

# RBI MASTERSPEC

## SECTION 23 52 33.19 - SAMPLE SPECIFICATION FOR RBI DOMINATOR BOILER

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes gas-fired, finned copper water tube boilers for heating hot water.
- B. Related Sections include the following:
  - 1. Division 23 Section "Breechings, Chimneys, and Stacks" for connections to breechings, chimneys, and stacks.
  - 2. Division 23 Section "Feedwater Equipment" for connections to condensate and feedwater system.
  - 3. Division 23 Sections for control wiring for automatic temperature control.

#### 1.3 SUBMITTALS

- A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each model indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer installed and field installed wiring.
- C. Source Quality Control Tests and Inspection Reports: Indicate and interpret test results for compliance with performance requirements before shipping.
- D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- E. Maintenance Data: Include in the maintenance manuals specified in Division 1. Include parts list, maintenance guide, and wiring diagrams for each boiler.

#### 1.4 QUALITY ASSURANCE

- A. Listing and Labeling: Provide electrically operated components specified in this Section that are listed and labeled.
  - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
  - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
- B. ASME Compliance: Boilers shall bear ASME "H" stamp and be National Board listed.
- C. FM Compliance: Control devices and control sequences according to requirements of FM.

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- D. CSD-1 Compliance: Control devices and control sequences according to requirements of CSD-1.
- E. Comply with NFPA 70 for electrical components and installation.

## 1.5 COORDINATION

- A. Coordinate size and location of concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

## 1.6 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents. Installing contractor shall provide one year of warranty parts and labor.
- B. Special Warranty: Submit a written warranty, executed by the contractor for the heat exchanger.
  - 1. Warranty Period: Manufacturer's standard, but not less than 10 years from date of Substantial Completion on the heat exchanger. Warranty shall be non-prorated and not limited to thermal shock. Additional 21 year thermal shock warranty on heat exchanger.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Manufacturer shall be a company specializing in manufacturing the products specified in this section with minimum five (5) years experience. Subject to compliance with requirements, manufacturers offering boilers that may be incorporated into the Work include, but are not limited to, the following:
- B. Design: Boilers shall be CSA design certified and shall not release any condensate during operation. Boilers shall be designed for operation with natural or propane gas and have a CSA certified input rating as noted on the drawings, and a combustion efficiency rating up to 85%.
- C. Service Access: The boilers shall be provided with access covers for easily accessing all serviceable components. The boilers shall not be manufactured with large enclosures, which are difficult to remove and reinstall. All accesses must seal completely as not to disrupt the sealed combustion process. All gas train components and blower motor must be accessible and able to adjust without the removal of covers or cabinet components.
- D. Indicating Lights: Each boiler shall include a diagnostic control panel indicating power on, operator, high limit, low water, low air, low gas pressure, high gas pressure, trial for ignition, low fire, high fire, flame failure, and inlet/outlet temperatures incorporated into the boiler. Access to all electrical controls shall be through a slide-out cabinet leaving diagnostic panel intact and not disrupted.
- E. Manufacturers: RBI (a Mestek Company) is the basis of design. Listed acceptable manufacturers shall be subject to compliance with requirements. Provide boilers by one of the following:

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1. RBI (a Mestek Company) - Dominator Series
2. A.O. Smith Water Products Co. - Genesis Series *Only*
3. Lochinvar Corp.- Copper Fin II Series *Only*
4. Raypak Corp. - Hi-Delta Series *Only*

## 2.2 COMPONENTS

- A. Combustion Chamber: The combustion chamber shall be enclosed with high temperature, ceramic fiberboard insulation. An access door shall be provided for ease of service and inspection of the heat exchanger. The boiler shall provide a heat exchanger slide-out guide rail to allow removal through the front of the heater without disruption of major electrical or gas train components.
- B. Heat Exchanger: The heat exchanger shall be inspected and bear the A.S.M.E. Section IV seal of approval. The A.S.M.E. Section IV seal of approval will not be provided as standard for jurisdictions not requiring the A.S.M.E. Section IV seal of approval. The heat exchanger shall be a two pass design with maximum working pressure of 160 psi. The water tube shall be of straight 7/8" I.D., .064" minimum wall thickness, integral finned copper tube, 7 fins per inch, with a fin height of 3/8". The water tubes shall be set horizontally with heavy galvanized steel "V" baffles tightly secured above the tubes throughout the length of the water tubes. Each end of the water tubes shall be strength rolled onto a steel tube sheet. The headers shall be secured to the tube sheet by properly placed stud bolts, flange nuts and with the use of "o" rings. Headers will be of **glass lined** construction. "O" rings must be constructed of EPDM and Silicone, capable of withstanding temperature of 540°F, 282°C. The use of red "o" rings constructed of Neoprene and Silicone with temperature ratings of 250°F, 121°C *will not* be allowed. A pressure relief valve of 50 lb/sq in. shall be equipped with the boiler and factory mounted.
- C. Jacket: 18 gauge galvanized steel with Galvalume finish to protect the primary steel from oxidation. (Indoor/Outdoor rated).
- D. Gas Burners: The burners shall be constructed of "4509 Uginox" Stainless Steel Alloy and fire on a horizontal plane.
- E. Rated Capacity: The boiler shall be capable of operating at rated capacity with pressures as low as 7" W.C. at the inlet to the burner pressure regulator.
- F. The burner shall be capable of 85% efficiency without exceeding a NOx reading above 30ppm.
- G. The burner and gas train shall be provided with the following trim and features:
  1. Burner Firing: 2-Stage with 2:1 turndown. Maximum of one (1) combustion air fan with two-speed operation to ensure accurate fuel-to-air ratios. (300 on/off only).
  2. Burner Firing: 4-Stage with 4:1 turndown. Maximum of two (2) combustion air fans with two-speed operation to ensure accurate fuel-to-air ratios (1050-2100).
  3. Burner Ignition: Intermittent grounded spark to pilot. Ceramic hot surface ignition *will not* be accepted.
  4. Safety Controls: Energize ignition, limit time for establishing flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, and allow gas valve to open.

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5. Flue Gas Collector: Enclosed combustion chamber with integral combustion air blower(s) and single venting connection.
6. Gas Train: Manual gas valves (2), redundant main gas valves (solenoid/diaphragm), firing valve, 'B' valve, pilot gas pressure regulator, and automatic pilot gas valve. All components to be factory mounted.
7. Safety Devices: Optional high/low gas pressure switches, air flow switches, and blocked flue detection switches. All safeties to be factory mounted.

## 2.3 BOILER TRIM

- A. Safety Relief Valve: ASME rated, factory set to protect boiler and piping as per schedule/drawings.
- B. Gauge: Combination water pressure and temperature shipped loose for field installation. Inlet/Outlet temperature gauges to be an integral part of the front boiler control panel to allow for consistent easy monitoring of temperatures. Factory mounted and wired.
- C. Low Water Cutoff and Outlet Flow Switch: Prevent burner operation when water falls below a safe level or when water flow is low. Flow switch shall be factory mounted. Provision for installation of a low water cut off shall be provided.
- D. Operating Controls: Standard control system will be a United Technologies Controls 600A Series spark-to-pilot proven ignition with full flame monitoring capability.
- E. Operating Temperature Control: Boiler staging will be controlled by a PID logic based two-stage or four-stage set point control. The controller will also handle boiler outdoor reset and pump control. A relay logic board will incorporate all relay functions and purge time delays.
- F. High Limit: Temperature control with manual reset limits boiler water temperature in series with the operating control. High limit shall be factory mounted and sense the outlet temperature of the boiler through a dry well.
- G. PROVIDE THE FOLLOWING STANDARD TRIM:
  1. Glass lined headers
  2. Terminal board for all electrical connections
  3. Low air pressure switches
  4. Blocked flue detection switches
  5. Flow switch (factory mounted and wired)
  6. Operating staging control with outdoor reset and pump control
  7. Temperature/pressure gauge
  8. Manual reset high limit
  9. Field convertible flue for top or rear outlet
  10. Field convertible combustion air adapter for side or rear inlet (750-2100)
  11. Air inlet filter

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12. Inlet/outlet thermometers (factory mounted and wired)

13. FM and CSD-1 gas train

H. PROVIDE THE FOLLOWING JOB SPECIFIC TRIM AND FEATURES:

1. Bronze fitted circulator provided by manufacturer (shipped loose)
2. Direct vent inducer and termination hood for side wall termination of vent pipe (shipped loose)
3. CSD-1 controls
4. Probe type low water cut off, manual reset (shipped loose)
5. Barometric damper
6. Boiler mounting rack for stacked configuration. Rack system must allow for height adjustment and be rated for seismic zone 4 application.
7. Outdoor installation
8. Cupronickel heat exchanger

## 2.4 MOTORS

- A. Refer to Division 23 Section "Motors" for factory installed motors.
- B. Boiler Blower Motor: Open drip-proof motors where satisfactorily housed or remotely located during operation. Blower motor shall incorporate two speed operation to control firing rate and maintain steady efficiency. There shall be no requirement to remove covers or gas train components to allow for air adjustments. Blower motor shall *not* exceed 3/4 HP and *not* require more than 14 amps.

## 2.5 SOURCE QUALITY CONTROL

- A. Test and inspect boilers according to the ASME Boiler and Pressure Vessel Code, Section IV. Boilers shall be test fired in the factory with a report attached permanently to the exterior cabinet of the boiler for field reference.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine area to receive boiler for compliance with requirements for installation tolerances and other conditions affecting boiler performance. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install boilers level and plumb, according to manufacturer's written instructions and referenced standards.
- B. Install gas fired boilers according to NFPA 54.
- C. Support boilers on 4" (100 mm) thick concrete base, 4" (100 mm) larger on each side than base of unit.

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- D. Install electrical devices furnished with boiler, but not specified to be factory mounted.
- E. Install a 1" drain valve on the outlet piping prior to the first shut off valve.

## 3.3 CONNECTIONS

- A. Connect gas piping full size to boiler gas train inlet with union.
- B. Connect hot water piping to supply and return boiler tapings with shutoff valve and union or flange at each connection.
- C. Install piping from safety relief valves to nearest floor drain.
- D. Connect breeching to boiler outlet, full size of outlet. The boiler shall operate on negative stack pressure and Category I vent material according to ANSI standards (AGA) (standard vertical venting). The boiler shall operate on positive stack pressure and Category III vent material. A listed stainless steel vent must be used. (Through the wall horizontal venting)
- E. Electrical: Comply with applicable requirements in Division 26 Sections.
- F. Ground equipment.
  - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

## 3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory authorized service representative to supervise the field assembly of components and installation of boilers, including piping and electrical connections. Report results in writing.
  - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Manufacturer's representative shall supply a factory authorized service technician to start up the boilers.

## 3.5 CLEANING

- A. Flush and clean boilers on completion of installation, according to manufacturer's written instructions.
- B. After completing boiler installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes including chips, scratches, and abrasions with manufacturer's touchup paint.

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## 3.6 COMMISSIONING

- A. Engage a factory authorized service representative to provide startup service. Start up to be performed only after complete boiler room operation is field verified to offer a substantial load, and complete system circulation. One year warranty shall be handled by factory authorized tech.
- B. Verify that installation is as indicated and specified.
  - 1. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 26 Sections. Do not proceed with boiler startup until wiring installation is acceptable to equipment Installer.
- C. Complete manufacturer's installation and startup checklist and verify the following:
  - 1. Boiler is level on concrete base.
  - 2. Flue and chimney are installed without visible damage.
  - 3. No damage is visible to boiler jacket, refractory, or combustion chamber.
  - 4. Pressure reducing valves are checked for correct operation and specified relief pressure. Adjust as required.
  - 5. Clearances have been provided and piping is flanged for easy removal and servicing.
  - 6. Heating circuit pipes have been connected to correct ports.
  - 7. Labels are clearly visible.
  - 8. Boiler, burner, and flue are clean and free of construction debris.
  - 9. Pressure and temperature gauges are installed.
  - 10. Control installations are completed.
- D. Ensure pumps operate properly.
- E. Check operation of pressure reducing valve on gas train, including venting.
- F. Check that fluid level, flow switch, and high temperature interlocks are in place.
- G. Start pumps and boilers, and adjust burners to maximum operating efficiency.
  - 1. Fill out startup checklist and attach copy with Contractor Startup Report.
  - 2. Check and record performance of factory provided boiler protection devices and firing sequences.
  - 3. Check and record performance of boiler fluid level, flow switch, and high temperature interlocks.
  - 4. Run-in boilers as recommended or required by manufacturer.

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- H. Perform the following tests for each firing rate for high/low burners and four stage burners. Adjust boiler combustion efficiency at each firing rate. Measure and record the following:
  - 1. Inlet gas pressure.
  - 2. Gas pressure on manifold.
  - 3. Combustion air box pressure(s).
  - 4. Flue gas temperature at boiler discharge.
  - 5. Flue gas carbon dioxide and oxygen concentration.
  - 6. Natural flue draft.
- I. Measure and record temperature rise through each boiler.

### 3.7 DEMONSTRATION

- A. Engage a factory authorized service representative to train Owner's maintenance personnel as specified below:
  - 1. Operate boiler, including accessories and controls, to demonstrate compliance with requirements.
  - 2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
  - 3. Review data in the maintenance manuals. Refer to Division 1 Section "Contract Closeout."
  - 4. Review data in the maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
  - 5. Schedule training with Owner with at least 7 days advance notice.

END OF SECTION 23 52 33.19