



Charles Sturt
University

Revision 1.0

Infrastructure Design Standards

Module S12: Hydraulic

Division of Finance (Strategic Infrastructure)
Charles Sturt University

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1. Introduction

1.1. Overview

The Charles Sturt University Infrastructure Design Standards (the Standards) outline the University's expectations for its built forms to achieve consistency in the quality of the design and construction of those built forms.

The Standards have been developed to provide guidance to the design team and to assist Facilities Management to drive a consistent approach to the design, construction, commissioning, handover, and operation of new capital projects to ensure the new asset is fully integrated into campus life and conforms to the University's standards and policies.

The successful integration of any new project into the day-to-day operation of campus life cannot be underestimated and is vital to ensuring the new asset provides a fully functional platform for Facilities Management clients and the University. The Standards will ensure Facilities Management is successful in supporting the University's strategic objectives now and into the future. The pitfall of viewing any new project as a standalone entity must be avoided as any new project is an extension of the existing campus.

The Standards are aligned with Charles Sturt's requisites for aesthetic appeal, life cycle maintenance and environmental sustainability, while ensuring that there is sufficient scope for innovation and technological advancements to be explored within each project.

1.2. The University

The history of Charles Sturt University dates to 1895, with the establishment of the Bathurst Experiment Farm. Formed progressively through the merge of regional institutions in south-western and western NSW, Charles Sturt was formally incorporated on 19 July 1989 under the Charles Sturt University Act 1989. As one of Australia's newer universities, Charles Sturt has been built on a tradition of excellence in teaching and research spanning more than 100 years.

With over 40,000 current students studying both on-campus and online, Charles Sturt University is the largest tertiary education institution in regional Australia. The University operates six main campuses across New South Wales in Albury-Wodonga, Bathurst, Dubbo, Orange, Port Macquarie, and Wagga Wagga, alongside specialist campuses in Canberra, Parramatta, and Goulburn. Charles Sturt University is structured around three Faculties: Arts and Education; Business, Justice and Behavioural Sciences; and Science and Health.

1.3. University Vision and Values

Charles Sturt University is committed to building skills and knowledge in its regions by offering choice and flexibility to students, while collaborating closely with industries and communities in teaching, research, and engagement. As a significant regional export industry, the University brings both strength and learning back to

its regions, positioning itself as a market-oriented institution. Its goals are to remain the dominant provider of higher education in its regions and a sector leader in flexible learning.

Charles Sturt University believes that wisdom has the power to transform communities. With perseverance and dedication, the University contributes to shaping resilient and sustainable regions for the future. Acknowledging the deep culture and insight of First Nations Australians, the University's ethos is encapsulated by the Wiradjuri phrase *yindyamarra winhanganha*, which translates to "the wisdom of respectfully knowing how to live well in a world worth living in." Through its values, Charles Sturt University fosters a welcoming community and learning environment that supports innovation, drives societal advancement, and gives back to the regions it serves.

1.4. Using the Infrastructure Design Standards

The Infrastructure Design Standards are written to advise Charles Sturt University performance requirements and expectations that exist above and beyond existing industry codes and standards.

The Infrastructure Design Standards do not repeat codes and standards.

Performance to Codes and Standards are a non-negotiable regulatory minimum of any design solution, to be determined for each project by the design team.

The Standards are to be used by all parties who are engaged in the planning, design, and construction of Charles Sturt's facilities. This includes external consultants and contractors, Charles Sturt's planners, designers, and project managers as well as faculty and office staff who may be involved in the planning, design, maintenance, or refurbishment of facilities. All projects must comply with all relevant Australian Standards, NCC, EEO as well as Local Government and Crown Land Legislation.

1.5. Modules

The Standards are divided into the following modules for ease of use, but must be considered in its entirety, regardless of specific discipline or responsibilities:

- **S01 Overview and Universal Requirements**
- S02 Active Transport
- S03 Acoustics
- S04 Building Management System
- S05 Electrical and Lighting
- S06 Energy Management
- S07 Ergonomics
- S08 Fire and Safety Systems
- S09 Floor and Window Coverings
- S10 Furniture
- S11 Heritage and Culture
- S12 Hydraulic

- S13 Information Technology
- S14 Irrigation
- S15 Mechanical Services
- S16 Roof Access
- S17 Termite Protection, Vermin Proofing and Pest Management
- S18 Security Systems
- S19 Signage
- S20 Sustainable Building Guidelines
- S21 Waste Management
- S22 Project Digital Asset and Data Requirements
- S23 Commissioning, Handover and Training

1.6. Related Documents

1.6.1. University Documents

The Standards are to be read in conjunction with the following relevant University documents, including but not limited to:

- Facilities and Premises Policy along with supporting procedures and guidelines
- Charles Sturt University Accessibility Action Plan 2020 - 2023
- Relevant operational and maintenance manuals
- Charles Sturt University Asbestos Management Plan
- Charles Sturt University Signage Guidelines
- Charles Sturt University Modern Slavery Statement
- Charles Sturt University Sustainability Statement
- Charles Sturt University Work Health and Safety Policy
- Charles Sturt University Risk Management Policy
- Charles Sturt University Resilience Policy
- Charles Sturt University Health, Safety and Wellbeing Policy

1.6.2. Federal Legislation

The planning, design and construction of each Charles Sturt University facility must fully comply with current relevant Federal legislation, including but not limited to:

- National Construction Code (NCC)
- Disability Discrimination Act 1992 (DDA)
- Environment Protection and Biodiversity Conservation Act 1999 (EPBC)
- Work Health and Safety Act 2011

1.6.3. NSW State Legislation

The planning, design and construction of each Charles Sturt University facility must fully comply with current relevant Federal legislation, including but not limited to:

- Work Health and Safety Act 2011
- Environmental Planning and Assessment Act 1979 (EP&A Act)
- Building and Development Certifiers Act 2018
- Heritage Act 1977
- Protection of the Environment Operations Act 1997 (POEO Act)
- Design and Building Practitioners Act 2020
- State Environmental Planning Policies (SEPPs)
- Local Government Act 1993

1.6.4. Federal Regulations and Standards

- Relevant Australian or Australian/New Zealand Standards (AS/NZS)
- Safe Work Australia Model Codes of Practice
- Work Health and Safety Regulations 2011
- Disability (Access to Premises – Buildings) Standards 2010
- National Environment Protection Measures (NEPMs)

1.6.5. NSW State Regulations and Standards

- SafeWork NSW Codes of Practice
- Disability (Access to Premises – Buildings) Standards 2010
- Building and Development Certifiers Regulation 2020
- NSW Work Health and Safety Regulation 2017
- Protection of the Environment Operations (General) Regulation 2022
- NSW State Environmental Planning Policies (SEPPs)
- Fire and Rescue NSW Fire Safety Guidelines
- NSW Local Council Development Control Plans (DCPs)

1.6.6. Manufacturer Specifications and Data Sheets

All installation must be carried out in accordance with manufacturer specifications and data sheets to ensure product performance over its intended life and so as not to invalidate any warranties.

1.6.7. Project-Specific Documents

Requirements specific to a particular project, campus, or other variable, will be covered by project specific documentation, such as client briefs, specifications, and drawings. These Standards will supplement any such

project specific documentation. The Standards do not take precedence over any contract document, although they will typically be cross-referenced in such documentation.

Extracts from the Standards may be incorporated in specifications; however, it must remain the consultant's and contractor's responsibility to fully investigate the needs of the University and produce designs and documents that are entirely 'fit for purpose' and which meet the 'intent' of the project brief.

1.7. Discrepancies

The Standards outline the University's generic requirements above and beyond the above-mentioned legislation. Where the Standards outline a higher standard than within the relevant legislation, the Standards will take precedence. If any discrepancies are found between any relevant legislation, the Standards and project specific documentation, these discrepancies should be highlighted in writing to the Manager, Capital Works.

1.8. Departures

The intent of the Standards is to achieve consistency in the quality of the design and construction of the University's built forms. However, consultants and contractors are expected to propose 'best practice / state of the art' construction techniques, and introduce technological changes that support pragmatic, innovative design. In recognition of this, any departures from relevant legislation, or the Standards, if allowed, must be confirmed in writing by the Manager, Capital Works. Any departures made without such written confirmation shall be rectified at no cost to the University.

1.9. Professional Services

All projects at Charles Sturt University require the involvement of adequately skilled and experienced professionals to interpret and implement the Standards. Consultants or contractors lacking proper qualifications and licenses are not permitted to conduct any work.

1.10. Structure of Document

This document is structured into 4 sections:

Section 1 Introduction (this Section).

Section 2 General Requirements – outlines the general requirements or design philosophies adopted at Charles Sturt University.

Section 3 Supporting Documentation – Legislation, Standards, Codes of Practice, University Policies, and other applicable technical references.

Section 4 Specifications (if applicable) – materials specifications and/or preferred lists for materials, processes or equipment used by Charles Sturt University.

2. General Requirements

2.1. Existing Service Details

Prior to completion of the works the contractor shall update the master services reticulation site layout plan and submit to the University for approval. Prior to completion of the works the contractor shall update the site Hydrant Block Plan to the approval of the relevant compliance authority. This shall include the updating and replacement of the associated existing external signage in a format equal to or better than the existing site Hydrant Block Plan.

2.2. Freshwater Supply

Reduced Pressure Zone (RPZ) devices and thermostatic mixing valves shall be positioned within a stainless-steel lockable enclosure. The position of the devices shall be lower than 1.8m to allow easy access to the cabinet and provide sufficient room around the devices for maintenance tasks to be performed. The service layout design shall be carefully considered to ensure that the least number of devices is required to meet regulation.

2.3. Water Pumps

Residual Grundfos pumps are preferred manufacturer.

2.4. Drinking Water Stations

The project design shall consider inclusion of an external refrigerated drinking water station with a high water and energy efficiency rating. This is part of the University's sustainability initiative to reduce the purchase of bottled water and water stations shall be no more than 100-150 metres apart.

Allow for signage adjacent to each water station as specified by the signage guidelines.

Hot and cold water beverage making facilities in tea rooms and common rooms shall use the Zip Hydro Tap model similar to HT1507 or for boiling water only, the Zip Autoboil, Hydroboil or Econoboil on wall model best suited for the application and use.

2.5. Potable Hot Water

Copper HW reticulation (pre-lagged). Inspection, testing & treatment is applied in accordance with code requirements for appropriate systems.

2.6. Architectural Fittings

The following specifications outline the requirements for architectural fittings across all projects. These fittings have been selected to ensure durability, sustainability, and compliance with relevant standards. Each product type is intended to align with the university's commitment to environmentally sustainable design (ESD) while

maintaining high-quality functionality and aesthetic consistency throughout educational and residential facilities.

- **WC:** Vitreous china pedestal pan with a wall-mounted dual flush cistern, similar to Caroma.
- **Urinals:** Waterless urinals should be considered as part of the Environmentally Sustainable Design (ESD) initiatives for each project. Acceptable systems for Charles Sturt University (CSU) include:
 - Uridan non-water urinal system
 - Caroma H2Zero
- **Vanity Sinks:** Vitreous china, similar to Caroma.
- **Tapware:** Chrome-plated brass 'flick mixers' or equivalent, such as from the Grohe range or an alternative supplier that provides tapware suited to educational and residential facilities. All tapware must meet Water Efficiency Labelling Standards (WELS), comply with AS/NZS 3718, and have a minimum 15-year warranty.
- **Fittings:** All exposed fittings must be chrome-plated brass.
- **Vent Pipes:** Internal exposed vent pipes shall be chrome-plated copper.
- **Hand Dryers:** Motion-activated, similar to those used by McDonald's.
- **Toilet Paper Dispenser:** Double Jumbo Roll Dispenser (Code: 4913).
- **Hand Soap Dispensers:** To be provided by the Principal for installation. Hand soap dispensers - provided by Principal for installation.

2.7. Sewer Reticulation System

Cement pipes for larger mains, PVC for smaller mains, round concrete pits, light weight cast iron cellular round airtight lids, identified as 'sewer' on lid.

2.8. Trade Waste

Maintenance of system, both statutory and preventative, is to be with the installing contractor during DLP.

2.9. Stormwater Reticulation System

Fibrous cement pipes, square concrete pits, and lightweight cast iron square cellular lids labelled as 'stormwater' are to be used for stormwater systems. While there is no specific CSU policy on the use of rainwater, all projects must comply with relevant regulations, Australian Standards, and health guidelines. External pits should be constructed with cast in-situ concrete, and pit lids should be cellular concrete like Gatic. For pits deeper than 900mm, galvanized step irons must be integrated into the pit walls. All exposed external drainage fittings, such as inspection openings (I.O.s), must be brass, as UPVC is not acceptable.

2.10. Greywater Reticulation Systems

In addition to the BCA requirements the minimum provision for conservation measures shall include the Building Sustainability Index (BASIX).

2.11. Natural Gas

Charles Sturt is committed to transitioning away from gas as part of its broader sustainability goals and efforts to reduce its carbon footprint. In line with its Clean Energy Strategy, the university is actively moving towards electrification of its campuses by phasing out gas reliance. Any projects that have the installation of gas services and appliances must be approved by the Manager, Sustainability.

2.12. Redundant Equipment and Services

All surplus hydraulic services and their related components (equipment, electricity, operation mechanisms, water systems, drainage, etc.) must be identified and removed within the scope of the project. Any penetrations are to be sealed to appropriate fire resistance level (FRL), and all building surfaces and finishes must be restored to their original condition.

2.13. Product Lifecycle and Support

All items must be backed by factory-trained service networks both domestically and globally. Equipment and related accessories must be selected from manufacturers with established reliability in production and a documented installation track record in Australia. This track record should include installations with a minimum operational history of eight years, accompanied by detailed reports on operational costs and lifecycle assessments if requested. Additionally, spare parts should be easily accessible with minimal lead times for ordering and delivery with availability for a period of ten years from the original equipment purchase date.

2.14. Water Efficiency Standards

All hydraulic designs must comply with national water conservation initiatives, such as Green Star or NABERS Water. These standards ensure water efficiency across all campus systems, contributing to sustainability goals.

- All external plumbing systems must include smart water meters with the ability to track real-time water usage, supporting data-driven water conservation strategies.
- Fixtures and fittings should meet or exceed the Water Efficiency Labelling and Standards (WELS) rating of 4 stars for toilets and urinals, and 5 stars for tapware and showers.
- Water-efficient landscaping should be considered, utilizing native, drought-resistant plants that require minimal irrigation, with drip systems preferred over traditional sprinklers.

2.15. Alternative Water Systems

The hydraulic design should integrate alternative water sources, such as rainwater harvesting and greywater reuse systems, to supplement non-potable water usage across the campus.

- Rainwater collected from roof catchments should be directed to storage tanks for reuse in irrigation and toilet flushing. Systems should be designed to handle at least 80% of anticipated demand for non-potable applications.

- Greywater systems shall treat wastewater from sinks, showers, and basins to a level suitable for toilet flushing and irrigation. These systems should comply with Australian Standard AS/NZS 1546 for greywater treatment systems, with regular monitoring and maintenance to ensure water quality.
- The design shall include clear signage on water systems to distinguish potable from non-potable sources and educate users on water conservation practices.

2.16. Preventative Maintenance and System Audits

A comprehensive preventative maintenance plan shall be developed for all hydraulic systems, ensuring long-term sustainability and system performance.

- The contractor must establish a maintenance schedule for all major equipment, including pumps, water meters, backflow prevention devices, and hot water systems. This schedule shall be submitted to the Principal prior to project completion.
- Annual audits of hydraulic systems, including water quality testing and pressure checks, shall be conducted to ensure compliance with safety and regulatory standards. The contractor shall provide a report on these audits, identifying potential issues and recommending corrective actions.
- Maintenance protocols should ensure that valves, thermostatic mixing devices, and pumps are regularly tested and serviced in accordance with manufacturer recommendations to prevent system failures and maintain energy and water efficiency.

2.17. Fire Water Supply and Pressure Testing

In addition to compliance with local fire safety regulations, the hydraulic system shall incorporate automated fire water pressure monitoring systems.

Regular pressure tests, flow tests, and hydrant inspections must be conducted as part of the project. Results shall be digitally logged and made available to the Principal and compliance authorities to ensure the system is operating within acceptable safety parameters.

3. Supporting Documentation

These below lists are not all-inclusive and those associated with the project are responsible for identifying and complying with all standards relevant to the scope of works.

3.1. Supporting Legislation

- Work Health and Safety Act 2011 (NSW)
- Work Health and Safety Regulation 2017 (NSW)
- Work Health and Safety Act 2011(ACT)
- Work Health and Safety Regulation 2011(ACT)
- Gas and Electricity (Consumer Safety) Regulation 2018 (NSW)
- Gas and Electricity (Consumer Safety) Act 2017 (NSW)
- Gas Supply Act 1996 (NSW)
- Water Act 1912 (NSW)
- Plumbing and Drainage Act 2011 (NSW)
- NSW Local Government Local Environmental Plans (LEP)

3.2. Supporting Standards

Standard Number	Standard Title
AS 1172.1:2014	Sanitary plumbing products, Part 1: Water closet pans
AS 1172.2:2014	Sanitary plumbing products, Part 2: Flushing devices and cistern inlet and outlet valves
AS/NZS 1221:1997	Fire hose reels
AS 1345-1995	Identification of the contents of pipes, conduits and ducts
AS 1432-2004	Copper tubes for plumbing, gasfitting and drainage applications
AS/NZS 1546.1:2008	On-site domestic wastewater treatment units, Part 1: Septic tanks
AS/NZS 1546.2:2008	On-site domestic wastewater treatment units, Part 2: Waterless composting toilets
AS/NZS 1546.3:2008	On-site domestic wastewater treatment units, Part 3: Aerated wastewater treatment systems
AS 1546.4:2016	On-site domestic wastewater treatment units, Part 4: Domestic greywater treatment systems
AS 1851-2012	Routine service of fire protection systems and equipment
AS/NZS 2243.3:2022	Safety in laboratories, Part 3: Microbiological safety and containment
AS 2419.1:2021	Fire hydrant installations, Part 1: System design, installation and commissioning
AS 2441-2005	Installation of fire hose reels
AS/NZS 2845.1:2022	Water supply - Backflow prevention devices, Part 1: Materials, design and performance requirements
AS/NZS 2982:2010	Laboratory design and construction
AS/NZS 3500.1:2021	Plumbing and drainage, Part 1: Water services

Standard Number	Standard Title
AS/NZS 3500.2:2021	Plumbing and drainage, Part 2: Sanitary plumbing and drainage
AS/NZS 3500.3:2021	Plumbing and drainage, Part 3: Stormwater drainage
AS/NZS 3500.4:2021	Plumbing and drainage, Part 4: Heated water services
AS 3814:2018	Industrial and commercial gas-fired appliances
AS 4775-2007	Emergency eyewash and shower equipment
AS/NZS 5601.1:2022	Gas installations, Part 1: General installations

3.3. Industry Codes of Practice

Plumbing Code of Australia (PCA)

<https://ncc.abcb.gov.au/editions/ncc-2022/adopted/volume-three/5-new-south-wales>

3.4. University Documents

Charles Sturt University Clean Energy Strategy 2030

<https://about.csu.edu.au/sustainability/clean-energy>

3.5. Other Resources

Energy Australia Natural gas safety

<https://www.energyaustralia.com.au/home/electricity-and-gas/energy-saving-and-safety/natural-gas-safety>

NSW Fair Trading Gas safety

<https://www.fairtrading.nsw.gov.au/buying-products-and-services/product-and-service-safety/gas-safety>

Work Safe ACT Liquid petroleum gas (LPG) safety

<https://www.worksafe.act.gov.au/health-and-safety-portal/safety-topics/dangerous-goods-and-hazardous-substances/liquid-petroleum-gas-lpg-safety>

Master Plumbers Code of Ethics

<https://plumber.com.au/code-of-ethics/>

Plumbing Code of Australia (PCA) Resources

<https://ncc.abcb.gov.au/sites/default/files/resources/2022/PCA-Resources-booklet.pdf>

NSW Fair Trading Regional plumbing and drainage inspections

<https://www.fairtrading.nsw.gov.au/trades-and-businesses/construction-and-trade-essentials/plumbers-and-drainers/regional-plumbing-and-drainage-inspections>