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Australian Standard 1797–1978

FIRE-TUBE, SHELL AND MISCELLANEOUS BOILERS —WELDED CONSTRUCTION

STANDARDS ASSOCIATION OF AUSTRALIA
Incorporated by Royal Charter

THE FOLLOWING GOVERNMENT DEPARTMENTS AND SCIENTIFIC AND INDUSTRIAL organizations were officially represented on the committee entrusted with the preparation of this standard:

Australian Chamber of Commerce
Australian Institute of Metals
Australian Liquefied Petroleum Gas Association
Australian Mines and Metals Association
Australian Sugar Refiners
Australian Valve Manufacturers Association
Australian Welding Institute
Australian Welding Research Association
Boiler and Unfired Pressure Vessel Manufacturers and Users
Bureau of Steel Manufacturers of Australia
Confederation of Australian Industry
Council of Fire and Accident Underwriters
Department of Mines
Department of the Capital Territory
Department of Defence
Department of Transport
Department of Manufacturing Industry
Electricity Supply Association of Australia
Institute of Fuel
Institution of Engineers, Australia
Lloyds Register of Shipping
Metal Trades Industry Association of Australia
Petroleum Refining Engineers Advisory Committee
Queensland Society of Sugar Cane Technologists
Railways of Australia Committee
Snowy Mountains Hydro-electric Authority
Society of Mechanical Engineers of Australia
State Departments of Labour and Industry and Machinery Inspection
Universities and Technical Colleges.

This standard, prepared by Committee ME/1, Boilers and Unfired Pressure Vessels, was approved on behalf of the Council of the Standards Association of Australia on 17 October 1978, and was published on 31 December 1978.

In order to keep abreast of progress in industry, Australian standards are regularly reviewed. Suggestions for improvements to published standards, addressed to the head office of the Association, are welcomed.

AUSTRALIAN STANDARD

RULES FOR FIRE-TUBE, SHELL AND MISCELLANEOUS BOILERS— WELDED CONSTRUCTION

AS 1797–1978

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PREFACE

This revised standard has been prepared by the Association's Committee on Boilers and Unfired Pressure Vessels. It forms part of the SAA Boiler Code (AS 1200) which is referred to in Statutory Regulations of the Australian States and Territories, and which covers the requirements for fire-tube boilers, water-tube boilers, unfired pressure vessels, pressure piping, welders competence and related matters.

The metric units adopted in this standard are those of the International System (SI). Values for pressure and stress are given in pascals (Pa) (or approved multiples thereof) which is a special name adopted by the General Conference of the International Committee on Weights and Measures for the unit newton per square metre (N/m^2).

For Class 1 boilers this standard is aligned in many areas to the British Standard BS 2790; Part 1:1969 (including Amendment No 1). In general, it includes requirements equivalent to those of ISO/R 831 of the International Organization for Standardization (ISO), except that the use of non-normalized plate complying with AS 1548, Steel Plates for Boilers and Unfired Pressure Vessels, is permitted.

Rules pertaining specifically to Lancashire and Cornish boilers have been omitted from the standard. Other requirements varying from those in BS 2790: Part 1, include rules relating to welding of tubes, breathing space and stayed areas of plates, furnace limitations, inspection clearances and openings, and boiler mountings. The sections of the standard covering welding, inspection and testing reflect current Australian practices.

The revision now covers Class 2 and Class 3 boilers previously specified in AS CB1, Part 1 (the ISO recommendation is not applicable to these classes). Requirements relating to the installation of water heating boilers are at present included in Interpretation No 4 to AS CB1.

The standard follows in principle other parts of the SAA Boiler Code by giving guidance to manufacturers, Statutory Authorities and users in the form of minimum engineering requirements which are necessary in the safe design, construction, inspection, testing and installation of boilers, other than water-tube boilers and locomotive boilers for railway purposes. The requirements have been formulated with the object of providing adequate protection of life and property, a reasonably long and safe period of usefulness, and a proper margin for deterioration in service.

No rules of construction can be written in sufficient detail to ensure good workmanship in construction. Each boiler manufacturer is responsible for taking every necessary step to make sure that the quality of workmanship and construction is in accordance with good engineering practice.

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

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

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

(iii) Adoption where a manufacturer states that a boiler is in accordance with the standard.

This standard makes reference to the following standards:

AS 1074 Steel tubes and tubulars threaded or suitable for threading with pipe threads of Whitworth form

AS 1170 SAA Loading Code
Part 2 — Wind forces

AS 1171 Methods for magnetic particle testing of ferromagnetic products and components

AS 1200 SAA Boiler Code

AS 1228 Rules for water-tube boilers

AS 1250 SAA Steel Structures Code

AS 1271 Valves, water gauges and other fittings for boilers and unfired pressure vessels

AS 1349 Bourdon tube pressure and vacuum gauges

AS 1375 SAA Industrial Fuel Fired Appliances Code

AS 1391 Methods for tensile testing of metals

AS 1544 Methods for impact tests on metals
Part 2 — Charpy V-notch

AS 1548 Steel plates for boilers and unfired pressure vessels

AS 1657 SAA Code for Fixed Platforms, Walkways, Stairways and Ladders

AS 1680 Code of practice for interior lighting and the visual environment

AS 1722 Pipe threads of Whitworth form
Part 1 — Sealing pipe threads

AS 1750 Steel sections and bars for boilers and unfired pressure vessels (other than bolting material)

AS 1796 SAA Welding Certification Code

AS 1835 Seamless steel tubes for pressure purposes

AS 1836 Welded steel tubes for pressure purposes

AS 1853 Rules for the design and construction of single automatic oil and gas burners and their application to boilers

AS 2062 Methods for non-destructive penetrant testing of products and components

AS 2129 Flanges and bolting for pipes, valves and fittings

AS 2177 Radiographic examination of welded butt joints in metals
Part 1 — Methods of test
Part 2 — Image quality indicators and recommendations for their use

AS 2207 Methods for the ultrasonic testing of fusion welded joints in steel

AS 3000 SAA Wiring Rules

AS CB15 SAA Pipe Welding Code
Part I — Oxy-acetylene welding of ferritic steel piping
Part III — Arc welding of ferritic steel piping

AS CB18 SAA Pressure Piping Code
Part I — Ferrous piping
AS Z5 Glossary of metal welding terms and definitions
AS Z6 Symbols for welding
AS ....* Methods for radiographic examination of castings
AS ....* Methods for ultrasonic examination of castings
BS 1503 Steels for fired and unfired pressure vessels — forgings
BS 1560 Steel pipe flanges and flanged fittings for the petroleum industry
Part 2 — Metric dimensions
BS 1952 Copper alloy gate valves for general purposes
BS 1953 Copper alloy check valves for general purposes
BS 1971 Corrugated furnaces for shell boilers
BS 2060 Copper alloy screw-down stop valves for general purposes
BS 2094 Glossary of terms relating to iron and steel
BS 3059 Steel boiler and superheater tubes
BS 4076 Steel chimneys
BS 4080 Methods for non-destructive testing of steel castings
ANSI B16.5 Steel pipe flanges, flanged valves and fittings
ASTM E125 Reference photographs for magnetic particle indications on ferrous castings
ASTM E446 Reference radiographs for steel castings up to 2 inches in thickness.

* In course of preparation.

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard Rules for FIRE-TUBE, SHELL AND MISCELLANEOUS BOILERS—WELDED CONSTRUCTION

FOREWORD

The application of the SAA Boiler Code may give rise to a continual need for consideration of unusual and other designs which do not comply in all respects with the requirements of the relevant standard or which are not adequately covered in any standard.

If it is desired to use materials or methods which do not comply with the requirements of or are not adequately covered by the Code, designs incorporating such departure should be submitted to the relevant Inspecting Authority for approval. Where necessary, SAA Committee ME/1, Boilers and Unfired Pressure Vessels, may be asked to serve in an advisory capacity in the determination of the suitability of such designs (see also Rule 1.6).

It is emphasized that this activity of the committee is limited to technical aspects of the Code and that the committee has no power or jurisdiction to adjudicate upon contractual matters or regulatory matters or the duties of any persons concerned with the subject of the submission.

Methods developed by Committee ME/1 for communicating the findings of the committee are as follows:

Committee Opinion A Committee Opinion is issued in reply to a specific enquiry from a specific organization and applies only to the set of circumstances referenced in the Committee Opinion. Copies of Committee Opinions are sent to the relevant Inspecting Authorities and may be used by the Authorities as the basis for approval of the particular application or for approval of similar submissions from other organizations. A list of current Committee Opinion is published in AS 1200.

Interpretation. An Interpretation is issued when the committee judges the subject of an enquiry to be of sufficient importance or of probable wide application. A postal ballot is held and the reply is published as an Interpretation which is to be regarded as equivalent to an Amendment to the relevant standard, effective from the date of issue. A list of current Interpretations is published in AS 1200.

Where the committee judges the subject to be suitable, Committee Opinion and Interpretations may be incorporated in an Amendment to the relevant standard, whereupon the Committee Opinion or Interpretation will be withdrawn. If the timing is appropriate, the finding of the committee may be issued directly as an Amendment.

SECTION 1. SCOPE AND GENERAL

1.1 SCOPE. These Rules (herein referred to as this 'Code' or 'the Code') apply to the materials, design, construction, installation, inspection and testing of all boilers of welded construction other than water-tube boilers and locomotive boilers for railway purposes. (For the codes applicable to the types of boilers not covered by this Code, refer to AS 1200.)

The boilers covered by the Code are intended for land use for providing steam (or other vapour) or high temperature hot water (or other liquid).

1.2 APPLICATION OF THE CODE.

1.2.1 Classification of Boilers. For the purpose of this Code, the classification in Table 1.2.1 shall apply.

1.2.2 Parts Covered. This Code applies to the pressure parts of boilers containing liquid and vapour up to and including the valves separating these liquid and vapour spaces from the vapour pipes to other equipment, liquid supply pipes, drain pipes and the surrounding atmosphere (safety valves and vents).

1.2.3 Parts Excluded. This Code does not apply to the requirements for certain ancillary equipment such as—

(a) superheaters and economizers; and

(b) pressure piping installations.

The codes to which such equipment shall comply are specified in AS 1200.

This Code does not apply to brickwork, similar settings, insulation or combustion equipment and ancillaries, except for the requirements which are important for basic safety and inspection, and items covered by Section 8.

NOTE: This Code is applicable to land installations only. For requirements for marine boilers reference should be made to the Federal or State maritime controlling authority, or to the recognized ship classification society, as applicable.

1.3 DEFINITIONS. For the purposes of this Code the following definitions apply:

1.3.1 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 or by electrical means. It shall also include valves, gauges and other fittings, as required in Section 7 herein and, where consistent with the requirements of this Code, shall include the boiler setting, and associated equipment. It does not include 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.

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

1.3.3 Element boiler — a boiler in which the water or other liquid is heated by an eclectrical element.

1.3.4 Integral piping — that piping within the whole of the circulatory system of the boiler between the feed inlet valve and the main stop valve. In addition, certain pipework (e.g. gauge pipes, blowdowns, soot blowers) connected to boiler pressure parts or to the pipes forming the main circulatory system, but not to external equipment or to atmosphere, is included in this category.

1.3.5 Design pressure — the gauge pressure used to determine the minimum thickness of the various pressure parts of a boiler in accordance with this Code.

NOTE: It is recommended that there should be an adequate margin between the operating pressure and the design pressure in order to prevent unnecessary blowing of safety valves.

TABLE 1.2.1

CLASSIFICATION OF BOILERS

Requirements	Class 3	Class 2	Class 1
Design pressure, MPa	Not exceeding 0.250	Not exceeding 0.750	Exceeding 0.750
Pressure (MPa) × Internal diameter (mm)	Not exceeding 300	Not exceeding 900	Exceeding Class 2 requirements
Welded joint efficiency η	0.65	(a) 0.85 Radiography of all welded joint junctions plus 10 percent of seams (Rule 5.4.2) (b) 0.75 No radiography	1.0
Postweld heat treatment	Not required	Rule 4.3.3	Rule 4.3.3
Mechanical tests (Production)	Rule 5.3.3.3	Rule 5.3.3.2	Rule 5.3.3.1
Non-destructive testing	Rule 5.4.2 (a)	Rule 5.4.2 (a)	Rule 5.4.2 (a)
Hydrostatic tests	Rule 5.5	Rule 5.5	Rule 5.5