>VIBRATION</td>
</tr>
<tr>
<td>PRESSURE GAUGE</td>
<td>X</td>
<td></td>
<td></td>
<td>CALIBRATION</td>
<td>PROPER OPERATION</td>
</tr>
<tr>
<td>DAMPER SETTING BOLTS</td>
<td>X</td>
<td></td>
<td></td>
<td>FOR TIGHTNESS</td>
<td>POOR COMBUSTION</td>
</tr>
<tr>
<td>PILOT BURNER</td>
<td>X</td>
<td></td>
<td></td>
<td>ELECTRODE WEAR &amp; CERAMIC CONDITION</td>
<td>CAUSE OF POOR IGNITION</td>
</tr>
<tr>
<td>DAMPER MOTOR AND DAMPER LIMIT SWITCH</td>
<td>X</td>
<td></td>
<td></td>
<td>COUPLING &amp; RUBBER INSERT (SPIDER) MOVEMENT, TIGHTNESS</td>
<td>VIBRATION, INTERLOCK ALARMS</td>
</tr>
<tr>
<td>OIL PUMP MOTOR</td>
<td>X</td>
<td></td>
<td></td>
<td>COUPLING &amp; RUBBER INSERT (SPIDER) WEAR</td>
<td>VIBRATION</td>
</tr>
</tbody>
</table>

Electric motors are pre-lubricated at the factory and do not require additional lubrication at start-up. Motors containing sealed bearings do not require additional lubrication during the first 15,000 hours of operation. Operating hours on the motor should be measured by the operating hour meter on the Boiler. Motors with grease fittings should only be lubricated with lithium-based grease at the time intervals given in Table 16.

**Table 16 Motor Service and Lubrication Schedule**

<table>
<thead>
<tr>
<th>TYPE OF SERVICE</th>
<th>FREQUENCY OF GREASING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seasonal (Motor/Boiler is idle for more than 6 months)</td>
<td>Yearly</td>
</tr>
<tr>
<td>Intermittently (normal daily operation of the Boiler)</td>
<td>Semi-annually</td>
</tr>
<tr>
<td>Continuous</td>
<td>Quarterly</td>
</tr>
</tbody>
</table>

Do not over grease the bearings. Over greasing will cause increased bearing heat and can result in bearing and motor failure.
Do not over grease the bearings. Over greasing will cause increased bearing heat and can result in bearing and motor failure.

This is a basic maintenance schedule. If the fuel or water is of exceptionally poor quality, increase the frequency of these checks. Compare the water quality with our standards and adjust the schedule accordingly.

### 5.2 TROUBLE SHOOTING

#### NOTE: Optional equipment, special order features or safety devices such as stack damper controls and limit switches, remote emergency stop switches, earthquake detection safety devices etc. are not covered in this section.

#### 5.2.1 Physical Problem and Corrective Action

**Table 17 Physical Problems and Corrective Action Chart**

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>ITEM TO CHECK</th>
<th>CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. With main power “on,” power lamp (inside ON-OFF switch) is not lit</td>
<td>1. circuit breaker(s) tripped? CB1 or CB4</td>
<td></td>
<td>Locate and correct short, reset circuit breaker</td>
</tr>
<tr>
<td></td>
<td>A) Yes</td>
<td>Short circuit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B) No</td>
<td>Switch is bad or wires are loose</td>
<td>Replace switch or tighten terminal wires</td>
</tr>
<tr>
<td>2. The feed water pump does not come on even though the pre-set water volume is not reached</td>
<td>1. Make sure water volume probes are not bent</td>
<td>Rod is grounding out</td>
<td>Straighten probe</td>
</tr>
<tr>
<td></td>
<td>2. Is probe insulator cracked?</td>
<td>Insulation failure</td>
<td>Replace</td>
</tr>
<tr>
<td></td>
<td>3. Check probe switch</td>
<td>Switch is faulty</td>
<td>Replace</td>
</tr>
<tr>
<td></td>
<td>4. Is feed water pump overload tripped?</td>
<td>Motor is faulty</td>
<td>Replace</td>
</tr>
<tr>
<td>3. Feed water pump runs, but water is not fed into boiler, or amount of water is insufficient.</td>
<td>1. Is main feed water valve and feed water stop cock open?</td>
<td></td>
<td>Open all feed water valves completely</td>
</tr>
<tr>
<td></td>
<td>2. Is water level correct in feed water tank?</td>
<td>Tank feed piping blocked</td>
<td>Clean the piping</td>
</tr>
<tr>
<td></td>
<td>3. Has air been bled at feed water pump?</td>
<td>Air bound pump</td>
<td>Bleed air completely</td>
</tr>
<tr>
<td></td>
<td>4. Pump motors direction of rotation</td>
<td></td>
<td>Reverse wires at feed water pump</td>
</tr>
<tr>
<td></td>
<td>5. Is water strainer plugged?</td>
<td></td>
<td>Clean strainer</td>
</tr>
<tr>
<td></td>
<td>6. If not 1-5</td>
<td>Pump capacity is too low</td>
<td>Overhaul the pump</td>
</tr>
<tr>
<td>4. Boiler flooding</td>
<td>1. Is insulator or water volume probe cracked?</td>
<td>Insulation failure</td>
<td>Replace</td>
</tr>
<tr>
<td></td>
<td>2. Electrical connection at probe</td>
<td>Poor connection</td>
<td>Tighten properly</td>
</tr>
<tr>
<td></td>
<td>3. Are probes dirty?</td>
<td>Scale, scum, etc., has broken the circuit</td>
<td>Clean with sandpaper or other abrasive material</td>
</tr>
<tr>
<td></td>
<td>4. Is floatless switch operating?</td>
<td>Faulty switch</td>
<td>Replace switch</td>
</tr>
<tr>
<td>PROBLEM</td>
<td>ITEM TO CHECK</td>
<td>CAUSE</td>
<td>REMEDY</td>
</tr>
<tr>
<td>---------</td>
<td>---------------</td>
<td>-------</td>
<td>--------</td>
</tr>
<tr>
<td>5. Even after combustion button is pushed, fan motor doesn’t start</td>
<td>1. Steam pressure above set point</td>
<td>None</td>
<td>Wait for steam pressure to lower</td>
</tr>
<tr>
<td></td>
<td>2. Is thermal overload tripped?</td>
<td>Faulty wires or faulty device</td>
<td>Repair or replace</td>
</tr>
<tr>
<td></td>
<td>3. High gas pressure limit switch</td>
<td>Faulty switch, wiring, or plugged pipe</td>
<td>Replace or tighten wires and clean piping</td>
</tr>
<tr>
<td></td>
<td>4. Motor power failure</td>
<td>Faulty electric relay or loose wiring</td>
<td>Replace relay or tighten wires</td>
</tr>
<tr>
<td></td>
<td>5. Low gas pressure switch</td>
<td>Wrong setting or faulty pressure switch</td>
<td>Replace switch or adjust adjust setting</td>
</tr>
<tr>
<td></td>
<td>6. Burner control relay or flame eye</td>
<td>Faulty</td>
<td>Replace</td>
</tr>
<tr>
<td>6. Combustion will not start</td>
<td>1. Is main gas/oil valve open?</td>
<td></td>
<td>Open main gas/oil valve</td>
</tr>
<tr>
<td></td>
<td>2. Damper position</td>
<td>Incorrect setting</td>
<td>Adjust to proper airflow</td>
</tr>
<tr>
<td></td>
<td>3. Fan cover</td>
<td>Dust build-up</td>
<td>Clean</td>
</tr>
<tr>
<td></td>
<td>4. Spark rod</td>
<td>Carbon on spark rods or porcelain on rod is broken</td>
<td>Clean or replace</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loose wire connection</td>
<td>Tighten connection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Faulty cord</td>
<td>Replace cord</td>
</tr>
<tr>
<td></td>
<td>5. Is pilot gas valve open? Do pilot gas solenoids open?</td>
<td>Loose wiring or faulty gas regulator/solenoid valve</td>
<td>Tighten wire connection or replace valves</td>
</tr>
<tr>
<td>7. Ignition starts, but flame dies out</td>
<td>1. Is gas/oil valve open?</td>
<td></td>
<td>Open the gas/oil valve</td>
</tr>
<tr>
<td></td>
<td>2. Is UV flame eye sensing the flame?</td>
<td>Faulty flame eye or loose wiring</td>
<td>Tighten wires or replace UV sensor</td>
</tr>
<tr>
<td></td>
<td>3. Is combustion adjusted correctly?</td>
<td>Loose stop bolts on air damper</td>
<td>Adjust combustion with Combustion Analyzer</td>
</tr>
<tr>
<td>8. Excess smoke from stack; frequent mis-fire</td>
<td>1. Gas/oil pressure</td>
<td>Pressure is too high</td>
<td>Adjust pressure setting</td>
</tr>
<tr>
<td></td>
<td>2. Damper setting is off or retainer is loose</td>
<td>Not enough air</td>
<td>Adjust or replace damper motor</td>
</tr>
<tr>
<td></td>
<td>3. Oil nozzle</td>
<td>Broken or worn</td>
<td>Replace nozzle</td>
</tr>
<tr>
<td></td>
<td>4. Air in nozzles</td>
<td>Oil dripping from nozzle</td>
<td>Replace nozzles or solenoid valves</td>
</tr>
<tr>
<td>PROBLEM</td>
<td>ITEM TO CHECK</td>
<td>CAUSE</td>
<td>REMEDY</td>
</tr>
<tr>
<td>---------</td>
<td>---------------</td>
<td>-------</td>
<td>--------</td>
</tr>
<tr>
<td>9. Steam is escaping from Safety Valve</td>
<td>1. High limit switch</td>
<td>Limit switch is set too high or broken</td>
<td>Adjust limit setting or replace</td>
</tr>
<tr>
<td></td>
<td>2. Pipe leading to steam pressure switch is plugged</td>
<td>Poor water condition or freezing at start-up</td>
<td>Clean pipe</td>
</tr>
<tr>
<td></td>
<td>3. Safety valve</td>
<td>Improper setting</td>
<td>Replace or have valve re-set</td>
</tr>
<tr>
<td>10. Popping sound occurs during high fire</td>
<td>1. Low gas/oil pressure</td>
<td>Excess air</td>
<td>Adjust pressure</td>
</tr>
<tr>
<td></td>
<td>2. Damper adjustment</td>
<td></td>
<td>Adjust damper</td>
</tr>
<tr>
<td>11. Flame fails when going from high to low fire</td>
<td>1. Damper position</td>
<td>Excess air</td>
<td>Adjust damper</td>
</tr>
<tr>
<td></td>
<td>2. Gas/oil pressure</td>
<td>Insufficient flow</td>
<td>Adjust pressure</td>
</tr>
<tr>
<td>12. Burner will not change from low to high fire</td>
<td>1. Damper position</td>
<td>Insufficient air</td>
<td>Adjust damper</td>
</tr>
<tr>
<td></td>
<td>2. Gas/oil pressure</td>
<td>Insufficient pressure</td>
<td>Adjust pressure</td>
</tr>
<tr>
<td></td>
<td>3. High fire solenoid fuel valve or two-stage fuel valve</td>
<td>Insufficient fuel flow for high fire</td>
<td>Check electrical wiring or re-set limits</td>
</tr>
<tr>
<td></td>
<td>4. Air duct connection</td>
<td>Air leakage</td>
<td>Tighten or replace connection</td>
</tr>
<tr>
<td></td>
<td>5. Hi or low steam pressure switches</td>
<td>Faulty wiring or pressure has reached the limit setting</td>
<td>Check electrical wiring or re-set limits</td>
</tr>
<tr>
<td>13. Fan motor runs, but ignition does not occur</td>
<td>1. Combustion air proving switch</td>
<td>Incorrect setting, broken or loose wiring</td>
<td>Manual re-set, tighten terminal contacts or replace switch</td>
</tr>
<tr>
<td></td>
<td>2. Fan rotation</td>
<td>Incorrect wiring</td>
<td>Reverse polarity</td>
</tr>
<tr>
<td></td>
<td>3. Spark rod</td>
<td>Faulty</td>
<td>Replace</td>
</tr>
<tr>
<td></td>
<td>4. Flame safeguard</td>
<td>Faulty</td>
<td>Replace</td>
</tr>
</tbody>
</table>
5.3 OPERATING DISCIPLINES

DANGER: The following points MUST be followed to avoid damage or injury:

a) Always open the main steam outlet valve slowly to prevent carry over or hammering.

b) If a misfire or flame failure occurs, locate the cause of the problem. (See Table 17) After correcting the problem, push the manual reset button on the flame safeguard and re-start the boiler. If the problem persists, shut down the boiler, call an authorized MIURA Service Agency.

c) Whenever fuses need replacing, use only specified ratings. When replacing a circuit breaker or magnetic contactor, ensure that the trip settings are set on the new component.

d) When testing the low water interlock, perform blow down as described earlier to lower the water level in the boiler. If the alarm does not sound when tested, see Trouble Shooting Guide.

e) Proper balance of gas and air flow is needed to insure complete combustion and optimum efficiency. Adjust the airflow as needed. (see Damper Adjustment in Operation and Maintenance Manual.

f) The over heat protection thermostat setting must never be changed without written permission authorization from MIURA. Failure to obtain authorization will result in voiding of all warranties. Changing this temperature setting will not be required if the customer chooses to raise or lower the boiler operating pressure.

g) When any boiler problem occurs, shut down the boiler at the control panel and turn the main electrical power off.

h) If there is a gas or oil smell in the boiler room, immediately shut down the boiler and turn off all power. Shut the main gas and oil valves. Immediately locate and repair the source of the leak.

i) Be careful when taking a water sample from the boiler and be sure to open the valve slowly. A water sample cooler is strongly recommended.

j) Do not re-light the pilot, or start the burner when the combustion chamber is filled with gas or is very hot.

k) In an emergency, push the “COMBUSTION” button and close the GAS VALVE first, then cut off main electrical power to the boiler.

l) 23w The economizer (optional) feed water valves should be left open under normal conditions. The by-pass valve should be used only during maintenance.

m) Do not close the feed water valves to the economizer (if applicable). Only in case of an economizer problem can the by-pass valve be used if installed.

n) If frequent Low Water Level alarms occur, clean the FIVE (5) water level probes and the feed water strainer prior to calling for service on the boiler. Over 90% of the Low Water Alarms are caused by dirty probes.
5.4 RECOMMENDED SPARE PARTS LIST

Table 18 Recommended Spare Parts List

<table>
<thead>
<tr>
<th>NO.</th>
<th>PART NAME</th>
<th>DESCRIPTION/PART #</th>
<th>WX-50</th>
<th>WX-65</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Damper Coupling Rubber Assembly</td>
<td>Lovejoy 5/8” x 7/16” L070</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Flame Eye</td>
<td>Honeywell C7035A1031</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Floatless Switch</td>
<td>DFB1B0-00-00-03</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16B1B0-00-10</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Indicator Lamp</td>
<td>32R-2911T (red)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Pressure Gage</td>
<td>Trerice No. 800, 0-300 PSIG 3 1/2” diameter</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Relay</td>
<td>LY-2, CSA, 120V</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LY-4, CSA, 120V</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Magnetic Contactor for Blower</td>
<td>Sprecher CA3-16</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Magnetic Contactor for Water Pump</td>
<td>Sprecher CA3-12</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Magnetic Contactor for Oil Pump (O Series)</td>
<td>Sprecher CA3-12</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Spark Rod Assembly</td>
<td>I-18</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Level Sensor Probe</td>
<td>Warrick 3H1C</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Feed Pump Seal Repair Kit</td>
<td>985167</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

*This is the longest level sensor probe. This probe may be shortened if necessary to replace probes in the LVC.*

After the end of the parts warranty, it is not necessary to order replacement parts from MIURA. One of our design advantages is the use of non-proprietary parts. The electrical control components and assorted valves may be purchased from any industrial parts house.

The list below is not all-inclusive and in general is more than required. If the customer does not have a stand-by boiler, is some distance away from the service representative, or simply desires to maintain a more comprehensive selection of spare parts, contact MIURA for a more customized list.

The customer is reminded that standard ground shipment of a Warranty Replacement Part is a MIURA expense. Express shipping charges will be billed to the customer. In addition, return of the defective part to MIURA must be done at customer expense. If a Warranty Replacement defective part is not returned to MIURA, the customer will be invoiced for the replacement sent. In addition, if the defective part failure is determined to NOT be a manufacturing defect, the customer will be invoiced by MIURA.
MIURA GAS/LOW NOx SERIES
High or Low Pressure Steam Boiler

MIURA BOILER WEST, INC. (Chicago)
600 Northgate Parkway, Suite M
Wheeling, IL 60090-3201

The descriptions and specifications are approximate.
Specifications subject to change to incorporate engineering advances. Manufacturer reserves the right to change specifications and dimensions at any time without liability for equipment previously or subsequently sold.