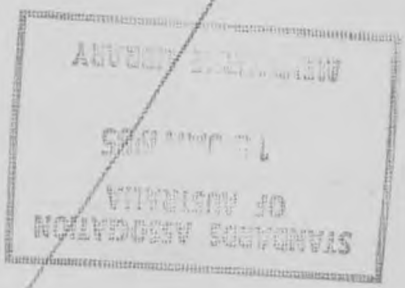
AS 1228—1984
UDC 621.181.5

Australian Standard 1228—1984

Amdt 1

BOILERS—WATER-TUBE



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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 17 April 1984 and published on 19 October 1984.

The following interests are represented on the Committee ME/1:

Aluminium Development Council
Australasian Institute of Metals
Australian Chamber of Commerce
Australian Compressed Air Institute
Australian Institute for Non-destructive Testing
Australian Institute of Petroleum Limited
Australian Liquefied Petroleum Gas Association
Australian Mines and Metals Association
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Railways of Australia Committee
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AMENDMENT No 1
to
AS 1228—1984
BOILERS—WATER-TUBE

CORRECTION

SUMMARY: This amendment applies to Clause 1.4 and Table 5.4.2(A).

Published on 2 December 1985.

AMDT No 1 DEC. 1985

Page 6. Clause 1.4.1.5.

After Clause 1.4.1.5, *insert* the following new clause:

1.4.2 Integral piping—all pressure piping other than headers and heating surface tubing within the terminal points specified in Clause 1.2.

NOTES:

1. Integral piping includes external downcomers; integral sootblower piping to the drain valves; sampling, air release, blowdown and drain piping between points to take off and the appropriate valves; and instrument and impulse piping to water gauges, transmitters and alarms. The principal integral boiler covered by this standard is shown diagrammatically in Appendix E.
2. Any component of the boiler circulatory pipework system which has multiple inlets, outlets or connections other than those used for instrument purposes, should be considered to be a header, and is to comply with the clauses covering cylindrical shells, drums or headers.

AMDT No 1 DEC. 1985

Page 26. Table 5.4.2(A).

3rd division (Type C1), 2nd column, 2nd line, *delete* '$\leqslant 32$' and *substitute* '$\geqslant 32$'.

AUSTRALIAN STANDARD

BOILERS—WATER-TUBE

AS 1228—1984

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PREFACE

This edition of this standard was prepared by the Association's Committee on Boilers and Unfired Pressure Vessels to supersede AS 1228—1980. The standard was first published in 1972 as part of the program of revision of Parts I-IV and V of AS CB1, SAA Boiler Code. It forms part of the SAA Boiler Code (AS 1200) which is referred to in Statutory Regulations in Australia, and which covers requirements for land installations of shell boilers, water-tube boilers, unfired pressure vessels, pressure piping, welder certification, and related matters.

Revisions and additions have been made throughout the standard; those clauses, tables and figures which have been subject to technical change are listed in Annex 2. The changes include—

(a) the introduction of tabulated design strength values for the materials specified, determined in accordance with the common policy that has been adopted by the committee for all its codes;

(b) the introduction of the concept of designing components operating in the creep range for a specified lifetime, in which case a review of the component's fitness for purpose is required if it is proposed to operate the component beyond its design lifetime;

(c) a review of heat treatment requirements;

(d) a complete review of non-destructive examination requirements;

(e) a review of the requirements for hot water boilers to align with the similar requirements of AS 1797, Fire-tube, Shell and Miscellaneous Boilers;

(f) incorporation of Interpretation No 8 to SAA Boiler Code, Coil-type Steam Generators.

The revisions relating to heat treatment may affect welding procedure requirements but it is not intended that existing approved welding procedures will be invalidated by minor changes such as small variations in heat treatment temperatures.

The standard follows, in principle, other parts of the SAA Boiler Code by giving guidance to manufacturers, Inspecting Authorities and users in the form of minimum engineering standards for the design, construction, inspection, testing and installation of water-tube boilers.

It is based on BS 1113 : 1969 which includes the relevant requirements of ISO/R 831. ISO/R 831 is the subject of continuing study and development to increase its scope and to take account of trends in design and construction, and this standard will accordingly be revised as further recommendations are issued.

The ISO Recommendation and the standards in this series 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.

The standard contains basic data necessary for design, including material specifications, design parameters, requirements for fabrication, inspection and testing. These requirements are specified in terms of principles to the fullest possible extent, supplemented where necessary by further detail to obtain uniform interpretation of principle and guidance as to best methods. In other areas the standard indicates where caution is necessary because it is felt that a direct prohibition would be unwise at the present level of knowledge.

The specific design requirements of the standard are based on a simplified engineering approach and are intended to be the standard methods of design. However, in special instances, particularly where guidance is not provided in this standard, other methods may be used provided that the validity of the design is satisfactorily established.

Section 4 of this standard (manufacture and workmanship) includes requirements for those matters which come within the normal function of the manufacturer. Requirements as to workmanship for plates, tubes, forgings and castings in the condition in which they are normally supplied to the manufacturer are included in the relevant standards specifying such materials.

This standard does not specify individual welding processes or procedures. It provides guidance by which a welding process or procedure or the application of equipment or material for various welding processes or procedures by individual manufacturers may be approved for the manufacture of water-tube boilers and their ancillary pressure parts. It also specifies requirements whereby the competence of individual welders may be established and qualified.

In general, the tests required for the approval of welding procedures, for the competence of welders and for production control, together with the requirements for non-destructive examination, have been formulated with fusion welding processes in mind. Where a pressure welding process is employed, e.g. flash welding for joining tubes, it will be necessary to modify or extend these requirements to ensure that adequate precautions are taken for the avoidance of faults peculiar to the process used. Special requirements of this nature should be subject to prior agreement between the manufacturer and the Inspecting Authority.

No guidelines on 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 such as will ensure compliance with good engineering practice.

The user will also need to consider many factors beyond those covered by this standard in the final specification of a boiler and is cautioned that the standard is not a complete design handbook and that he should be aware of the need for competent engineering judgement.

It should be noted that the standard has been written primarily to suit conditions in Australia where there is a strong relationship between the manufacturer (and designer) and the Inspecting Authority. However, it is not intended to weaken the important link between these parties and the purchaser, who will be concerned with many other aspects beyond the scope of this standard and who may specify additional or alternative requirements; but such requirements must not

be less than those already specified in the standard and must comply with the requirements of the Inspecting Authority in the State where the boiler is to be oeprated. Statements of above requirements should form part of the contract documents between the purchaser and manufacturer. Attention is drawn to Appendix D which sets out information that should be supplied by the purchaser and the manufacturer.

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.

CONTENTS

STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
BOILERS—WATER-TUBE

FOREWORD

This standard does not prohibit the use of materials or methods of design or construction which are not specifically referred to herein. Therefore the application of the standards which comprise 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 by that or other standards.

Where it is desired to use materials or methods of design or construction which do not comply with the requirements of or are not adequately covered by the standard, 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 design.

NOTE: Users are advised that this standard is usually used as the basis for the requirements for water-tube boilers in all States and Territories of Australia.

In addition, where ambiguity is found, or where doubt arises as to the meaning or effect of the requirements of this standard or whether anything ought to be done or not done in order to comply fully with the standard, the question should be referred to SAA Committee ME/1 for an interpretation of the intent of those particular requirements of the standard.

It is emphasized that the abovementioned activities of the committee are limited to technical aspects of the standard and that the committee has no power or jurisdiction to adjudicate upon contractual or regulatory matters or the duties of persons concerned with the subject of the submission.

A method developed by Committee ME/1 for communicating the findings of the committee is by the use of Rulings. A Ruling is issued in reply to a specific enquiry from a specific organization and applies only to the set of circumstances referenced in the Ruling. Copies of Rulings 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. Current Rulings are available under the reference 'SAA Doc. 1200R'.

Where the committee judges the subject to be suitable, a Ruling may be incorporated in an amendment or revision to the relevant standard, whereupon the Ruling is withdrawn.

NOTE: The term 'Ruling' has been adopted to apply to all such interpretations. In the past both 'Ruling' and 'Committee Opinion' had been used.

SECTION 1. SCOPE AND GENERAL

1.1 SCOPE. This standard sets out requirements for materials, design, construction, installation, inspection and testing of those parts of water-tube steam boilers and water-heating boilers subject to pressure.

NOTE: With the approval of the Inspecting Authority, this standard may also apply to the parts of 'water-tube type' vapour generating and hot liquid units subject to internal vapour or liquid pressure.

1.2 APPLICATION. This standard specifically applies to land installations of water-tube boilers, as defined in Clause 1.4 including integral superheaters, reheaters and steel tube economizers and also to superheaters, reheaters and steel tube economizers independently fired or heated.

It also applies to all pressure parts containing fluid up to and including the valves separating the pressure parts from—

(a) steam pipes to and from other equipment;

(b) water pipes to and from other equipment;

(c) drain pipes; and

(d) the surrounding atmosphere, except that for safety valves, their vent piping to the atmosphere is also covered.

In the case of equipment such as reheaters which may not incorporate valves at their supply and return connection points, the standard applies to the equipment included between the inlet to the inlet header and the outlet from the outlet header of such equipment.

The standard does not apply to brickwork or similar settings, supports, insulation, air preheaters, mechanical stokers, ash disposal equipment, forced or induced draught equipment or their accessories, except for items important to basic safety and inspection (see Section 8).

1.3 REFERENCED DOCUMENTS. A list with titles of the documents referred to in this standard is given in Annex 1.

1.4 DEFINITIONS. For the purposes of this standard the following definitions shall apply.

1.4.1 Boilers.

1.4.1.1 *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, and other fittings, as required in Section 7 herein 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.

1.4.1.2 *Water-tube boiler*—a boiler in which the heat transfer takes place through the wall of tubes inside which the fluid to be heated flows or circulates.

1.4.1.3 *Natural circulation boiler*—a water-tube boiler in which fluid circulation is a result of the thermo-syphonic head produced by heating.

1.4.1.4 *Forced, assisted or controlled circulation boiler*—a water-tube boiler in which mechanical pumping is used either entirely or partly to promote the circulation of fluid through the tubes.

1.4.1.5 *Once-through boiler*—a water-tube in which the fluid passes from the inlet to the outlet of the boiler without internal recirculation.

New Clause 1.4.2. - See Amend. 1.

1.4.3 Design lifetime—the lifetime specified by agreement between the manufacturer and the purchaser for each boiler component operating in the creep (high temperature) range and used in determining material design strength; it is expressed in hours service at specified conditions.

NOTE: The design lifetime relates only to the creep performance of the relevant component and is not necessarily related to the life of the boiler.

1.4.4 Design pressure—the maximum allowable operating pressure (not including accumulation, Clause 7.2.3) for—

(a) natural or assisted circulation boilers, at the top of the steam or water drum;

(b) once-through forced circulation boilers, at the final superheater outlet, except where an intervening shut-off valve is fitted;

(c) steam reheaters, independently fired superheaters, and economizer separated from the boiler by a shut-off valve, at the final outlet of the particular equipment.

1.4.5 Calculation pressure.

(a) Except as specified in (b) below, the calculation pressure for all pressure parts is the design pressure (Clause 1.4.4) increased, where applicable, to take into account the pressure differential and hydrostatic head corresponding to the most severe conditions of operation.

(b) For those portions of the pressure parts of superheaters of natural and assisted flow boilers, and of independently fired superheaters (including the integral piping up to and including the steam stop valve), and of reheaters, which are manufactured from ferritic wrought steel and forgings, whose design is governed by design strengths derived from S_R (see Clause 2.2.2) and for those made from austenitic wrought steels (see Clause 2.2.3), the calculation pressure is the pressure at which the highest set safety valve on the superheater or reheater outlet is set to lift, increased to take into account the pressure drop corresponding to the most severe conditions of operation.

1.4.6 Design temperature—the metal temperature at the coincident calculation pressure, used to select the design strength and to determine the dimensions of the boiler component under consideration.

1.4.7 Design strength—the maximum allowable stress for use in the formulas for calculation of pressure parts.

1.4.8 Minimum calculated thickness—the minimum thickness calculated according to the formulas to resist loadings, before corrosion or other allowances are added.