

Supply and install steam boiler(s) suitable for unattended operation, which shall be manufactured in Australia using skilled labour and proven materials, for optimum life and efficiency and will comply with the following Australian Standards:

- AS1200-2000 Pressure Equipment
- AS1228-2006 Pressure Equipment – Boilers
- AS1657-1992 Fixed platforms, walkways, stairways and ladders – Design, construction and installation
- AS1853-1983 Automatic oil and gas burners – Mechanical draught
- AS2593-2004 Boilers Safety Management and Supervision Systems
- AS1271-2003 Safety valves, other valves, liquid level gauges and other fittings for boilers and unfired pressure vessels
- AS3000-2007 Electrical Installations
- AS3814-2009 Industrial and commercial gas-fired appliances
- AS3920.1-1993 Assurance of Product Quality – Pressure Equipment Manufacture
- AS3992-1998 Pressure equipment – Welding and brazing qualification
- AS4037-1999 Pressure equipment – Examination and testing
- AS4343-2005 Pressure equipment – Hazard levels
- AS4458-1997 Pressure Equipment – Manufacture

The boiler(s) shall be of Forbes manufacture or equal approved and must comply with the following performance and construction criteria:

Construction

The boiler will be manufactured utilizing a "flexible" tube design that promotes high velocity internal circulation for maximum heat transfer and improved boiler efficiency.

It shall have a horizontal configuration and have adequate steam space to ensure that there will not be water carry over under normal operating conditions.

Totally removable side panels on one side of the boiler will be provided to enable easy and complete access to the furnace, boiler tubes and burner head.

The tube circuitry of the boiler shall be completely self-draining to the lowest point in the system, minimising the chance of sludge or scale inhibiting circulation.

The boiler will be constructed using adequate sized unheated downcomers to ensure that circulation throughout the tube bank is effective.

The boiler shall be designed for a maximum Working Pressure of 1100 kPa and Operating Pressure of 1050 kPa.

The boiler will be provided with an adequate number of inspection openings to facilitate internal boiler inspection and cleaning.

Steam Drum

The steam drum shall be designed for the evaporation rate and steam pressure and generously sized to provide a buffer for large load variations.

ADELAIDE

599 Port Road, West Croydon SA 5008
Ph: 61 8 8268 8877 Fax: 61 8 8347 1311

MELBOURNE

49 Lambeck Drive, Tullamarine Vic 3043
Ph: 61 3 8336 1100 Fax: 61 3 8336 1177

MELBOURNE (Hunt Boilers)

11 Helen Kob Drive, Braeside Vic 3195
Ph: 61 3 9580 9377 Fax: 61 3 9580 9411

BRISBANE (Hunt Boilers)

10/37 Mortimer Road, Acacia Ridge Qld 4110
Ph: 61 7 3277 4730 Fax: 61 7 3277 9730

SYDNEY (Hunt Boilers)

4/38 Powers Road, Seven Hills NSW 2147
Ph: 61 2 9674 1255 Fax: 61 2 9674 1877

PERTH (Hunt Boilers)

1/14 Baling Street, Cockburn Central WA 6164
Ph: 61 8 9414 8787 Fax: 61 8 9414 8383

The drum shall also incorporate a water distribution pipe to promote even water distribution and an internal baffling to provide effective steam and water separation and a steam dryer from which quality steam is delivered.

Tubes

The 'flexible' tube circuitry of the boiler shall include the ability to enable individual tubes to be replaced with minimal downtime and without welding.

Burners and Burner Control

The burner shall be of packaged forced draught type designed.

The following burner control protocol shall apply:

Boiler with capacity of upto 2MW	High/Low Burner Operation
Boiler with capacity greater than 2MW	Fully Modulating Burner Operation

Where the boiler capacity exceeds 2 MW, the burner shall automatically modulate to suit load conditions required of the plant.

Burner modulation will be achieved using a steam pressure transmitter fitted to the steam drum. It shall transmit a 4-20mA analogue signal to the PLC and via a PID loop, the firing rate shall be adjusted to match load conditions.

Boiler Valves and Mountings

The boiler shall be supplied complete with all necessary valves and fittings including main steam stop valve, safety valve(s), feed water isolating and check valves, blowdown valve, and water gauges.

Feed Water Pumps

The pump(s) shall be a multistage centrifugal type manufactured from a cast iron casing with all impellers, shafts, bolts, studs and nuts manufactured from stainless steel type 316. Motors shall be totally enclosed fan cooled with an ingress protection of IP54 (minimum) 415 Volt, 3 phase, 50 cycle.

For boilers with a capacity of upto 500 kilowatts one feedwater pump shall be provided. For boilers with a capacity greater than 500 kilowatts two feed water pumps shall be supplied that automatically change over after each boiler lockout condition or start up.

Refractory

Where possible a fibre type refractory shall be used to minimise weight and improve insulation effectiveness.

Equipment Access

A freestanding ladder platform shall be provided that will enable operation of the necessary valves and fittings.

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Control Overview

The boiler shall be provided with a 'Failsafe' integrated boiler management system connecting the boiler, burner and water systems and their safety interlocks.

The following control protocol shall apply:

Boiler with capacity of upto 650 kilowatts	Relay based control system
Boiler with capacity greater than 650 kilowatts	PLC based control system

The boiler control panel shall be rated to IP55 and incorporate all necessary visual indication to enable effective operation of the boiler.

Where a PLC is used it shall be based on the Allen Bradley Micrologix 1500 and must communicate to external protocols including RS-232, DF1 half duplex and DF1 full duplex.

PLC based systems shall also include a touch screen that allows for the control of boiler operation and provides the display of current operating conditions, discrete first up fault identification and detailed fault memory.

For boilers with a capacity greater than 500 kilowatts, they shall incorporate into the management system a self-check boiler water level control and self-check flame safeguard.

Safety Interlocks

The boiler management system shall, as a minimum, control and detect the following:

- Loss of pilot flame or main flame;
- Low water
- Extra low water (on boiler capacity of greater than 500 kilowatts only);
- Low feed water tank level;
- Over pressure in boiler;
- Loss of combustion air;
- Gas pressure;
- Electric phase failure;
- PLC operation (on boiler capacity of greater than 650 kilowatts only).

Boiler Flues (Chimney)

The boiler shall be provided with boiler flues designed such that there will be no positive pressure at connection to the boiler, manufactured from material not less than 1.6 mm, which is hot dipped galvanized or stainless steel, of a spiral welded style of construction.

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FORBES-BRYAN 'flexible' Series WATERTUBE STEAM BOILER – 300 kW to 2MW

Documentation

The boiler shall be provided with complete set of documentation as follows:

- Design Registration Statement
- Design verification Statement
- Manufacturer's Data Report
- Copies of all Material Certificates
- Copies of all Non-destructive Test Reports
- Complete Instruction Manuals (2 sets - electronic)

General Capacity Specification

The boilers shall be provided as follows:

Model	Forbes-Bryan or approved equal
Rated Continuous Capacity	300 kW to 2 MW
Top drum diameter	FAB 406 mm / FRV 610 mm
Bottom drum diameter	FAB 219 mm / FRV 273 mm
Transport Mass	1.45 tonne to 7.20 tonne
Flooded Mass	1.67 tonne to 9.12 tonne
Evaporation from and at 100°C	478.5 kgs/hr to 3190 kgs/hr
Minimum Thermal Efficiency	80%
Design Temperature	250°C
Design pressure	1100 kPa
Maximum operating pressure	1050 kPa
Hydrostatic Test Pressure	1650 kPa
Fuel type	Natural Gas
Burner	Riello, Saacke, Nu Way packaged type or approved equal
Principle Design Standards	AS1200, AS1228, AS2593, AS3920.1, AS3992, AS4343 and AS4458

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