Charles Sturt University

Revision 1.0

Infrastructure Design Standards

Module S15: Mechanical Services

Division of Finance (Strategic Infrastructure)
Charles Sturt University

Document Control

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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. Overview

The purpose of this Mechanical Services Standard is to define Charles Sturt University's fundamental requirements regarding the design, construction, and commissioning of mechanical systems. It aims to provide clear guidance and set minimum standards to ensure that these systems are developed, installed, and commissioned to achieve optimal energy efficiency, suitability for their intended purposes, high quality, durability, performance as designed, ease of maintenance, safety for access and operation, minimal environmental impact, and cost-effectiveness over their entire lifecycle.

2.2. Essential Conditions

All mechanical services installations must comply with and/or provide the following:

- The University's mechanical systems shall be designed to comply as a minimum with part J5 of the National Construction Code (NCC) - Air-conditioning and ventilation systems.
- A design solution will be procured from a suitably qualified and experienced mechanical engineer / designer. Smaller-scale projects may be designed through supplier engagement with the endorsement of the Manager, Capital Works.
- Energy efficiency and acceptable comfort conditions shall be the prime consideration in the design of the mechanical system.
- Plant is not to be mounted on the roof or installed in ceiling spaces, unless otherwise approved by the Manager, Capital Works and Director, Facilities Management.
- Externally installed window air conditioning units are not permitted.
- The mechanical solution must efficiently deliver the necessary conditions to each thermal zone or application. The mechanical engineer / designer must evaluate the holistic concept of system design using all provided data.
- Mechanical solutions must adhere to the guidelines outlined in Standard 55 of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) concerning thermal environmental conditions for human occupancy.
- Solution design shall enable ease of modification and flexibility to accommodate future reconfiguration of rooms or partitions.
- Plant type selection shall be based upon a life cycle analysis of the most effective and economic solution available.
- Spaces containing temperature-sensitive equipment that produces heat loads such as DIT communication rooms and specialist research facilities shall have special consideration of cooling solutions along with integration into both Building Automation System (BAS) and Building Management Information System (BMIS).
- All equipment installation must adhere to the manufacturer's guidelines, including provisions for maintenance access, and comply with the specifications outlined in AS 3666.

- Consideration must be given to the locations of all plant in relation to accessibility, noise and vibration and visual aesthetics.
- Plant situated external to building structures at ground level must be enclosed within a locked enclosure, allowing for asset protection, safety and access Facilities Management operations staff and maintenance contractors. This enclosure should not impede the plant's performance or maintenance procedures.

2.3. Specification Development

- All mechanical services design work is required to be carried out via suitably qualified and experienced mechanical engineers and designers.
- The University may request copies of engineered design calculations to review.
- The University may also request changes to the design personnel if there is concern that the personnel engaged are not at an appropriate level of experience.
- The mechanical engineer / designer may engage third-party consultants, specialists, or suppliers, yet retains full responsibility for the design and review processes.
- Unless expressly instructed otherwise, all equipment must be newly procured and meet the highest standards of quality.
- Sound engineering judgment should be exercised to devise suitable solutions.
- The consultant should note that this document serves as a guideline and may not encompass every scenario.
- Any deviations from these guidelines should be communicated promptly to the university.

2.3.1. Design Report

The mechanical engineer / designer shall prepare a return Mechanical Services Design Report that confirms the following key aspects of the proposed project:

- Scope of Works
- Works by Others and Associated Works
- Design Criteria
- System Description
- Sustainability Considerations (energy efficiency, materials selection, decommissioning / disposal of equipment at end-of-life, control methodology, equipment selection, demand management)
- Energy Consumption Analysis
- Cost-Benefit Analysis
- Cost-Planning Advice (supply, installation, associated works, contingencies, overheads, etc)

2.3.2. Specialised Facility Requirements

The design and development of mechanical services must consider the unique operational and environmental conditions of specialised facilities, including but not limited to laboratories, glasshouses, and medical facilities. These spaces require specific design solutions to ensure compliance with regulatory standards, optimal functionality, and safety. The following guidelines apply:

Laboratories

- Must adhere to AS/NZS 2243 series for laboratory safety, particularly regarding planning, operational aspects, and fume cupboard specifications.
- Ventilation systems must comply with or exceed AS/NZS 1668.2 to ensure adequate indoor air quality (IAQ) and effective contaminant control.

Glasshouses

- Environmental control systems must maintain precise humidity, temperature, and light levels tailored to the specific requirements of the research or operational use.
- Design considerations should include systems that comply with AS/NZS 3666 for microbial control in air-handling and water systems, ensuring plant health and minimizing risks of contamination.

Medical Facilities

- HVAC systems must meet stringent air quality and contamination control standards. Reference AS/NZS 3666 and AS 1682 standards to ensure systems support safe and hygienic environments.
- Design must account for infection control measures, including appropriate pressure differentials, air filtration, and environmental monitoring systems.

All mechanical service designs must be reviewed and endorsed by the Manager, Capital Works, to ensure that these specialised requirements are adequately addressed and integrated into the overall facility operation. Where applicable, consultation with relevant stakeholders, such as facility users and compliance officers, is required to tailor mechanical solutions to meet the specific needs of each facility.

2.4. Sustainability

The mechanical engineer / designer must take into consideration the environmental sustainability of the mechanical works in alignment with the University's Clean Energy Strategy 2030.

2.4.1. Clean Energy Strategy 2030

Charles Sturt University aims to achieve significant milestones with its Clean Energy Strategy 2030, focusing on several key objectives. Firstly, the university plans to exclusively procure electricity from solar and wind sources through External Power Purchase Agreements (PPAs), thereby enhancing its commitment to sustainable energy practices. Additionally, the strategy emphasises enhancing energy efficiency across its campuses, aiming to reduce energy consumption per capita by implementing advanced equipment and sustainable building practices.

Furthermore, the university aims to expand its onsite renewable energy capacity and integrate energy storage solutions as viable business cases emerge. This initiative not only enhances campus sustainability but also contributes to grid stability and resilience. The adoption of electric vehicles (EVs) forms another crucial aspect of the strategy, aimed at reducing transport costs and transitioning to a cleaner transportation system powered entirely by electricity.

In line with its commitment to sustainability, the university plans to phase out natural gas usage, replacing outdated and inefficient systems with cleaner electric alternatives. This transition supports environmental goals by reducing carbon emissions and improving air quality on campus and in surrounding communities. Lastly, the university aims to improve energy productivity by optimising space management and operational processes to achieve higher output per unit of energy consumed, thereby maximizing efficiency and sustainability across its operations.

2.4.1. Sustainable Design Considerations

In the Mechanical Services Design Report, these aspects of mechanical services should be comprehensively documented.

- **Energy efficiency** in mechanical services is critical to reduce operational costs and environmental impact. This involves selecting high-efficiency HVAC systems, pumps, and motors, optimising ductwork, and piping layout to minimize energy losses, and integrating renewable energy sources where feasible.
- **Materials selection** for mechanical systems should prioritize those with low embodied energy and high durability, promoting sustainability and minimizing environmental impacts throughout their lifecycle.
- **Decommissioning and disposal strategies** for mechanical equipment must adhere to environmental regulations, emphasizing recycling and responsible disposal methods to minimize waste and environmental impact.
- **Control methodology** in mechanical design should incorporate smart controls and automation systems to optimise energy use, respond dynamically to occupancy patterns, and enhance overall system efficiency.
- **Equipment selection** should prioritise energy-efficient components and systems that meet or exceed industry standards for sustainability, considering lifecycle costs and performance.
- **Demand management strategies** should be implemented to balance peak loads, optimise energy use during off-peak times, and enhance overall system efficiency.

2.5. Construction Requirements

The University's geographic diversity across various latitudinal zones combined with the age and complexity of built environments presents complexity for mechanical solution design. With this, the specifications for the construction of new buildings, and the refurbishment of existing buildings differ and must be assessed on a case-by-case basis.

2.5.1. New Builds

Mechanical services within University buildings must adhere to the minimum legal standards, encompassing all relevant regulations such as Australian Standards, Local Council requirements, and Work Health & Safety (WHS). Each building must have suitable mechanical services installed according to the University's project requirements, NCC, and Australian Standards. Furthermore, additional measures might be necessary to address specific building requirements (e.g., laboratories), risks or to satisfy University insurers.

Consultants and contractors must consider the long-term implications of capital, energy, and maintenance costs, as well as durability, when proposing any performance solution. This will be achieved through engagement with Sustainability at Charles Sturt will provide solution guidance in alignment with the University's sustainability strategy. Further collaboration is required with Project User Groups and Campus Facilities Managers to determine any additional mechanical services required to accommodate the proposed occupancy, associated hazards, planned equipment, and environmental factors. All proposed solutions should be supported with a cost-benefit analysis.

2.5.2. Refurbishments

All existing mechanical services within a building should be extended or replaced as needed for the specified project. Design considerations for projects in existing buildings should be evaluated individually and developed in accordance with this standard. The project's scope will dictate the design requirements and the extent of upgrades to existing services.

Items not explicitly specified within the project scope should not be included in the overall project cost to minimize the necessity for value engineering services. It is the responsibility of the consultant or contractor to liaise with the Project Manager to obtain comprehensive project details, particularly concerning space and fit-out requirements.

For new projects within existing buildings, it is essential to thoroughly evaluate refurbishment expectations to ensure alignment with the approved budget. As part of the project scope, all redundant and obsolete pipework, equipment, fixtures, wiring, and inaccessible ceiling spaces associated with the project must be removed. Prior to installing new services, all exposed surfaces should be restored, and redundant and obsolete underground services should be removed unless otherwise approved by the project officer.

2.5.3. Plant Upgrades and Replacement

Plant upgrades and replacement in mechanical services are crucial components of an effective asset replacement strategy, ensuring ongoing efficiency and sustainability:

- **Efficiency Enhancements**: Upgrading mechanical plants integrates advanced, energy-efficient technologies, reducing operational costs and environmental impact.
- **Regulatory Compliance**: Replacement of outdated equipment ensures compliance with evolving standards, enhancing sustainability, and reducing the campus's carbon footprint.
- **Cost-effectiveness**: Strategic upgrades can lead to significant savings through improved energy efficiency and reduced maintenance costs over the lifecycle of new equipment.

- **Environmental Impact**: Replacing older systems with modern alternatives helps lower greenhouse gas emissions and promotes environmental stewardship.

An effective asset replacement strategy involves assessing current system performance, evaluating technological advancements, and conducting lifecycle analyses to determine the optimal timing for upgrades and replacements. Documenting these decisions in detailed reports not only tracks improvements but also informs future strategies, ensuring the university campuses remain adaptable and sustainable in its mechanical infrastructure for the long term. This proactive approach supports a resilient and efficient campus environment, aligning with broader sustainability objectives and enhancing operational effectiveness.

2.5.4. Equipment Reuse

There may be circumstances where the reuse of existing mechanical equipment is feasible and advantageous within our standards. In such cases, contractors are required to provide comprehensive evidence of the condition and performance capabilities of the equipment proposed for reuse. This documentation should include thorough assessments of operational efficiency, reliability, and compatibility with current sustainability standards. Additionally, sustainability considerations play a pivotal role in determining the viability of equipment reuse, particularly in minimizing environmental impact and maximizing energy efficiency.

2.6. Energy Requirements

When planning for new builds or upgrading existing mechanical plant equipment, a thorough analysis of power requirements becomes crucial to ensure that all systems meet operational needs efficiently and reliably. This process begins with a detailed assessment of current and projected future electrical load requirements. This includes analysing historical data, forecasting future demand growth, and considering any planned operational changes or expansions that could affect power consumption.

Energy efficiency considerations are integral to this analysis for both new installations and upgrades. Evaluating how newer technologies or equipment designs can reduce overall power consumption while maintaining or improving operational output is essential. This assessment encompasses the efficiency ratings of motors, HVAC systems, lighting, and other power-consuming components to optimise energy usage effectively.

Managing peak demand periods is another critical aspect for both new builds and existing systems. Designing systems that can efficiently handle peak loads through strategies like load shedding or peak shaving helps in maintaining stable operations and reducing overall energy costs. Additionally, ensuring power quality and reliability is paramount.

Evaluating the adequacy of existing electrical infrastructure to support new installations or upgraded equipment is also vital for both scenarios. This includes assessing transformer capacities, switchgear ratings, and distribution networks, while ensuring compliance with Australian Standards. Lastly, conducting a lifecycle cost analysis that considers both initial capital costs and long-term operational expenses ensures that the chosen power solutions are cost-effective over their entire lifespan.

2.7. Heritage Requirements

Designs for heritage-protected buildings should prioritise minimising alterations to the original building fabric whenever possible. They should also include provisions for recording original architectural details and their locations to facilitate accurate reinstatement if needed. Project Officers are to work with the Space Planning Team to confirm the heritage status of buildings in scope.

All wiring and pipework must be concealed within existing wall cavities, with wall chases utilised only when necessary and with prior approval from the Heritage Consultant. Additionally, the routing and installation of mechanical services should be designed to minimise their visual impact on the building. This involves running ductwork and piping in concealed areas and locating equipment in non-visible areas whenever feasible.

2.8. Ventilation Rates

Ventilation requirements for internal spaces shall meet or exceed the standards outlined in AS/NZS 1668.2. For areas where indoor air quality (IAQ) is critical such as laboratories, ventilation rates higher than those stipulated in AS/NZS 1668.2 should be considered. However, these increased rates must be balanced with energy efficiency concerns.

In zones where occupancy levels vary significantly, the use of CO^2 monitoring is recommended to adjust ventilation rates accordingly. Naturally ventilated spaces that are regularly occupied must adhere to the minimum ventilation rates specified in AS/NZS 1668.4. Design calculations should demonstrate compliance with these requirements, and where necessary, onsite measurements should confirm achievement of these rates before practical completion.

2.9. BMS Integration and Alarm Requirements

The university's energy manager shall be consulted for the purposes of BMS integration and alarm requirements. The university's preferred alarms management system is the university wide Optergy BMS developed by Alerton.

2.10. Warranties

The Principal shall be named as the warrantee. It is essential to register warranties with manufacturers as required. Copies of warranties delivered with components and equipment must be retained and handed over to the Principal upon achieving practical completion.

Warranty periods shall commence either at practical completion or at the acceptance of installation if acceptance does not coincide with practical completion. This ensures that warranty coverage begins promptly upon the system's operational readiness or when the installation is formally accepted by the Principal, ensuring comprehensive coverage and protection throughout the specified warranty periods.

By adhering to these guidelines, the project team ensures clarity and accountability regarding warranty terms and conditions, thereby safeguarding the long-term performance and reliability of mechanical systems and equipment across campus facilities.

2.11. Approval of Installer

If the installation is not conducted by the manufacturer, and the product warranty is contingent upon the manufacturer's approval of the installer, it is imperative to submit the manufacturer's written approval of the installing firm. This documentation serves to verify that the selected installer meets the manufacturer's standards and specifications for proper installation and ensures compliance with warranty conditions. By obtaining manufacturer approval, the project team affirms that the installer possesses the necessary expertise and competence to execute the installation correctly, safeguarding the integrity and performance of mechanical systems and equipment.

2.12. Testing, Commissioning and Tuning

The designer shall mandate the successful contractor to accommodate two site visits following the award of practical completion, scheduled in agreement with the Project Officer and the respective Campus Facilities Manager. Typically, these visits are scheduled during peak summer and winter seasons. The primary purpose of these visits is to conduct a comprehensive review of the building's operations against the control strategy and to finalize any necessary fine-tuning. This process aims to optimize both energy efficiency and occupant comfort, ensuring that mechanical systems perform at their peak efficiency levels throughout varying climatic conditions. These visits serve as critical checkpoints to validate system performance and alignment with design intent, thereby enhancing overall operational effectiveness and longevity of campus facilities.

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

National Construction Code of Australia (NCC) 2022 (Cth)

Work Health and Safety Act 2011 (NSW)

Work Health and Safety Regulation 2017 (NSW)

Ozone Protection and Synthetic Greenhouse Gas Management Act 1989 (Cth)

Protection of the Environment Operations Act 1997 (NSW)

Protection of the Environment Operations (General) Regulation 2009 (NSW)

Environment Protection Regulation 2019 (ACT)

Waste Minimisation and Management Act 1995 (NSW)

Waste Management and Resource Recovery Act 2016 (ACT)

3.2. Supporting Standards

Standard Number	Standard Title
AS 1324.1:2001	Air filters for use in general ventilation and air conditioning, Part 1: Application performance and construction
AS 1324.22003	Air filters for use in general ventilation and air conditioning, Part 2: Methods of test
AS 1668.2:2012	The use of ventilation and air conditioning in buildings - Ventilation design for indoor air contaminant control
AS 1668.3:2001	The use of ventilation and air conditioning in buildings - Smoke control systems for large single compartments or smoke reservoirs
AS 1668.4:2012	The use of ventilation and air conditioning in buildings - Natural ventilation of buildings
AS 1682.1:2015	Fire, smoke and air dampers, Part 1: Specification
AS 1682.2:2015	Fire, smoke and air dampers, Part 2: Installation
AS 2243.1:2021	Safety in laboratories, Part 1: Planning and operational aspects
AS/NZS 2243.6:2010	Safety in laboratories, Part 6: Plant and equipment aspects
AS/NZS 2243.8:2014	Safety in laboratories, Part 8: Fume cupboards
AS/NZS 2243.9:2009	Safety in laboratories, Part 9: Recirculating fume cabinets
AS/NZS 3666.1:2011	Air-handling and water systems of buildings - Microbial control, Part 1: Design, installation and commissioning
AS/NZS 3666.2:2002	Air-handling and water systems of buildings - Microbial control, Part 2: Operation and maintenance
AS/NZS 3666.3:2011	Air-handling and water systems of buildings - Microbial control Performance-based maintenance of cooling water systems
AS/NZS 3666.4:2011	Air-handling and water systems of buildings - Microbial control Performance-based maintenance of air-handling systems (ducts and components)
AS 4041:2006	Pressure piping

Standard Number	Standard Title
AS 4254.1:2021	Ductwork for air-handling systems in buildings, Part 1: Flexible duct
AS 4254.2:2012	Ductwork for air-handling systems in buildings, Part 2: rigid duct
AS 4260:1997	High efficiency particulate air (HEPA) filters - Classification, construction and performance
AS 4332:2004	The storage and handling of gases in cylinders
AS/NZS 4552.2:2010	Gas fired water heaters for hot water supply and/or central heating, Part 2: Minimum energy performance standards for gas water heaters
AS 4809:2017	Copper pipe and fittings - Installation and commissioning
AS/NZS 5601.1:2022	Gas installations, Part 1: General installations
AS/NZS 5149.1:2016	Refrigerating systems and heat pumps - Safety and environmental requirements, Part 1: Definitions, classification and selection criteria (ISO 5149-1:2014, MOD)
AS/NZS 5149.2:2016	Refrigerating systems and heat pumps - Safety and environmental requirements, Part 2: Design, construction, testing, marking and documentation (ISO 5149-2:2014, MOD)
AS/NZS 5149.3:2016	Refrigerating systems and heat pumps - Safety and environmental requirements, Part 3: Installation site (ISO 5149-3:2014, MOD)
AS/NZS 5149.4:2016	Refrigerating systems and heat pumps - Safety and environmental requirements, Part 4: Operation, maintenance, repair and recovery (ISO 5149-4:2014, MOD)
AS/NZS 5601.1:2022	Gas installations, Part 1: General installations
AS/NZS 60079.10.1:2022	Explosive atmospheres, Part 10.1: Classification of areas - Explosive gas atmospheres
AS/NZS 60079.29.2:2016	Explosive atmospheres, Part 29.2: Gas detectors - Selection, installation, use and maintenance of detectors for flammable gases and oxygen
SAA/SNZ HB32:1995	Control of microbial growth in air-handling and water systems in buildings
SAA HB 40.1-2001 Series	The Australian Refrigeration and Air-conditioning Code of Good Practice

3.3. Industry Codes of Practice

Refrigeration and Air Conditioning Contractors Association (RACCA) Code of Practice

http://racca.asn.au/

ASHRAE Standard 55 – Thermal Environmental Conditions for Human Occupancy

https://www.ashrae.org/technical-resources/bookstore/standard-55-thermal-environmental-conditions-for-human-occupancy

Plumbing Code of Australia (PCA)

https://www.fairtrading.nsw.gov.au/trades-and-businesses/construction-and-trade-essentials/plumbers-and-drainers/plumbing-code-standards-and-notes

NSW Government Code of Practice Managing the Work Environment and Facilities

https://www.safework.nsw.gov.au/__data/assets/pdf_file/0016/50074/Managing-the-work-environment-and-facilities.pdf

3.4. Other Resources

SafeWork NSW Maintaining Thermal Comfort in Indoor Work Environments

https://www.safework.nsw.gov.au/resource-library/heat-and-environment/maintaining-thermal-comfort-in-indoor-work-environments

SafeWork NSW Ventilation at work

https://www.safework.nsw.gov.au/hazards-a-z/ventilation-at-work

SafeWork NSW Bushfire smoke

https://www.safework.nsw.gov.au/safety-starts-here/physical-safety-at-work-the-basics/bushfire-smoke

SafeWork NSW Workplace management of respiratory conditions including asthma

https://www.safework.nsw.gov.au/resource-library/workplace-management-of-respiratory-conditions-including-asthma

SafeWork NSW Mould at work

https://www.safework.nsw.gov.au/hazards-a-z/mould

NSW Office of Environment and Heritage I am your optimisation guide Heating, Ventilation and Airconditioning Systems

https://www.environment.nsw.gov.au/resources/business/150317hvacguide.pdf