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AS 2593—1983
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Australian Standard 2593—1983

BOILERS—UNATTENDED

STANDARDS ASSOCIATION OF AUSTRALIA
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This Australian standard was prepared by Committee ME/1, Boilers and Unfired Pressure Vessels. It was approved on behalf of the Council of the Standards Association of Australia on 7 October 1982 and published on 7 February 1983.

The following interests were represented on the committee responsible for the preparation of this standard:

Aluminium Development Council

Australasian Institute of Metals

Australian Chamber of Commerce

Australian Compressed Air Institute

Australian Institute of Energy

Australian Institute for Non-destructive Testing

Australian Institute of Petroleum Limited

Australian Liquefied Petroleum Gas Association

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This standard was issued in draft form for comment as DR 81087.

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6 JAN 1987

AMENDMENT No 1
to
AS 2593—1983
BOILERS—UNATTENDED

REVISED TEXT

SUMMARY: This amendment applies to Preface, Contents, Clauses 1.2, 1.4.3.1, 1.4.3.10, 1.4.9, 1.4.30, 1.4.31, 1.4.32, 1.4.33, 2.2.3, 2.2.4.1, 2.2.4.2(a), 2.2.4.2(b), 2.2.4.3, 2.2.4.4, 2.2.5, 2.2.5.1, 2.2.5.4, 2.2.5.5, 2.3.1(d), 2.3.3, 2.3.4.3, 2.3.4.4, 2.5.1, 2.5.2, 2.5.3, 3.4, 3.8.1(c), 3.8.1(d), 3.11.3, 3.11.4, 3.11.5, 3.11.6, 3.13.3, 3.14.1, 3.15, 3.15.1, 3.15.2, 3.15.3.1, 3.15.3.2, 3.16, 3.17, 4.2.3, 5.2.1(b), 5.3, 6.1.3, 6.2, 6.3, 6.4, 8.3, 8.4, and Section 9.

Published on 5 January 1987.

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Page 2. Preface.

2nd paragraph, *delete* 1st sentence and *substitute*:

While the standard as published in 1983 was primarily directed to boilers up to 3 MW, the range is extended, but not limited, by this amendment to 6 MW.

AMDT No 1 JAN. 1987

Page 3. Contents.

Insert (new) '3.17 Power Failure Protection'.

Add to 6.2: 'and Access'.

Insert (new) 'SECTION 9. TESTING AND MAINTENANCE'.

AMDT No 1 JAN. 1987

Page 4. Clause 1.2.

In (a), *delete* '3 MW' and *substitute* '6 MW'.

Delete (e) and (f) and *substitute*:

(e) for the generation of steam, or other vapour, for which duty only water-tube type or electric type boilers are permitted for unattended operation;

(f) for the heating of water, or other liquid at a pressure above that of the atmosphere and to a temperature not less than that of the normal atmospheric boiling temperature of the liquid, for which duty any type of boiler complying with AS 1228 or AS 1657 is permitted for unattended operation, provided that for other than water-tube and electric type boilers, steam or vapour is not generated in the boiler and the boiler drum or shell is fully flooded;

Delete the Note under (f) and *substitute*:

NOTE: Not for definitions in Clause 1.4.3, other Clauses in this Standard refer to steam and water only; it is intended that this Standard may be applied to other fluids subject to the approval of, and compliance with any additional safety features required by the Inspecting Authority.

In (g), *delete* last line, i.e. 'Pulverized fuel firing is not covered.'

Delete last paragraph and *substitute*:

It is not intended that the requirements of this standard apply to boilers deemed to be low-hazard boilers by the Inspecting Authority in the State or Territory in which the boiler is to be installed.

AMDT No 1 JAN. 1987

Page 4. Clause 1.4.3.1.

Delete existing Clause and *substitute*:

1.4.3.1 *Boiler*—an arrangement of vessels and interconnecting parts, wherein steam, or other vapour, is generated or water or other liquid is heated at a pressure above that of the atmosphere by the application of fire or the products of combustion or by electrical means or by solar means.

It also includes valves, gauges, fittings and controls directly associated with the boiler and, where consistent with the requirements of this standard, includes the boiler setting, and associated equipment.

It does not include a fully flooded system or pressurized system where the water or other liquid is heated to a temperature lower than the normal atmospheric boiling temperature of the liquid.

AMDT No 1 JAN. 1987

Page 5. Clause 1.4.3.10.

Delete last line and *substitute*:

'an engine or furnace.'

AMDT No 1 JAN. 1987

Page 5. Clause 1.4.9.

Delete existing definition and *substitute*:

1.4.9 Fail-safe—a feature which ensures that absence or malfunction of any critical control or safety component, system or function will not result in an unsafe condition.

AMDT No 1 JAN. 1987

Page 5. Clause 1.4.30.

After Clause 1.4.30, *insert* three new definitions as follows:

1.4.31 Maintenance contractor—a person or organization approved by the Inspecting Authority and authorized by a maintenance contract to perform testing and maintenance on the boiler and its operating and safety systems.

1.4.32 Maintenance contract—a written agreement between the owner and contractor which specifies the terms, conditions and extent of testing and maintenance to be carried out on the boiler by the contractor.

1.4.33 Owner—the person or organization who owns or is responsible for the care and safety of the boiler.

AMDT No 1 JAN. 1987

Page 6. Clause 2.2.3.

Delete existing Clause and *substitute*:

2.2.3 Tube Diameter. The maximum outside diameter of any tube exposed to combustion flame or furnace radiation shall be 80 mm.

AMDT No 1 JAN. 1987

Page 6. Clause 2.2.4.

In heading, *delete* **'for Natural Circulation Boilers.'** and *substitute* **'or Boilers Other than Coil-type Forced Circulation Boilers.'**

AMDT No 1 JAN. 1987

Page 6. Clause 2.2.4.1.

Delete second line and *substitute*:

'AS 1228, each boiler other than a coil-type forced circulation boiler shall be'.

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Page 6. Clause 2.2.4.2(a).

Delete first paragraph and *substitute*:

At least two approved low water safety devices, independent of each other, at least one of which shall be a float type fitted directly into the steam drum. For boilers exceeding 500 kW power output, the float type low water device shall be incorporated into an approved self-checking system.

Insert additional (last) paragraph as follows:

Where used, as part of a self-checking system, the low water device shall comply with the following requirements:

(i) Operate on a time cycle such that the self-checking operation is performed at intervals less than the time taken for the water level to drop from normal operating level to a level which would expose any uncooled heating surface to the products of combustion, with the boiler operating at its rated power output and the feed water isolated. The duration of the self-checking operation shall not exceed 20 percent of the total cycle time.

(ii) Operate as a normal low water device at all times except for the period of the self-checking operation.

(iii) Have fail-safe circuitry and operating sequences.

(iv) Is actuated to a complete shutdown by any of the following:

A. Lowering of the water line below a preset level.

B. Seizing of the float or actuating mechanism.

C. Failure to go into self-checking mode after the prescribed interval.

D. Failure of the switch mechanism to operate during the change over (self-check/operating).

E. Failure of the low water device or switch mechanism to return to the normal position after the self-checking operation.

AMDT No 1 JAN. 1987

Page 6. Clause 2.2.4 (b).

First paragraph, last line, *delete* full stop and *add*:

'unless otherwise approved.'

AMDT No 1 JAN. 1987

Page 6. Clause 2.2.4.3.

Second last line, *delete* 'with the' and *substitute* 'calculated on the basis of'.

AMDT No 1 JAN. 1987

Page 6. Clause 2.2.4.4.

After Clause 2.2.4.4, *insert* new Clause as follows:

2.2.4.5 *Assisted Circulation.* Each boiler fitted with a pump to assist natural circulation shall be interlocked to prevent operation of the combustion equipment unless water flow is established and maintained.

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AMDT No 1 JAN. 1987 **Page 6. Clause 2.2.5.**

In heading, before **'Forced'**, *insert* **'Coil-type'**.

AMDT No 1 JAN. 1987 **Page 6. Clause 2.2.5.1.**

Delete existing Clause and *substitute*:

2.2.5.1 *General.* Each coil-type forced circulation boiler shall comply with the requirements in AS 1228 for such boilers and shall be fitted with equipment specified in Clauses 2.2.5.2 to 2.2.5.5.

AMDT No 1 JAN. 1987 **Page 6. Clause 2.2.5.4.**

Under Clause 2.2.5.4 but above the Note, *insert* new Clause as follows:

2.2.5.5 *Feed water pumps.* Feed water pumps shall comply with the requirements of Clause 2.2.4.3, except that for boilers having a power output not exceeding 1 MW only one pump need be fitted.

AMDT No 1 JAN. 1987 **Page 7. Clause 2.3.1(d).**

Delete first word 'The' and *substitute*:

'For fire-tube boilers, the'.

AMDT No 1 JAN. 1987 **Page 7. Clause 2.3.3.**

Delete existing Clause and *substitute*:

2.3.3 Tube Diameter. The maximum outside diameter of any tube exposed to combustion flame or furnace radiation shall be 80 mm.

AMDT No 1 JAN. 1987 **Page 7. Clause 2.3.4.3.**

Second last line, *delete* 'with the' and *substitute* 'calcu ate . on the basis of'.

AMDT No 1 JAN. 1987 **Page 7. Clause 2.3.4.4.**

Second paragraph, last line, *delete* 'operat.. ' and *substitute* 'design'.

AMDT No 1 JAN. 1987 **Page 7. Clause 2.5.1.**

Third line, *delete* asterisk and a oc ted footnote.

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Page 7. Clause 2.5.2.

Delete existing Clause and *substitute*:

2.5.2 Low Water and Overtemperature Protection.

2.5.2.1 *Low water safety devices.* For element boilers, low water level safety devices shall comply with AS 1797 and this Clause (2.5.2). The lowering of the actual boiler water level to a level such as will cause any low water safety device to be actuated shall cause complete shutdown.

2.5.2.2 *Overtemperature protection.* Each element boiler shall have safety devices or safety features to protect the pressure-retaining parts against heating above their design temperature, in accordance with one of the following:

(a) (i) Electric elements which fail before any pressure-retaining part is heated above its design temperature (see Note 1); and

(ii) for boilers with a power output exceeding 20 kW, at least one overtemperature safety device (see Notes 2 and 3). For boilers with a power output exceeding 500 kW, the device should incorporate approved self-checking features.

(b) Where the electric element cannot be assured of failing before any pressure-retaining part is heated above its design temperature (see Note 1)—

(i) for boilers with a power output not exceeding 500 kW, at least two overtemperature safety devices (see Notes 2 and 3), completely independent and having different modes of operation, or at least one low-water safety device (see Note 2(a)) incorporating approved self-checking features; or

(ii) for boilers with a power output exceeding 500 kW, at least two overtemperature safety devices (see Notes 2 and 3), one of which shall be a low-water safety device (see Note 2(a)) incorporating approved self-checking features.

NOTES:

1. For compliance with (a)(i) above, approved calculations or proof test must be carried out to demonstrate the acceptability of the combination of element type, size, location, and capacity with the pressure-retaining parts, dimensions, and material properties. Where the voltage may fall below 90 percent of rated voltage, an undervoltage lockout device should be fitted.
2. For compliance with (a)(ii) or (b) above, one or more of the following safety devices may be used:
   (a) The low water safety device specified in Clause 7.8.2.2(d) of AS 1797—1986 where the device is an overtemperature safety thermostat. This thermostat may make use of a thermocouple or capillary tube attached directly to the sheath of the element or of the change in electrical resistance of the element. The sensor of such overtemperature safety device is to be fitted to the hottest element, and this element must be the first energized and the last de-energized. Alternatively where it is desired to have cyclic step control of elements, the sensor(s) must be located and arranged to cause de-energizing of the operating element(s) and complete shutdown in the event of low water and overheating of any element.
   (b) Temperature sensors attached to the outer shell of the boiler in at least two areas where maximum temperature of the pressure-retaining parts would be expected under any failure condition.
   (c) Temperature relief safety valve located in the top space of the boiler. This relief valve must open to reduce pressure when the steam or water temperature exceeds the boiler design temperature.
3. Each of the overtemperature safety devices (except that in Note 2(c)) is to be able to remove supply to the element(s) by de-energizing a contactor coil or operating a trippable circuit-breaker, and each must cause complete shutdown. Where the electric elements cannot be assured of failing before the pressure retaining parts exceed their design temperature, the first operating overtemperature safety device must de-energize the contactor coil and the other overtemperature safety device trip the circuit breaker.

The main electricity supply to the boiler is to be fitted with a fuse of the appropriate rating and type.

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Page 7. Clause 2.5.3.

In heading, after '**Make Up**', *insert* '**or Feed**'.

5th line, *delete* 'with the' and *substitute* 'calculated on the basis of'.

AMDT No 1 JAN. 1987

Page 8. Clause 3.4.

Second paragraph, first line, *delete* 'main fuel valve in the fuel system' and *substitute* 'main fuel safety shut-off valve in a gas-fired system or oil-fired system'.

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Page 8. Clause 3.5.

First line, *delete* 'Flame detectors' and *substitute* 'Where flame detectors are required by Clause 3.16, each detector'.

Third and fourth lines, *delete* '(see Clause 3.16)'.

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Page 8. Clause 3.8.1(c).

Delete '1.5 mm' and *substitute* '1 mm'.

AMDT No 1 JAN. 1987

Page 8. Clause 3.8.1(d).

Before the first word, *insert*:

'for boilers over 20 kW power output,'

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Page 9. Clause 3.11.3.

Delete first sentence and *substitute*:

The combustion equipment shall be capable of effecting satisfactory combustion within the designated combustion chamber boundaries.

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Page 9. Clause 3.11.4.

First line, *delete* 'Each burner' and *substitute* 'Combustion equipment'.

Fourth line, *delete* 'burner' and *substitute* 'combustion equipment'.

Eighth line, *delete* 'burner' and *substitute* 'combustion equipment'.

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Page 10. Clause 3.11.5.

Seventh line, *delete* 'burner' and *substitute* 'combustion equipment'.

Eighth line, *delete* 'burner' and *substitute* 'combustion equipment'.

Delete second paragraph and *substitute*:

Where there is a possibility that fuel retained in the combustion equipment after shut-off could be cracked or ignited by residual heat, means shall be provided for its expulsion or for heat shielding. (See also Clause 5.3.)

AMDT No 1 JAN. 1987

Page 10. Clause 3.11.6.

Second line, *delete* 'a burner' and *substitute* 'combustion equipment'.

Fourth line, *delete* 'a burner' and *substitute* 'the combustion equipment'.

AMDT No 1 JAN. 1987

Page 10. Clause 3.13.3.

Second line, after 'main' *insert* 'combustion equipment'.

Last line, *delete* 'burner' and *substitute* 'combustion equipment or pilot burner'.

AMDT No 1 JAN. 1987

Page 10. Clause 3.14.1.

Insert (new) second paragraph as follows:

For solid-fuel-fired combustion equipment, any automatic ignition system shall comply with the requirements of Clause 3.3.4.

AMDT No 1 JAN. 1987

Page 10. Clause numbering.

Delete '5' and *substitute* '3.15'.

AMDT No 1 JAN. 1987

Page 10. Clause 3.15.1.

First line, *delete* 'Each burner' and *substitute*:

'Each oil or gas burner or solid-fuel-fired combustion system'

AMDT No 1 JAN. 1987

Page 10. Clause 3.15.2.

First line, *delete* 'burner' and *substitute* 'combustion equipment'.

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Page 11. Clause 3.15.3.1.

Second line, *delete* 'burner' and *substitute* 'combustion equipment'.

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Page 11. Clause 3.15.3.2.

Second line, *delete* 'burner' and *substitute* 'combustion equipment'.

AMDT No 1 JAN. 1987

Page 11. Clause 3.16.

After Clause 3.16, *insert* new Clause as follows:

3.17 POWER FAILURE PROTECTION. The boiler and combustion equipment shall be designed and constructed so that loss of electric power at any time during the operating cycle will not create a hazard to any person.

The combustion chamber, bed, or grate system shall be designed and operated to minimize the stored energy in the system upon power failure.

Where a potential hazard may exist, e.g. where the combustion chamber is substantially refractory lined, a type test shall be performed by the manufacturer to the satisfaction of the Inspecting Authority to ensure that the boiler complies with the above requirement.

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Page 12. Clause 4.2.3.

Delete existing Clause and *substitute*:

4.2.3 Fault Shutdown Condition for Other than Forced Circulation Boilers. The boiler management system of a boiler other than a forced circulation boiler shall shut down and lock out the fuel input in the event of any of the following operating faults:

(a) Fall in water level below a predetermined level in the highest set level controller/low water device where more than one such device is fitted.

(b) Failure of low water safety device to pass self-check test.

(c) Inadequate air for satisfactory combustion or purging.

(d) Incorrect pressure/temperature in the main fuel supply.

(e) Start or main flame ignition failure.

(f) Flame failure.

(g) Failure of flame detector to pass self-check test.

(h) Detection of gas leakage during the gas valve tightness check.

The boiler management system of each such boiler shall cause complete shutdown of the master control system in the event of any of the following operating faults:

(i) Fall in water level below a predetermined level—

A. in the level controller/low water device where only one such device is fitted; or

B. in the extra-low water device where more than one such device is fitted.

(ii) Fall in the feed water tank level below a predetermined level.

(iii) Inadequate feed water or circulating pump flow.

(iv) Phase failure.

NOTE: Conditions external to the boiler may require additional shutdown interlocks.

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Page 15. Clause 5.2.1(b).

Delete 'liquid' and *substitute* 'water'.

AMDT No 1 JAN. 1987

Page 15. Clause 5.3.

Delete existing Clause and *substitute:*

5.3 SPECIFIC REQUIREMENTS FOR SOLID-FUEL-FIRED BOILERS.

5.3.1 General. Each solid-fuel-fired boiler shall be of a type approved by the Inspecting Authority. Each component employed in the boiler installation shall be designed and constructed so as to prevent a hazardous condition from arising.

5.3.2 Fuel Quality. The fuel type and characteristics shall be specified by the manufacturer as being suitable for the equipment supplied. The fuel shall be of reasonably uniform quality and of appropriate particle size distribution for the firing equipment and the automatically controlled combustion system. The fuel grading should be in accordance with the manufacturer's recommendation but in no case should the quantity passing a screen of square apertures of 1 mm sides exceed 5 percent.

5.3.3 Combustion Equipment. The fuel shall be burnt on a grate, hearth, or fluidized bed. The equipment shall be designed to minimize the formation of clinker.

5.3.4 Automatic Pilot Ignition. Where fitted, the automatic pilot ignition system for a solid-fuel-fired combustion system shall comply with the relevant requirements in Sections 3 and 4 for a gas pilot or a low fire gas start flame system.

5.3.5 Controls and Safety Devices. Each automatic solid-fuel-fired system shall be fitted with the following controls and safety devices:

(a) Automatic means of regulating the flow of fuel to the bed, grate, or hearth.

(b) Automatic means to stop the supply of fuel to the combustion equipment.

(c) Start flame burner shut-off valve.

5.3.6 Burn-back Protection. The system for feeding fuel shall be designed to prevent burn-back into the bunker. This may be achieved by one of the following methods:

(a) The fuel-feeding system shall be provided with two independent steam, water, or other fire-extinguishing fixed spray systems, independent of the boiler management system, fitted in the fuel feeder or chute to extinguish any fire caused by a burn back of the fuel. The sprays shall be automatically controlled by thermostats to operate upon temperature rise in the fuel feeder, chute, or hopper.

(b) The fuel supply chute or duct shall have an air break between the bunker and the combustion equipment hopper which will prevent a burn-back into the fuel storage bunker.

(c) Other approved methods.

5.3.7 Power Failure Protection.

5.3.7.1 *General.* The boiler shall comply with the relevant requirements of Clause 3.17 and with the requirements of Clauses 5.3.7.2 and 5.3.7.3.

5.3.7.2 *Auxiliary water supply pump.* Unless the boiler has been type tested and approved by the Inspecting Authority (see Clause 3.17), an independent water pump shall be provided, either steam-driven or engine-driven, to automatically operate upon power failure and maintain the water level in the boiler. The feed water control valve shall automatically open on power failure.

5.3.7.3 *Draught safety device.* Where the air for combustion is supplied by means of natural draught, or where a balanced draught system permits a flow of air greater than 25 percent of the maximum combustion air requirement to continue through the grate, hearth, or bed after loss of power, a damper shall be fitted to the air supply inlet which shall automatically close on loss of electric power or fault shutdown (see Clause 5.2.4).

5.3.8 Solid Fuel and Residue Handling Plant.

5.3.8.1 *Fuel bunker.* Storage facilities, e.g. bunkers and hoppers, shall be substantially of closed construction.

The design shall be such as will prevent the leakage of fuel or combustible dust in the vicinity of the boiler. Provision shall be made to automatically maintain the level in the bunker using a pneumatic or mechanical feeder, or the storage capacity of the fuel bunker should be equal to the fuel usage of the boiler system for a period of 24 h.

5.3.8.2 *Fuel handling.* Fuel handling from the storage bunker to the combustion equipment shall be by gravity, pneumatic means, or other approved means. Where appropriate, the fuel chute for a gravity feed system shall be designed to minimize the segregation of fines and maintain a uniform distribution across the fuel feeder.

5.3.8.3 *Ash handling.* Any ash handling and storage shall be designed and constructed so as to—

(a) minimize any dust escaping into the environment; and

(b) prevent any temperature hazard to personnel from arising.

5.3.8.4 *Grit or dust collectors.* Means shall be provided to remove dust from the products of combustion and ensure compliance with the requirements of the authority having jurisdiction over atmospheric pollution. Where a fabric type filter is provided, it should be fitted with adequate fire-protection equipment.

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Page 17. Clause 6.1.3.

Renumber this Clause as '**6.1.4**'.

Insert new Clause as follows:

6.1.3 Solid Fuel Installations. Solid fuel installations shall comply with the requirements of the Inspecting Authority.

AMDT No 1 JAN. 1987

Page 17. Clause 6.2.

Delete first paragraph including clause number and heading and *substitute*:

6.2 HOUSING AND ACCESS.

6.2.1 Housing. Except for electric boilers, the boiler shall be located in a boiler house, room, or other suitable enclosure capable of being locked to prevent access by unauthorized personnel. For an electric boiler, any housing shall comply with the requirements of the Inspecting Authority having jurisdiction for the installation.

Insert new Clause as follows:

6.2.2 Access. Each boiler shall be provided with all platforms, walkways, stairways, and ladders necessary for its safe operation, inspection, and maintenance. Where required for the regular operational checks of controls and operating equipment, such platforms, walkways, stairways, and ladders shall be fixed in position and shall comply with AS 1657.

AMDT No 1 JAN. 1987

Page 17. Clause 6.3.

Delete first paragraph and *substitute*:

6.3 FEED WATER SUPPLY. Except for electrode boilers and electric element boilers not exceeding 500 kW power output with elements which fail before the pressure-retaining parts exceed their design temperature, means shall be provided to cause complete shutdown in the event of inadequate feed water supply to the boiler. Compliance with this requirement may be achieved by—

(a) a low water safety device fitted in the feed tank; and

(b) a flow-sensing device fitted in the feed water supply line.

AMDT No 1 JAN. 1987

Page 17. Clause 6.4.

Delete existing Clause and *substitute*:

6.4 WATER TREATMENT.

6.4.1 General. Each boiler shall be supplied with water having characteristics in accordance with the boiler manufacturer's recommendations and with Clause 6.4.3.

6.4.2 Treatment Plant. The water treatment equipment and the method of treatment provided for each boiler shall be in accordance with the boiler manufacturer's recommendations and with the recommendations of a person or organization suitably experienced in feed water treatment.

6.4.3 Water Quality. The method of water treatment shall be such as will—

(a) minimize the formation of scales, contaminants, etc that may cause loss of heat transfer or overheating of the metal surfaces; and

(b) minimize corrosion from the feed water.

NOTE: The recommended characteristics for feed and boiler water for unattended fire-tube boilers are as those given in Appendix D of AS 1797—1986. These recommended characteristics are also suitable for unattended water-tube boilers operating in accordance with the limits given in Clause 1.2. For further guidance on feed and boiler water requirements, particularly for water-tube boilers, see BS 2486.

6.4.4 Blowdown.

6.4.4.1 *General.* The blowdown facilities provided shall be capable of removing any precipitates formed by the water treatment and maintaining the concentration of suspended and dissolved solids below the maximum recommended by the boiler manufacturer when the blowdown is operated once every 24 h. Blowdown facilities shall be provided at low point in the boiler drum. Each boiler header shall be provided with facilities for adequate drainage.

Except where otherwise approved, each steam boiler which consumes water other than condensate return and intended for operation for a period in excess of 8 h without human supervision shall be provided with at least one automatic blowdown device fitted to the water drum.

AMDT No 1 JAN. 1987

Page 20. Clause 8.3.

After last sentence, *add* '(See also Section 9.)'

AMDT No 1 JAN. 1987

Page 20. Clause 8.4.

After Clause 8.4, *insert* new Section as follows:

SECTION 9. CHECKING, TESTING AND MAINTENANCE

9.1 GENERAL. The continued safety and reliability of an unattended boiler during its operation is directly dependent on the regularity and quality of the checking, testing, and maintenance carried out on the boiler. The checking, testing, and maintenance of each unattended boiler shall comply with this Section (9) which incorporates compliance with the manufacturer's recommendations and the requirements of the Inspecting Authority.

9.2 PERSONNEL. The contractor, and the owner where maintenance is carried out by the owner, shall be qualified and experienced in all facets of the boiler and its combustion equipment controls and safety systems.

The persons who carry out the testing and maintenance shall be thoroughly familiar with all operating procedures and equipment functions, and shall be capable of rendering sound judgement on whether the equipment is in reliable operating condition.

9.3 RESPONSIBILITIES.

9.3.1 Program and Procedures. The manufacturer of the boiler shall provide (see also Clause 8.3) a checking, testing, and maintenance program and detailed checking, testing, and maintenance procedures to ensure reliability and maximum safety conditions. The program and procedures shall be approved by the Inspecting Authority for use by the owner.

The procedures shall include at least the checking, testing, and maintenance requirements specified in Clauses 9.4, 9.5, and 9.6, and the program shall include at least the following:

(a) Daily checking in accordance with Clause 9.4.1.

(b) Periodic testing and maintenance in accordance with Clauses 9.4.2 and 9.5.1.

(c) Yearly testing, maintenance, and inspection in accordance with Clause 9.5.2.

NOTE: During initial operation of the boiler, more frequent checking, adjusting, cleaning, etc will be required.

9.3.2 Daily Checking. The owner shall be responsible for the daily checking of the boiler to ensure its safe and reliable operation.

9.3.3 Periodic and Yearly Testing and Maintenance. Periodic and yearly testing and maintenance shall be performed by the contractor under a maintenance contract (see Clause 9.7) or, where approved by the Inspecting Authority, by the owner.

NOTE: Inspecting Authority approval of such testing and maintenance by the owner may be restricted to situations where the owner employs persons competent to carry out the testing and maintenance of the boiler controls and safety devices.

Notwithstanding the above, where the owner of a boiler receives notice from the Inspecting Authority to the effect that he has failed to comply with the procedures previously approved by such Authority, the Authority may require the owner to transfer all testing duties to an approved contractor.

9.4 CHECKING AND TESTING.

9.4.1 Daily Checking. Except for excluded boilers (see next paragraph), the boiler operating and safety systems shall be checked at least once in every day of operation, in accordance with the procedures specified in Clause 9.3.1.

The excluded boilers shall be electrode boilers, electric element boilers with elements which fail before the pressure-retaining parts exceed their design temperature and electric element boilers not exceeding 250 kW power output with elements which cannot be assured of failing before the pressure-retaining parts exceed their design temperature.

NOTE: For the electric boilers excluded from these requirements, the boiler should be examined daily for any obvious deterioration and blown down as recommended by the manufacturer.

The following daily checks shall be included in the procedures:

(a) Blow down and check water gauge glasses for correct water level.

(b) Blow down boiler.

(c) Check start-up and shutdown for correct sequences.

(d) Check operation of flame failure detection system for automatic shutdown.

(e) Examine all glands, flanges, and connections to ensure that no substantial leaks have occurred.

(f) Examine all locks and seals to ensure that no unauthorized tampering has occurred.

Where the boiler is operated continuously, the daily checking shall include at least one shutdown and start-up, unless otherwise specifically approved by the Inspecting Authority.

Where the daily checking reveals the need for maintenance or adjustment, such maintenance shall be carried out as soon as practicable, in general in accordance with Clause 9.5.1.

The following information shall be recorded in a suitable log:

(i) Date and time of checking.

(ii) Each check and examination performed and the result thereof.

(iii) The name of the person performing the checking.

9.4.2 Periodic Testing. Except for excluded boilers (see next paragraph), periodic testing of the boiler operating and safety systems, in addition to the daily checking (see Clause 9.4.1), shall be carried out at intervals not exceeding 5 weeks or as otherwise required by the Inspecting Authority.

The excluded boilers shall be electrode boilers, electric element boilers with elements which fail before the pressure-retaining parts exceed their design temperature and electric element boilers not exceeding 250 kW power output with elements which cannot be assured of failing before the pressure-retaining parts exceed their design temperature.

The procedure shall be in accordance with that specified in Clause 9.3.1 and shall include the following checks:

(a) Remove water level devices, disassemble, check chambers, valves, etc, assemble and check operation.

(b) Check the operation of fan and airflow interlocks.

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(c) Check safety shut-off valve(s) for leakage.

(d) Check fire start interlock.

(e) Check steam pressure interlock.

(f) For oil: Check fuel pressure and temperature interlocks.

(g) For gas: Check main gas filter, and high and low fuel pressure interlocks.

(h) Clean and check fuel filter(s).

(j) Clean and check water filters.

(k) In areas with hard or contaminated water, check the effectiveness of the water treatment on a monthly basis.

NOTE: In other areas, this checking may take place every three (3) or six (6) months.

(l) Other examinations and tests as required by the contractor or Inspecting Authority.

The following information shall be recorded at the time of testing:

(i) Date and times of arrival and departure of the person performing the testing.

(ii) Each test and examination performed and the results thereof prior to any adjustment or maintenance work.

(iii) Particulars of any malfunction.

(iv) Details of maintenance work required if outside the scope of the maintenance contract.

(v) The name of the person performing the testing.

9.4.3 Changes to Procedures. Where the testing reveals the need to change the maintenance procedures or equipment adjustment, appropriate changes shall be made in the procedures specified in Clause 9.3.1 and where relevant, to the maintenance contract (see Clause 9.7).

9.5 MAINTENANCE.

9.5.1 Periodic Maintenance. At the time of each periodic testing (see Clause 9.4.2), all maintenance specified in the periodic maintenance procedure (see Clause 9.3.1) shall be carried out.

Where maintenance that is not specifically covered in the maintenance procedure is required, such maintenance shall be carried out as soon as practicable, account being taken of the safety of the boiler.

Where any doubt exists as to the safety of the boiler system because of the need for maintenance, the boiler shall not be re-started until such maintenance has been completed.

Where maintenance of the boiler is performed by a contractor and the owner disputes the necessity of any additional maintenance recommended by the contractor, he may appeal to the Inspecting Authority within 7 days of receiving the contractor's recommendation and the Inspecting Authority shall determine the matter.

9.5.2 Yearly Maintenance. At least once per year, the boiler and its operating and safety systems shall be thoroughly checked and overhauled in accordance with the procedure for annual maintenance specified in Clause 9.3.1. The procedure shall include the inspection of all pressure parts, valves, and fittings as required by the Inspecting Authority, and the following:

(a) Open boiler, clean and arrange for annual inspection of pressure parts as required by the Inspecting Authority.

(b) Clean and examine boiler internally for scale or corrosion.

(c) Inspect and overhaul all valves, fittings, pumps, etc.

(d) Clean and test every interlock and safety system.

(e) Check electric equipment and wiring.

(f) Check all instruments.

(g) Start-up and check operation of all components for—

(i) correct operation and sequence;

(ii) leaks or loose connection; and

(iii) correct calibration and adjustment.

9.5.3 Maintenance by the Boiler Manufacturer. At the option of the owner, maintenance outside the scope of the maintenance contract (see Clause 9.7) may be performed by the boiler manufacturer.

In such cases, the boiler manufacturer shall provide a written report detailing all maintenance work performed on the boiler and shall either leave the boiler in a condition suitable for immediate start-up or shall advise the contractor or owner, as appropriate, of maintenance completed and items to be made good before boiler start-up.

9.5.4 Records. All maintenance work on the boiler and its systems shall be recorded as follows:

(a) Details of any maintenance work performed in conjunction with daily or periodic testing may be recorded on the documentation for the relevant testing or on a separate report as in (b).

(b) Details of yearly maintenance, maintenance by the boiler manufacturer, or any additional maintenance shall be recorded on a separate report by the party carrying out the maintenance work and be submitted to the owner.

9.6 RETENTION OF RECORDS. Records of all testing and maintenance shall be retained by the owner for a period of no less than 18 months. During this period, the owner shall, upon demand, make such records available to the Inspecting Authority.

9.7 MAINTENANCE CONTRACT.

9.7.1 General. A boiler owner who does not test and maintain his own boiler (see Clauses 9.4 and 9.5) shall enter into an approved maintenance contract with an approved contractor.

Except where otherwise permitted by the Inspecting Authority, a maintenance contract shall be in force at any time the boiler is operated.

The owner shall provide the contractor with access to the boiler for the maintenance program at agreed times.

9.7.2 Scope of Contract. The maintenance contract shall be approved by the Inspecting Authority, and shall include the following:

(a) The periodic testing of the boiler as specified in Clause 9.4.2.

(b) The maintenance of the boiler as specified in Clause 9.5, excluding Clause 9.5.3.

(c) Any other maintenance specifically detailed on the maintenance contract.

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(d) Specific details pertaining to the contract, e.g. contract period, supply of replacement parts.

9.7.3 Termination of Contract. Where the contract period is nearing expiry or where the contract is terminated by either party, the owner shall notify the Inspecting Authority and the contractor accordingly, and shall either negotiate and extend the existing maintenance contract or engage another contractor immediately after completion of the contract.

AUSTRALIAN STANDARD

BOILERS—UNATTENDED

AS 2593—1983

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PREFACE

This standard was prepared by the Association's Committee on Boilers and Unfired Pressure Vessels at the request of the Minister for Labour and Industry, Victoria, to assist in achieving uniform safety requirements for boilers intended to operate without continuous attendance.

SEE AMENDMENT 1

The standard is primarily directed to boilers up to 3 MW rating. Considerable information and experience is available in Australia on the operation of such boilers, particularly in Victoria where they have been covered by regulations for about 10 years. As further experience is gained, it is expected that the scope of this standard will be extended; however, the standard may be applicable to more highly rated automatic boilers where prior consent of the Inspecting Authority is obtained.

The standard includes most of the requirements contained in Victorian Regulation No 214 together with the appropriate requirements of AS 1853, Automatic Oil and Gas Burners and Their Application to Boilers, and takes account of the draft proposals agreed to by all inspecting authorities.

The overall safety and efficiency of a boiler is dependent on appropriate supervision, inspection and maintenance of the boiler. Inspecting authorities have issued or are currently preparing regulations to cover such aspects, and this standard is to be read in conjunction with the appropriate statutes or regulations.

The design parameters, types of boilers, associated equipment, controls and installation requirements in this standard have been selected to maximize the two most important features essential to safe and reliable operation of boilers without continuous human supervision, viz—

(a) the overall system of control of operations which must be highly reliable, maximize fail-safe features of all equipment, and utilize self-checking fail-safe features for all critical control equipment; and

(b) the type of boiler and energy input which must be such that in the rare event of the overall system of control failing unsafe, the mode of failure of the boiler system will result in minimal risk to any person.

During the preparation of this standard, liaison was established with the SAA Committee on Industrial Fuel-fired Equipment (ME/21) to ensure that compatibility with its standards AS 1853 and AS 1375, SAA Industrial Fuel Fired Appliances Code, would be maintained. It was agreed that this standard should be published as a document substantially complete in itself including some requirements which were also in AS 1853. For the next editions of AS 1375 and 1853, the committee responsible for those standards will review and expand requirements which are applicable to all types of boilers as well as other types of fuel-fired appliances. Any such requirements in the boiler standards may then be withdrawn and replaced by suitable cross-references.

Users of this standard are reminded that it has no legal authority in its own right, but may acquire legal standing in one or more of the following circumstances:

(a) Adoption by a government or other authority having jurisdiction.

(b) Adoption by a purchaser as the required standard of construction when placing a contract.

(c) Adoption where a manufacturer states that a vessel is in accordance with this standard.

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard for BOILERS—UNATTENDED

SECTION 1. SCOPE AND GENERAL

1.1 SCOPE. This standard specifies requirements for boilers which are intended to be operated for periods with limited or no human supervision. It includes special features within the control, management and supervision systems, associated valves and fittings, housing and installation of these boilers.

1.2 APPLICATION. This standard specifically applies to boilers— SEE AMENDMENT

(a) having power output up to 8 MW;

(b) having design pressures up to 1.75 MPa;

(c) having no superheater;

(d) for fixed land installations;

(e) of a water-tube (either natural or forced circulation) or electrode or element type in which steam or other vapour is generated or water is heated above 99°C or other liquid is heated above a temperature not more than 1°C below the normal atmosphere boiling temperature of the liquid; SEE AMENDMENT

(f) of any type other than in (e) above, e.g. fire-tube type, in which water is heated above 99°C, or other liquid is heated above a temperature not more than 1°C below the normal atmospheric boiling temperature of the liquid, without steam or vapour generation in the boiler and the boiler drum or shell is fully flooded; SEE AMENDMENT

NOTE: Except for definitions in Clause 1.4.3, other clauses in this standard refer to steam and water only, not other fluids but it is intended that such references may be deemed to apply to other approved fluids.

(g) having any of the following sources of energy input:

(i) Gas fuel (mains or other gases).

(ii) Oil fuel with a closed flashpoint greater than 23°C.

(iii) Solid fuels.

(iv) Waste heat fluids.

(v) Electric power.

(vi) Solar radiation.

SEE AMENDMENT

Pulverized fuel firing is not covered.

This standard may also be applied to boilers outside the limits specified in (a) to (g) above where equivalent safety and reliability are ensured and the boiler and its installation are approved by the Inspecting Authority, purchaser and manufacturer.

SEE AMENDMENT

This standard does not apply to the conditions of operation and maintenance essential to continued safety and reliability; this is specified by the Inspecting Authority in the State or Territory in which the boiler is to be installed. However, it is intended that suitable checks, tests and maintenance will be carried out periodically and these will be in accordance with the manufacturer's recommendations and the requirements of the Inspecting Authority.

1.3 REFERENCED DOCUMENTS. A list with titles of the documents referred to in this standard is given in the Annex.

1.4 DEFINITIONS. For the purpose of this standard, the following definitions apply:

1.4.1 Approved, approval—approved by, or approval of, the Inspecting Authority.

1.4.2 Authority having jurisdiction—the authority having statutory powers to control the design, manufacture and installation of services, pollution control equipment, fire protection systems and others, as appropriate.

NOTE: The definition is not intended to mean the purchaser or manufacturer where no authority appears to have jurisdiction. In such cases, the matter should be referred to the Inspecting Authority.

1.4.3 Boilers. SEE AMENDMENT

1.4.3.1 *Boiler*—any vessel or vessels including interconnecting parts wherein steam, or other vapour, is or is intended to be generated, or water, or other liquid, is or is intended to be heated at a pressure above that of the atmosphere by the application of fire or the products of combustion, by electrical means, by solar radiation or by process fluids.

The term 'boiler' excludes a fully flooded system or pressurized system where the water is or is intended to be heated to a temperature not greater than 99°C, or other liquid is or is intended to be heated to a temperature not more than 1°C below the normal atmospheric boiling point temperature of the liquid.

A boiler is deemed to include valves, gauges, fittings and controls directly associated with the boiler and, where consistent with the requirements of this standard, the boiler setting and associated equipment.

1.4.3.2 *Electrode boiler*—a boiler in which the water or other liquid is heated by the passage of an alternating current through the liquid.

1.4.3.3 *Element boiler*—a boiler in which the water or other liquid is heated by an electrical element.

1.4.3.4 *Fire-tube boiler*—a boiler in which the water or other liquid to be heated is contained in a vessel which may be directly heated and/or contain tubes in which combustion takes place or through which products of combustion flow.

1.4.3.5 *Forced circulation boiler*—a water-tube boiler composed of a small number of long tubes in which evaporation is substantially suppressed and into which tubes a regulated flow of water is forced, a mixture of steam and water flowing from the outlet end of each tube and entering an unheated separator where the water and steam are separated, the water returning to the system.

1.4.3.6 *Hot water boiler*—a boiler used for heating water or other liquid without generating steam or vapour.

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