



Hunter Water Corporation ABN 46 228 513 446

Standard Technical Specification for:

<p style="text-align: center;">STS 650 PRESSURE EQUIPMENT</p>

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Standard – STS 650 PRESSURE EQUIPMENT

1 Purpose

This standard technical specification (STS) details the requirements of Hunter Water Corporation (Hunter Water) for the design, manufacture, installation, modification and commissioning of pressure equipment that is, or is to become, the property of Hunter Water.

These specifications are available from the Hunter Water website: www.hunterwater.com.au.

1.1 Scope

STS 650 Pressure Equipment applies to fixed asset pressure equipment that is supplied, installed or modified, and that is to be owned or controlled by Hunter Water.

Pressure equipment is defined in STS650 as in AS/NZS 1200 as:

- Pressure equipment is a pressure vessel or pressure piping to which AS/NZS 1200 applies and having a hazard level of A, B, C or D according to AS4343. Examples include but are not limited to air receivers, air compressors, autoclaves, boilers, pressurised storage tanks, fired heaters and heritage boilers.

1.2 Excluded Equipment

The scope does not include:

- Pipework. Pipework is addressed in Hunter Waters STS600;
- Gas cylinders covered under the *AS 2030 Gas Cylinders* series, up to a volume of 3000L;
- Other equipment as set out or excluded in Appendix A3 of *AS 1200 Pressure Equipment*.
- Domestic-type hot water heaters;
- Hydraulically actuated equipment, including hydraulic cylinders and rams;
- Hydraulic pressure vessels, including inert gas-type 'dampers', shock absorbers, or accumulators, in which the product of pressure (MPa) and gas volume (L) does not exceed 30 MPaL;
- Portable fire extinguishers;
- Pressurised machines such as compressors and pumps;
- Storage tanks designed for storage of liquids at atmospheric pressure.

2 Interpretation

For the purposes of interpreting *STS 650 Pressure Equipment*, except where the context requires otherwise:

- 'drawings' means the drawings detailing the work involved in a particular project in hand
- 'include' means including, but not limited to, and is used to provide clarification or examples of the type and nature of items intended
- 'specification' means a specification detailing the work involved in a particular project
- 'standard drawings' means Hunter Water drawings
- 'standards' means applicable industry standards and includes:
 - o Australian Standards (AS)
 - o Australian/New Zealand Standards (AS/NZS)
 - o American National Standards Institute (ANSI) Standards and
 - o International Organization for Standardization (ISO).
- 'standard technical specification' (STS) references any of Hunter Water's standard technical specifications, as implied by the text.

Headings are for the convenience of the reader and shall not be used in the interpretation of this standard technical specification.

Unless otherwise stated, expressions such as 'give notice', 'submit', 'approval', or 'directed' mean 'give notice to', 'submit to', 'approval by', or 'directed by' the person nominated by Hunter Water.

Approval does not imply acceptance of responsibility by Hunter Water for compliance with this STS. Unless issued in writing, approval has not been granted.

Failure to comply with the requirements of this STS or any referred documentation may result in rejection. Where equipment or manufacture are rejected, notice will be given by Hunter Water in writing. All associated rectification work shall be completed by the contractor at their cost.

2.1 Order of precedence

All work shall meet all stated requirements in this STS in addition to project specifications or standards specified.

Any deviation from this STS shall be approved in writing on a case by case basis by Hunter Water's Document Owner.

The order of precedence for this STS are, from high to lowest:

- Legislative requirements
- Content in this STS
- Australian Standards

3 Roles and responsibilities

3.1 Document Owner

The Document Owner of this Hunter Water STS for pressure equipment is Hunter Water's Manager Capability Engineering.

3.2 Responsibilities

The Document Owner shall approve the issue of any updated version of this STS in writing.

Any concession to any requirement in *STS 650 Pressure Equipment* is valid only when authorised in writing by the Document Owner.

4 Definitions

Where the following term, abbreviation, or expression occurs in this STS, it is defined as follows, unless the context implies otherwise.

Term, Abbreviation, Expression	Definition
AICIP	Australian Institute for the Certification of Inspection Personnel
AS	Australian Standard
ASME	American Society of Mechanical Engineers
AS/NZS	Australian and New Zealand Standard
Designer	The person performing design in relation to plant, a substance or a structure, including <ol style="list-style-type: none"> a. Design of part of the plant, substance or structure, and b. Redesign or modify a design (Definition as per WHS Act 2011 (NSW))
EN	European Standard
Hazard	A source, situation, or act with the potential for harm resulting in human injury or ill health, damage to property or the environment, or a combination of any of these.
Hazard level	Hazard level as per AS 4343
Hunter Water	Hunter Water Corporation
Hydropneumatic accumulator	Accumulators with a flexible bladder as a separation element between compressible gas cushion and operating fluid
ISO	International Organization for Standardization
OEM	Original equipment manufacturer
Pressure equipment	Definitions of pressure equipment and all pressure equipment types are as per AS/NZS 1200 or AS 4942, whichever is applicable.
Relief valve	Relief valves also includes safety valves
Risk assessment	The overall process of risk identification, risk analysis and risk evaluation
WHS	Work, health and safety

5 Pressure Equipment Requirements

Pressure equipment must be:

- designed, manufactured and installed to ensure a minimum design life of 20 years;
- designed for the lowest hazard level possible, whilst meeting the operational requirements.

Boilers and pressure vessels:

- must not be hazard level de-rated based on location by designers, i.e. for boilers and pressure vessel, calculation of the hazard level must only consider contents, pressure and volume.
- vessels with hazard levels of B, C, D, or E only must be installed at Hunter Water facilities. Pressure vessels of hazard level A must not be installed at Hunter Water facilities, due to the associated risks. Where the storage requirement exceeds that of a hazard level B vessel, install additional vessels as required to achieve hazard level B.

Any revision of hazard level from the manufacturer's advice shall be risk assessed and verified by an AICIP-certified inspector. Guidance material for a pressure vessel risk assessment is available in Appendix C of AS 1210 Pressure Vessels.

5.1 Pressure Vessel Design and Manufacture

Pressure vessels must be designed, manufactured, and tested in accordance with the requirements of either *AS 1210 Pressure Vessels* or *AS 2971 Serially Produced Pressure Vessels*. Where *AS 1210* allows the use of the international standards *ASME Section VIII, Division 1* and *BSI PD5500*, these alternative standards must only be used if evidence is provided by the manufacturer that the design has been assessed and conforms to the requirements of *AS 1210 Pressure Vessels*.

5.2 Pressure Vessel Installation

Pressure vessels must be installed with markings, protective devices and other fittings in accordance with the requirements of *AS 1210 Pressure Vessels*, regardless of the standard of design/manufacture.

5.3 Boiler Requirements

Boilers must be designed, manufactured, installed and tested to the Australian boiler standard *AS 1228 Pressure Equipment – Boilers*, or the international boiler standard *ASME BPVC Section I*.

5.4 Air Receivers

Air receivers must have a pressure relief valve(s) to relieve pressure from external energy sources. Relief valves may be fitted to connecting pipework, any isolation valves between the accumulator and the relief valve that do not simultaneously isolate the vessel from the energy source shall be lockable in the open position by padlock.

A pressure gauge that meets the requirements of *AS 1210 Pressure Vessels* shall be provided to display air pressure for each air receiver.

5.5 Air Receivers

Air receivers must be manufactured from:

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- Carbon steel manufactured to an grade as specified in *AS 1210 Pressure Vessels* and protected with an epoxy coating in accordance with the requirements of *WSA-201 Manual for Selection and Application of Protective Coatings*, or
- Galvanised carbon steel manufactured to an appropriate grade as specified in *AS 1210 Pressure Vessels*.

Air receivers larger than 150 L capacity:

- must be fitted with an automatic condensate drain together with a separate manual ball valve drain off a tee connection;
 - Automatic drains must be connected to an oil and water separator unit, where the compressor contains oil;
 - Water from the separator can drain to site stormwater systems, however draining to wastewater systems is preferred.
 - The condensate water, without an oil/water separator must drain to the site wastewater system

5.6 Accumulators

Accumulators must have:

- An epoxy coating in accordance with the requirements of *WSA-201 Manual for Selection and Application of Protective Coatings*;
- protection from over pressure by means of a pressure relief valve, unless:
 - a documented risk assessment in accordance with AS1210 identifies a that a pressure relief valve is not required.

5.7 Hydro-pneumatic Accumulators

Hydro-pneumatic accumulators must:

- Have a capacity of less than 150L;
- Have a WorkSafe NSW Design Registration if they are rated at a Hazard Level of C, D or E, in lieu of compliance to AS-1210;
- Be rated for a pressure that is a minimum of 50 per cent higher than the shut-off head of the associated upstream system, such that a failure in the control system cannot over-pressurise the accumulator;
- Be permanently marked with the design pre-charge pressure specific to the application;
- Be protected from over pressure by means of a pressure relief valve, unless:
 - a documented risk assessment in accordance with AS1210 identifies a that a pressure relief valve is not required,
- Be externally protected with a painted coating.

5.8 Relief and Safety Valve Requirements

This section applies to relief and safety valves used to protect pressure vessels or boilers from over pressurisation. Any reference hereafter to relief valves also includes safety valves.

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Relief valves must be:

- Designed, manufactured and installed in accordance with the requirements of *AS 1271 Safety Valves, Other Valves, Liquid Level Gauges and Other Fittings for Boilers and Unfired Pressure Vessels*, *AS 1210 Pressure Vessels* and other applicable Australian Standards;
- Installed vertically;
- Installed with a silencer where it will be greater than 85dBA when operated
- Either brass or grade 316 stainless steel. The operating environment must be considered when selecting appropriate pressure relief valve materials. If neither brass nor grade 316 stainless steel is appropriate for the operating environment then an alternative shall be recommended to Hunter Water for approval prior to installation;
- Permanently marked or provided with a tag displaying the following information:
 - device name, type and tag number
 - manufacturer and serial number
 - nominal size (DN)
 - set pressure (in kPa)
 - test date or date of manufacture.
- Right-angled outlet valves. Circumferentially venting pressure relief valves must only be used for valves less than 26 mm in diameter that are located in dry, clean, indoor environments;

6 Modification of Pressure Equipment

Modification of pressure equipment must ensure compliance with the Australian Standard relevant to the equipment.

7 Commissioning of Pressure Equipment

7.1 Pre-commissioning

The pre-commissioning of pressure equipment installation or modification must include:

- Completion of inspections required by *AS/NZS 3788 Pressure Equipment – In-service Inspection*.
 - Inspections completed by AICIP certified inspectors for pressure vessels, boilers and pressure relief valves as required by and in accordance with *AS/NZS 3788 Pressure Equipment – In-service Inspection*.
- Rectification of deficiencies identified in the *AS/NZS 3788 Pressure Equipment – In-service Inspection* commissioning inspection or from the pre-commissioning checklist (Appendix B: Boiler and Pressure Vessel – Pre-commissioning Checklist)
- Submission of a signed and completed pre-commissioning checklist as per Appendix B: Boiler and Pressure Vessel – Pre-commissioning Checklist to Hunter Water.

7.2 Registration of Pressure Equipment

Boilers and pressure vessels with a hazard level of:

- A, B or C must be 'item registered' with SafeWork NSW under the Work Health and Safety (WHS) Regulation 2017.
- A, B, C, or D must be 'design registered' with SafeWork NSW under the WHS Regulation 2017 prior to installation at any Hunter Water site.

All registration processes must be completed prior to undertaking pre-commissioning or any on-site pressurisation of the equipment.

7.3 Commissioning

Pressure equipment must be commissioned in accordance with AS1200 and the manufacturers commissioning procedure.

8 Decommissioning or Disposal

Decommissioning and disposal of boilers and pressure vessels must be have a risk assessment and safe work method statement. The risk assessment and safe work method statement must address, as a minimum:

- depressurisation of the boiler or pressure vessel
- purging of contents
- no harm to the environment
- removal of the serial number and any other unique identification markings
- rendering the boiler or pressure vessel unusable or inoperable
- the safety of personnel doing the work.

For each boiler or pressure vessel to be disposed of, submit to Hunter Water a signed and completed pressure vessel decommissioning checklist for each vessel. Refer Appendix C: Boiler and Pressure Vessel – Decommissioning .

Hunter Water shall submit Appendix C to SafeWork NSW with a brief covering letter or email to de-register the boiler or pressure vessel. This is to be recorded in Hunter Water's document management system.

9 Boilers and Pressure Vessels – Documentation Requirements

Pressure equipment must have documentation provided compliant with STS903 and STS906. This section details the additional documentation requirements for boilers and pressure vessels.

9.1 Site Hard Copy Documentation Requirements

At pre-commissioning for each boiler or pressure vessel supplied, installed or modified provide the following documentation in electronic format & hardcopy:

- In-service inspection report by an AICIP approved inspector (where a commissioning inspection is required by *AS/NZS 3788 Pressure Equipment – In-service Inspection*);
 - Install the report securely on site near the vessel in a weatherproof display box or frame.
- registration certificate from SafeWork NSW (for boilers or pressure vessels with a hazard level B or C)
 - Install the certificate securely on site near the vessel in a weatherproof display box or frame.

9.2 O&M Documentation Requirements

Operation and Maintenance documentation for boilers and pressure vessels supplied, installed, or modified at Hunter Water must comply with Hunter Water's *STS 906 Operation and Maintenance Manual Requirements*. In addition, the following documentation must be provided:

- Manufacturer's data report (or equivalent statement of compliance with equipment standard);
- Designer's or manufacturer's risk and safety information and instructions;
- Pre-commissioning in-service inspection report by an AICIP-approved inspector (if required by *AS/NZS 3788 Pressure Equipment – In-service Inspection*);
- Design registration certification and design verification documentation for boilers and pressure vessels with hazard levels B, C, or D;
- Item registration certification for boilers and pressure vessels with hazard levels B or C;
- a documented risk assessment for each pressure vessel installed or modified, that includes determination of the hazard level, including consideration of the location near other equipment in which it is installed and the frequency with which workers are expected to be in the vicinity, for boilers and pressure vessels of hazard level B or C.
- for modified boilers or pressure vessels:
 - engineering verification report demonstrating that modifications to any pressure vessels have been designed and implemented in accordance with the relevant Australian Standards

10 Related Documents

In addition to *STS 650*, all work must comply with relevant current standards and regulations inclusive of all amendments. In particular:

- Workplace Health and Safety Regulations
- WorkCover NSW Codes of Practice
- Safe Work Australia Model Codes of Practice
- Hunter Water's Design Manuals
- Hunter Water's Standard Technical Specifications
- Hunter Water's Standard Drawings

Appendix A: Standards is a list of Standards referenced in this specification and other Standards relevant to the scope.

11 Document control

Document Controller: Manager Engineering Capability

Version	Date	Author	Details of change	Approval date	Approved by	Next scheduled review
1.0	August 2017	R Lonergan	Initial release	01/11/2017	D Cleary	August 2019
2.0	September 2018	R Lonergan	Section 5.5 and 8.4	24/09/2018	S Horvath	September 2020
3.0	October 2020	G Moore	Re-drafted	October 2020	L Backhausen	October 2022

Appendix A: Standards

The documents listed below and in Appendix C of AS/NZS 1200 are deemed relevant to pressure equipment within STS 650. This is not an exhaustive list.

Reference number	Title
AS/NZS 1200	Pressure equipment
AS 1210	Pressure vessels
AS 1228	Pressure equipment – Boilers
AS 1271	Safety valves, other valves, liquid level gauges and other fittings for boilers and unfired pressure vessels
AS 1358	Bursting discs and bursting disc devices – Application, selection and installation
AS 2030	Gas cylinders
AS 2337	Gas cylinder test stations
AS 2593	Boilers – Safety management and supervision systems
AS 2971	Serially produced pressure vessels
AS/NZS 3788	Pressure equipment – In-service inspection
AS 3873	Pressure equipment – Operation and maintenance
AS 3892	Pressure equipment – Installation
AS 3920	Pressure equipment – Conformity assessment
AS 4037	Pressure equipment – Examination and testing
AS 4041	Pressure piping
AS 4343	Pressure equipment – Hazard levels
AS 4458	Pressure equipment – Manufacture
AS 4942	Pressure equipment – Glossary of terms
AS/NZS 1170.0	Structural design actions, Part 0: General principles
AS/NZS 1170.2	Structural design actions, Part 2: Wind actions
AS 1170.4	Structural design actions, Part 4: Earthquake actions in Australia
AS 3600	Concrete structures
AS 4100	Steel structures
AS 3990	Mechanical equipment steelwork
AS/NZS 2312	Guide to protection of steel by use of protective coatings
AS/NZS 3992	Pressure equipment – Welding and brazing qualification

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Reference number	Title
AS/NZS 5601	Gas installations
AS/NZS 60079	Explosive atmospheres
ASME BPV-I	Boiler and pressure vessel code, Section I, Rules for construction of power boilers
ASME BPV-V	Boiler and pressure vessel code, Section V, Non-destructive examination
ASME BPV-VIII-1	Boiler and pressure vessel code, Section VIII, Rules for construction of pressure vessels, Division 1
ASME BPV-VIII-2	Boiler and pressure vessel code, Section VIII, Rules for construction of pressure vessels, Division 2: Alternative rules
ASME BPV-IX	Boiler and pressure vessel code, Section IX, Qualification standard for welding and brazing procedures, welders, brazers and welding and brazing operators
ASME X	Fibre-reinforced plastic pressure vessels
ASME B31.1	Power piping
ASME B31.3	Process piping
BSI PD5500	Specification for unfired fusion welded pressure vessels

Appendix B: Boiler and Pressure Vessel – Pre-commissioning Checklist

Boiler and pressure vessel pre-commissioning checklist	
Site: HWC vessel ID:	
Vessel description: Serial number:	
Check the following items	Initial as complete and comments
Protective device (for example, relief valve) is provided and is rated appropriately for design pressure of vessel and flow rate	
Any relief valve(s) are marked/tagged with: [Device name, type and tag number]; [Test date or date of manufacture]; [Set pressure (in kPa)]; [Manufacturer and its serial number]; [Nominal size (DN)] as required under AS 1271	Relief valve set pressure:
Pressure gauge is fitted to vessel as per requirements of AS 1210 (required if vessel is fitted with a pressure relief device)	
Automatic condensate drains are provided for air receivers upstream of air dryers and >150L, or at unmanned sites	
Boiler or pressure vessel is marked as compliant to an approved Australian Standard (for example, AS 1228 or AS 1210)	
For pressure vessels: Permanently marked as per requirements of AS 1210 including: [manufacturer]; [design pressure]; [test pressure]; [test date]; [hazard level]; [serial number]; [design approval number for vessels with hazard level A,B, C or D]	
Boiler or pressure vessel is permanently labelled with Hunter Water’s vessel identification number, as per STS 600	
Where required by AS 3788, commissioning inspection report by qualified AICIP inspector is securely stored near equipment and has been electronically submitted to Hunter Water	
SafeWork NSW equipment item registration certificate is securely stored near equipment with hazard level A, B or C	

Contractor’s representative
 Name:
 Position:
 Company:
 Signature:
 Date:

Hunter Water Mechanical Engineer
 Name:
 Position:
 Signature:
 Date:

Appendix C: Boiler and Pressure Vessel – Decommissioning Checklist

Boiler and pressure vessel decommissioning checklist	
Site: HWC vessel ID:	
Vessel description: Serial number:	
Complete the following items	Initial as complete and comments
Applications notifying SafeWork NSW of removal or disposal of any pressure equipment with hazard level A, B or C have been prepared and submitted to Hunter Water (ready for Hunter Water to submit to SafeWork NSW)	
Identification markings removed from any pressure vessels being disposed of	
Pressure vessels being disposed of rendered unusable	
Details of what has been done with the disposed pressure equipment listed (for example, scrapped for scrap metal)	
Remaining connecting piping and equipment are safe to operate and the site has been tidied up and made safe to work in	
Decommissioning documentation of changes to current systems has been prepared and submitted to Hunter Water for records	

Contractor’s representative

Name:

Position:

Company:

Signature:

Date:

Hunter Water Mechanical Engineer

Name:

Position:

Signature:

Date: