

Australian Standard™

Pressure equipment—Installation



This Australian Standard was prepared by Committee ME-001, Pressure Equipment. It was approved on behalf of the Council of Standards Australia on 30 December 2000 and published on 27 February 2001.

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Australasian Institute of Engineer Surveyors
Australian Aluminium Council
Australian Building Codes Board
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STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 3892—2001

Pressure equipment—Installation

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Technical Committee ME-001 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

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NOTES

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee ME-001, Pressure Equipment to supersede AS 3892—1995, *Pressure equipment—Installation*.

This Standard is the result of a consensus among representatives on the Joint Committee to produce it as an Australian Standard.

The first issue of this Standard consolidated, rationalized and extended the requirements and recommendations in AS 1210, *Pressure vessels*, AS 1228, *Pressure equipment—Boilers*, AS 2593, *Boilers—Unattended and limited attendance* and associated Standards. It was part of a major program to restructure, unify and simplify the various Standards for particular types of equipment and components in accordance with AS/NZS 1200, *Pressure equipment*. AS/NZS 1200 covers requirements for land installations of boilers, pressure vessels, pressure piping and associated matters.

The Committee recognized there was a need to specify requirements and give further guidance to installers, purchasers and users on the installation of pressure equipment. Existing Standards on boilers give some (but not consistent) guidance for their safe installation, while pressure vessel Standards provide little information for their installation.

The objective of the Standard is to provide requirements for safe installation of pressure equipment.

The main changes in this revision include the following:

- (a) A new section incorporating the requirements for the installation of pressure piping.
- (b) A new appendix giving guidance on the competency of installers.
- (c) A new appendix on management systems.
- (d) Alignment with Standardization Guide No. 17.1, *Drafting of Standards that may be referenced under occupational health and safety legislation*.

This Standard provides the minimum installation requirements to ensure the initial and continued safe and reliable performance of the pressure plant. In many circumstances, additional requirements may be necessary for adequate performance or safety.

It is envisaged that experience gained in the use of the Standard will highlight areas that need to be strengthened. It is intended that the Standard will be regularly reviewed and revised as necessary to ensure it remains a useful document to all parties concerned and provides safe and reliable pressure plant.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

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STANDARDS AUSTRALIA

Australian Standard

Pressure equipment—Installation

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies the requirements for, and gives guidance on, the installation of pressure equipment (boilers, pressure vessels and pressure piping), control, and safety equipment constructed in accordance with AS/NZS 1200 and Standards referenced therein, together with other relevant Standards.

NOTES:

- 1 No requirements can be written in sufficient detail to cover all aspects of installation for the great variety of pressure equipment. Each installer should ensure that the quality of the installation is in accordance with all applicable requirements and is adequate for continued safe performance of the equipment. This may require further work to be undertaken and the seeking of expert advice.
- 2 ‘Duty of care’ is now prescribed on employers and employees regardless of regulation or standards. This Standard does not supersede ‘duty of care’.
- 3 Users of this Standard are reminded that it has no legal authority in its own right, but may acquire legal standing if adopted by government or any other authority having jurisdiction, or if specified as part of a commercial contract.

1.2 OBJECTIVE

This Standard is intended to—

- (a) establish uniform minimum requirements for the installation of pressure equipment to ensure safe performance and protection of personnel, equipment and the environment; and
- (b) provide information and guidance for suppliers, installers, purchasers and various authorities.

1.3 APPLICATION

This Standard applies to, but is not limited to, the following pressure equipment:

- (a) Static boilers (including superheaters, economizers, reheaters and air heaters) but excluding domestic pressure cookers, domestic coffee machines and similar boilers.
- (b) Static fired and unfired pressure vessels (including industrial fired heaters, water heaters, feedwater heaters, heat exchangers and other similar equipment).
- (c) Pressure piping assembled on or off-site.
- (d) Associated auxiliaries, e.g. boiler combustion equipment, fuel storage and handling equipment, combustion air and flue gas systems, feed and circulating pumps.
- (e) Associated appurtenances, e.g. safety valves, pressure gauges, water gauges, blowdown systems, feedwater controllers, soot blowers, steam and water valves, and bursting discs.
- (f) Associated pressure equipment control systems.
- (g) Associated piping.

1.4 REFERENCED DOCUMENTS

A list of documents referred to in this Standard is given in Appendix A.

1.5 DEFINITIONS

For the purpose of this Standard, the definitions given in AS/NZS 1200 and those below apply.

1.5.1 Competent person

A person who has acquired, through training, qualification, or experience, or a combination of these, the knowledge and skills enabling that person to perform the task required.

1.5.2 Installation (the process of)

The placing into position or erection of pressure equipment, the fitting of associated appurtenances and auxiliaries, and associated checks in preparation for commissioning and operation at a construction site or plant site. It includes reinstallation, relocation and re-erection of equipment.

NOTE: Some portion of the installation may occur at the manufacturer's works.

1.5.3 Installation

A complete assembly of pressure equipment in a location.

1.5.4 May

Indicates the existence of an option.

1.5.5 Purchaser

A body corporate, firm or person, who buys the pressure equipment from the manufacturer.

NOTE: It may include the owner or user.

1.5.6 Shall

Indicates that a statement is mandatory.

1.5.7 Should

Indicates a recommendation.

SECTION 2 GENERAL REQUIREMENTS

2.1 COMPLIANCE

The completed installation shall comply with this Standard. Where appropriate, the following should be observed:

- (a) Drawings and specifications.
- (b) The recommendations of the suppliers or manufacturers of the pressure equipment, associated appurtenances and auxiliaries.
- (c) Requirements of local government by-laws and ordinances, and other bodies or agencies. These may include one or more aspects of the following:
 - (i) *Gas supply*
e.g. AS 5601 (AG 601) and AS 3814 (AG 501).
 - (ii) *Fuel oil supply*
e.g. AS 1940.
 - (iii) *Electricity supply*
e.g. AS/NZS 3000.
 - (iv) *Liquefied gas installations*
Liquid petroleum gas (LPG) installations, e.g. AS/NZS 1596, anhydrous ammonia installations, e.g. AS 2022, liquefied natural gas (LNG) installations, e.g. AS 3961.
 - (v) *Major hazard facilities*
Examples of relevant documents include *Control of Major Hazard Facilities National Standard* [NOHSC:1014(1996)] and *National Code of Practice* [NOHSC:2016(1996)].

2.2 SAFETY DURING INSTALLATION

2.2.1 General

During the installation, appropriate safety requirements shall be observed. The provision of a clear set of safe working procedures for the prevention of hazardous incidents during installation, appropriate to the complexity, should be available.

These procedures should ensure the following:

- (a) Provision of a safe working environment for the installation.
- (b) Development and maintenance of a written plan of action regarding safety practices.
- (c) Development and implementation of an installation layout analysis. Review for the development of other elements of safety practices and emergency procedures.
- (d) Provision of a communication facility, such as a telephone service or equivalent.
- (e) Provision of whatever illumination of the working areas is considered necessary for safe working.

- (f) Instigation of an assessment of the possible hazards involved with the installation of the pressure equipment. The areas of risk should include but not be limited to the following:
 - (i) Pressure plant location.
 - (ii) Fuel handling system design.
 - (iii) Fire protection provisions.
 - (iv) Explosion relief provisions.
 - (v) Equipment failure.

NOTE: See Appendix B for a guide methodology of incident investigation.

2.2.2 Orderliness of systems and surrounding area

The pressure equipment system and its surrounding area shall be kept in a clean, safe and tidy condition.

This, typically, should include—

- (a) the removal of all excess equipment and materials (including flammable and combustible materials) from the area;
- (b) the removal of all substances and obstacles from stairways, platforms, roads and access areas that could cause a hazard to personnel; and
- (c) the removal or isolation of spillages of solid, liquid and gaseous fuels, ash and dust.

2.2.3 Entry into pressure equipment systems

All the appropriate requirements of AS 2865 and additional specific site requirements shall be undertaken before entering a confined space.

2.2.4 Entry into flues and furnaces

Safety procedures for entry into flues or furnaces shall be similar to those for entry into pressure equipment systems (see Clause 2.2.3).

2.2.5 Hot work on pressure equipment systems

All hot work, such as oxy-cutting, welding and grinding, shall be carried out in accordance with safe working procedures to control risk of fire, explosion, collapse, or other damage to equipment or persons, in compliance with AS 1674.1, AS 1674.2 and AS 2865.

Prior to the commencement of hot work, a hot work permit shall be obtained or, if no hot work permit system exists, written permission shall be obtained from the owner or the owner's representative.

The permit should document the fire prevention and protection requirements that have been provided prior to beginning the hot work operations. It should indicate the date(s) authorized for hot work, the duration of the permit and identify the object on which hot work is to be performed. The permit should be kept on file until completion of the hot work operations, or in the event of an emergency arising or an incident happening, until an investigation is completed.

2.2.6 Static electricity

Where static electricity may be generated by the process or work, suitable precautions shall be instigated, and the static electricity should be discharged in accordance with AS/NZS 1020.

2.2.7 Cooling pressure parts by hosing

Except in an emergency, no pressure part should be hosed with cold water to reduce its temperature quickly, otherwise major, immediate or unforeseen damage may occur.

2.2.8 Isolation from an existing system

Where it is necessary to connect to an existing operating system, suitable provisions shall be made to isolate all pressure sources from the new work until completion of the installation. The provisions shall be located between the vessel and each connected source of pressure.

Isolation of all connecting parts of the system shall be undertaken by the following:

- (a) One stop valve and a blanking plate.
- (b) Two stop valves with an atmospheric vent between; both stop valves shall be chained and padlocked in the closed position. The keys shall be retained by the appropriate personnel.
- (c) The removal of a section of interconnecting pipework.

2.2.9 Isolation from liquid-filled equipment

Provisions for isolation shall be located between the equipment and each connected source of pressure. Isolation procedures for liquid-filled pressure equipment shall not cause excessive pressure build-up.

This may be achieved by —

- (a) pressure protection devices remaining in service when liquid-filled pressure equipment is isolated;
- (b) liquid-filled pressure equipment being partially drained to allow for thermal expansion; or
- (c) pressure equipment being depressurized and vented, and the provision of blanks on the pipe flanges immediately upstream and downstream of any removed pipe section or equipment.

Caution is required when draining or venting to prevent failure due to vacuum.

2.2.10 Risk management

Risk assessment shall be performed which identifies hazards that may arise from, and during, the installation of pressure equipment and its interaction with any existing system. See AS 3873 and AS/NZS 4360.

The risk assessment should be reviewed where changes are made to the existing pressure equipment system and new equipment is added to the system.

Risk documentation with reference to hazard analysis risk assessments and changes should be retained for a period of at least two years. Such documentation should be appropriate to the complexity of the system and should comply with the risk assessment statements included in the relevant pressure equipment Standards.

2.2.11 Control of risk

Measures to control risks to an acceptable low level should be implemented or adequate safeguards to minimize the possibility of accidents should be provided.

A procedure for the timely investigation and analysis of any problem arising from the installation of pressure equipment should be established and for the instigation of the necessary corrective action. Each corrective action should be documented to identify that action has been taken and is effective, and the relevant notification given.

2.3 PROTECTION OF EQUIPMENT

The management system, automatic control system and other operating or safety, or both, systems for pressure equipment shall be adequately protected during installation. Conditions which may cause deterioration or damage include the following:

- (a) Weather conditions.
- (b) Dust or atmospheric pollutants.
- (c) Unauthorized tampering. Security facilities should be provided for outdoor installations.
- (d) Any physical cause, such as impact by forklift trucks, cranes or from materials being lifted and shifted.

2.4 MANAGEMENT SYSTEMS

A management system for the installation of pressure equipment should be implemented and maintained to satisfy the needs and objectives of the organization and be appropriate to the equipment to be installed and the processes, size and structure of the organization.

The management system may be used by the organization to demonstrate its ability to meet the installation requirements.

NOTE: A guide to management systems for installation of pressure equipment is given in Appendix C.

SECTION 3 INSTALLATION, ORGANIZATION AND PERSONNEL

3.1 GENERAL REQUIREMENTS

3.1.1 General

The scope of the installation shall be defined to ensure that the equipment and services provided by the installer achieve the desired outcome, and where appropriate, comply with the relevant requirements of this Standard.

Organizations or personnel consulted on the design, installation coordination and other technical or safety aspects of the installation, should have the necessary qualifications, competence and experience to provide engineering advice that will ensure compliance with all of the relevant Standards and specifications.

When various parts of the installation are to be carried out by different organizations, measures shall be taken to ensure compatibility between separate parts, components or services.

Safe work practices shall be developed and implemented to control the entrance, presence and exit of the personnel in all process areas involved with installation.

3.1.2 Instruction

Necessary drawings, documentation, site details, instructions and any other special information, including information from equipment and the system suppliers, safety information and instructions applicable to the supplied equipment and services shall be provided.

All necessary safety information and instructions applicable to the supplied equipment and services shall be obtained from the designer, manufacturer and installer.

3.2 INSTALLATION

3.2.1 General

The installation of the pressure equipment and associated plant shall be in accordance with requirements in Clauses 2.1 and 2.2. Unless otherwise specified, this shall include associated checks and inspections. The relevant organizations shall be advised of any unique hazards that could be presented by the installation work, or if any hazards relating to the pressure equipment are found during the installation work.

The information provided on-site should include the following:

- (a) Necessary information to enable the equipment to be installed so as to eliminate or minimize risks.
- (b) All relevant emergency provisions and safe work practices operative at the site from potential fire, explosion or toxic release hazards related to the installation of pressure equipment.

3.2.2 Training and competency documentation

Personnel shall receive appropriate training in the current installing procedures. A record shall be kept which contains the identity of the employee, date and details of the training, the means to verify that the employee has understood the training and the competency level attained.

NOTE: See Appendix D for a guide for competency of installers.

SECTION 4 INSTALLATION OF BOILERS

4.1 HOUSING

4.1.1 Protection

Unless the boiler complies with the requirements of Clause 4.9 for outdoor installation, the boiler shall be housed in a boiler house, room or other suitable enclosure that provides adequate protection from weather and security from unauthorized access (see Clause 4.3.8).

4.1.2 Floors

Floor surfaces and treads of stairs and ladders shall be of such material and construction as to provide a firm footing when wet. Materials should be fire-resistant.

4.1.3 Drainage

The surface upon which the setting of a boiler is placed shall be properly drained. Drainage from roofs, steam pipes and other sources shall be led away from supports and settings. Settings shall be sloped and channelled to prevent water from remaining in contact with any part of the boiler or boiler supports.

Adequate drains shall be provided for steam, water, and compressed air pipes and fittings. Free-flow drains required for warming up steam pipes and any hazardous drains shall be piped to a safe discharge point. Flashing mixtures (e.g. from the gauge glass or boiler blowdown) shall not be discharged directly into floor drains or trenches.

Provision should be made for floor channels to be drained and carry all floor level pipes without impeding access around the boiler. Pipes in floor channels should be arranged to prevent external corrosion.

Provisions should be made to trap liquids and prevent their entry into public drains.

NOTE: The installation of a suitable drip-tray under the boiler will satisfy the drainage requirement.

4.2 FOUNDATIONS AND SUPPORTS

4.2.1 General

Each boiler shall be provided with suitable foundations, appropriate fastenings and supports. The foundations and structures shall be constructed to withstand any loads and forces transmitted to them, including inherent loading in the structure; loading imposed through expansion of the boiler, vessels or pipework; loading due to other equipment; or forces due to wind, earthquake or other external forces, or as specified by the purchaser.

Foundations shall be sized in accordance with soil conditions and reinforced to carry all loads and forces imposed without settling or distortion that would affect the safety or serviceability of the installation.

Every supporting column or beam shall be protected from any furnace heat by suitable refractory material or effective air spaces. Steel supports should not be heated to a temperature of more than 300°C. Concrete should not be heated to a temperature of more than 200°C.

Provision shall be made for free expansion of the boiler, where applicable.

All foundations shall be of material not substantially affected by water or oil.