University of South Australia

UNIVERSITY OF SOUTH AUSTRALIA

UNISA TECHNICAL STANDARDS

University of South Australia

Contents

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V11	Mar 2025	AS/WIS/ME	Section L – Section renamed and replaced by a separate document (refer link). Changes to section M 6.1 Defibrilators

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A

INTRODUCTION

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A 1 Introduction

A 1.1 Preface

These Technical Standards have been compiled to provide clear, concise communication of the University of South Australia's requirements for the planning, design and construction of new and upgraded facilities.

The specifications provide direction and guidelines to enable Consultants and Contractors to effectively translate the University's requirements into acceptable design solutions. They must be read in conjunction with the Project Brief and any project specific design requirements provided by the Contract Supervisor.

The specifications are not intended to replace the level of initiative, competence and care expected of consultants. Consultants must carefully consider the merits of the UniSA Technical Standards, in context with the needs of each specific project. If a consultant considers a particular Technical Standard to not be appropriate, or a more suitable solution is available, proposals to this effect should be raised through the Contract Supervisor for consideration by the University.

In the absence of written approval for deviation from these specifications, the University will assume that the requirements contained in the UniSA Technical Standards have been fully addressed and incorporated into the proposed design solution and documentation.

Feedback regarding these Technical Standards is actively encouraged as it provides a mechanism for continuous improvement and allows the UniSA Technical Standards to remain current and keep pace with industry and technological changes within the buildings infrastructure environment. The specialist industry knowledge held by the University professional service providers is invaluable to the success of our current and future projects; as such, your contribution to future editions of these Technical Standards will be gratefully accepted.

Any queries in regard to these Technical Standards or the University requirements on any project should be directed to the Contracts Supervisor.

A 1.2 Purpose

This document has been produced in order to set out the minimum standard requirements for all building works on new and existing buildings for all University of South Australia campuses.

The University of South Australia will be referred to as 'the University' throughout this document.

To allow for ease of use the whole document has been divided into sections. However, in order to complete any project to the University's standard, it should be utilised in its entirety, regardless of responsibilities or discipline.

A 1.3 Applicability

This document should be utilised by those involved with:

- Project briefing
- Design, development and preparation of specific project specifications
- Project management
- Delivery of projects
- Maintenance activities

The UniSA Technical Standards provide guidelines to the selection of materials, finishes and components for use within University projects of all sizes. These Technical Standards are to be adhered to throughout all site and building works across the University.

Whilst design innovation is encouraged and new materials and products will always be considered, any variation from the UniSA Technical Standards must be approved by the University through the Contract Supervisor.

A 1.4 University of South Australia Portfolio

The University was founded in January 1991 when the South Australian Institute of Technology and the Magill, Salisbury and Underdale campuses of the South Australian College of Advanced Education were amalgamated.

The University educates professionals and citizens to the highest standards; creates and disseminates knowledge; and engages with communities to address the major issues of our time.

In order to complete the University's mission there are numerous campuses which constitute the University portfolio:

Adelaide – City East Campus

North Terrace and Frome Road

Please note this campus has a heritage listed building on site (Brookman Building).

Adelaide – City West Campus

Western End of North Terrace

Please note this campus has two heritage listed buildings on site (Law Building and 9 Light Square).

Magill Campus

St Bernards Road

Magill

Please note this campus has a heritage listed building on site (Murray House).

Mawson Lakes Campus

Mawson Lakes Boulevard

Mawson Lakes

Whyalla Campus

Nicholson Avenue

Whyalla

Mount Gambier Campus

Wireless Road

Mount Gambier

A 1.5 Standards and Reference Documentation

The following details a comprehensive list of applicable standards and the University reference documents:

University Standards and Reference Documents

Relevant University Policies, Procedures & Guidelines, including WHS Policy, Equal Opportunity Policy

UniSA ESP drawings and ESP/compliance manuals for individual buildings

Asbestos Management Plan

Campus Signage Manual

University's online Contractor Induction System

UniSA Accessibility Guidelines

UniSA Space Management & Planning Guidelines

Facilities Management Unit Asset Management Plans

Facilities Management Unit Risk Management Plans

University Procurement Policy

Facilities Management Unit Probity Plan

University Master Plan Documents (where available)

University Asset Plans/Strategies

Existing O&M manuals

Other Reference Documents

NATSPEC

South Australian WHS Act and associated Regulations and Codes of Practice

Building Code of Australia

Australian Standards

Commonwealth Disability Discrimination Act

SA Development Act

Local Government Development Plans

SA Water Corporation regulations

Australian Gas Association Regulations

SA Fire Services Regulations

SA Fire Services Regulations

Work Health and Safety Regulations

The UniSA Technical Standards have utilised NATSPEC, which is to be adhered to, including any supplementary clauses noted.

A 1.6 Variances

Any variances from the requirements outlined in this document must be received by the Contracts Supervisor.

Requests for variances must be submitted in writing and there is no guarantee that variances will be approved.

A 1.7 Revision Management

This document will be reviewed annually in February with the review requirement captured within the Facilities Management Unit, Quality Management System.

Should a significant amendment be required before the next scheduled review, an updated version will be distributed accordingly with changes highlighted.

Comments and suggestions on improvements and amendments to the UniSA Technical Standards are encouraged and should be directed to the Manager: Maintenance and Technical Services within the Facilities Management Unit.

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SAFETY IN DESIGN

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B 1 Preface

It is expected that this section is read in conjunction with all other sections of the UniSA Technical Standards, in order to achieve a fully comprehensive understanding of the University requirements.

All works undertaken at the University must comply with the requirements of NATSPEC specifications and the designers must use this, plus the University specific modified clauses as a basis for their specifications.

The designer shall amplify the NATSPEC requirement where necessary to meet specific project requirements.

The designer may use their own specification, but only with written approval from the University. Where alternative specification is used, it must ensure that the specified standards, quality and outcomes are equivalent to or greater than those specified through NATSPEC. NATSPEC supplementary clauses specified in this document are to be inserted into the designer's specifications.

The designer must not reduce the requirements of NATSPEC and/or the UniSA Technical Standards clauses without written approval from the Contracts Supervisor.

On smaller projects where the scope of work does not justify a full NATSPEC specification the designer may propose a "notes on drawing" type of specification, as long as the pertinent elements of the NATSPEC and supplementary University clauses are included, with the Contract Supervisors approval

NATSPEC supplementary clauses which are required to be inserted into the designer's specifications have been placed inside a blue box and text has been *italicised*.

B 2 Introduction

Safety in design means the integration of control measures throughout the design process to eliminate or minimise (where elimination is not reasonably practicable) risks to health and safety throughout the life of the building or structure being designed. Designers need to consider how safety can best be achieved in each of the lifecycle phases.

A safe design approach begins in the conceptual and planning phases with an emphasis on making choices about design, materials used and methods of construction that enhance the safety of the finished building or structure.

Direct costs associated with unsafe design, including retrofitting costs, workers compensation, increased insurance levies, environmental clean ups and negligence or liability claims, can be significant.

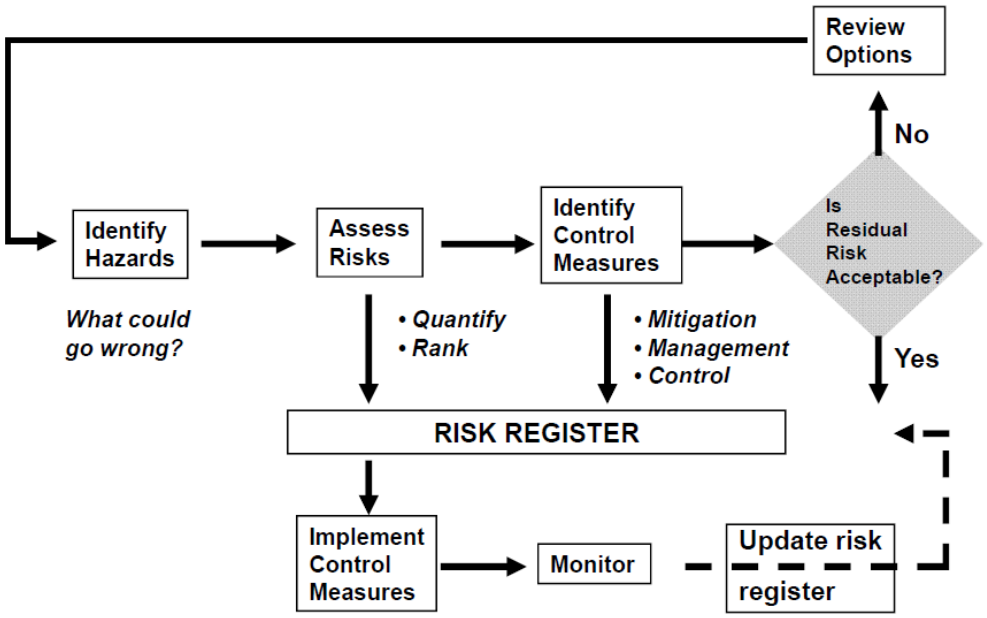
'Eliminating the hazard' is the most effect risk control measure and is often cheaper and easier to achieve in the early design phases than when real risks present themselves during construction or occupation.

B 3 Safety in Design Reviews

Safety in design reviews should be undertaken for any design where it can be reasonably expected that people may need to work (either as an end-user or maintainer) within, on or around the building or structure. As a minimum, safety in design must be included as a specific risk management function in all design and construction reviews.

Reviews should identify and control hazards and risks related to:

- All work activities associated with the intended use of the building or structure as a workplace, including fixtures integral to its use.
- Any maintenance, repair, service and cleaning activities for the building or structure when it is in use.
- Construction of the building or structure.



The responsibilities of designers in this review process include:

- Identifying and controlling hazards and risks associated with the above activities.
- Informing the University of any high risks in its design requirements.
- Recommending design alternatives that will eliminate or reduce risks arising from the original design.
- Providing evidence of the process undertaken.

Refer to the University FMU Safety in Design Principles for further information.

B 4 Project Information

The scope of the UniSA Technical Standards does not include the following for individual projects:

- Project Brief.
- Consultancy Brief, including scope of services and specific roles and responsibilities for the Principal Consultant and Consultant Team.
- Contract Documentation, including specific roles and responsibilities for Managing and/or Main Contractors and Sub-Contractors (where these parties may undertake design activities).
- Relevant University Policies, Procedures & Guidelines that are stand-alone documents as noted in these Technical Standards.

This information will be provided in the project pack at the outset of the project.

B 5 The Designer

For the purposes of these Technical Standards, 'The Designer' is defined as any individual or group carrying out design activates related to the University's built assets, or their constituent elements.

B 5.1 Designer Responsibilities

A key function of these Technical Standards is to uphold the University's legal obligations and commitments.

It is the responsibility of the Designer to ensure all legal requirements, standards and obligations pertaining to building design and/or construction of a facility are diligently met when undertaking work for the University.

If there is conflict between these Technical Standards and other legislated requirements, then the standard which provides the highest standard of risk mitigation shall take precedence. Where Australian Standards are quoted, reference shall always be made to the most recent edition.

In all cases of potential conflict, appropriate consultation with the University must occur with all issues to be referred to the Contract Supervisor in the first instance.

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B 6 Variations

All requests for variations from these Technical Standards shall be referred to the Contracts Supervisor for review to ensure potential changes do not increase risk. Final approval for departure from the UniSA Technical Standards will be reviewed and agreed to by the Director: Facilities Management (or nominee).

B 7 Compliance with UniSA Technical Standards

Any departures from the UniSA Technical Standards should be raised with the Contract Supervisor to arrive at a solution acceptable to the University.

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B 8 Work Health and Safety Legislation

The following legislative documents and associated subordinate legislation are referred to in this section for compliance as a minimum, where applicable:

- Work Health and Safety Act 2012 (SA)
- Work Health and Safety Regulations 2012 (SA)
- SafeWork SA Policy
- Relevant Codes of Practice, Australian Standards and Statutory requirements

B 9 University Work, Health and Safety Requirements

In addition to Work Health and Safety legislative requirements, the University WHS policies and procedures must be taken into account in the design and construction of new buildings, additions and refurbishments.

B 9.1 Reference Documents

The following reference documents provide a detailed guide to the design, documentation and construction and are available on request:

- University Policy – Health, Safety & Injury Management
- University WHS Procedure – Confined Spaces / Restricted Spaces
- University WHS Procedure – Contractor Management
- University WHS Procedure – WHS Consultation
- University WHS Procedure – Safe Workplace Design
- University FMU Safety in Design Principles
- University FMU 'Working Safely at the University' online contractor program.

B 9.2 Consultation

Consultation with key stakeholders in relation to WHS issues must be undertaken in accordance with the University WHS Procedure – Safe Workplace Design. The procedure outlines the design requirements for prevention of adverse health and safety issues and/or outcomes related to the design, construction, fit-out, provision of working space for employees, and maintenance of new or refurbished buildings, owned or leased by the University.

Sufficient time must be allowed in the project program for adequate consultation to be undertaken. The University WHS Services will be invited to participate during the consultation process as required under the University FMU Project Management procedures.

B 9.3 WHS Services

The University administers workplace health and safety through WHS Services, a strategic operational team within Human Resources. The team provides occupational health, safety, welfare and injury management consultancy and advisory services across the University.

B 9.4 Contractor Management

Prior to commencing work at any the University campus or building location, all contractors must successfully complete the University's mandatory Online Contractor Program 'Working Safely at the University'. Contractor ID Cards will be issued on successful completion of the online program and are required for access to the University sites.

Refer to the University WHS Procedure – Contractor Management for further information.

B 9.5 Confined Spaces

Where applicable the project team shall:

- communicate details of any new confined spaces created by projects to the Contract Supervisor for addition to the Confined Space Register
- provide signage that conforms to the UniSA Signage Manual to all new confined spaces created by a project
- ensure that confined spaces and restricted spaces under its control are locked at all times except where authorised work is being carried out within them.

- maintain all relevant documentation relating to confined spaces and restricted spaces for the duration of the project including but not limited to Safety in Design decision points, written entry permits, JSA's & hot work permits.

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C

DESIGN CONTROLS

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C 1 Project Information

All sections must be read in conjunction with all other sections of the UniSA Technical Standards in order to gain a comprehensive understanding of the University's requirements. Along with the following documents:

- University Preliminaries document (including associated Schedules)
- University Contractors Manual
- University Health, Safety & Injury Management Policy
- University WHS Procedures – see WHS Section Below
- University Equal Opportunity Policy
- University Evacuation Procedures
- University Asbestos Management Policy
- University Heritage Buildings Register (details available from Contract Supervisor)

These Technical Standards do not include the following for individual projects:

1. Project Brief
2. Consultancy Brief – including scope of services and specific roles and responsibilities for the Principal Consultant and Consultancy Team.
3. Contract Documentation – Including specific roles and responsibilities for the Managing and/or Main Contractors and Sub-Contractors (where these parties may undertake design activities)
4. Relevant University Policies, Procedures and Guidelines, which are stand-alone documents as noted in these Technical Standards

This information will be provided in separate documentation at the outset of the project.

C 2 Overarching Design Principles

C 2.1 Aesthetic Considerations

All new buildings, additions and refurbishments are to be designed with reference to their surrounding environment, function and potential visual impact. Due care must be given to complementing and enhancing the existing streetscape and environment. Select materials and finishes to be sympathetic to the surroundings, aesthetically pleasing and functional.

C 2.2 Amenity & Simplicity

Planning solutions should be approached with amenity and simplicity in mind, both in the final product and in the construction process. Considerations include:

- Providing an environment within which teaching, learning, research, administration and recreation can take place successfully and in a sustainable manner.
- Providing natural light and ventilation in preference to artificial systems for tutorial rooms and other teaching spaces.
- Avoiding complex articulation and building footprints, as well as minimising building perimeters.
- Achieving sensible fenestration design.
- Avoiding complex roof forms and junctions.
- Minimising buildability issues, including site access, disruption to existing operations and trade sequencing.
- In order to support gender diversity, aim to exceed standard toilet compliancy and provide Unisex/All Gender toilets where possible.
- Avoiding subgrade areas for high valued analysis equipment, important IT processing equipment such as data centres, server rooms, hub rooms, comms rooms, or other important facilities equipment

C 2.3 Flexibility

All planning should seek to provide for the maximum degree of flexibility to ensure that future alterations can be achieved easily and cost effectively.

Considerations include:

- Use of lightweight internal walls where security and acoustic requirements permit.
- Sensible placement of toilets, stairs and plant rooms.
- Location of services and fixtures on external (rather than internal) walls wherever possible to provide maximum flexibility during subsequent refurbishments planning for possible future expansion, alteration or adaptation to new uses.
- Allocation of sufficient space for plant rooms at the design stage. Careful consideration should be given to providing adequate space for possible future expansion, as well as access for installation of replacement or additional plant.
- Adequate future provision shall be made for both vertical and lateral ducting to accommodate communications cabling and other services. Ducts shall be easily accessible so that the covers can easily be removed and reinstated.

C 2.4 Building Legibility

Design consideration must be given early in the design process to the legibility of the building and, in particular, the ready visual identification of entry points. While this is partly in response to security considerations, it also relates to the convenience of users and effective wayfinding on each campus.

C 2.5 Efficiency & Economy

UniSA projects should reflect the best value obtainable. Initial construction, operations and life cycle costs should all be considered. Features of efficient design should include:

- Use of simple, repetitive building structures.
- Use of standard rather than purpose made components.
- Building levels designed to balance cut and fill in earthworks.
- Avoidance of large, non-functional under croft areas, unless they perform a necessary flood buffer or storage function to improve flood resilience of the building.
- Double volume spaces and large circulation areas kept to functional minimum.
- Service areas concentrated in central locations.

C 2.6 Functionality

All spaces must be designed to optimise their functionality and usefulness for teaching, research, administrative and staff support purposes. Careful consideration shall be given to ensure that undesirable noise from adjoining properties and spaces does not have a detrimental impact on the functionality of any space.

Foyer size and width of corridors shall be chosen to allow for high use periods, especially during changeover of lectures or large classes.

Particular care must be taken to avoid glare through windows due to either direct or indirect sunlight, or reflections from paving, roads or adjacent buildings.

C 2.7 Vending Machines

Consideration shall be given in the design of public external spaces adjoining 24-hour access facilities such as lecture theatres, libraries, or commercial buildings on UniSA campuses, for the installation by others of vending machines. Allowance should be made for lighting, power, water supply and drainage to sewer.

Vending machines shall only be located in areas approved by UniSA and in all cases must be aesthetically integrated into the space.

C 2.8 Universal Design

Universal design is the process of designing services and facilities to be used by everyone, to the greatest extent possible, without the need for adaptation or specialised design. The aim is to provide a solution that can accommodate all people, including people with a disability, to provide equitable access for all.

UniSA has established Accessibility Guidelines to define overall objectives and strategies for all projects and programs, as well as to outline the expectations for consultants and contractors involved in design and construction projects.

C 2.9 Safety and security

UniSA aims to obtain a safe, secure building in the simplest, yet most effective way, involving practical and cost considerations. All buildings, car parks, walkways, bicycle paths and their

immediate environs shall be designed to achieve a positive working and learning environment, whilst reducing the opportunity for crimes against UniSA property, staff and students.

C 2.10 Wind Control

Individual buildings or groups of buildings must be designed to avoid the problems associated with wind turbulence, particularly at building entries and public spaces.

C 2.11 Signage

Allowance should be made in the design of the external entry facade of the building for the installation of any major signs in conformity with UniSA Branding & Style Guide, as well as the Campus Signage Manual.

The Campus Signage Manual provides an approved strategy and implementation framework for wayfinding and signage systems to be implemented throughout all existing and future buildings and facilities, both on and off campus. Its aim is to ensure all applications meet quality standards of simplicity, uniformity and aesthetic appeal, while being highly functional in providing clear wayfinding and appropriate information.

C 2.12 Building Efficiency

Building efficiency (UFA/GFA as percentage) should not be less than the following:

Table: Building Efficiency

Type	Efficiency
Science type	60%
Humanities & Arts type	65%
Administrative	70%
Library	75%

C 2.13 Space Utilisation Factors

Space utilisation factors set out in the table below should be assumed unless otherwise specified in the Project Brief or directed by the Contract Supervisor.

Table: Space Utilisation Factors

Type	Room Frequency	Seat Occupancy
Lecture Theatres	75%	75%
Tutorial Rooms	75%	75%
Laboratories	50%	75%
Special Use Rooms	50%	75%

Room frequency factors indicate the proportion the space is occupied within a typical teaching day (9 am – 5 pm, Monday – Friday). Seat occupancy factors indicate the average proportion of seats occupied.

C 2.14 Works to Heritage Buildings

Any alterations or restoration works proposed for heritage buildings must be approved by the relevant authorities. All work shall comply with the ICOMOS Burra Charter, as revised, as well as the relevant Conservation Plan established for the building. Copies of the Conservation Plans are available on request.

When alterations are required within these heritage buildings, the Consultant Team must provide design proposals which are in context with, and sympathetic to, their immediate surroundings and comply with UniSA's planning principles. Solutions must not impinge detrimentally on the heritage elements and spaces of such buildings and require approval from the Capital Projects Director via the Contract Supervisor before proceeding.

C 2.15 The Designer

For the purposes of these Technical Standards, 'The Designer' is defined as any individual or group carrying out any/all design activities related to the University's built assets, or their constitutional elements.

C 2.15.1 Designer Responsibilities

It is the Designer's responsibility to uphold the University's legal obligations and commitments.

It is the responsibility of the Designer to ensure all obligations pertaining to the building design and/or construction of facility are diligently met, such as legal requirements and standards, when any work is undertaken for the University.

Should there be a conflict between these Technical Standards and any other legislative requirements, the standard which provides the highest standard of risk mitigation must take preference. Where any Australian Standards are quoted, the reference must always be made to the most recent edition/update.

In all cases of potential conflict, appropriate consultation with the University must occur with all issues brought to the attention of the Contracts Supervisor.

C 2.16 Variations

All requests for variations must be referred to the Contracts Supervisor for review, to ensure potential changes will not expose the University to any unforeseen risk. Final approval for departure from these Technical Standards will be reviewed and agreed to by the Director: Facilities Management (or nominee)

C 2.17 Sustainable Development

Development of UniSA campuses must be based on sound environmentally sustainable principles including as a minimum:

- Passive design
- Water conservation
- Energy efficiency
- Waste management
- Indoor air quality

C 3 Work Health & Safety

All Work Health & Safety legislative requirements, including Schedules 1 and 2 of the WHS Regulations, must be taken into consideration of the design and construction of new buildings, additions and refurbishments.

Consultation with key stakeholders in relation to WHS issues must be undertaken in accordance with University WHS Procedure – Safe Workplace Design. The University's WHS Services will also be invited to participate during the consultation process as required.

C 4 Acoustics

The ultimate utility and function of teaching, administrative and staff support areas is highly dependent on the control of external and internal noise. Buildings shall be designed to the recommended Design Sound Levels and Reverberation Times for Building Interiors as set out in AS 2107.

The table below shows design objectives, not absolute minimum requirements. Materials and construction used shall typically be capable of achieving these figures. A deficit of one or two decibels when testing in the building may be acceptable. Sound insertion loss is defined as the difference in sound reduction from room to corridor when the door is wide open and when it is closed.

Project specific acoustic requirement and treatments shall be confirmed with the University representative.

Table: Sound Reduction Requirements

	Subjective Impression of Sound Reduction [1]	
Privacy Class	**Thru walls & ceilings**	**Thru doors**
Class 1 Lecture theatres. Meeting rooms. Nominated offices.	High degree of privacy. Voices in next room just audible but not intelligible.	Voice audible but generally unintelligible unless person close to door.
Class 2 Collaborative teaching spaces. Tutorial rooms. Specialist teaching spaces. Enclosed offices (individual or shared).	Good degree of privacy. Possible to understand some normal conversation from adjacent space, but generally not distracting.	Voice audible but generally unintelligible unless person close to door.
Class 3 Open plan offices. Libraries. Laboratories.	Voices audible and conversation intelligible unless using subdued voices. Low privacy but reduction of general office noise noticeable.	Voices audible and conversation intelligible.

The level of ambient sound from air conditioning, ventilation and other mechanical equipment, traffic noise and other intrusive noise, must be neither so high that it is objectionable, nor so low that the resulting quiet causes intruding speech and other activity noise to be objectionable.

The Designer must ensure that all requirements of the EPA are met.

The Designer should note that Meeting Rooms at the University are commonly used for video conferencing, and therefore it may be more appropriate to target the reverberation time stated in AS 2107 for video/audio conference rooms (Tmf 0.2 – 0.4 seconds).

To reduce acoustic artifacts, such as flutter echoes, acoustic treatments should be evenly distributed throughout Meeting Rooms.

The University's general preference is that acoustic wall panels should be installed over a minimum of two adjacent walls in addition to a carpet and/or an acoustic ceiling. These are most effective when installed in a 1.5 metre high strip approximately 1 metre above the floor level.

However, the most appropriate solution shall be determined by the Designer and shall be confirmed during the design.

When targeting a low reverberation time, consideration should also be given to lower frequency (bass) sound to prevent rooms sounding 'boomy' or 'boxy'. In most cases, use of a suspended ceiling over a large airspace should be sufficient to control low frequency reverberation.

It is also the University's general preference that acoustic panels have a minimum 25 mm thickness to provide better low frequency performance.

The most recent legislation documents can be found here: Environment Protection (Noise) Policy 2007. The EPA has also issued a guideline to be utilised in understanding this legislation. This can be found here: Guidelines for the use of the Environmental Protection (Noise) Policy 2007

C 5 Thermal Insulation Performance

All buildings must maximise opportunities for thermal insulation.

Standard window frames must be thermally broken, and bespoke designs must be thermally enhanced as a minimum.

Double-glazed windows are a minimum requirement for all new buildings and refurbishments.

Effective building sealing is mandatory to minimise air infiltration.

All main entries must be air locked at the appropriate scale to be effective.

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C 6 Animal, Vermin and Pest Infestation

C 6.1 Vermin

All cavities/apertures must be sealed/closed-off to ensure that rats, mice, possums and the like are unable to gain access into the internal spaces.

C 6.2 Animal

Façade detailing should avoid ledges or protrusions, wherever possible, to ensure that birds are unable to perch, roost or nest.

C 6.3 Termite Control

Unless the requirement is specifically excluded by the BCA/NCC and approved by the building certifier, anti-termite treatment must be provided to all new buildings. All workmanship and materials must conform to the requirements of the Australian Standard for the protection of buildings from subterranean termites. Physical barriers are preferred to chemical treatments that require cyclic applications.

Consideration must be given to any disruption to adjacent building users where treatments are required.

All tree roots which have been exposed throughout excavation, including stumps, logs and other timber must be fully excavated and removed from the building site. Tree roots from adjacent trees are to be reported to the Contracts Supervisor prior to removal

C 7 Vandalism (graffiti)

Anti-graffiti coatings must be applied to all vulnerable surfaces as directed by the University.

C 8 Design Reports

C 8.1 Design Report Guidelines

A project Design Report is required at various stages throughout the development of a project to allow the University to review the work and confirm that the evolving design is meeting the requirements.

The level of reporting required will be confirmed by the Contract Supervisor.

Design Reports are nominally required at the following stages, depending on the size of the project:

- End of Schematic Design Phase
- End of Design Development Phase
- 50% Documentation Phase
- 90% Documentation Phase

Additional tech review stages may be undertaken depending on the complexity of the design as required by stakeholders and the Contract Supervisor.

A Design Report is to be provided at these stages to allow the University to endorse that the work meets the previously agreed requirements. The University is not responsible for checking design drawings and specifications – this is the responsibility of the designer.

The University requires the Design Reports to confirm that the design achieves the project brief and statutory requirements and to also provide a record of the design decisions that are made as the project develops.

Design Reports provide the logic behind design decisions so that concurrence and approval can be given to these decisions. The document is also a useful reference to be utilised to integrate new project personnel into a project and for providing clear understanding of the projects history.

The initial design report at Concept Design stage must address the requirements of the project brief and demonstrate how those requirements are being achieved. The Design Report must incorporate a statement of design intent for each element and summarise the major design issues and the background to their resolution. The report should also detail how the requirements of the project brief are achieved, the standards adopted and how the requirements of these standards are satisfied. The report must detail any deviation from the project brief, standards statutory requirements or other University requirements.

Subsequent Design Reports are to include updated drawings and identification of how issues that were unresolved at the time of the early report have been addressed.

The report is to be a stand-alone document, which contains sufficient drawings and information without the need to refer to the actual design or other project information such as the minutes of the design reviews.

The report must demonstrate how each aspect of the project brief has been addressed and will need to include drawings and schedules that define the proposed scope of work, and descriptions and explanations of proposed concepts.

Design Reports are to be presented in both hard and soft format with a copy normally included in the operating and maintenance manuals.

C 8.2 Documentation Standards

C 8.2.1 General

The University attaches considerable importance to the provision of proper documentation of the design and due regard shall therefore be paid to the detail and completeness of such documents. Documentation must be clear, concise and precise.

C 8.2.2 Text Document Format

The format of the Design Reports will be generally as follows:

- The page size must be A4 but may be A3 where drawings are incorporated
- New sections must commence on new pages
- MS Word or PDF Format
- A Revision Box must be included and contain:
  - Revision Number
  - Author
  - Checked
  - Approved
  - Date

C 8.2.3 Drawings Format

The drawings must be in PDF format and clearly legible when printed on A3 size sheets.

All drawings must be to a professional standards and drawn in accordance with the relevant Australian, IEC or International (ISO) Standards.

Where appropriate, the drawing scale must be shown. The drawings must also include a graphic scale to facilitate scaling when a sheet is reproduced at a different size to the original.

All drawings must have a revision box containing:

- Revision Number
- Designed
- Drawn
- Checked
- Approved
- Date

Where the use of non-standard symbols is unavoidable, reference to the symbol(s) must be made in the form of a legend on the drawing, accompanied by the explanation and description.

C 8.3 Updated Reports

After the initial Concept Design Report has been accepted, each time a Design Report is updated, i.e., at Design Development and Documentation stages, the Design Report is to provide the current drawings and identify how all unresolved item from the previous reports have been addressed.

C 8.4 Issues Register

The Design Report must contain an Issues Register as a high-level guidance to the Contract Supervisor on any significant issues that may impact on the project, its budget or its timely completion. Entries may be made by a stakeholder.

C 8.5 Design Report Approval

Following the preparation and presentation of the Design Report, the University will review the document and provide any comments or amendments required which will be incorporated into an updated version of the report. This will then be signed off by the Contract Supervisor.

This endorsement will provide acceptance of the Design to that stage.

It is expected that the Design Report will be continually developed throughout the design process in a regular fashion until completion of the design. Then a Tender Design Report (100% design) is provided for inclusion in the Operation and Maintenance Information.

It is expected that at Tender Design Report stage there will be nil or negligible unresolved items and that all items are allocated a cost. The University expects nil or negligible cost difference between Tender documentation issue and Construction documentation issue.

C 8.6 Report Format

The Design Report format should reflect the format of the project brief and any additional University requirements. For example:

- Introduction
- Site Planning
- Architectural
- Building Services
- Mechanical
- Electrical
- Communications
- IT
- Fire
- Security
- Structural and Civil
- Cost Plan
- Comparison to Budget
- Variance Summary
- Assumptions, Risks and Opportunities
- Building Certification and Compliance
- Construction Program
- Recommendations
- Issues Register

C 8.7 The Architectural and Engineering Sections

The report sections addressing the Architectural and Engineering aspects of the project will need to include:

C 8.7.1 Drawings

- Architectural
- Building Services – internal and external, below and above ground
- Electrical
- Mechanical
- Fire
- Security
- Structure
- Civil

C 8.7.2 Schedules

The Contract Supervisor will determine schedules, for example:

- Comparison of Briefed requirements to design outcome
- Materials and finishes
- Furniture and equipment
- Door hardware
- Other Schedules as required

C 8.7.3 Text

The text provided within the Design Report needs to address each of the issues identified in the project brief.

Indicative sections are given below, however, the exact report structure should reflect the nature and scale of the project to an appropriate level agreed with the Contract Supervisor:

- A INFRASTRUCTURE DIVISION PHIOLOSPHY AND POLICIES
  - General
  - Value for Money
  - Life Cycle Costs
  - Planning for Future Expansion
  - Energy Conservation
  - Pollution and Waste Control
  - Access for Disabled
  - External Environments
  - Water
  - Compliance to Standards
  - Security
  - Communications
  - Use of Australian and New Zealand Materials
  - Rainforest or Heritage Area Timbers
  - Occupational Health and Safety

- B GENERAL DESIGN CRITERIA
  - Building Form Planning
  - Environmental Management Plan
  - Energy Use
  - Asbestos
  - Lead Based Paint Survey
  - RFI Shielding
  - Drawing Standards
  - Interface with Existing Services
  - Certification

- C PRIMARY BUILDING ELEMENTS
  - Design Standards and Criteria
  - Fire Engineering

- D SECONDARY BUILDING ELEMENTS

- General
- Insulation
- Floor Finishes
- Walls
- Ceilings
- Doors
- Door Hardware
- Window

- E INTERNAL ENVIRONMENT
  - Sun Control and Lighting
  - Acoustic Performance
  - Floor Finishes
  - Signage
  - Fire Protection

- F BUILDING ENGINEERING SERVICES
  - General Requirements
  - Mechanical Services
  - Electrical and Lighting
  - Fire Detection and Protection
  - Plumbing
  - Building Management System
  - Transportation Systems
  - Security Systems
  - Audio Visual Technology
  - Communications Infrastructure
  - Certification

- G EXTERNAL WORKS
  - Pedestrian and Vehicular Movement
  - Stormwater Management
  - Engineering Services – electrical reticulation, water, stormwater, sewer, gas
  - Street Lighting
  - Fencing
  - Signage
  - External Furniture

- H SECU**RI**TY

- I COMMUNICATION

- J FURNITURE FITTINGS AND EQUIPMENT

C 9 Documentation and Drawings

C 9.1 Introduction

CAD drawings supplied to the University must be readily opened and read by the Facilities Management Unit's AutoCAD software, without requiring modifications or editing.

The Building Records drawings are published on the Facilities Management Unit website in PDF format.

C 9.2 Conditions of Compliance

If, in the opinion of the Facilities Management Unit Spatial Information Officer, all or any part of the electronic drawing(s) provided to the Facilities Management Unit fails to comply with the requirements, the entire package may be returned for checking and correction before re-submission.

Rectifications and re-submission, and any resultant delays, must be made entirely at the supplier's cost.

C 9.3 Provided Drawings

Where the University provides reference drawings to suppliers, it is to be noted that the provided drawings are indicative only and are subject to change without notice.

All measurements must be checked on site.

The format of architectural base floor plan file names is ACxxPlnn, where A = Architectural, PL = Plan, C = Campus Number, xx =Building Number, and nn = Building level.

- C 8.4 Drawing Requirements
- Architectural as-built floor plans are required regardless of the size of the project or whether O & M Manuals are provided
- All CAD drawings must conform to the highest level of quality and accuracy
- The accuracy of the drawing must be maintained using appropriate object snaps
- The model must be drawn at a scale of 1 unit = 1mm, that is, real world full scale
- The model must be drawn in 2D (no 'z' values)
- The Colour and Linetype properties of all entities are to be set to ByLayer A descriptive layer naming convention must be used which logically identifies all drawn entities.

Numbered, or illogical layer names are not acceptable

- The Linetype Scale property of all entities is to be set to 1.0
- The drawings are to be fully purged of unreferenced or unused items
- CAD programs other than AutoCAD may be used; however, all drawings provided to the University must be in a format fully compatible with the University's AutoCAD system
- Education versions of Autodesk software must not be used under any circumstances

C 9.5 Submission Requirements

The drawing package must include the following:

- Electronic drawings as specified (both .DWG and .PDF formats)
- All associated or referenced drawings (e.g. title block drawings)
- All plot style tables (.ctb files), and any font shape files if used

- BIM model if used

C 9.5.1 Specific Requirements – Architectural Drawings

Architectural Drawings MUST include:

- Floor Plans, Roof Plan (where applicable), Elevations, Sections and Details
- Text clearly showing room name and room number (as previously agreed with the University – refer to Space Numbering Guidelines)
- Fixed joinery fittings, steps, changes in level, lecture theatre tiers, balustrades and handrails
- The ceiling height of each room on the floor plans (where the ceiling is raked, maximum and minimum floor to ceiling heights are required)
- The type of floor covering on the floor plans, including the delineation of changes in floor finish
- The various levels vertically within the building, including the roof plan, are to be reflected by the provision of a separate drawing for each level
- An Architectural Site Plan is required to indicate features such as roadways, paths and paving, signage, carparks, lighting, etc. (where modified or added), if these features are not indicated on other supplier drawings

C 9.5.2 Specific Requirements – Structural Engineering, Civil Engineering, Landscape Drawings

Drawings must include any referenced or linked detail drawings and/or related data.

C 9.5.3 Specific Requirement – Engineering Services Drawings

Engineering Services Drawings must include:

- Comprehensive legends of symbols used on the drawings
- Schematic Diagrams such as Electrical Line Diagrams

C 9.5.4 Specific Requirement – Essential Safety Provisions (ESP) Drawings

Where “fire block plans” (showing detectors and circuits) are created (new buildings) or modified (refurbishments to existing buildings), the Contractor must provide three (3) sets of either new or appropriately marked up hard copy drawings, in colour; two (2) to be placed in the Fire Indicator Panel’s Fire Alarm Plans folder, the third to be provided to the University’s Project Manager.

Modifications to electronic ESP drawings supplied by the University must follow the provided structure.

The various Essential Safety Provision (ESP) items that are required to be shown on the other supplied drawings are listed below. Requirements for each specific project should be confirmed with the University’s Project Manager.

- Sprinklers
- Exit & Emergency Lighting
- Compartmentation details including fire doors
- Fire Indicator Panel
- Fire hose reels
- Egress routes to required exits
- Emergency alarm initiating devices (manual call points, break glass alarms)
- EWIS
- Warden Intercom Points
- Evacuation Refuges
- Hydrant and Booster details

- Emergency lifts
- Smoke hazard management
- Mechanical air handling systems, associated HVAC control and fire dampers
- Access for fire appliances

C 9.5.5 Specific Requirement – Survey Drawings

In addition to the survey drawings created at the surveyor's scale with z coordinates, a copy of the electronic drawings at a scale of 1 unit = 1mm and with all z coordinates converted to 0 (zero) must be provided.

Site surveys will be carried out by the University's preferred subcontractor.

All survey drawings must be based on the Australian Height Datum (AHD)

The following information must be included:

- The exact footprint of the new building or building extension in relation to the existing buildings in the immediate vicinity, including the Reduced Level of the lowest floor slab, and an agreed main reference point
- In-ground services information and associated access pits, including pipe sizes and isolation valves
- Location of all services features such as hydrants and booster pumps
- All paths and roads, carparks, signage and lighting

C 9.6 Space Numbering

C 9.6.1 Numbering Systems

The University has numbering systems for buildings, levels, rooms and external spaces. These are described in the Space Numbering Guidelines which can be provided on request by the Project Manager. Numbering impacts a number of University management systems, and as such, numbering should not be changed without review by the Facilities Management Unit.

C 9.6.2 Responsibilities for Space Numbering

The Facilities Management Unit's Spatial Information Officer is responsible for assigning space numbers regardless of the size of scope of the project. This applies to new buildings as well as spaces under refurbishment.

Consultants are responsible for implementing the numbering assigned by the University into documentation from the end of design development.

Contractors are responsible for integrating the approved numbering system into documentation and labelling where applicable.

C 9.6.3 Numbering Protocols

Building number and descriptor, level numbering and room numbering are required to be assigned by the completion of the design development phase of projects and incorporated into documentation including floor plans, specifications and schedules. Typically plans are provided to the Spatial Information Officer at the start of design development for a first pass at room numbering, with iterations throughout the process as changes are made. Although a formal review is conducted at the end of design development, there may be subsequent changes to room numbers if the plans are amended for any reason throughout the documentation and construction process. All changes must be reviewed and approved by the Spatial Information Officer.

C 9.7 Asset Numbering Guidelines

C 9.7.1 Asset Numbering Goals

Asset numbering is intended to fulfil the following goals:

- Identification of a specific item of equipment / asset (unique number)
- To be able to associate relevant information with that unique item (e.g. O&M information, service reports, condition assessments, etc.)
- To establish a hierarchy to enable "rolling up" into asset classes – for asset management, budget management, etc.
- To be able to deconstruct the numbering system for meaning (e.g. not simply a series of numbers with no real-life meaning)

Assist in locating an asset (campus and building)

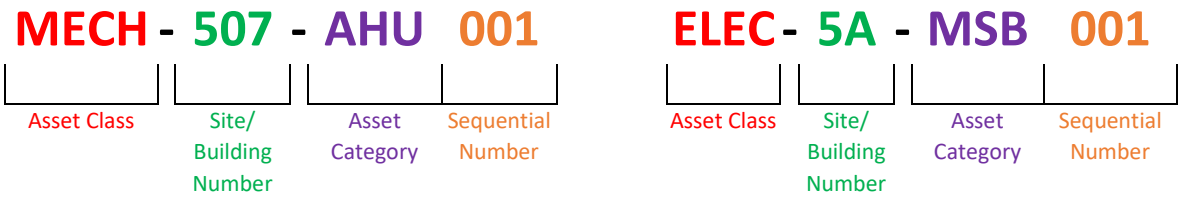
Intuitive reference for users (e.g. for service reports, system search, etc.)

- Labelling on site to confirm working with right asset
- Consistent reference for the life of an asset – from conception (consultant design) to end of life
- Consistency in numbering across all assets and prevent the use of AHU1 (for example) across every project
- The asset numbering forms the basis of an Asset Register
- Only items that need to be maintained or otherwise managed will be given an asset number (e.g. to an appropriate and manageable level of drill-down)

The above goals are achieved through a combination of Asset ID and barcode number.

C 9.7.2 Asset ID

Below is an example of a fictitious asset ID which illustrates each component (colours are for reference only)



C 9.7.2.1 Asset Class

Always four characters.

From a defined list – source from the University.

C 9.7.2.2 Site/Building Number

Typically three numeric digits (for site and buildings). For structures (refer Space Numbering Guidelines for definition), will be a number followed by one or two letters (e.g. '5A' or '5AB').

Campus site plans show each building and structure number.

Where an asset is not located within / on a building or structure, use the appropriate site number (e.g. '500' for Mawson Lakes). It may be necessary to refer to the space numbering approved by the Facilities Management Unit to determine whether the asset should be assigned to a building, structure or site number.

Assets not located on a particular campus (or within a defined zone of a campus) are identified as 'Offsite' and will either be allocated a site number of 200 (where within South Australia) or 800 (where outside South Australia but within Australia).

For portable assets not fixed to any particular campus/location, use '000'.

Note that the Mawson Lakes tunnel has a building number (590) – for assets within the tunnel, use 590, not the number of the building above.

Note that the building/structure number relates to where the asset is physically located, not the area it serves.

C 9.7.2.3 Asset Category

May be anything from 1 to 6 characters.

From a defined list – source from the University.

Asset Category is typically an acronym or other intuitive reference to a type of equipment / asset.

The acronym is not repeated across Asset Classes so can form a unique reference with the sequential number in its own right (within one building or structure) – refer section 3.

C 9.7.2.4 Sequential Number

Always three digits.

Sequential numbering restarts for each building or structure, therefore currently limited to 999 of any one Asset Category in one building/structure. If more than 999 is required for a single building or structure, seek further direction from the Facilities Management Unit.

C 9.7.2.5 Placeholders

Always a single hyphen with no spaces separating the numbering elements of the Asset ID (i.e. "-").

C 9.7.2.6 Layout

There are no spaces (" ") to be included in the Asset ID at any point including between placeholders and elements, between any characters of the ID nor in place of any unallocated characters such as for Asset Category when the full allowable six digits are not used i.e. "_AHU001" or "AHU_001". No fields are to be left unpopulated. This results in a total allowable range for an Asset ID (including the placeholders) of between 12 and 18 characters.

C 9.7.3 Assigning Asset ID

All new building projects must apply the described Asset ID to all agreed assets (to be confirmed with the Facilities Management Unit). All documentation references (drawings, specifications, design calculations, etc.) must use this Asset ID, however note that a shortened form may be used by dropping the Asset Class – e.g. '507-AHU001' instead of 'MECH-507-AHU001'.

For refurbishment projects, all new assets must be assigned an Asset ID in line with the described asset numbering system. It will be necessary to contact the Facilities Management Unit to determine the next free sequential number to apply to new assets for each building/structure/site. All documentation references must use this Asset ID as outlined above. When existing assets are modified or referenced, where available the current Asset ID should be used in documentation references in preference to any historic identification.

Dual Asset IDs can be used on large projects, where approved by the University. In this instance each asset would have 2 IDs, the primary Uni SA ID and the Project ID. Both IDs would have to be reflected on all documents and labels.

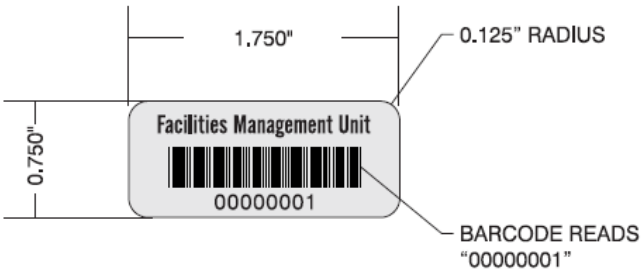
C 9.7.4 Barcode

C 9.7.4.1 Type

A barcode is applied to all agreed assets (to be confirmed with the Facilities Management Unit). The barcode is an eight-digit number, i.e. 00000001. Self-adhesive barcode labels are provided by the Facilities Management Unit.

An example of what the barcode labels look like is shown below:

Figure 1: Example of Facilities Management Unit barcode label



C 9.7.4.2 Application

The University will apply all barcodes to assets. Barcodes will be applied at the time of commissioning or other suitably agreed upon time throughout the project.

The barcode is to be located on the asset in a position that is readily visible and easily reached for the purposes of scanning. For curved assets the barcode must be placed so that the lines run in the same plane to ensure legibility when using a scanner. Where the size, shape or location of an asset restricts the application of a barcode as prescribed it is recommended to place the barcode in a tag and attach this to the asset.

C 9.7.5 General Notes

C 9.7.5.1 Different uses of Asset ID and Barcode

The barcode represents the unique identification for the physical item of equipment (asset). The barcode number is retained for the life of that item of equipment and is not re-used when the equipment is replaced.

The Asset ID is effectively a 'placeholder' for the asset/item of equipment within its operational network. It is retained even when the physical item of equipment is replaced. For example, when a switchboard is replaced, it will retain the Asset ID of the previous switchboard in that location, but will be assigned a new barcode number. This assumes a like-for-like replacement, where the replacement item fundamentally serves the same or similar function within the operational network. The University will determine when a new Asset ID is assigned to an asset.

C 9.7.5.2 Asset Relocation and Replacement

If an asset moves from one building to another (e.g. a room air conditioner), it will be assigned a new Asset ID but will retain the existing barcode number. If an asset moves to a new location within the same building or structure, UniSA Facilities Management Unit will determine if a new Asset ID is required.

Barcode numbers will never be re-used. If an asset is replaced, it will be assigned a new barcode number.

C 9.7.5.3 Asset Relationships

Where there are relationships between assets (e.g. parent/child), this will be recorded as data within the Asset Register. Relationships are not reflected within the Asset IDs themselves.

University of South Australia

C 10 Operation and Maintenance Manuals Requirements

C 10.1 Disciplines

The Operation and Maintenance Manuals are to be grouped into the following disciplines:

- Architectural
- Electrical Services
- Mechanical Services
- Hydraulic Services
- Fire Services
- Transportation Systems
- Data and Communications
- Electronic Security (Gallagher Access Control & FLIR CCTV)
- Audio Visual
- BMS (may be included with Mechanical Services)
- Essential Safety Provisions and Compliance
- Structural
- Civil
- Landscape
- Survey

Following disciplines can be included as subsections under another manual:

- Plant and Equipment
- Elevated work platforms
- Staging and rigging
- Gantry Equipment
- Accessibility assets

Other disciplines may be agreed upon, as required for specific projects.

Within each O&M Manual section, each of these disciplines may be broken down into sub-groups as required by the project.

For example, Architectural may be broken down into the following sub-groups:

GROUP	GROUP
Finishes	Roofing
Furniture and Fixtures, Fittings & Equipment	Waterproofing
Windows and Curtain Walls	Internal Walls and Partitions
Doors and Hatches	Operable Walls
Door and Window Hardware	Metal Fixtures
Glazing	Signage
Cladding	Pest Control Systems

Landscaping can be divided into the following groups:

GROUP	GROUP
Planting	Paving
Irrigation	Urban Elements

C 10.2 General Requirements

The O&M manuals are to provide concise descriptions, technical details, operation and maintenance instructions and schedules, commissioning records, logbooks, catalogues, principles of operation, method of operation and other information that will enable the on-going operation and maintenance of the fabric, services, plant and equipment.

The comprehensive descriptions are to be accompanied by appropriate diagrams and other necessary illustrations as required to facilitate knowledge and understanding about the operation of the plant and equipment. Examples include hydraulic flow diagrams, electric wiring diagrams, electronic circuit plans and mechanical air flow diagrams, etc.

Ensure the content of the documents is provided by personnel with skill and experience in the operation and maintenance of the installation and that the content is clear, succinct, accurate and relevant, the terminology is appropriate, and the grammar is correct.

Note that there is no requirement to provide asset details in the O&M Manuals where assets are not maintainable or operable, however excluded detail is to be provided in the “description” section in broad detail. This exclusion does not extend to drawings.

C 10.3 Submission Requirements

Provide O&M Manuals in electronic format only (hard copy manuals will not be accepted).

Information shall be provided on a USB drive. A separate USB drive shall be provided for each trade discipline as outlined in section C9.1 Disciplines.

Electronic information for individual disciplines must be divided into Section folders, each named as outlined in Section C 10.4 O&M Manual Sections. Sub-folders using a logical structure and naming convention are acceptable.

The manual must include all drawings in electronic format as set out in Section C 8 Documentation and Drawings as well as electronic versions of all documents defined in Section C 10.4.

Acceptable electronic file formats include:

- Searchable pdf
- Word documents
- Excel spreadsheets / csv files
- AutoCAD drawings
- Scanned brochures in pdf format (searchable if possible)
- Revit (BIM) files (note: these are in addition to, not replacing, drawings as outlined in Section C 8)

Document/file naming must be descriptive of the contents of the file, with file names not exceeding 150 characters in length.

C 10.4 O&M Manual Sections

Each O&M Manual Discipline is to include the following Sections:

Section 1—Introduction and Contents

Introduction – introduce the main features of the installation for the discipline including a project summary with building number, UniSA project number and year of construction.
Contents – provide a comprehensive contents list for all the Sections

Directory – specific directory of contractor/supplier details for the discipline

Section 2—Asset Register

Asset Register – A complete list of all equipment/elements used in the installation, as set out below (note the different asset register structures for Services disciplines and Architectural and Landscape disciplines). The Asset Register must also be provided electronically - use the electronic template provided by the University.
Switchboard legends (for relevant discipline).

Table 3 - Asset Register Structure for Services disciplines

Details	Definition
Asset ID No.	To be sourced from the University
Campus	Campus Name
Building / Location	Building / Location Name
Level / Zone	Level or Zone number (final)
Room / Grid Ref No.	Room or Grid Ref number (final)
Location Info	Room name / use or location of asset within room / area
Discipline	From list set out in this Technical Standard or as agreed for specific project
Asset Category	Sub-category of discipline
Asset Description	Description of the asset
Make / Manufacturer	Manufacturer's name
Model No.	Model number/details of the asset
Serial No.	Serial number of the asset
Date of Installation	Date installed / acquired
Supplier	Supplier/vendor's name (contact details must be included in the discipline directory)
Country of origin / manufacture	Country of manufacture/origin
Warranty details	Name and type of warranty provided
Warranty expiration date	Date of warranty expiration
Estimated life / useful life (years)	Useful life from install given normal wear and tear and treatment

Table 4 - Asset Register Structure for Architectural and Landscape disciplines

Details	Definition
Unique ID / Asset Designation	Typically a code as identified on drawings / specifications (e.g. floor finish type, chair type, etc.)
Location	Indicative location if multiple (e.g. meeting rooms, offices, etc.) or final room number and room name if individual item
Discipline	From list set out in this Technical Standard or as agreed for specific project
Asset Category	Sub-category of discipline
Asset Description	Brief description of the asset (e.g. "feature carpet", "meeting room chair", etc.)
Make / Manufacturer	Manufacturer's name

Details	Definition
Details	E.g. model number, colour and/or finish, size etc. – all information required to source the identical product
Date of Installation	Date Installed / Acquired
Quantity	How many of each item or number of square metres
Country of origin / manufacture	Country of manufacture / origin
Warranty details	Name and type of warranty provided
Warranty expiration date	Date of warranty expiration
Estimated life / useful life (years)	Useful life from install given normal wear and tear and treatment
Additional comments	Any additional comments on the specific asset

Note: The Asset Register for Architectural and Landscape disciplines is expected to include all finishes, furniture and equipment, joinery units and other fixtures, and all elements such as glazing, ceiling types, etc.

Section 3—Drawings

This section must include:

- Drawing Register, clearly listing all drawing numbers, drawing names, drawing content, version status and version date
- Drawings – full size, to scale

Drawings should include the full documentation set for the discipline. This may include (but is not limited to): floor plans, FFE plans, ceiling plans, roof plans, elevations, sections, details, site plans, arrangement plans, shop drawings, schematic diagrams (e.g. wiring diagrams, flow diagrams). Drawings must represent as-built (with the exception of shop drawings where relevant).

Electronic versions of all drawings must also be provided as set out in Section C 8 Documentation and Drawings.

Section 4—Specifications & Schedules

Include all Specifications and Schedules that form part of the documentation set for the discipline.

Section 5—Operation / Maintenance / Cleaning

This section should include all information necessary to understand the operation, maintenance and/or cleaning requirements for each element of the installation.

This will typically include the following (where relevant):

- System Descriptions
  - A general description of the installation as required for providing a general understanding of equipment and its operation, including design principles, operating principles (including any interfaces and interoperability issues), and any special features.
  - Technical descriptions of each system / installation, written to ensure that they can be clearly understood by persons not familiar with the installation.
  - Performance data detailing the mode of operation of each system.

- *Operating Instructions*
  Manufacturer's literature or a written precise description of the operation procedure in plain English. This is typically to include:
  - Safe starting, running, operation and shut-down procedures for the equipment, including a logical step-by-step sequence of instructions for each procedure.
  - Control sequences and flow diagrams
  - Legend for colour-coded services
  - Schedules of the parameter settings of each protective device, including fixed and adjustable circuit breakers, protective relays, adjustable photoelectric switches, pressure switches, and any other control and monitoring device as established during commissioning and maintenance.
  - Instructions for the proper installation and dismantling of the equipment.

- Technical Data Sheets / Brochures
  Where not included in other sections, provide manufacturers or suppliers technical literature assembled specifically for the project and excluding irrelevant matter. Each product data sheet must be marked to clearly identify the specific products and components used in the installation and the data applicable. Include additional instructions and illustrations as required to identify any changes to the manufacturer's data or to illustrate the function of each component in the installation.

- Maintenance
  - Instructions for maintenance, testing, inspection or cleaning, typically including:
    - Emergency procedures including emergency services contact numbers and procedures for fault-finding
    - Manufacturers' technical literature as appropriate
    - Detailed recommendations for the frequency of performance of routine maintenance, testing, inspection or cleaning tasks
    - List of procedures and tasks associated with preventive (routine) maintenance
    - Procedures for safe troubleshooting, disassembly, repair and reassembly, cleaning, alignment, inspection and adjustment, a logical step-by-step sequence of instructions for each procedure.
  - Schedules of maintenance, testing, inspection or cleaning
    Schedule of frequency of required or recommended maintenance, testing, inspection or cleaning for each type of equipment, refer examples below. Note these examples indicate the type of information expected, they are not prescriptive templates.

Table 5 - Maintenance Schedule Example

Information/Data Name	Definition Of Information
Location of the equipment / element	Include building name, level number, room number and name and any other information required for prompt and unequivocal identification.
Description of equipment / element	Describe the equipment
Unique identification label	As attached to each piece of equipment.

Information/Data Name	Definition Of Information
Inspection type	Weekly, monthly, 6 monthly, annual, 3 yearly etc.
Maintenance required	Description of tasks.

Table 6 - Maintenance Frequencies Example

Equipment / Element Description	Weekly	Monthly	Bi Monthly	Quarterly	6 Monthly	Annual
Equipment A	X	X	X	X	X	X
Equipment B		X		X		X
Equipment C		X		X		X
Equipment D			X		X	X

Table 7 - Maintenance Calendar Schedule Example

Equipment / Element description	Qty	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Equipment A	X	B	B	B	B	B	B	B	B	B	B	B	B
Equipment B	X	C			C			C			C		
Equipment C	X	B	C	B	B	C	B	B	C	B	B	C	B
Equipment D	X							A					

Table 8 - Maintenance Tasks Example

Building Access And Egress		Service Type			
Check and record in logbook:		A	B	C	D
1	All doors should open freely without the use of a key. If an automatic-unlocking device has been approved, check that the door opens freely when the device is actuated.	▲	▲		
2	All hold-open devices operate correctly.	▲	▲		
3	Treads are stable and non-slip surfaces are in good condition.	▲		▲	
4	All handrails are in good repair.	▲		▲	
5	Obstructions above the rail which would tend to break a handhold.	▲		▲	
6	Handrail is continuous between stair landings.	▲		▲	
Comments A = Annual, B = Monthly, C = 3 monthly, D = bi-monthly, E = Weekly Any concern regarding disability access and egress – check with the appropriate authority					

- Maintenance during Defects Liability Period
  All records of maintenance carried out during the Defects Liability Period.
  Tools and testing equipment
  List of specialised tools and testing equipment and instructions for the use and maintenance of the tools and testing equipment.

At Practical Completion, the Contractor must provide the University with two (2) complete sets of any special, non-generic tools and portable indicating instruments that are not commercially available and are necessary for operation, maintenance, dismantling or assembly of plant and equipment provided, together with suitable means of identifying, storing and securing the tools and instruments.

- Spares and consumables
  - Schedule of spares (including bearings) with an expected operation life less than 40,000 hours, including item label, manufacturer name, address and contact number, catalogue number, name and address of local distributor, and expected replacement frequency.
  - Schedule of spare parts necessary for maintenance.
  - Schedule of consumable items (oil, grease, belts, and bearings) to be used during servicing.
- *Imported equipment*
  Provide a list of all imported equipment, including country of origin and importer details.

Section 6—Certificates, Warranties and Guarantees

Includes manufacturers' warranties and guarantees, certificates from authorities, Certificates of Compliance for electrical and plumbing works. If installation is not by the manufacturer, and product warranty is conditional on the manufacturer's approval of the installer, submit the manufacturer's approval of the installing firm.

Before, and as a condition of the issue of the Final Certificate, vendors must submit warranties:

- In an appropriate form
- Executed by contractor and warrantor (or warrantors in case of joint warranties)
- For the required warranty period.

Warranty conditions:

- Where a warrantor is a subsidiary of another organisation, the warrantor submits that organisation's guarantee of performance of warranty.
- Submit product warranties which are coextensive with or additional to the terms and warranty period of any manufacturer's published warranty, and do not derogate from any warranty implied by law.
- Where any part of work is required to be repaired or made good under a warranty, the warranty period:

Must not terminate until that part has been satisfactorily repaired or made good

In respect of that part, must recommence from date of completion of repair or making good.

Section 7—Commissioning and Test data

Records of test results and commissioning data.

C 10.5 Operation and Maintenance Manuals – specific requirements

C 10.5.1 Specific requirements for Essential Safety Provisions and Compliance Manual

All Essential Safety Provisions and compliance information is to be contained within the separate Essential Safety Provisions / Compliance Manual.

In addition to the above general O&M manual requirements, the following is required:

Section 1—Introduction and Contents

- BCA assessment statement with particular reference to all fire and lift safety requirements, including:
  - Classification
  - Structure
  - Fire Resistance & Compartmentation
  - Access and egress
  - Services & Equipment
- Completed ESP checklist to identify all installed or modified systems/features which trigger the requirement for maintenance in accordance with Ministers Specification SA76 - use the electronic template provided by the University

Section 2—Registers

- An Asset Register for each type of Essential Safety Provision equipment. The register shall be in a standard UniSA Asset Register format - use the electronic template provided by the University. The register shall contain all equipment/building elements which require maintenance under Ministers Specification SA76
- Safety in design risk register – end of design SID report
- Safety in design risk register – end of construction SID report

Section 3—Drawings

The following drawings are to be provided:

1. Site plan drawn to scale of not less than 1:500 showing any proposed and/or existing structure erected on the site, the boundaries of the site, the levels of the site, vehicular access roads within the site, adjoining streets and compass point [Section 3 Drawings].
2. Layout and detail drawings identifying the full extent and design of all relevant fire safety measures and systems [Section 3 Drawings], including:
   - Compartmentation, fire wall/separation, fire/smoke doors and/or windows and services penetrations. Means of egress, detailing paths of travel
   - Signs, including lifts and all signage associate with egress paths, etc.
   - Access for fire appliances
   - Emergency lifts
   - Exit & emergency lighting
   - Fire extinguishers & hose reels
   - Smoke hazard management
   - Mechanical air handling systems, associated HVAC control and fire dampers
   - EWIS details and location of warning devices
   - Hydrant and booster details,
   - Fire Alarm System and detector layout
   - Fire Sprinkler System and layout

Section 4—Specifications & Schedules

- A consolidated services penetrations register to record all services penetrations through fire and smoke walls. Register shall include photographic record of each penetration. ESP drawings shall be updated to show locations of all new penetrations - use the electronic template provided by the University

Section 5—Operation / Maintenance / Cleaning

- Précis of operation for all fire detection and protection systems - use the electronic template provided by the University. Where project involves work to existing building, existing précis of operation shall be amended to capture changes related to the project including fire matrix updates. Précis of operation shall include a schedule of alternative solutions.
- A schedule of the type and frequency of required or recommended maintenance, testing or inspection for each type of equipment classified as Essential Safety Provision.

Section 6—Certificates, Warranties and Guarantees

- Copy of ESP Form 1 [Section 6 Certificates, Warranties and Guarantees]
- Copy of ESP Form 2 [Section 6 Certificates, Warranties and Guarantees]
- Building Development Approval documents
- Building Occupancy Certificate [Section 6 Certificates, Warranties and Guarantees]
- Where a fire hydrant or sprinkler system is installed, a current certificate of flow test
- Copies of all plant/systems registrations with relevant authorities (e.g. Safework SA registrations)

Section 7—Commissioning and Test data

- All commissioning and test data relating to ESP, e.g. integrated building test.

C 10.5.2 Windows and Curtain Walls (Architectural) - Special Information

Organic film coating warranty

Warrantors must submit paint manufacturer's warranty for specified coating, including warranty conditions, if any, applying to conversion coating mass, dry film thickness of paint coatings, and number of coatings.

Joint product warranties

Warrantors must submit following product warranties with, and as part of, curtain wall warranty:

- glass manufacturer's warranty
- toughened and heat strengthened glass warranty
- aluminium framing suite manufacturer's warranty including non-standard components i.e. frameless sash windows, if applicable
- aluminium finish applicator's warranty—an undertaking by applicator of finish to refinish or replace aluminium items where:
  - finish cracks, peels, or shows pitting or corrosion, discernible from 1500 mm distance, resulting from atmospheric conditions normal for environment of installation
  - when tested to AS/NZS 1580.481.1.2 a coloured finish discolours in service to a degree greater than 2 on Rating Scale of Table 1 of that standard, compared to an unweathered reference sample; or
  - colour change in coloured finish of either or both of any two adjacent sections results in a colour difference between them which exceeds Rating Scale measure of range of colour variation accepted in contract approved colour sample range.

Drawings

The drawing set must be an "as installed" shop drawing set of the works installed.

Identify site-glazed panels.

C 10.5.3 Door and Window Hardware (Architectural) – Special Information

Hardware schedule

Amended (updated) door hardware schedules should be submitted at key milestones including but not limited to the 75% & 100% technical reviews. These should be prepared by the architect and door hardware supplier and show highlighted changes to the contract door hardware schedule.

They should include:

- UniSA approval of hardware samples.
- UniSA acceptance of an equivalent item to a specified item.
- Contract variation to a door hardware requirement

C 10.5.4 Waterproofing (Architectural) – Special Information

Waterproofing Warranty

Provide a warranty in respect of manufacture and installation of the waterproofing membrane against any and every effect or failure which may occur during the warranty period arising out of any fault of the system, workmanship fabrication, fixing or quality of materials used.

The warrantor's liability must include cost of removal and replacement of defective materials, making good any leakage staining or other damage to building caused by any such defect or failure, and any defect in or failure of the joints or edge sealing, and any defects or failure caused by any inherent property of the waterproofing membrane.

C 10.5.5 Furniture and Fixtures, Fittings and Equipment (Architectural) – Special Information

Submit the manufacturer's recommendations for demounting and relocation of fixtures, fittings and equipment, and recommendations for service use, care and maintenance of all furniture and fixtures, fittings and equipment (including joinery).

C 10.5.6 Pest Control Systems (Architectural) – Special Information

Provide details of all provisions for permanent pest control. For example:

Table 9 - Pest Control Schedule Example

Location	Type
All slab penetrations	Woven stainless steel mesh
All slab control joints and footing/slab joints	Woven stainless steel mesh
Building perimeters – where insufficient clearance between the slab edge and paving level	Woven stainless steel mesh

C 10.5.7 Plantings (Landscape) – Special Information

Plant Schedule

Provide a list of plants—common name, botanical name, quantity.

Product warranty

Submit the supplier's written statement certifying that plants are true to the required species and type, and are free from diseases, pests and weeds.

C 10.5.8 Irrigation (Landscape) – Special Information

As-built drawings

As-built drawings for irrigation installations must be accurate within 500 mm for all irrigation components installed and detail any changes made during installation from the initial design.

Laminated plan and schedule

Within each irrigation control cabinet must be a laminated plan and an approved laminated irrigation schedule.

C 10.5.9 Architectural, Civil and Structural Information

Drawings – Special Information

As-built drawings

An electronic copy of the last issued revision of Architectural design drawings and Civil and Structural Engineering design and approved shop drawings must be provided with the Operation and Maintenance Manual. To clarify, hard / paper copies are not required.

C 10.6 Timing of Delivery of O&M Manual information

There are a number of versions of asset information expected as the project progresses. Submit progressive revisions of the manual information throughout the course of the construction project to ensure the accuracy of content and the familiarisation of the University with the installation.

C 10.6.1 Preliminary O&M Manual information

For equipment put into service during construction and operated by the University only, submit Preliminary O&M Manual information at least two (2) weeks before handover of responsibility for equipment operation.

C 10.6.2 Draft O&M Manual information

Submit Draft O&M Manual information, including maintenance records, at least eight (8) weeks before the Date for Practical Completion for review by the Consultant Team. Include provisional record drawings and preliminary performance data.

Submit the revised Draft Manuals no later than two (2) weeks before the Date for Practical Completion for review by the University. If available, include certificates from authorities and warranties.

C 10.6.3 Final O&M Manual information

On completion of commissioning and within one (1) month after Practical Completion, submit final O&M Manual information. Incorporate any changes from the Consultant Team, review by the University and training sessions as set out elsewhere in this section and include any additional relevant material.

C 10.6.4 Revisions

Within two (2) weeks after completion of the defects liability period and/or maintenance period, submit amendments incorporating changes and comments.

C 10.6.5 Information Delivery Checklist

The following checklist is intended to provide a guide to the Principal Consultant, Contractors and University staff, in ensuring that the O&M Manual information has been delivered as per the

specifications provided. The timeline is directed at the provider of the action item, whether it is the Contractor or Principal Consultant.

C 11 Plant Certification and Registration

Certification and registration of plant/equipment/systems installation and plant/equipment/systems design shall be the responsibility of the installing contractor. This will include but not be limited to all plant requiring certification and/or registration with SafeWorkSA, local councils, OTR and other authorities. All costs associated with such activities shall be the responsibility of the installing contractor.

C 12 Defects Liability Period Requirements

C 12.1 Maintenance Records

Maintenance records for each discipline must be provided monthly to the contract supervisor for the duration of the DLP and a copy issued to the maintenance@unisa.edu.au inbox. Note that records must align with the previously provided Maintenance Schedule and where deviation has occurred written notice must be provided.

Table 10 - O & M Manual Deliverables Checklist

Action Item	Timeline	Provided By	Recipient
Architectural For Construction Drawings	To be provided no later than two (2) weeks before the date of Practical Completion	Contractor	The University of South Australia
As-Built Drawings	Final as-built drawings to be provided within one (1) month after Practical Completion	Contractor to Principal Consultant	The University of South Australia
Training	To be provided within one (1) month after Practical Completion	Contractor	The University of South Australia
Directory of contacts (preliminary)	To be provided at Practical Completion. Final version to be included in relevant O&M Manual section.	Contractor to Principal Consultant	The University of South Australia
Preliminary Manual information	(only for equipment put into service during construction and operated by the University) To be provided two (2) weeks before handover of responsibility.	Contractor to Principal Consultant	The University of South Australia
Draft Manual information	To be provided eight (8) weeks before Practical Completion for review by Consultant Team.	Contractor to Principal Consultant	Consultant Team
Revised Draft Manual information	To be provided two (2) weeks before Practical Completion for review by the University and use in training.	Contractor to Principal Consultant	The University of South Australia
Final Manual information	To be provided with one (1) month after Practical Completion.	Contractor to Principal Consultant	The University of South Australia
Tools and Instruments	To be provided at Practical Completion.	Contractor	The University of South Australia
ESP Schedules (preliminary)	To be provided at Practical Completion. Final version to be included in relevant O&M Manual section.	Contractor to Principal Consultant	The University of South Australia

Where space or system modifications are implemented during the DLP period, manual updates shall

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UNISA TECHNICAL STANDARDS

D

MECHANICAL SERVICES

	SECTION	
	A	Introduction
	B	Safety in Design
	C	Design Controls
x	D	HVAC/Mechanical
	E	Electrical and Lighting
	F	Fire Protection and Detection Services
	G	Plumbing
	H	Building Management System
	I	Transportation Systems
	J	Security Systems
	K	Audio Visual Technology
	L	Communications Infrastructure
	M	Architectural

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Contents

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D 1 General Requirements

D 1.1 Introduction

It is expected that this section is read in conjunction with all other sections of the UniSA Technical Standards, in order to achieve a fully comprehensive understanding of the University requirements.

All works undertaken at the University must comply with the requirements of NATSPEC specifications and the designers must use this, plus the University specific modified clauses as a basis for their specifications.

The designer shall amplify the relevant NATSPEC requirements where necessary to meet specific project requirements or to provide increased levels of quality and/or performance with approval from the Contracts Supervisor.

The designer may use their own specification, but only with written approval from the University. Where alternative specification is used, it must ensure that the specified standards, quality and outcomes are equivalent to or greater than those specified through NATSPEC. NATSPEC supplementary clauses specified in this document are to be inserted into the designer's specifications.

The designer must not reduce the requirements of NATSPEC and/or the UniSA Technical Standards clauses without written approval from the Contracts Supervisor.

On smaller projects where the scope of work does not justify a full NATSPEC specification the designer may propose a "notes on drawing" type of specification, as long as the pertinent elements of the NATSPEC and supplementary the University clauses are included, with the Contract Supervisors approval

NATSPEC supplementary clauses which are required to be inserted into the designer's specifications have been placed inside a blue box and text has been *italicised*.

D 1.2 Responsibilities

To be inserted – Clause 1.1 RESPONSIBILITIES – NATSPEC 0701 Mechanical Systems

The scope of works for the mechanical systems include, but are not limited to, the following:

- *The designer shall insert a bullet point list of the scope of mechanical works*
- *……*
- *…….*

The contractor shall determine the full scope of the works from review of this specification and all associated contract drawings.

The contractor shall attend site to satisfy himself of the existing systems and site conditions.

No claim shall be entertained for lack of knowledge of the contract documentation or of existing systems which could reasonably have been known from prior investigation

D 1.3 Standards and Regulations

The following table details the Standards and Regulations, which are additional to those referred to in Section C and are specific to the Mechanical Services:

Table 1 – List of Standards and Regulations

CODE	DESCRIPTION
As 1324.1	Air filters for use in general ventilation and air conditioning – Application performance and construction
AS/NZS 1668.1	The use of ventilation and air conditioning in building – Fire and Smoke control in multi-compartment buildings
AS 1668.2	The use of ventilation and air conditioning in buildings - Mechanical ventilation in buildings
AS 1668:3	The use of ventilation and air conditioning in buildings - Smoke control systems for large single compartments or smoke reservoirs
AS 1668:4	The use of ventilation and air conditioning in buildings - Natural ventilation of buildings
AS/NZS 1677.2	Refrigerating Systems – Safety Requirements for fixed applications
AS 1682.1	Fire, smoke and air dampers - Specification
AS 1682.2	Fire Dampers – Installation
AS 1894	The storage and handling of non-flammable cryogenic and refrigerated liquids
AS 1940	The storage and handling of flammable and combustible liquids
AS/NZS 2243.1	Safety in laboratories – planning and operational aspects
AS/NZS 2243.2	Safety in laboratories – chemical aspects and storage
AS/NZS 2243.6	Safety in laboratories – plant and equipment aspects
AS/NZS 2243.7	Safety in laboratories – electrical aspects
AS/NZS 2243.8	Safety in laboratories – fume cupboards
AS/NZS 2243.9	Safety in laboratories – recirculating fume cabinets
AS 2430.3.4	Classification of hazardous areas Part3.4: Examples of area classification – Flammable gases
AS/NZS 2982	Laboratory Design and Constructions
AS 2896	Medical gas systems – Installation and testing of non-flammable medical gas pipeline systems
AS/NZS 3666.1	Air handling and water systems of buildings – Microbial control – design, installation and commissioning
AS/NZS 3666.2	Air handling and water systems of buildings – Microbial control – operation and maintenance
AS/NZS 3666.3	Air handling and water systems of buildings – Microbial control – Performance-based maintenance of cooling water systems
AS 4041	Pressure Piping
AS 4120	Code of Tendering
AS 4122	General conditions of contract for engagement of consultants
AS 4254.1	Ductwork for air handling systems in buildings – flexible duct
AS 4254.2	Ductwork for air handling systems in buildings – rigid duct
AS 4260	High efficiency particulate air (HEPA) filters – Classification, construction and performance
AS 4289	Oxygen and acetylene gas reticulation systems
AS 4332	The storage and handling of gases in cylinders

CODE	DESCRIPTION
AS 4426	Thermal insulation of pipework, ductwork and equipment – Selection, installation and finish
AS 4580	Thermal Resistance of insulation for ductwork used in building air conditioning
AS 4552	Gas fired water heaters for hot water supply and/or central heating
AS 4809	Copper pipe and fittings – Installation and commissioning
AS/NZS 5601.1	Gas Installations – General Installations
AS/NZS 60079.10.1	Explosive atmospheres - Classification of areas - Explosive gas atmospheres
AS/NZS 60079.29.2	Explosive atmospheres - Gas detectors - Selection, installation, use and maintenance of detectors for flammable gases and oxygen
AS/NZS ISO 9001	Quality Management Systems – Requirements
SAA/SNZ HB 32	Control of microbial growth in air handling and water systems of buildings
SAA HB 40.1	The Australian Refrigeration and Air Conditioning Code of Good Practice, Reduction of emissions of fluorocarbon refrigerants in commercial and industrial refrigeration and air conditioning applications
ASHRAE 111	Practices for measurement, testing, adjusting and balancing of building heating, ventilation, air conditioning and refrigeration systems
ICANZ	Industry Code of Practice for the Safe Use of Glasswool and Rockwool
	Office of the Gene Technology Regulator Guidelines for Certifications of Physical Containment Facilities

This above list is not all-inclusive and those associated with the project are responsible for identifying and complying with all standards relevant to the scope of works.

All Mechanical Services installations must comply with the version as referenced in the BCA, otherwise the most current version of the standard or code at the time of tender.

To be inserted – Clause 1.5 Standards – NATSPEC 0701 Mechanical Systems

Comply in all respects with the requirements of the current standards applicable to the works in respect to equipment, materials, workmanship and installation techniques.

Comply with the following standards and regulations:

- *National Construction Code*
- *Australian Standards*
- *SA Water Corporation*
- *Australian Gas Association Regulations*
- *SA Fire Services Regulations*
- *SA Government Acts governing the Works*
- *Work Health and Safety Regulations*

D 1.4 Quality

All mechanical services design work is required to be carried out via suitably qualified and experienced designers. The University may request copies of the designer's calculations in order 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.

All design work must be checked and reviewed by a suitably qualified and experienced peer prior to issuing for pricing. The designer must have a formal check and review process. The University may request evidence of the design checking and review process.

On occasion a designer may utilise a third-party designer (sub-consultant / specialist contractor / chiller manufacturer / supplier, etc.) however, the designer retains responsibility for the design and review process.

Unless specifically directed otherwise, all equipment designed, specified and installed must be new and of the highest quality.

D 1.5 Installation Requirements

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

Plant is not to be mounted on the roof, unless otherwise approved by the University

Plant is not to be installed in ceiling spaces, unless otherwise approved by the University

Cables and pipes must be combined in common accessible service ducts and shafts wherever possible, with sufficient clearance for future replacement, with valves and other equipment requiring maintenance grouped in accessible locations.

Utilise common and sequential systems of nomenclature, numbering and colour coding of all service systems complying with the University Asset Numbering Guidelines – as set out in Section C.

Provide facilities for storage of ready-use spare parts and regeneration chemicals immediately adjacent to all items of equipment

Install vibration and noise isolation sufficient to prevent transmission or generation of objectionable effects in occupied areas

Provide washing and cleaning facilities, including floor drainage and bunds for all appropriate items of plant.

Ensure a distribution switchboard capacity has 30% spare capacity for addition of future circuits in all cases

Install integration hour meters and/or flow meters on all items of equipment which require service or maintenance according to these parameters

Provide a completely automatic, unattended operation of all plant and equipment, unless special permission from the University is granted for plant attendance, excluding normal daily start/stop and inspection functions.

All equipment must be installed in accordance with manufacturer's recommendations including associated maintenance access and the requirements of AS 3666. All air handling units or fan coil units must be installed to provide a minimum fall ratio of 100-1 within one side (highest point), of the internal drip tray to the opposite external discharge drainpipe (lowest point).

Special consideration must be given to the locations of all plant in relation to accessibility, noise and vibration and visual impact. The plant must be readily accessible via permanent roadways, corridors or permanent fixed stairways or ladders complying with statutory requirements.

The location of the plant external to building structures at ground level, must be enclosed in a locked enclosure to provide restricted access to maintenance staff only. The enclosure must not affect performance or maintenance of the plant.

All laboratories shall be fitted with gas emergency shut off provisions for each of the following gases (where reticulated):

- natural gas
- other flammable gases
- hazardous gases

The designer shall liaise with the user group to determine types of laboratory gases requiring reticulation and their associated classification. It is acceptable for the gas isolation to be integrated with the power isolation such that a common emergency stop button isolates power and gases simultaneously.

All emergency stop buttons shall be shrouded and key resettable using standard Ronin keys as per NHP Sprecher & Schuh range or approved equivalent. Refer to Electrical Section E2.1 for labelling requirements.

D 1.6 Preferred Manufacturers

The University requires that only proven proprietary equipment, with local service availability must be selected.

Where built-up plant or equipment is required, standards of construction must be no less than accepted industry standards and must comply with all statutory requirements and designed and constructed for a life of no less than 20 years, with a minimum service and maintenance requirements. Particular attention must be given to ease of access to items requiring replacement or routine maintenance.

It is a requirement that new equipment is compatible with the Legacy systems the University has implemented:

- Emergency Lighting Central Test and Monitoring – Stanilite Nexus (LX or RF as applicable)
- Building Management System – Modbus LONWorks – Niagara/Invensys central located server
- Automatic Lighting Control – Clipsal C-Bus
- Fire Detection and Alarm – Ampac

Whilst the University does not wish to restrict the designer's ability to select the most appropriate equipment to meet particular requirements it is the University's preference that equipment selected satisfies the following:

- A reputable manufacturer with a proven track record
- Local Adelaide representation and support in design and post installation operation
- Local Adelaide spare parts availability
- Australian manufacturer is preferred.

The following is an indicative list, which the University considers to represent the desired quality levels:

Table 2 – List of Preferred Manufacturers

Equipment / Component	Manufacturer / Supplier
Switchgear and components	Schneider, ABB, NHP
Electrical Accessories	Clipsal, HPM, Legrand
Split DX Air Conditioning Units	Temperzone
VRV Air Conditioning Units	Daikin, Mitsubishi
Package Air Conditioning Units	Temperzone

Evaporative Cooling Units	Bonaire, Braemar
Air Handling Units	Trane, Carrier, Fan Coil Industries, Air Design, GJ Walker
Fans	Fantech, Pacific HVAC, Ziehl-Abegg, Flakt-Woods
Heat Recovery Ventilation Units	Munters, Air Solutions, Daikin, Mitsubishi, Air Change
Chillers	Powerpax, Trane, York, McQuay
Boilers	Hunt, Raypak, Maxitherm, Tomlinson, Aira
Pumps	Grundos, KSB, Ajax
Cooling Towers	BAC, Evapco, Aquacool
Fume Cupboards	Dynaflow
Air Filters	Airepure, Camfil Farr, Peregrine Industries
Air Terminal Fittings	Holyoake, Bradflo, Krantz, Smartair
Electric Duct Heaters	General Elements
Variable Volume Boxes	Air Grilles, Holyoake, Celmec, Barcol Air
Fire Dampers	Air Grilles, Bullock, Riley, Trox, Holyoake
Equipment / Component	**Manufacturer / Supplier**
Fan Coil Units	Carrier, Air Design, Temperzone, Fan Coil Industries
Heat Exchangers	Alfa Laval, Senior Thermal Engineering
Humidifiers	Munters, CondAir
Variable Speed Drives	Danfoss

The mechanical services designer and contractor are welcome to propose alternatives, however, they must clearly demonstrate equal or greater technical, cost and/or quality performance.

To be inserted – Clause 1.10 Alternative Products – Natspec 0701 Mechanical Systems

All specified items represent a required level of quality and performance.

Unless specifically required to integrate with an existing University of South Australia system the contractor is at liberty to propose alternatives to the specified items subject to compliance with the UniSA Technical Standards and written approval from the Contracts Supervisor.

Where alternative equipment to that specified is proposed by the contractor, the contractor shall provide full details of technical, cost and/or programme benefit to the project with full supporting documentation (including calculations, modelling, etc.) at the contractors cost. The contractor shall retain design responsibility for any alternative proposals accepted including any unforeseen issues.

Any unapproved products provided shall be removed and replaced with the specified item at no cost to the University.

D 1.7 Safety in Design

Those involved in the design of the mechanical services must undertake the necessary Safety in Design reviews and activities as required by the contract.

Generally the University prohibits any working on energised equipment in accordance with the WHS Regulations. Where isolation of the equipment is demonstrably impracticable the contractor must provide a Safe Work Method Statement (SWMS) fully detailing how risks have been managed as low as reasonably practicable. It shall specifically address why isolation is impracticable and how access to energised electrical parts will be prevented. No working on energised equipment shall proceed without written approval from the University. Approval of the SWMS by the University does not relieve the contractor of primary responsibility for undertaking safe work

The mechanical designer should consider the following particular items as part of the Safety in Design, however they are not limited to:

- Locations of all plant and parts requiring maintenance i.e. at height, above or adjacent to risk areas, proximity to other plant, etc.
- Methods of safe isolation for access and maintenance of switchboards and equipment
- Satisfactory maintenance space around mechanical equipment
- Satisfactory space and access to internal components requiring maintenance and/or replacement

The designer must address the Safety in Design aspects in the Design Reports

The installer of the works must review the Safety in Design documentation throughout the works, to identify any risks throughout the works and any residual risks to the University on completion.

D 1.8 Operation Hours

The operation hours shall be reviewed and confirmed with the University for each individual project.

D 1.9 Sustainability

The designer must take into consideration the Environmental Sustainability of the mechanical works taking into account the whole of life cost and operational benefit.

All Buildings must be designed to suit the local environmental conditions. They must be designed to optimise the thermal and lighting conditions using minimum non-renewable sources of energy.

The preliminary design phase for all new buildings must include a life cycle costing in accordance with AS 3595. Elements relating to the commissioning are to be undertaken and must include an overview or projection of the development of the Campus in ten years hence and assessment of how any decisions made will impact on future development of the Campus. This must include building aspect, fabric and services.

Elements that the designer must consider, include, but are not limited to, the following:

- Energy efficiency
- Materials selection
- Decommissioning / disposal of equipment at end-of-life
- Control methodology
- Equipment selection
- Demand management

The sustainability aspects must be addressed in the Design Reports

D 1.10 Cost Planning

The mechanical services designer must provide input into the project cost planning as required by the contract.

The mechanical services designer should provide cost planning advice for the supply, installation, associated works, contingencies, overheads, etc. to indicate a total cost to the University.

Any element specifically excluded must be clearly indicated so that a total cost to the University may be determined.

D 1.11 Attendance

It is incumbent on the mechanical engineer and contractor to make themselves aware of existing conditions as far as reasonably practicable when designing and/or performing works at the University. The University reserves the right to hold the designer and/or contractor liable for works performed that are of a sub-standard or non-compliant nature.

The mechanical services designer must attend design and construction meetings as required by the contract and outlined below.

The University expects the mechanical services designer, not a delegate to attend at a minimum: -

- Technical reviews as directed by the Contract Supervisor
- Design team meetings appropriate to the size of the works. (Minimum of one meeting)
- Construction phase meetings appropriate to the size of the works. (Minimum of one meeting), plus any meetings where the Contract Supervisor deems there is significant mechanical elements that requires the designer's input
- Ongoing site inspections as considered appropriate by the Contract Supervisor (minimum bi-monthly)
- Mechanical services first fix inspection
- Mechanical services final fix inspection
- Mechanical services commissioning where required by Contract Supervisor
- Mechanical services final / defects inspection prior to Practical Completion
- Mechanical services final / defect inspection prior to end of Defects Liability Period (DLP). DLP inspection report to be issued to the University five working days prior to end of formal DLP.

The Mechanical designer must identify his/her proposed meeting site attendance schedule in their engagement proposal

The mechanical installer must attend meetings as required by the contract and considered necessary by the Contracts Supervisor

To be inserted – Clause 1.9 PERMITS NOTICES AND INSPECTIONS – NATSPEC 0701 Mechanical Systems

Make applications, obtain all permits, and arrange testing, all as necessary for the installation and placing into operation of the works where required by any Authority including:

- *SA Water corporation*
- *Department of Premier and Cabinet – Work Safe SA*
- *The Office of the Technical Regulator*
- *Australian Communications Authority*
- *Site Telecommunications Carrier*
- *SA Power Networks*
- *SA Fire Services*
- *Energy Retailer*

Provide all associated documentation required for the applications. Pay all associated fees.

To be inserted – Clause 1.9 PERMITS NOTICES AND INSPECTIONS – NATSPEC 0701 Mechanical Systems

Make applications, obtain all permits, and arrange testing, all as necessary for the installation and placing into operation of the works where required by any Authority including:

- *SA Water corporation*

- *Department of Premier and Cabinet – Work Safe SA*
- *The Office of the Technical Regulator*
- *Australian Communications Authority*
- *Site Telecommunications Carrier*
- *SA Power Networks*
- *SA Fire Services*
- *Energy Retailer*

Provide all associated documentation required for the applications. Pay all associated fees.

D 1.12 Plant Rooms and Access

Plant rooms must be designed to enable safe and easy access to all equipment for maintenance purposes. The following minimum criteria must be achieved:

- Walkways and equipment layouts to be designed with safe access for maintenance of the largest equipment in mind. Ease of equipment replacement is to be considered
- Plant room lighting to be designed to enable maintenance to be carried out safely
- Enclosed spaces (such as large air handling units) must incorporate internal luminaires
- Exposed hazards to be appropriately protected – i.e. covers on drains
- The University requires that all maintenance can be carried out in a safe manner – the design of the plant room must facilitate this requirement.

D 1.13 Population Densities

If it is not specified in the Project Brief, or agreed otherwise with the University, the requirements of AS 1668.2 will apply.

D 1.14 Design Conditions

All ventilation and air conditioning systems must be designed to meet the following design criteria:

Table 3 – List of Design Conditions

Item	Design Criteria
Extreme ambient conditions under which all plant shall operate – Adelaide Region	Summer: 46.0^{o}C dry bulb maximum 22.0^{o}C wet bulb maximum Full Solar Load Winter: 0.0^{o}C minimum
External ambient conditions for air conditioning plant full load performance	Summer: 38.0 ^{o}C dry bulb maximum. 21.0 ^{o}C wet bulb maximum. Full solar load. Winter: 4.0 ^{o}C dry bulb minimum. Zero solar load.

Item	Design Criteria
Ambient Conditions under which all plant shall operate – Other Regions	Design Conditions as per AIRAH DA09
Internal Conditions for plant full load performance - occupied spaces.	Cooling: 24.0°C dry bulb, 50% humidity Heating: 23.0°C dry bulb, 50% humidity
Internal Conditions for plant full load performance – Telecommunication closets	28°C dry bulb
Outside air, supply air, exhaust air, mechanical smoke venting and infiltration of air in perimeter areas	To the requirements of the Australian Standards and the Building Code of Australia
Internal Heat gains – people	70W per person, sensible – general 60W per person, latent – general
Internal Heat gains – lighting	10W/m^2 – general
Internal Heat gains – power	25W/m^2 – general
Population Densities	As agreed with the University, else to requirements of AS 1668.2
Maximum Noise levels at adjoining property boundaries	All areas to the requirement of Australian Standard 2107 – Acoustics – Recommended design sound levels and reverberation times for building interiors. Not to exceed levels in the Environmental Protection Act
Ductwork Sizing	Maximum Pressure Drop: 0.8 Pa/m maximum, all ductwork 0.5 Pa/m maximum, for outside air ductwork connected to fan coil units Maximum Velocity, Supply and Exhaust ductwork: 7.5 m/s maximum, main risers large systems and kitchen exhaust 6.0 m/s maximum, main horizontal branches 5.0 m/s maximum, minor branch ducts 4.0 m/s maximum, branch ducts to single outlets 3.0m/s maximum, flexible ductwork Maximum Velocity, Return air ductwork: 7.0 m/s maximum, main risers large systems 5.0 m/s maximum, main horizontal branches
Pipework Sizing (fixed flow systems)	Pipework under 50mm: 1.2m/s Maximum velocity Pipework over 50mm: 200Pa/m Maximum pressure drop
Pipework Sizing (variable flow systems)	Pipework under 50mm: 1.5m/s Maximum velocity Pipework over 50mm: 400Pa/m Maximum pressure drop
Outside Louvers	Maximum 2 m/s velocity through free area

Any changes to the above design conditions for a project or installation must first be approved by the University.

D 2 Equipment

D 2.1 Air Conditioning Units

The units must be of commercial quality, proprietary manufactured off-site, factory assembled, and factory tested.

Each unit must produce no less than the design capacities when operated at the design conditions specified in the design criteria.

Adequate and safe access must be provided for inspection, testing and maintenance of all items of the air conditioning plant.

All air conditioning systems must be connected and controlled via the University BMS system.

Split ducted and packaged DX units shall be of digital scroll compressor type.

All split ducted, split ceiling cassette and split under ceiling units shall have integral condensate pumps.

To be inserted – Clause 3.2 WORK ON EXISTING SYSTEMS – NATSPEC 0701 Mechanical Systems

When de-commissioning air conditioning equipment pump down and reclaim all refrigerant in accordance with relevant Australian Environmental Protection legislation. Refrigerant shall remain property of the principal and any credits for recycled refrigerant shall be passed on in full to the principal.

D 2.2 Air Handling Units

Each unit must produce no less than the design capacities when operated at the design conditions specified in the design criteria.

D 2.3 Chillers

The complete chiller must comply with the referenced Standards/Codes, and the design and installation must comply with the pressure vessel regulations, to the approval of the Statutory Authorities.

Each complete Chiller must be factory assembled, pressure tested and charged. The chiller must then be factory run and tested, and evidence of the testing to be provided.

Chillers shall be fitted with integral harmonic filters.

Literature and Selection data must be submitted and comprise of the following:

- Full description
- Manufacturer's noise levels
- Weights and spatial including weights
- Services required, including electrical requirements
- Ancillary items and additional features/options provided
- COP at 100%, 80%, 60%, 40% and 20% of full load and Integrated Part Load Value (IPLV)
- Technical data of associated equipment required for the control and satisfactory operation of the chiller

A menu driven, factory installed and wired, microprocessor based chiller management system, must be provided.

Where chillers are installed in enclosed plantrooms refrigerant detection system shall be provided for the plantroom. Detection system shall comply with the requirements of AS1677.2. Alarming shall include local audio and visual alarms and remote alarm monitoring through Uni Gallagher and BMS systems.

To be inserted – 2.1 General Motors and starters – NATSPEC 0711 Chillers

Provide integrated harmonic suppression filters to limit the harmonics to within the value prescribed by the electricity distributor

To be inserted – 3.2 Installation General – NATSPEC 0711 Chillers

The fully assembled water chiller must be pressure tested, both refrigerant side and water side, to the requirements of the applicable Standards/Codes.
All costs associated with testing, certification and pressure vessel registration shall be the responsibility of the contractor.

D 2.4 Boilers

Condensing boilers shall be used unless approved otherwise.

Each complete boiler must be factory assembled, pressure tested, and factory tested for operation of controls, sequencing and safety devices. Evidence of the hydrostatic pressure testing must be provided.

Literature and selection data must be submitted and comprise of a complete mechanical and engineering description of the boiler equipment, upon which the proposal is based, such as type of equipment, the manufacturer's guaranteed efficiency levels, surface areas of heat exchangers, water velocity and friction loss through heat exchanger tubes, details and technical data of associated equipment required for the control and satisfactory operation of the boiler plant.

D 2.5 Cooling Towers

All materials must be stainless steel.

The spray water circulating pump must be of the end suction, centrifugal type.

The arrangement of the cooling tower must allow for ease of access for the inspection and maintenance of the fill, drift eliminators, water distribution system or any other wetted components.

To be inserted – Clause 3.2 Completion – General – NATSPEC – 713 Cooling Towers

The water distribution over the fill pack shall be with overlapping spray patterns

D 2.6 Pumps

The pumps must deliver the scheduled fluid quantity against the resistance of the installed system. Test curves for each pump marked with the duty point/range must be provided.

Pumps must be selected to operate as close as possible to the maximum efficiency point. Pumps must be factory assembled units.

D 2.7 Evaporative Units

Adequate and safe access must be provided for inspection, testing and maintenance of the evaporative coolers.

D 2.8 Ventilation and Extraction

All fans and motors must be selected to allow an additional increase of 10% in the specified air quantity with the associated increase in system resistance.

Full calculation of the system static pressure must be used to determine the selection of the fan.

D 2.9 Coils

Face velocity should not exceed 2.5m/s, and shall not have less than 310 or more than 480 fins per meter. Coils must be circuited for counterflow operation.

D 2.10 Humidifiers

Critical applications must utilize resistive element type steam humidifiers. Steam humidifiers must be designed to deliver pure and sterile steam into the air stream. The units must be suitable for use with the specific pressure and quality of water available at each specific site, and analysis of the water must be obtained in order to select the appropriate units.

Non-critical applications must use evaporative pad humidifiers. Water distribution system must be configured to allow for appropriate level of control. A minimum of 2 stage control must be used unless approved otherwise.

D 2.11 Ductwork

All main ductwork, not handling corrosives, will be constructed from sheet metal.

Plastic ducting shall be limited to corrosive fume systems. Corrosives applications shall use Unplasticized polyvinylchloride (PVC) ducts with walls less than 6.3 mm thick. If the area involves very high values (such as for nanotechnology cleanrooms), then plastic lined ducting tested and approved in accordance with FM 4922 shall be considered. If exhaust has the potential for organic chemical vapours to condense out and leave combustible residue inside the ducting, then a process for inspecting inside ducts shall be considered.

Flexible ductwork shall only be used for final connection of grilles/registers/cowls to nearby sheet metal ducts and plenums, subject to following conditions:

- Flexible ductwork shall not exceed 5m in length.
- Flexible ductwork shall only be used where fully enclosed within ceiling space. Exposed flexible ductwork shall not be accepted.

The dampers must be provided for balancing the system, including to the following:

- Each flexible duct connection to a rigid duct
- Branch connection to a group of air outlets
- Any branch connection

All ductwork shall be protected to prevent ingress of foreign matter and moisture during transport and storage. Protection shall be maintained until final mounting.

D 2.12 Air Grilles

Only air grilles/diffusers with detailed published performance data shall be selected. Refer to list of preferred manufacturers. A detailed air grille schedule must be provided to the University for approval, including make, type/model, colour, and flow rates. Allowance must be made to provide a sample of each air grille if required. Fabric air diffusers shall not be used.

D 2.13 Filtration

Air Filters must comply with the requirements of AS1668.1.

The air filters must be dry media disposable type, complying with AS 1324 and installed to comply with AS 3666.

The air filters must be selected for a minimum average efficiency of 85% to test dust No. 1

Face velocity must not exceed 1.7 m/s for panel filters and 2.5 m/s for bag and extended media filters. The system must be designed for final pressure drop as follows:

- 125Pa for panel filters
- 250Pa for bag and extended media filters
- 550Pa for HEPA filters

D 2.14 Piping, Valves and Fittings

Chilled and heating water pipe work shall be copper tube to AS 1432 or steel to AS 1074. Rolled grooved couplings are acceptable provided they meet the specified operating conditions and are installed in accordance with manufacturer's recommendations. The use of quick connect fitting shall not be used, unless authorised by UniSA's technical reference group. All condenser water pipe work shall be copper tube to AS 1432 for diameters less than 200mm. For diameters over 200mm, 316 stainless steel or HDPE pipework shall be used.

All pipe work shall have isolating valves/drain points at regular intervals for ease of maintenance.

Isolation valves must be provided in pipe connections to each item of equipment, machinery or plant. Balancing valves must generally be provided with pumping systems not provided with flow adjustment.

All hot and chilled water system valves and flanges shall be insulated.

Where modifications are required to existing water and air distribution systems, e.g. adding new connections, or deleting existing connections, allowance must be made to check and rebalance all related water and air systems

Strainers must be provided upstream of equipment, e.g. control valves, pumps etc. and must be arranged to allow normal operation of systems when being inspected and/or maintained.

Valves and strainers must generally be line sized.

All condensate drains shall be Copper to AS 1432 Type B. First 1 meter of the condensate drain shall be insulated.

Valves and strainers must generally be line sized.

To be inserted – Clause 3.1 Installation – Installation – 0751 Piping

Uniformity of pipework should be maintained through the whole of the installation. Piping must be supplied in full standard straight lengths, free from defects, and with ends sealed against ingress of foreign materials during erection

D 2.15 Water Treatment

An approved specialist water treatment company must be engaged prior to construction for treatment of the following systems:

- Condenser water
- Chilled water

- Heating water

The details of the proposed specialist water treatment company must be provided to the University, for approval prior to the appointment. The details must include the proposed water treatment (cleaning chemicals, inhibitors, biocide types, etc.), process (frequency, treatment levels, etc.) and program.

D 2.16 Variable Speed Drives

Variable Speed Drives (VSD's) must be provided for all fans and pumps unless otherwise approved by the University. The VSD's must be controlled via the University's BMS control systems. VSD drives shall be Danfoss FC 102 or approved equal with LONworks High Level Interface and NABERS Compliant Integrated Energy Meter.

Variable speed drives shall be set up as follows:

For Drive on Pumps / Compressors:

ID	Name	Required Setup	Unit
103	*Torque Characteristics*	*Variable torque or Compressor Torque*	
171	*Start Delay*	*5*	*s*
1410	*Mains Failure*	*Coasting*	
1411	*Mains Voltage at Mains Fault*	*342*	*V*
1412	*Response to Mains Imbalance*	*Derate*	
1420	*Reset Mode*	*Automatic reset x 2*	
050	LCP Copy	No copy	

For Drive on Fans:

ID	Name	Required Setup	Unit
103	*Torque Characteristics*	*Variable torque*	
173	*Flying Start*	*Enabled*	
1410	*Mains Failure*	*Kinetic back-up*	
1411	*Mains Voltage at Mains Fault*	*342*	*V*
1412	*Response to Mains Imbalance*	*Derate*	
1420	*Reset Mode*	*Automatic reset x 2*	
050	*LCP Copy*	*No copy*	

Variable Speed Drives to be installed with overall braided screened cable between the VSD and motor, suitably terminated with RF Braid Glands at the motor terminal box and clamped at the VSD to ensure earthing continuity of the braid to manufactures instructions, pigtail termination of the braided screen will not be accepted.

Variable Speed Drives shall be a minimum of IP55 rating and installed in a readily accessible indoor location. Where no suitable indoor location is possible, the Variable Speed Drive shall be a minimum of IP66 rating and sheltered from direct sunlight by a suitably manufactured solar shade that does not impede the airflow ventilation requirements of the VSD.

D 2.17 Motors and Starters

External Rotor (ER) motors are not to be selected on equipment for applications requiring a variable speed drive. If no alternatives to the ER motor configuration are available, then a suitably enclosed and ventilated Sinusoidal Output Filter must be installed between the Variable Speed Drive and the ER motor.

D 2.18 Fume Cupboards

Noise levels associated with the fume cupboard in operation, must not exceed NR50 at the operator's position in front of the cupboard, with the sash fully open.

Each fume cupboard must be served via a separate exhaust fan and ductwork system. As a general rule, manifold fume cupboards shall not be accepted unless reviewed and approved by the University.

The discharge velocity must be between 10m/sec and 15m/sec and must discharge through a flue of sufficient height to penetrate the building boundary layer in accordance with the referenced Standards/Codes, to the requirements of the relevant Environmental Protection legislation, Statutory Authorities and so as not to affect the performance of adjacent exhaust flues.

All new fume cupboards shall be fitted with auto closing sashes and sash alarms.

Design and selection of fire protections systems within the fume cupboards will be based on a comprehensive risk assessment completed in collaboration with Uni SA. Risk assessment shall take into account anticipated use of chemicals (type and quantity), gases reticulation within the cupboards (flammable/oxidizing) and building fire protection (i.e. whether the building is sprinklered or not).

D 2.19 Compressed Air Plant

Compressed air plant shall be capable of delivering the air dryness and purity as required for the application. An independent dew point sensor shall be installed in the system for the purposes of moisture monitoring and alarming. Localized end of line oil/water separators shall be considered as an added of layer of protection for sensitive equipment.

D 2.20 Noise and Vibration

Each system must be designed to minimise the transmission of noise and vibration. Where reciprocating or rotating equipment is installed, these must be isolated from the structure via vibration isolators. Special acoustic requirements will be detailed on a project-by-project basis. However, in general noise levels must comply with AS 2107 or local government representatives.

D 2.21 Oxygen Depletion and CO2 Detection alarming

Where there is a risk of oxygen depletion in a laboratory, oxygen depletion monitoring shall be considered. Dangerous Goods consultant shall be engaged to undertake a risk assessment and make recommendations.

Where there is a potential for unsafe concentrations of CO2 to be generated within a space carbon dioxide monitoring shall be considered. Dangerous Goods consultant shall be engaged to undertake a risk assessment and make recommendations.

D 2.22 Hazardous Areas

AS/NZS 60079.10.1 shall be consulted to establish the hazardous area classification for areas housing/reticulating any flammable gases or vapours. This includes but is not limited to laboratories and gas stores. Areas classified as hazardous shall have a risk assessment undertaken to manage the risk associated with the classification.

D 2.23 Registered Plant

All plant requiring plant and plant design registration by SafeworkSA shall be registered as part of the project. All costs associated with testing, certification and registration shall be the responsibility of the contractor. Examples of plant requiring registration include but are not limited to:

- Boilers
- Chillers (pressure vessels)
- Autoclaves (pressure vessels and boilers)
- Compressed air plant (pressure vessels)

D 3 Automatic Controls

Control schematics and fully functional descriptions of the control of each system, must be provided and include – normal operation, fire mode operations, safety control, fault conditions, and alarming.

The following energy saving controls should be incorporated in the design process unless otherwise approved or directed by the University:

- Push button after hours control for air conditioning systems and/or zones with adjustable timer (set to two hours), and green run light indicator
- Use of signal from motion detector provided by the electrical contractor to implement unoccupied mode temperature reset (increasing the set point deadband to +/-4°C).
- Monitoring of oxygen levels in high occupancy areas to control the amount of outside air supply.

All air handling system NOT required to operate for fire and smoke control shall be shut down in fire mode (excluding any special purpose systems).

All control systems must be fully compatible with the University's BMS control systems.

D 4 Design Reports

The mechanical designer must submit formal Design Report documents as required by the contract for technical review by the University.

In addition to the specific elements discussed in Section C of this document, the mechanical services Design Report/s must include, to the extent that they are applicable to the project, but not be limited to the following:

- Completed Design Certificate relevant to the stage of design
- Proposed scope of works and details of the system arrangement
- Schedule of applicable regulations, standards, policies and guidance publications on which the design is based.
- Details of deviations of the above
- Details of any third party and/or record information upon which the design relies
- Assumptions or exclusions
- Safety in Design review
- Sustainability review
- Proposed point of supply for the works including the supply capacity/characteristics/condition assessment, demonstrating adequate capacity is available at the point of supply and in the reticulation system
- Detail of any proposed modifications to existing systems or equipment
- Heat load calculations for all conditioned areas
- Static pressure drop calculations for all HVAC systems

- Acoustic calculations for selection of attenuators and other acoustic attenuation
- Pumped system calculations for the system resistance and pump selections
- Mechanical switchboard locations, design fault level, voltage drop allocation, circuiting arrangements, earthing arrangements and protection arrangement
- Building Monitoring Systems (BMS) functional description of all systems and plant
- Manufacturer selection of major equipment
- Basis for sizing of major equipment

Table 4 - Mechanical Services Design Deliverables Matrix:

Design Report Stage		Mechanical Service Design Deliverables
End of Schematic Design	General	• Preliminary heat loads, ventilation rates, and other main mechanical plant and system sizing estimates based on schedule of accommodation and reasonable allowances • Determine cost/benefit impact of masterplan options to mechanical services
	Reporting	• Advantages/disadvantages of masterplan options • Understanding of mechanical systems requirements • Identify spatial requirements for main mechanical plant and systems • Confirmation of scope of services • Items requiring further clarification • Information required
	Documentation	• Mark up of masterplan options indicating concept layouts and preliminary spatials • Return design brief including design criteria
End of Design Development	General	• Developed heat load estimates, ventilation rates, and other main mechanical plant and systems based on building form and preliminary information from other services • Preliminary size and location of main mechanical systems including air conditioning units, fans, ductwork, pumps, pipework, chillers, boilers, mechanical switchboards etc. to inform Architectural building development • Preliminary major service routes • Coordination of preliminary electrical, fire and other services requirements relating to the mechanical plant and systems • Preliminary equipment selection • The UniSA Technical Standards reviewed and assessed
	Reporting	• Confirmation of spatials of main mechanical plant and systems • Confirmation of mechanical systems provided to individual facilities / building

Design Report Stage		Mechanical Service Design Deliverables
		• Description of system proposals • Items requiring further clarification • Information required • Preliminary opinion of cost based on square meter rates • Concept Design Certificate
	Drawing	• Preliminary schematic drawings of mechanical systems • Layout drawings showing preliminary locations of major plant i.e. air conditioning units, ductwork, chillers, boilers, pumps, piping, mechanical switchboards, distribution boards etc. • Updated mechanical services brief
50% Documentation Phase	General	• Mechanical services design to suit approved building form • Final plant and equipment sizes based on design • Defined location and sizes of plantrooms, services risers, etc. to suit designed equipment • Defined size, location and route of all ductwork, piping, electrical routes, and underground services • Defined sizes of major plant
	Reporting	• Final Heat load calculations. • Final Confirmation of systems being provided. • Final confirmation/coordination with other services. • Schedule of selected equipment. • Developed opinion of costs including elemental cost for major plant and equipment. • Final minor items requiring clarification. • Final minor items of information required. • Statement of any specialist systems requiring design development responsibility by contractor. • Schematic Design Certificate
	Documentation	• Complete schematic drawings of airflow and piping systems with flow rates and sizes. • Layout drawings for air conditioning and pipework mechanical services showing preliminary ductwork and diffuser layouts, mechanical equipment layouts, pipework layouts, switchboard locations, etc. • Functional control description and control schematics • Preliminary Mechanical Specification

Design Report Stage		Mechanical Service Design Deliverables
90% Documentation Phase	General	• Final coordinated mechanical services design suitable for tender and construction • All systems and equipment fully and clearly defined and specified
	Reporting	• Confirmation of all systems fully designed • Statement of any minor outstanding information and/or assumptions • Elemental opinion of cost • Confirmation of any design development of specialist systems by contractor
	Documentation	• Complete schematic drawings including schedules of equipment • Complete mechanical, air conditioning and pipework services layout coordinated with building form, ceiling, furniture, joinery and other services • Functional descriptions and controls details complete • Complete specification for mechanical services • All documentation fully checked, reviewed and signed-off in accordance with contractual Quality Assurance Requirements • Final Services Brief • Detailed Design Certification

D 4.1 Design Certification

The designer must produce a 'Design Certificate' identifying which codes and standards the design has been based on, including the issue date and version of the code or standard, and certifying compliance with those codes.

The 'Design Certificate' must be signed by the designer responsible for the design, not a delegate, and issued with the documentation issued for pricing.

D 5 Mechanical Electrical

Generally the University prohibits any working on energised electrical equipment in accordance with the WHS Regulations. Where isolation of the equipment is demonstrably impracticable the contractor must provide a Safe Work Method Statement (SWMS) fully detailing how risks have been managed as low as reasonably practicable. It shall specifically address why isolation is impracticable and how access to energised electrical parts will be prevented. No working on energised electrical equipment shall proceed without written approval from the University. Approval of the SWMS by the University does not relieve the contractor of primary responsibility for undertaking safe work

The University's preference is that all mechanical services are supplied from a dedicated Mechanical Services Switch Board (MSSB) rather than from local general lighting and power distribution boards. However the University recognises this may not be practicable in all instances and the designer shall advise the Contract Supervisor where they believe this is not the most effective solution depending on existing provision and advise alternative options for University review and direction.

The designer shall assume all general mechanical services, excluding dedicated ventilation systems e.g. fume cupboards etc. shall shutdown on a fire signal unless otherwise directed. The designer shall advise the Contract Supervisor when this is not practicable and advise alternative options for University review and direction.

All switchboards must be dead front and fully enclosed to a minimum IP2X.

High current sections (>63A) must have Form 2b separation.

The designer must ensure adequate maintenance access is provided to all sections of the switchboard.

Unless approved by the Contracts Supervisor external switchboards must not be provided. Where approved, external switchboards must be provided with a rainproof canopy covering the board and mandated maintenance space. Switchboards defined as Heavy Current in AS/NZS3000 must not be located externally under any circumstance.

All main switchboards must be provided with a multi-function digital meter integrated to the University BMS system.

All switchboards must be rated to carry the estimated diversified maximum demand plus 25% for future expansion and must provide 30% spare physical capacity for future expansion (i.e. 70% full).

The designer must provide the following information for each switchboard on the main single line diagram:

- Number of poles
- Fault level in kA
- IP rating
- Form of separation
- Top or bottom entry
- Busbar temperature rating

The designer and installer attention is drawn to the specific the University requirement for switchboard labelling noted in the supplementary NATSPEC details below. The designer and installer must ensure these requirements are passed on to the switchboard manufacturers.

Unless otherwise directed, lighting and general socket outlet circuits shall not be supplied from trade services switchboards. The only exceptions are socket outlets for supply to small items of trade plant e.g. small pumps, small fans, controllers etc. Where existing supplies are identified as part of a project they must be rewired back to a local general lighting and power distribution board.

Liquid piped services, except sprinkler services where required by code, must not be run above electrical switchboards. The designer must liaise with hydraulic and electrical trades to coordinate and ensure this does not occur.

To be inserted – Clause 3.4 CABLE SYSTEMS – NATSPEC 0781 Mechanical Electrical

General

Provide the following main and submain systems in accordance with NCC and Australian Standards:

- Main and submain cables in electrical switch rooms and mechanical plant rooms on cable ladders.

- Submain cables on cable trays or ladders.

Provide the following systems for final sub-circuits:

- Cast concrete slabs: Unsheathed cable in heavy duty UPVC conduit.

- False ceiling spaces: Thermoplastic insulated and sheath (TPS) cables supported by steel catenary wires

- Accessible roof spaces: Thermoplastic insulated and sheathed cables supported by steel catenary wires or fixed directly to structural members

- Concealed spaces: unsheathed cable in UPVC conduit

- Plant Rooms: Unsheathed cable in heavy duty UPVC conduit, on spacer blocks

- Plastered or rendered surfaces: Cable in UPVC conduit

- Stud walls without bulk insulation: Thermoplastic insulated and sheathed cables

- Walls with bulk insulation: Cable in UPVC conduit

Buried in ground:

-PVC cables in heavy duty UPVC conduit

D 6 Labelling

Identification labels must be provided to indicate the point of access to in-ceiling or hidden services requiring maintenance or adjustment, e.g. at access panels, ceiling tiles, etc.

The labels must be 10mm round, traffolyte type labels, and colour coded to match the type of hidden service as follow:

Table 5 – List of Labels

Label Colour	Type
Blue	Mechanical
Black	Untreated Waste / Sewage
Green	Cold water/hot water/recycled water/drinking water
Yellow	Gasses
Red	Fire
Orange	Electrical Power
White	Electrical Communications

Labels are to be installed as follows:

- In T-Bar Ceilings install centrally on the t-bar frame. An arrow pointing to the tile to be used for access is to be engraved on the marker (refer diagram below, NTS)

- In solid ceilings install in the corner of the access panel

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D 7 Record Drawings

To be inserted – Clause 3.17 Record Drawings – NATSPEC 0171 General Requirements

Refer to the UniSA Technical Standards, Section C, Operation and Maintenance Manuals for additional requirements

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D 8 Operation and Maintenance Manuals

To be inserted – Clause 3.18 Record Drawings – NATSPEC 0171 General Requirements

Refer to the UniSA Technical Standards, Section C, Operation and Maintenance Manuals for additional requirements

D 9 Plant Certification and Registration

Certification and registration of plant/equipment/systems installation and plant/equipment/systems design shall be the responsibility of the installing contractor. This will include but not be limited to all plant requiring certification and/or registration with SafeWorkSA, local councils, OTR and other authorities. All costs associated with such activities shall be the responsibility of the installing contractor.

University of South Australia

UNISA TECHNICAL STANDARDS

E

ELECTRICAL AND LIGHTING

	SECTION	
	A	Introduction
	B	Safety in Design
	C	Design Controls
	D	HVAC/Mechanical
x	E	Electrical and Lighting
	F	Fire Protection and Detection Services
	G	Plumbing
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	I	Transportation Systems
	J	Security Systems
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	L	Communications Infrastructure
	M	Architectural

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Contents

E 1 General Requirements

E 1.1 Introduction

It is expected that this section is read in conjunction with all other sections of the UniSA Technical Standards, in order to achieve a fully comprehensive understanding of the University requirements.

All works undertaken at the University must comply with the requirements of NATSPEC specifications and the designers must use this, plus the University specific modified clauses as a basis for their specifications.

The designer shall amplify the NATSPEC requirement where necessary to meet specific project requirements or to provide increased levels of quality and/or performance with approval from the Contracts Supervisor.

The designer may use their own specification, but only with written approval from the University. Where alternative specification is used, it must ensure that the specified standards, quality and outcomes are equivalent to or greater than those specified through NATSPEC. NATSPEC supplementary clauses specified in this document are to be inserted into the designer's specifications.

The designer must not reduce the requirements of NATSPEC and/or the UniSA Technical Standards clauses without written approval from the Contracts Supervisor.

On smaller projects where the scope of work does not justify a full NATSPEC specification the designer may propose a "notes on drawing" type of specification, as long as the pertinent elements of the NATSPEC and supplementary the University clauses are included, with the Contract Supervisors approval

NATSPEC supplementary clauses which are required to be inserted into the designer's specifications have been placed in a box, with italic text.

E 1.2 Responsibilities

To be inserted – Clause 1.1 RESPONSIBILITIES – NATSPEC 0901 Electrical Systems

The scope of works for the electrical systems include, but are not limited to, the following:

- The designer shall insert a bullet point list of the scope of electrical works
- ……
- …….

The contractor shall determine the full scope of the works from review of this specification and all associated contract drawings.

The contractor shall attend site to satisfy himself of the existing systems and site conditions.

No claim shall be entertained for lack of knowledge of the contract documentation or of existing systems which could reasonably have been known from prior investigation

E 1.3 Standards and Regulations

The following table details the Standards and Regulations, which are additional to those referred to in Section A and are specific to the Electrical Services:

Table 1 - List of Standards and Regulations

CODE	DESCRIPTION
AS/NZS 3000	Wiring Rules

CODE	DESCRIPTION
AS/NZS 3008	Electrical Installations – Selection of Cables
AS/CA S009	Installation Requirements for Customer Cabling
AS/NZS 1680	Interior Lighting
AS/NZS 1158	Lighting for Roads and Public Spaces
AS 2293	Emergency Escape Lighting and Exit Signs for Buildings
AS 2243	Safety in Laboratories
AS 2067	Substations and High Voltage Installations Exceeding 1kV a.c.
AS/NZS 1768	Lighting Protection
HB 13	Electrical Equipment for Hazardous Areas
NCC	National Construction Code
SAPNS	SA Power Networks Service and Installation Rules

This above list is not all-inclusive and those associated with the project are responsible for identifying and complying with all standards relevant to the scope of works.

All Electrical Services installations must comply with the most current version of the standard or code at the time of tender.

To be inserted – Clause 1.5 Standards – NATSPEC 0901 Electrical Systems

Comply in all respects with the requirements of the current standards applicable to the works in respect to equipment, materials, workmanship and installation techniques.

Comply with the following standards and regulations:

- *National Construction Code National Construction Code*
- *Australian Standards*
- *SA Water Corporation*
- *Australian Gas Association Regulations*
- *SA Fire Services Regulations*
- *SA Government Acts governing the Works*
- *Work Health and Safety Regulations*
- *SA Power Networks codes and standards*

E 1.4 Quality

All electrical services design work is required to be carried out via suitably qualified and experienced designers. The University may request copies of the designer's calculations in order 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.

All design work must be checked and reviewed by a suitably qualified and experienced peer prior to issuing for pricing. The designer must have a formal check and review process. The University may request evidence of the design checking and review process.

On occasion a designer may utilise a third-party designer (sub-consultant / specialist contractor / lighting manufacturer / supplier, etc.) however, the designer retains responsibility for the design and review process. Unless specifically directed otherwise, all equipment designed, specified and installed must be new and of the highest quality.

E 1.5 Preferred Manufacturers

The University requires that only proven proprietary equipment, with local service availability must be selected.

It is a requirement that new equipment is compatible with the Legacy systems the University has implemented:

- Emergency Lighting Central Test and Monitoring – Stanilite Nexus (LX or RF as applicable)
- Building Management System – Modbus LONWorks – Preferred meters are Schneider A9MEM3275-NMI with 282CTMECH CT isolation links and Circutor CVM-MINI-LON Power Analyser
- Automatic Lighting Control – Clipsal C-Bus
- Fire Detection Control and Indicating Equipment (FDCIE) - Ampac
- Emergency Warning Control and Indicating Equipment (EWCIE) - Ampac
- Electronic Security System - Gallagher

Whilst the University does not wish to restrict the designer's ability to select the most appropriate equipment to meet particular requirements it is the University's preference that equipment selected satisfies the following:

- A reputable manufacturer with a proven track record
- Local Adelaide representation and support in design and post installation operation
- Local Adelaide spare parts availability
- Australian manufacturer is preferred.
- Unrestricted access to system hardware and licensed software

The following is an indicative list, which the University considers to represent the desired quality levels:

Table 2 – List of Preferred Manufacturers

Equipment / Component	Manufacturer / Supplier
Switchgear and components	Schneider, ABB, NHP
Electrical Accessories	Clipsal, HPM, Legrand
High Voltage Transformers and Components	ABB, Crompton, Reyrolle, Schnieder
General Luminaires	Moonlighting, Phillips Lighting, Pierlite, Eagle Lighting
Diesel Generators	Caterpillar, Cummins, FG Wilson, Olympian

The electrical services designer and contractor are welcome to propose alternatives, however, they must clearly demonstrate equal or greater technical, cost and/or quality performance.

To be inserted – Clause 1.10 Alternative Products

All specified items represent a required level of quality and performance.
Unless specifically required to integrate with an existing University of South Australia system the contractor is at liberty to propose alternatives to the specified items subject to compliance with the UniSA Technical Standards and written approval from the Contracts Supervisor.
Where alternative equipment to that specified is proposed by the contractor, the contractor shall provide full details of technical, cost and/or programme benefit to the project with full supporting documentation (including calculations, modelling, etc.) at the contractors cost. The contractor shall retain design responsibility for any alternative proposals accepted including any unforeseen issues.
Any unapproved products provided shall be removed and replaced with the specified item at no cost to the University.

E 1.6 Safety in Design

Those involved in the design of the electrical services must undertake the necessary Safety in Design reviews and activities as required by the contract.

Generally the University prohibits any working on energised electrical equipment in accordance with the WHS Regulations. Where isolation of the equipment is demonstrably impracticable the contractor must provide a Safe Work Method Statement (SWMS) fully detailing how risks have been managed as low as reasonably practicable. It shall specifically address why isolation is impracticable and how access to energised electrical parts will be prevented. No working on energised electrical equipment shall proceed without written approval from the University. Approval of the SWMS by the University does not relieve the contractor of primary responsibility for undertaking safe work

The electrical designer should consider the following particular items as part of the Safety in Design, however they are not limited to:

- Locations of luminaires and other electrical equipment for maintenance i.e. at height, above or adjacent to risk areas, proximity to other plant, etc.
- Methods of safe isolation for access and maintenance of switchboards and equipment
- Satisfactory maintenance space around electrical equipment
- Satisfactory space and access to internal components requiring maintenance and/or replacement

The designer must address the Safety in Design aspects in the Design Reports

The installer of the works must review the Safety in Design documentation throughout the works, to identify any risks throughout the works and any residual risks to the University on completion.

E 1.7 Sustainability

The designer must take into consideration the Environmental Sustainability of the electrical services taking into account the whole of life cost and operational benefit.

All Buildings must be designed to suit the local environmental conditions. They must be designed to optimise the thermal and lighting conditions using minimum non-renewable sources of energy.

Elements that the designer must consider, include, but are not limited to, the following:

- Energy efficiency
- Materials selection
- Decommissioning / disposal of equipment at end-of-life
- Control methodology including automatic controls
- Luminaire selection
- Demand management
- Power factor correction

The sustainability aspects must be addressed in the Design Reports

E 1.8 Cost Planning

The electrical services designer must provide input into the project cost planning as required by the contract.

The electrical services designer should provide cost planning advice for the supply, installation, associated works, contingencies, overheads, etc. to indicate a total cost to the University.

Any element specifically excluded must be clearly indicated so that a total cost to the University may be determined.

E 1.9 Attendance

It is incumbent on the electrical designer and contractor to make themselves aware of existing conditions as far as reasonably practicable when designing and/or performing works at the University. The University reserves the right to hold the designer and/or contractor liable for works performed that are of a sub-standard or non-compliant nature.

The electrical services designer must attend design and construction meetings as required by the contract and outlined below.

The University expects the electrical services designer, not a delegate to attend at a minimum: -

- Technical reviews as directed by the Contract Supervisor
- Design team meetings appropriate to the size of the works. (Minimum of one meeting)
- Construction phase meetings appropriate to the size of the works. (Minimum of one meeting), plus any meetings where the Contract Supervisor deems there is significant electrical elements that requires the designer's input
- Ongoing site inspections as considered appropriate by the Contract Supervisor (minimum bi-monthly)
- Electrical services first fix inspection
- Electrical services final fix inspection
- Electrical services commissioning where required by Contract Supervisor
- Electrical services final / defects inspection prior to Practical Completion
- Electrical services final / defect inspection prior to end of Defects Liability Period (DLP). DLP inspection report to be issued to the University five working days prior to end of formal DLP.

The Electrical designer must identify his/her proposed meeting site attendance schedule in their engagement proposal

The electrical installer must attend meetings as required by the contract and considered necessary by the Contracts Supervisor

To be inserted – Clause 1.9 PERMITS NOTICES AND INSPECTIONS – NATSPEC 0901 Electrical Systems

Make applications, obtain all permits, and arrange testing, all as necessary for the installation and placing into operation of the works where required by any Authority including:

- *SA Water corporation*
- *Department of Premier and Cabinet – Work Safe SA*
- *The Office of the Technical Regulator*
- *Australian Communications Authority*
- *Site Telecommunications Carrier*
- *SA Power Networks*
- *SA Fire Services*
- *Energy Retailer*

Provide all associated documentation required for the applications. Pay all associated fees.

E 1.10 Design Conditions

All air conditioning systems must be designed to meet the following design criteria:

Table 3 – List of Design Conditions

Item	Design Criteria
Ambient Conditions under which all plant must operate – Adelaide Region	• 46.0°C dry bulb maximum • 22.0°C wet bulb maximum • Full Solar load • 0.0°C dry bulb minimum
Ambient Conditions under which all plant must operate – Other Regions	• Design Conditions as per AIRAH DA09
Internal conditions for plant full load performance	• Cooling: 24.0°C dry bulb, 50% Humidity • Heating: 23.0°C dry bulb, 50% humidity
Earth resistivity	• 100 ohm – metres nominal
Hours of operation – general	• 24-hour operation • 7 days
Maximum noise levels at adjoining property boundaries	• Not to exceed levels specified for commercial properties and residential properties in the Environmental Protection Act
Equipment balancing criteria – maximum allowable vibration levels (maximum peak to peak displacement mm)	• All equipment not to exceed limits set in Australian Standard 1359 – Rotating electrical machines – General requirements and Australian Standard 2625 – Rotating and reciprocating machinery – Mechanical vibration
Protective earthing system	• MEN earthing system in accordance with AS/NZS3000
Electricity Supply	• 400/230 volts, +10%, -6%, 3 phase, 4 wire, 50Hz in accordance with SA Power Networks Service Rules and Conditions of Supply • Design and utilise only systems and equipment to be capable of guaranteed rated performance on both present and future supply voltages
Voltage Drop	• Voltage drop at switchboards limited to 2.5% (maximum) of nominal LV supply voltage of 400 volt, 3 phase. • Voltage drop at final distribution points limited to 5% (maximum) of nominal LV supply voltage of 400 volt, 3 phase
Internal Lighting Reflectances	• Ceiling 70% • Walls 50% • Floors 20%, unless actual finishes reflectances known

Item	Design Criteria
Internal lighting maintenance factor	• 0.8 unless site specific conditions dictate otherwise
Population Densities	• As agreed with the University, else to the requirements on AS1668.2

E 2 Performance Criteria

E 2.1 Electrical Systems

The designer must calculate the estimated diversified maximum demand of the works. Where appropriate the designer must make an application to SA Power Networks to identify associated utility infrastructure works.

The building main switchboards and consumer mains must be sized and rated to accommodate the estimated total diversified maximum demand.

The sub-main cabling must be sized based on the protective device size. If the protective device is a moulded case circuit breaker the sub-main cabling must be sized based on the maximum frame size.

The sub-main protective device sizing and volt-drop calculations must be based on the estimated maximum demand of the sub-board plus 25% spare for future expansion.

The final accessories must be permanently labelled using the manufacturer's proprietary labelling system (i.e. Clipsal label window, Legrand Excel Life press stud etc.) or fixed labelling system such as IPA studs. Adhesive labels must not be used.

The accessory labelling must be fixed to the body of the accessory, not to the removable cover plates.

UniSA ISTS have specific data outlet labelling requirements. Please refer to Section L8 for details.

Where the accessory is installed in a student accessible area and has a removable cover plate it must be fixed by a screw or similar requiring a tool for removal.

An example of accessory range considered to satisfy the University requirements is the Legrand Excel Life Secure Plate series and the Schneider Clipsal Pro Series.

Where works are required to existing systems, the designer must ensure the scope of works makes due allowances for out-of-hours working where necessary, temporary works to maintain supplies, works necessary to maintain existing supplies etc.

Where works detail removal of existing services or making existing services redundant the designer and installer must ensure that any redundant electrical equipment is safely isolated, disconnected, removed and disposed of unless specifically directed otherwise by the Contracts Supervisor. This includes final circuit cabling in ceiling spaces, wall cavities, underground conduits, etc.

When the existing final circuits are made redundant and/or removed, the corresponding circuit breaker (or fuse carrier) must be removed and handed in to the University for spares, and a pole filler supplied to clearly show actual spare capacity.

All laboratories shall be fitted with emergency shut off provisions for laboratory power and each of the following gases (where reticulated):

- natural gas
- other flammable gases
- hazardous gases

The designer shall liaise with the user group to determine types of laboratory gases requiring reticulation and their associated classification. It is acceptable for the gas isolation to be integrated with the power isolation such that a common emergency stop button isolates power and gases simultaneously.

The emergency shut off shall not interrupt supply to any fume cupboard or dedicated extract ventilation systems.

All emergency stop buttons shall be shrouded and key resettable using a standard Ronin type key as per NHP Sprecher + Shuh range or approved equivalent. Keys shall be provided to the Contract Supervisor.

Each emergency stop button shall be provided with an engraved label as follows:

- Red with white lettering – minimum 15mm letter height
- Power isolation only – "EMERGENCY SHUTDOWN – ALL POWER"
- Power and gas isolation – "EMERGENCY SHUTDOWN – ALL POWER & GASES"

To be inserted – Natspec Clause 2.2 – Electrical Accessories – 0901 Electrical Systems

Quality Assurance

Implement a quality system for the works in accordance with Australian/New Zealand ISO 9000.1 – Quality management and quality assurance Standards – Guidelines for selection and use and Australian/New Zealand ISO9001 – Quality Systems – Model for quality assurance in design, development, production, installation and servicing

To be inserted – Clause 2.3 Accessories, Outlets and Appliances – Natspec 0901 Electrical Services

Provide and install all accessories, outlets, appliances and appliance connections complete with the final interior design of the space.

Accessory selection and locations require approval to ensure that each item is compatible with the final interior design of the space.

Provide accessories and outlets as follows:

Accessory flush plates – removable cover plates shall be fixed to the accessory by means of a screw or similar as per Legrand "Excel Life Secure Plate Series" or equal. Accessory to include proprietary circuit identification as per Clipsal "Window ID" and Legrand Excel Life series X range or Schneider Clipsal Pro Series or equal.
Protected and/or weatherproof accessories - non-corroding metal or polycarbonate enclosures.
Accessories in plantrooms – Polycarbonate enclosures to min IP53 as per Clipsal "Weathershield" range or equal
Isolating switches or direct connected equipment including Mechanical Services plant - "Clipsal 56" or 'NHP ISO' series or approved equivalent.
Isolating switches for fire and life safety plant including Mechanical Services smoke control systems - "Wilco A" series or approved equivalent.
***tches**:*
Provide 15 A minimum rated rocker switches suitable for fluorescent lighting loads. Light switches shall include proprietary labelling system and secure cover plate as described above. Provide multi switch positions ganged under one cover plate, arranged in ganged boxes similar in plan to the lighting points controlled. Where more than 6 switches are required at the one location, install mechanisms on a flush mounted multigang lighting control panel.

ver outlets:

Provide combination rocker switched socket outlets, generally flush wall mounted and of identical manufacture to switches. Mount double outlets under one flush plate. Power outlets shall include proprietary labelling system and secure cover plates as described above. Provide three phase outlets of 5 pin (3mm diameter earth and neutral) pattern, housed in non-corroding metal or polycarbonate enclosures, "Wilco A" or "Clipsal 56" series or approved equivalent. Outlets to be controlled by an integral lockable

To be inserted – Clause 2.4 Appliances – Natspec 0901 Electrical Services

General

Provide all appliances internally wired and complete with control switches, controllers and connecting links.

Unless stated otherwise provide isolating switch adjacent all direct connected appliances and equipment.

Connect each three-phase appliance with a separate neutral and earth.

Install the final connection to any equipment installed away from, but within 600mm of, a wall or column in flexible PVC conduit.

Where any equipment is located at greater than 600mm from the wall, provide cabling installed within concealed conduit, in-floor ducting cast into the slab or service pole.

Check immediately all equipment arriving on site for its electrical loading and phase connections. Advise the Contract Supervisor in writing where equipment is deemed to be unsuitable for connection to the designated building supply and await instruction"

To be inserted – Clause 3.5 Cable Systems – Natspec 0901 Electrical Systems

Plastic switched socket outlets

Horizontal outlets: Outlets mounted to horizontal surfaces e.g. meeting desks, workstations etc. must have safety / auto shutters.

To be inserted – Clause 3.5 Cable Systems – Natspec 0901 Electrical Systems

Plastic switched socket outlets

General

Provide the following main and submain systems in accordance with NCC and Australian Standards:

Main and submain cables in electrical switch rooms and mechanical plantrooms on cable ladders.

Submain cables on cable trays or ladders.

Provide the following systems for final sub-circuits:

Cast concrete slabs: Unsheathed cable in heavy duty UPVC conduit.

False ceiling spaces: Thermoplastic insulated and sheath (TPS) cables supported by steel catenary wires.

Accessible roof spaces: Thermoplastic insulated and sheathed cables supported by steel catenary wires or fixed directly to structural members.

Concealed spaces: Unsheathed cable in UPVC conduit.

Plant rooms: Unsheathed cable in heavy duty UPVC conduit, on spacer blocks.

Plastered or rendered surfaces: Cable in UPVC conduit.
Stud walls without bulk insulation: Thermoplastic insulated and sheathed cables.
Walls with bulk insulation: Cable in UPVC conduit.
Buried in ground:
PVC cables in heavy duty UPVC conduit.

To be inserted – Clause 3.6 Accessories - Natspec 0901 – Electrical Systems

General

Selection: Compatible with the final interior design.
Orientation: Compatible with the final design.
Position: Make allowance for accessories to be relocated within a radius of 2 meters from position shown on design drawings.
Acoustic separation: Satisfy the project requirements for acoustic separation.
Labelling: Provide proprietary labels, i.e. Clipsal ID mechanisms, Legrand push-in plugs etc., or engraved traffolyte labels. Printed adhesive labels are not acceptable.

Construction

Face plates: High impact polycarbonate construction or metal.
Protected and weatherproof: Non-corroding metal or polycarbonate enclosures.

Location

Mounting heights: To the centre of the equipment.
Face brickwork or special finish walls: To the nearest brick, panel, tile course and mounted vertically.
Rendered brick or insitu concrete walls: Recessed horizontal in standard metal wall boxes.
Hollow block walls: Fixed direct to the blockwork.
Lightweight stud walls or demountable partitions: Directly on the panelling using proprietary fixing brackets.
Fixed furniture: Insulated and mechanically protected at the rear.

E 2.2 Cable Support and Duct Systems

Cable tray must be designed to support all consumer and sub-main cabling and be sized to provide 50% physical spare capacity for future expansion.

Cable trays must be designed to support the final circuit cabling along the main reticulation routes i.e. along corridors etc. and sized to provide 50% spare physical capacity for future expansion.

Conduits must be designed and sized in accordance with AS/NZS3000 and provide 50% spare physical capacity for future expansion.

Cable pits must be designed to provide sufficient space to pull and band cables through and making due allowance for a 50% increase of cabling through the pit.

To be inserted – Clause 2.1 Conduits – Natspec 0911 Cable Support and Duct Systems

Amend the "Sizes" and "Fixings" section as follows:

Sizes

Conduits: ≥ 20 mm.
Underground: ≥ 40 mm.
Conduits for telecommunications: ≥ 25 mm nominal bore.

Fixings

Surface mounted: Double sided fixed.

In concrete slabs: Tie to structural steel.
Type: Metal saddles are to be double sided. Zinc plated for internal use and hot dipped galvanised for external use or where exposed

To be inserted – Clause 2.3 Non- Metallic conduits and fittings – Natspec 0911 Cable Support and Duct Systems Insert the following to "General" section:
Buried conduit: Heavy Duty: AS/NZS 2053

To be inserted – Clause 2.5 Cable Support Systems – Natspec 0911 Cable Support and Duct Systems
Insert the following:
"Minimum steel thickness:

- Trays < 150mm wide: 1 mm.
- Trays > 150mm, < 300 mm wide: 1.2 mm.
- Trays > 300mm wide: 1.6 mm.
- Folded edge > 19mm deep and radiused.

Accessories: Use fish plates or splines for tees, crosses and joints."

To be inserted – Clause 2.6 Catenary Systems – Natspec 0911 Cable Support and Duct Systems
Replace the clause with the following:
General
Catenary systems: May be used within suspended ceiling spaces in lieu of cable tray and ladder systems for support of final circuit wiring and/or telecommunications final outlet distribution wiring only.
Wire: Provide 3mm stainless steel or PVC coated 3mm galvanized cable, couplings and support fixings for catenary systems."

To be inserted – Clause 2.7 Cable Pits – Natspec 0911 Cable Support and Duct *Systems*
Amend "General" section as follows:
General
Location: Provided as indicated on the drawings or at every major change in direction of a pipe duct and conduit, or at 100 m minimum intervals on long straight duct and conduit routes.
Cable support: Use galvanised iron brackets to separate layers of cables in the pit.
Slack cables: Leave maximum length of slack cables in pits to cater for future alteration."
Amend "Pit Covers" section as follows:
"Pit covers
General: Provide pit covers to suit expected loads of pedestrian or vehicular traffic in the location in which it is installed. Fit flush with the top of the pit. Use reinforced concrete or load carrying "Gatic" type or similar. Provide lid construction in accordance with the manufacturer's recommendations."

To be inserted – Clause 2.7 Cable Pits – Natspec 0911 Cable Support and Duct Systems
Amend "General" section as follows:
General

Location: Provided as indicated on the drawings or at every major change in direction of a pipe duct and conduit, or at 100 m minimum intervals on long straight duct and conduit routes.
Cable support: Use galvanised iron brackets to separate layers of cables in the pit.
Slack cables: Leave maximum length of slack cables in pits to cater for future alteration."
Amend "Pit Covers" section as follows:
"Pit covers
General: Provide pit covers to suit expected loads of pedestrian or vehicular traffic in the location in which it is installed. Fit flush with the top of the pit. Use reinforced concrete or load carrying "Gatic" type or similar. Provide lid construction in accordance with the manufacturer's recommendations."

To be inserted – Clause 2.8 Columns – Natspec 0911 Cable Support and Duct Systems
Insert the following to "Design" section:
"Footings: To be designed by an accredited structural engineer and independently certified."
Insert the following:
"Accessory mountings: Provide adjustable mountings, to suit accessories, and with provision for rigidly clamping each item in position, once adjusted correctly."

To be inserted – Clause 3.3 – Conduit Systems – Installation – Natspec 0911 Cable Support and Duct Systems
Insert the following:
"Draw-in boxes
Provide draw-in boxes no greater than 7.5 m apart for vertical lengths of conduit runs.
Conduit saddles and brackets
Space conduit saddles a maximum of 1200 mm apart for metallic conduit and 1000 mm apart for non-metallic conduit. In areas subject to high ambient temperatures or other severe duty, maximum saddle spacing for non-metallic conduit 500 mm.
Where two or more conduits are run in parallel they may be grouped. Provide suitable surface brackets where conduits cannot be fixed.
Conduits in concrete slabs
Conduit boxes: Use deep type conduit boxes in reinforced concrete slabs so that the conduit may be run above the bottom layer of reinforcement. Terminate metallic conduit in floor slabs in solid cast metal boxes. Do not use pressed metal boxes.
Expansion joints: Where crossing expansion or construction joints the conduit installation make allowance for any movement between the adjacent slabs. Finish the conduit in the first slab poured to within 90 mm of the joint and provide a 300mm long sleeve of the next largest conduit size internally greased and fitted over the first conduit. Fit the conduit in the second slab poured similarly be fitted into the larger conduit leaving a clearance of 100 mm minimum between the conduit ends for movement. Tape all joints make waterproof prior to the concrete being poured.
Conduits and fittings chased in
Route: Do not bury in plastered walls except for switch boxes, lighting boxes, general-purpose outlets, couplings and junction boxes. Space parallel conduits at least 10 mm apart.
Minimum cover: Where chases are greater than 80 mm in width, provide expanded mesh over the full width and length of the chase.
Conduit size: 25mm maximum diameter.

Fixing: Fix firmly in position to prevent movement and/or vibration
Prohibited floor slabs and face brickwork
Do not run conduits in the floor slabs of boiler rooms, plant rooms and tank rooms. Chasing will not be permitted in face brickwork. Install any conduit or wall boxes in such walls on the reverse face."

To be inserted – Clause 3.5 Catenary Systems – Installation – Natspec 0911 Cable Support and Duct Systems
Insert following text to "Anchoring" section:
"Do not fix catenary systems to other trades plant, equipment or associated support systems. Provide anchoring at maximum 3m spacing"
Insert following text to "Fixing" section:
"Electrical cables shall be tied to catenary at maximum 1m spacing using proprietary nylon cable ties. Maximum deflection for loaded catenaries shall not exceed 150mm"

To be inserted – Clause 3.6 Cables in Trenches – Installation – Natspec 0911 – Cable Support and Duct Systems
Replace clause with the following:
General: Conform to the Service trenching work section.
Sand bed and surround
Provide at least 150 mm clean sharp sand around cables and conduits installed underground. Clear the bottom of the trench of all rocks, stones and other hard and sharp materials. Fill the trench to a depth of 50mm with a layer of selected filling prior to cable placement.
Sealing ducts and conduits
Seal the ends of conduits entering the building with a weak concrete slurry to prevent moisture and vermin entry. Seal the joints of all conduits or pipes enclosing PVC/PVC and XLPE/PVC wiring with approved PVC jointing compound.
Draw wires
Arrange so that cables may be drawn out of the duct and conduit in the event of any cable failure. Install 4 mm² polypropylene draw string or 2.5 mm² galvanised steel wire in conduits for future installation of cable.
Water proofing: Provide puddle flanges around conduits where they pass into cable pits. Install bell mouth accessory on end of conduit located within wall of pits and flush with inside surface of pits on conduits > 100mm dia.
Pipe ducts and conduits
Bedding: 50 mm compacted depth, compacted fill and extending the full width of the trench.
Layout: Avoid sharp bends and locate drawing in points above ground.
Cleaning: Swab clean before installing any cables."

E 2.3 Low Voltage Power Systems

The electrical designer must calculate the estimated maximum demand of the proposed electrical works.

The designer must calculate and indicate earthing conductor size.

Where the designer has based the protective device selection using a single manufacturer cascading to satisfy fault level protection the designer must clearly indicate this in the Design Report and

nominate the manufacturer the design is based on. Should a tendering contractor nominate to use an alternative manufacturer, it is incumbent on the designer to ensure the alternate design operates as designed.

Where the designer has used fault current limited fuses to manage fault levels this must be documented in the Design Report.

The designer must specify and utilise a common manufacturer of protective devices throughout the system. Where the works are on an existing system the protective device manufacturer must be as per existing, where practicable.

The designer must clearly indicate where dedicated power supplies are required to be provided to items of equipment.

Where works are documented to main switchboards and/or modifying sub-main cables the designer must include for thermoscanning of terminations at load to confirm installation integrity.

Double GPO outlets are generally required to be provided, unless single outlets are required/applicable to specific items of equipment.

Single gang cleaner's outlets, on dedicated circuits, must be provided at maximum 20m spacing.

As a guide, two (2) double GPO's must be provided per workstation, however, the designer must confirm the actual outlet provision required.

Where socket outlets are provided in internal student accessible communal areas the designer must allow for the provision of USB charger outlets integrated with the outlet on a common face plate. Exact provision is to be agreed with the Contract Supervisor as part of the design review process.

The designer must clearly indicate which outlets are to be on cleaners supply, emergency standby supply, UPS supply and/or supplying dedicated equipment.

GPO's must be the following colours (unless in medical installations where the requirements of AS/NZS3003 shall prevail):

Table 4 – GPO Colours

GPO Provided for	Colour	Engraving
Cleaners Outlets	Beige	Cleaning Purposes Only
Emergency Standby Supply	Red	
UPS Supply	Red	UPS

Unless directed otherwise, final circuit cabling must be designed and arranged in accordance with the following parameters:

- Maximum sixteen (16) 10A outlets (i.e. 16 singles / 8 doubles) per 20A circuit
- Maximum ten (10) 10A outlets (i.e. 10 singles / 5 doubles) per 16A circuit
- Maximum 60% load on a lighting final circuit protective device i.e. 6A on a 10A circuit breaker
- Maximum 20 electric ballasts per 30mA RCD

The designer must give due consideration to the provision of dedicated supplies to nominated equipment and / or specific areas i.e. kitchenettes, laboratories etc. where individual items of equipment may exceed the capacity of standard GPO circuit arrangements.

Unless otherwise directed, lighting and general socket outlet circuits shall not be supplied from trade services switchboards. The only exceptions are socket outlets for supply to small items of trade plant e.g. small pumps, small fans, controllers etc. Where existing supplies are identified as part of a project they must be rewired back to a local general lighting and power distribution board.

The aluminium conductors must not be specified without prior approval from the University.

The designer must consider EMI issues where appropriate to the project i.e. high current, sensitive equipment, accommodation areas etc. and address in the Design Report

A communication earth cable must be provided to all communication cabinets. Refer to the University ISTS 'Communications Infrastructure' section for requirements.

To be inserted – Clause 2.3 Power Cables – Natspec 0921 Low Voltage Power Systems

Amend "Cable" section as follows:

"Default insulation: X-90."

"Minimum size: Conform to the following:

- *Lighting sub-circuits: 2.5 mm2.*
- *Power sub-circuits: 2.5 mm2.*
- *Sub-mains: 6 mm2."*

To be inserted – Clause 2.3 Non- Metallic conduits and fittings – Natspec 0911 Cable Support and Duct Systems

Insert the following to "Plastic switched socket outlets" section:

"Removable faceplates: Securely fixed with retaining screw mechanism."

Insert the following:

"Pendant outlets: Suspend at 1800mm above floor level. Enclose sub-circuit support wire PVC flexible sheath. Use stranded stainless steel support wire."

To be inserted – Clause 2.6 Electrical Accessories – Natspec 0921 Low Voltage Power Systems

Insert the following to "Emergency stop switches" section:

"Type: Shrouded and key resettable as per NHP Sprecher & Schuh or approved equivalent."

E 2.4 High Voltage Power Systems

The only High Voltage power system the University currently has responsibility for is at the Mawson Lakes campus.

The designer must review and assess the existing system infrastructure and ensure that all equipment designed and installed is compatible with existing systems.

The design of any works to the high voltage systems must consider spare capacity for future expansion and this must be specifically identified and addressed in the Design Report.

The University has no particular preference between oil and air-cooled transformers however all transformers must include adjustable tap changing.

From a fire risk perspective, the University's preference for new transformers installed internally within buildings is air-cooled type where practicable, notwithstanding SA Power Networks standards and requirements.

All protection relays must incorporate the following, at a minimum:

- Time overcurrent
- Instant overcurrent
- Time earth fault

The current equipment types installed at Mawson Lakes are:

- Circuit Breakers

Reyrolle Pacific 11kV VD4 – LMT

PPS Reyrolle LMVP/RPMT/QMRO

- Line Switches

PPS Reyrolle LMVP/RPMT/QMRO

- Protection Relays

Reyrolle/Siemens Argus 7SR11

Schneider MiCOM P121

- Fault trip cabinets

Magellan 24V Powertronics MCR Series Rectifier 24MCR 005

The designer is at liberty to propose equipment types to suit the project, however, the University requires vacuum type circuit breakers to be considered due to their lesser maintenance requirements.

All equipment selections must consider and be accompanied by full details of the required maintenance due to the inconvenience caused to the University operations to carry out safe maintenance on the high voltage installation.

The University has a preference to limit the range of manufacture in the installation to reduce the maintenance burden of carrying various spare parts. The designer must take this into account in their equipment selection.

All equipment selections must be identified in the Design Report.

E 2.5 Power Generation

Unless specifically directed by the Contracts Supervisor the designer must undertake a risk and cost/benefit analysis of the works to identify if inclusion of alternative power generation is appropriate. This must be documented in the Design Report.

Where permanently installed diesel standby generators are agreed to be provided the following must apply:

- The designer must undertake an analysis of the required standby load to be supported. This must be documented in the Design Report
- The generator must be sized to meet the required standby load plus 25% for future expansion
- Unless otherwise directed, the generator must be rated for standby operation
- The designer must undertake an acoustic analysis of the generator and make due allowance for the provision of attenuation as appropriate
- The generator must have sufficient fuel capacity to provide 24 hours running at 75% of full load
- The generator must include a self-bunded base mounted integral fuel tank. The designer must advise the Contracts Supervisor if this is not possible.
- The electrical designer must carry out all necessary fuel system design to ensure correct operation of the generator
- The designer must allow for the necessary interfaces with the University BMS and Security systems to transmit the required alarm conditions and ensure they are incorporated

- The generator system must be designed with a proprietary control system interfaced with changeover switch. The generator system must not rely on external control systems (i.e. BMS) to function correctly
- The generator must be located and oriented to ensure that maintenance access and re-fueling access is provided
- Where an internal generator is proposed the electrical designer must ensure adequate ventilation and attenuation is provided
- Where a generator is provided this must generally not be considered the standby power source for wet fire systems
- The generator must include a facility to connect a test load to allow offline full load testing without disconnecting the normal supply

To be inserted – Clause 2.1 Fittings – Natspec 0754 Liquid Fuels
Insert "fuseable link operated valve and fuel system leak detection alert connected to University electronic security system"

To be inserted – Clause 2.3 Engines – Natspec 0931 Power Generation – Engine Driven
Replace "General" section with the following:
"General: Provide plug-in or bolted terminal facility for connection of a temporary test load such that permanent load remains connected."
Delete "Resistive test load" section

To be inserted – Clause 2.4 Diesel Fuel Storage – Natspec 0931 Power Generation – Engine Driven
"Provide an integral double wall self-bunded base fuel tank with sufficient capacity to provide 24hours operation at 75% of rated standby load with all necessary piping, controls, indicators and alarms."

To be inserted – Clause 2.6 Controls – Natspec 0931 Power Generation – Engine Driven
"Provide manufacturers proprietary control system integrated with manual / auto changeover switch. The system shall not rely on any third-party system i.e. BMS to function correctly."

To be inserted – Clause 2.7 Control Panels – Natspec 0931 Power Generation – Engine Driven
"Alarm / control signals
General: Provide the following signals for connection to the facility BMS and University Electronic Security System i.e. Gallagher:
– *Mains failure – signal from ATS*
– *Generator running and able to accept load*
– *Generator at 80% full load*
– *Fuel level at 20% capacity*
– *Common fault*
– *Mains reinstated / healthy – signal from ATS*
– *Generator switched off, cool down complete and in standby mode*

– *Emergency stop button operated”*

To be inserted – Clause 2.10 Acoustic Enclosures – Natspec 0931 Power Generation – Engine Driven

Replace “General” section with the following:
“General
General: Provide weatherproof acoustic enclosures to surround generating sets, including inlet and outlet sound attenuators to meet the requirements of the acoustic assessment”
Replace “Sound pressure level limit” element with the following:
“Sound pressure level limit
General: Measure at 12 locations 1 m from the enclosure exterior surface, at 1.5 m above floor or roof levels, with the generating set operating at constant maximum rated full load output, with doors closed and service penetrations sealed to confirm compliance with acoustic requirements”

To be inserted – Clause 2.11 Marking – Natspec 0931 Power Generation – Engine Driven

“Signs
Warning: Provide the following on each side of each generating set:
– *"WARNING: This set may start at any time without notice."*
Lettering: 50 mm high, red on white background.”

To be inserted – Clause 3.2 Permanent Test Load – Natspec 0931 Power Generation – Engine Driven

Unless specifically directed by the Project Manager, delete requirement for permanent test load. Generator system to be provided with facility to plug-in or terminals for connection of temporary test load without need to disconnect permanent connection.

To be inserted – Clause 3.5 Exhaust System – Natspec 0931 Power Generation – Engine Driven

Insert following to “Exhaust piping” section:
“Locate exhaust more than 5m from pathway, any opening window or door or ventilation system air intake, and as necessary to comply with AS/NZS1668.2.”

To be inserted – Clause 3.8 Completion – Natspec 0931 Power Generation – Engine Driven

Insert the following:
“Upon completion of all tests fill fuel tank to capacity immediately prior to handover”

To be inserted – Clause 2.2 Photovoltaic Module - Natspec 0933 Power Generation - Photovoltaic

Insert the following to “General” section:
“Photovoltaic modules and inverters must comply with IEC61730 and either IEC61215 or IEC61646, as detailed in AS/NZS 5033 and shall be an approved product on the Clean Energy Council accreditation scheme”

To be inserted – Clause 3.1 Installation – Natspec 0933 Power Generation - Photovoltaic

Replace "Support" section with the following:
"Support
Aluminium support only. Timber support not acceptable.
Roof mounted plant and equipment:
If a horizontal platform is required, or the area of the plant and equipment is extensive, seek the advice of a professional engineer for the documentation of a suitable platform.
If balustrades or screening are required, seek the advice of a registered architect.
For roof level support circumstances, if any of the following apply, seek the advice of a professional engineer:
The total load from any unit of plant or equipment exceeds 500 kg.
The load from a unit of plant or equipment to any single support point exceeds 100 kg.
The average loading of plant and equipment over the area extending 1 m on all sides beyond the plant and equipment exceeds 25 kg/m2.
If the roof slope is greater than 10 degrees, adopt the manufacturers' documented installation procedures, or seek the advice of a professional engineer.
In all other cases, under each support point use treated timbers (90 x 45 mm) laid parallel to the span of the roof sheeting or the roof pitch extending to the first purlin, rafter or batten more than 1 m from the plant or equipment.
Ground level mounted plant and equipment:
If the ground slope is greater than 15 degrees, or the area of the plant and equipment is extensive, seek the advice of a professional engineer for the documentation of a suitable slab or platform.
If balustrades or screening are required, seek the advice of a registered architect.
In all other cases, provide proprietary plastic or concrete supports installed with falls that achieve a raised, impervious and water shedding bearing surface."

Where practicable photovoltaic modules should be mounted in a manner that avoids the accumulation of combustible matter such as paper litter and leaf litter.

Where practicable, inverters and isolation points should be located at grade, easily accessible for the fire brigade and appropriately signed.

E 2.6 Uninterruptable Power Supply

Unless specifically directed by the Contracts Supervisor the designer must undertake a risk and cost/benefit analysis of the works to identify if inclusion of permanently installed uninterruptible power supplies (UPS) is appropriate. This must be documented in the Design Report

Where UPS are agreed to be provided the following must apply:

- The designer must undertake an analysis of the load to be supported. This must be documented in the Design Report
- The UPS must be sized to meet the required load plus 25% for future expansion
- The designer must nominate the capacity and duty of the unit at full load in the Design Report
- The UPS distribution must be arranged with an external maintenance bypass to allow removal of the complete unit (including associated batteries)
- The designer must allow for the necessary interfaces with the University BMS and Security systems to transmit the required alarm conditions and ensure they are incorporated

- The UPS must be located to ensure that maintenance access is provided
- The designer must ensure adequate ventilation and temperature control is provided to maintain operation

To be inserted – Clause 2.6 Monitoring and Control – Natspec 0937 Uninterruptible Power Supply

Replace "Remote functions" section as follows:

"Remote Functions

General: Connect the following status indicators to the BMS System:

– Mains healthy

– Mains fail

– Supply on UPS

– Common fault – operation of scheduled alarms"

E 2.7 Switchboards

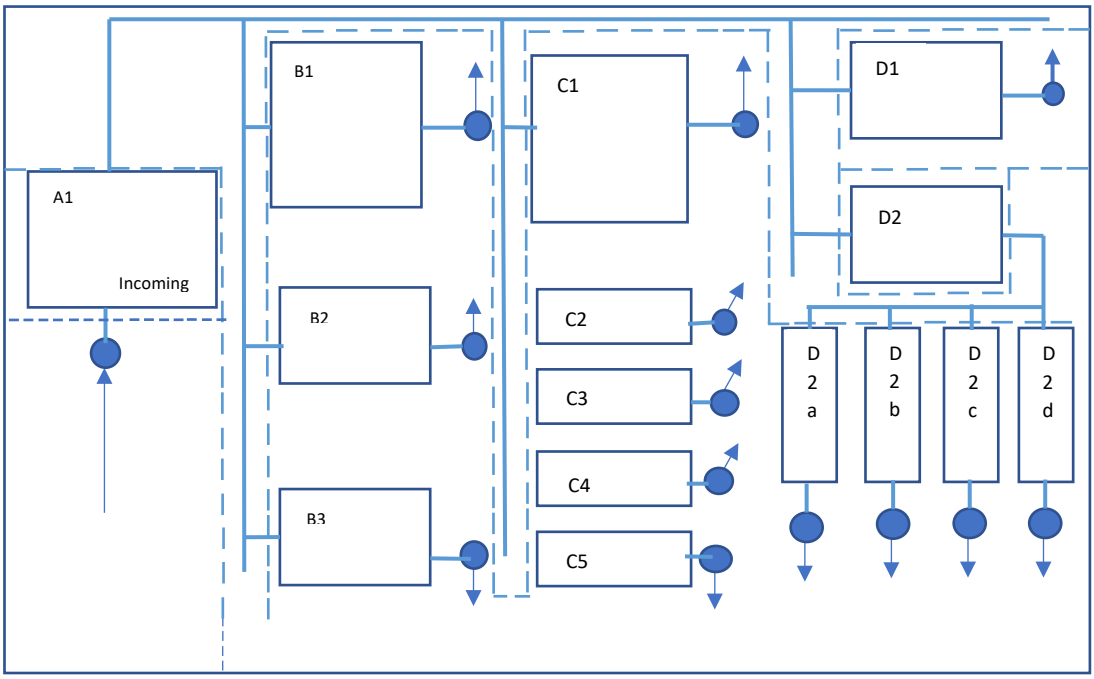
Liquid piped services, except sprinkler services where required by code, must not be run above electrical switchboards. The designer must liaise with hydraulic and mechanical trades to coordinate and ensure this does not occur.

All switchboards must be dead front and fully enclosed to min IP2X

Unless a higher level of separation is required to satisfy the requirements of AS/NZS3000 main switchboards must generally have Form 2b separation however the incoming supply(s) and

switch (es) sections must be provided with Form 4b separation. Refer following Diagram:

Diagram 1 - Switchboard Separation Diagram



High current sections (>63A) of trade services switchboards must have Form 2b separation.

Distribution boards and MCB distribution sections of trade services switchboards must be Form 1 and have isolating chassis as per Schneider Isobar or NHP Grizz-Bar or approved equivalent.

Suffix ‘i’ and ‘h’ separation must not be accepted.

The designer must ensure adequate maintenance access is provided to all sections of the switchboard.

Unless approved by the Contracts Administrator external switchboards must not be provided. Where approved, external switchboards must be provided with a rain proof canopy covering the board and the mandated maintenance space.

Switchboards defined as Heavy Current in AS/NZS3000 must not be located externally under any circumstances.

All main switchboards must be provided with a multi-function digital meter integrated to the University BMS system.

All new building main switchboards must at a minimum include capacity for connection of power factor correction.

All sub and distribution boards must include at a minimum, space for installation of metering for future connection to the University BMS system.

Sub-metering must be provided as required by the NCC. The designer must identify in the Design Report the extent of the metering to be provided.

All switchboards must be rated to carry the estimated diversified maximum demand plus 25% for future expansion.

Main switchboards must provide 30% spare physical capacity for future expansion (i.e. 70% full). The designer must identify the frame sizes of the spare ways.

Sub and distribution boards must provide 50% spare physical capacity for future expansion (i.e. 50% full). The designer must nominate the chassis size including spare poles.

Transient overcurrent protection must be provided for the following:

- All main switchboards
- Sub and distribution boards served by externally run sub-main cabling
- Sub and distribution boards serving ISTS equipment

An emergency lighting test switch must be provided to all distribution boards serving emergency lighting.

The designer must provide the following information for each switchboard on the main single line diagram:

- Number of poles
- Fault level in kA
- IP rating
- Form of separation
- Top or bottom entry
- Busbar temperature rating

The designer and installer attention is drawn to the University specific requirement for switchboard labelling noted in the supplementary Natspec sections below. The designer and installer must ensure the requirements are passed to switchboard manufacturers.

To be inserted – Clause 2.1 General – Natspec 0941 Switchboards – Proprietary

Replace "Remote functions" section as follows:

"Doors

General: Provide lockable hinged doors with a circuit card holder unless enclosed in cupboards or in an area which is not readily accessible to the public.

Swing: 120 degrees.

Handles: Carbon T-handle

Barrel: Bi Lock GGME coded to the University's master-key system."

Insert the following element:

"Gland plates: 3mm aluminium"

To be inserted – Clause 3.1 General – Natspec 0941 Switchboards – Proprietary

"Cable supports

Cable supports: Support or tie mains and submains cables on entry. Provide cable supports suitable for stresses resulting from short circuit conditions"

To be inserted – Clause 2.1 Custom-built Switchboard Construction– Natspec 0942 Switchboards – Custom Built

Layout

Locate cable zones and vertical busbar compartments to provide separate access to the zones and compartments.
Equipment mounting heights above floor to the centre line of the equipment:

- *Toggles and handles of circuit breakers, fused switch units and isolators:*
  - *Wall mounted assemblies: 500-1900mm.*
  - *Floor mounted assemblies: 200 - 2000mm*
- *Control switches, indicating lights, meters and instruments on doors:*
  - *Wall mounted assemblies: 1000 - 1700mm.*
  - *Floor mounted assemblies: 200 - 1800 mm.*
- *Push button emergency switching devices: 800 - 1600mm.*
- *Cable Terminations: to suit cable size, lug and bending radius.*

Arc Chutes
Locate arc chutes and ventilating outlets so that emissions of flame or hot metal particles will not cause electrical breakdown in adjacent compartments. Direct emissions upwards and away from operator.
Ventilation
Provide adequate low-level inlet and high-level outlet vents at top, sides or rear of switchboards. Ventilation openings on front of switchboards are prohibited. Cover ventilation openings using non-combustible and non-corroding 1mm mesh complete with replaceable dust filters (where specified) of adequate area or provide head temperature rise calculations.
Construction
Wall mounting: Reinforce at bolt holes. For flush or semi-flush assemblies, provide angle trims of the same material and finish as the enclosure."
Replace the "Spare Capacity" section with the following:
Spare Capacity
Default spare poles: ≥ 50%."

To be inserted – Clause 2.2 Cable Entries – Natspec 0942 Switchboards – Custom Built
"Materials: Conform to the following:

- *Generally: 3 mm thick aluminium, 5 mm thick composite material or laminated phenolic.*
- *For MIMS cables and cable glands: 6 mm thick brass."*

To be inserted – Clause 2.4 Doors and Covers – Natspec 0942 Switchboards Custom Built
Replace the "Door Layout" section with the following:
"Door layout
Maximum width: 900 mm.
Main switchboard doors – minimum width – 700mm
Minimum swing: At least 120º.
Door stays: Provide stays to outdoor assembly doors.
Adjacent doors: Space adjacent doors to allow both to open to 120º at the same time."
Insert the following to "Door Construction" section:
"Barrel: Bi Lock GGME coded to the University's master-key system."
Replace the "Escutcheon plates" section with the following:
"Escutcheon plates

General: Provide hinged removable covers with neat circuit breaker toggle cut-outs allowing interchangeability of 1, 2 and 3 pole circuit breakers. Provide corrosion-resistant lifting handles or knobs. Provide unused circuit breaker toggle cut-outs with firmly fixed blanking in-fill pole covers."

To be inserted – Clause 2.5 Factory Finishes – Natspec 0942 Switchboards – Custom Built

Replace "Factory finishes schedule" with the following:

Mounting structure (brackets)	***To match enclosure***
Enclosure - Indoor	*Indoor assemblies: Orange X15* *Assembly interior: Orange X15*
Enclosure - Outdoor	*Outdoor assemblies: Orange X15* *Assembly interior: Orange X15*
Escutcheons	*Removable equipment panels:* *Internal assemblies: White* *External assemblies: White*
Doors	*To match enclosure*
Plinths	*Black*

To be inserted – Clause 2.6 Busbars – Natspec 0942 Switchboards – Custom Built

Insert the following to the "General" section

"All miniature circuit breaker chassis sections shall be isolating type as Schneider Isobar or NHP GrizzBar or approved equivalent."

Insert the following:

"Protection: All unused terminals to be protected and insulated."

To be inserted – Clause 2.7 Neutral Links and Earth Bars – Natspec 0942 Switchboards – Custom Built

Replace the "Terminals" section with the following:

"Terminals

General: Provide terminals for future circuits. 2 screw cable tunnels per circuit.

Earth bar: Provide dedicated earth bar for all RCD units."

To be inserted – Clause 3.2 Assembly Entries – Natspec 0942 Switchboards – Custom Built

Replace "Cable entries" section with the following:

"Cable entries

General: Neatly adapt one or more cable entry plates, if fitted, to accept incoming cable enclosure. Provide the minimum number of entry plates to leave spare capacity for future cable entries. Do not run cables into the top of weatherproof assemblies.

Single core cables: Pass separately through non-ferrous gland plates via a propriety cable gland. Do not use metal saddles"

To be inserted – Clause 3.3 Marking and Labelling – Natspec 0942 Switchboards – Custom Built

Replace the clause with the following:

General

General: Label the switchboard assembly with traffolyte engraved labels in conformance with AS/NZS 3439.1 including the following minimum information:

- *Emergency operating procedures.*
- *Switchboard reference*
- *Source of supply*
- *Board bus-bar rating*
- *Form of Separation*
- *Upstream supply protective device rating and type*
- *Supply active size*
- *Supply neutral size*
- *Supply earth size*
- *Fault current level*
- *Manufacturer, date and unique project reference*

Minimum text sizes: -

- *Main switchboard designation = 25mm*
- *Distribution board / sub-distribution board / services switchboard designation = 15mm*
- *All other details = 6mm*

Sub circuits: with IPA studs, colour to match phase, number to match circuit:

Legend cards: with description of final circuit including cable and protective device size"

To be inserted – Clause 2.2 Switch-Isolator – Natspec 0943 Switchboard components

"Locking: Provide for padlocking in the "OFF" position.

Handles: Removable only when switch is in open position."

To be inserted – Clause 2.4 Fuse-Switch Units – Natspec 0943 Switchboard components

Replace "General" section with the following:

"General Operation: Provide an extendable operating handle at least 100 mm above the floor which remains clear of other equipment over the range of positions."

To be inserted – Clause 2.5 Auto-Transfer Switches – Natspec 0943 Switchboard components

"Indication: Provide power available indicator lights for each source and each phase of incoming supplies.

Manual Operation: Provide control switches to enable manual override and testing of the changeover transfer operation.

External Control Connections: Provide external control connections as necessary to integrate with other systems i.e. generator, BMS etc.

External Status Interfaces: Provide external status interfaces as necessary to integrate with other systems i.e. generator, BMS etc."

To be inserted – Clause 2.6 Moulded Case and Miniature Circuit Breakers – Natspec 0943 Switchboard components

Replace with clause with the following:

*"**General***

All circuit breakers to be of common manufacture.

Moulded case breakers: To AS 60947.1, AS 2184 and AS 60947.2.

Miniature circuit breakers: Interrupting capacity classification to AS/NZS 60898.1 or AS/NZS 3111.

- *For general building services: Type C unless otherwise indicated.*
- *For motor protection: Type D.*

Operation: Independent manual operation including positive ON/OFF indicator.

Trip type: Conform to the following:

- *Moulded case breakers: < 250A. Adjustable thermal, fixed magnetic. ≥ 250A. Provide solid state protection relay.*
- *Miniature circuit breakers: Fixed thermal and fixed magnetic.*

Adjustable short circuit trip settings: Set to discriminate with upstream and downstream devices using Ipscc.

Minimum breaking capacity: -

– *Moulded case circuit breakers: 18kA*

– *Miniature circuit breakers: 10kA*

Isolation facility: Required.

Mounting: Mount circuit breakers so that the ON/OFF and current rating indications are clearly visible with covers or escutcheons in position. Align operating toggles of each circuit breaker in the same plane. To permit interchange of single pole and three pole breakers of the same frame size.

Utilisation category: Moulded case breakers:

- *Final sub circuits category: Category A.*
- *Mains and submains: Category B.*

Trip settings: Set as documented, seal, and label.

Interchangeable trip units: Connect trip units so that trip units are not live when circuit breaker contacts are open.

Fault current limiting circuit breakers: Select breaker frame sizes from one manufacturer's tested range of breakers to give cascade and discrimination protection within the switchboard and downstream switchboards as required."

To be inserted – Clause 2.8 Electrical Indicating Measuring Meters – Natspec 0943 Switchboard components

Generally all new meters to be digital type. Remove references to analogue operation from specification.

To be inserted – Clause 2.28 Anti-Condensation Heaters – Natspec 0943 Switchboard components

*"**General***

General: Provide anti-condensation heaters to external switchboards"

To be inserted – Clause 3.2 Completion Checklist – Natspec 0943 Switchboard components

Insert the following clause:
*"**3.2 COMPLETION CHECKLIST***
General: Upon completion of the works after testing and prior to handover complete the following checklist:

At Completion	*No*	*Yes*	*Contractor Comments*
Are all cables terminated securely?	¨	¨	
Are cable strands escaping from circuit breaker tunnels? If so, re-terminate.	¨	¨	
Is sufficient space available within cable ducts for easy access, modification to existing wiring systems and installation of future wiring systems?	¨	¨	
Are duct covers fitted without pressing cables?	¨	¨	
Are major submain cables labelled at each cable end identifying the cable size, protection device rating and setting, distribution board supplied and other information required by the Electrical Specification?	¨	¨	
Are any wiring systems strained? If so, reinstall.	¨	¨	
Are cables installed through glands providing a close fit in accordance with AS/NZS3000? If not, reselect the gland size.	¨	¨	
Can the escutcheon be closed without exerting force? If not, revisit the installation.	¨	¨	
Has a completed schedule card been placed in the switchboard card holder?	¨	¨	
Are all redundant materials removed from the switchboard and surrounding area including debris?	¨	¨	
Are all redundant cables removed from the switchboard and for the entire length?	¨	¨	
Are wiring systems bunched neatly and secured with cable ties or the like? Are cable tie ends cut to an appropriate length?	¨	¨	
Are all sharp edges and burrs removed entirely?	¨	¨	
Are spare cable bushes sealed to maintain IP rating?	¨	¨	
Is power monitoring devices and other active devices configured correctly?	¨	¨	
Are ELV type wiring systems (such as communications connections to networkable meters) installed within a conduit or the like for separation from LV wiring systems?	¨	¨	

E 2.8 Power Factor and Harmonic Correction

The designer must make an assessment of the type of equipment being provided and document in the Design Report if power factor correction is recommended to achieve a power factor of 0.95 lagging and/or harmonic correction is required to meet SA Power Network requirements.

For major new building projects the designer must make an assessment of the estimated diversified maximum demand and determine the reactive power necessary to provide an improvement in power factor from 0.85 lagging to 0.95 lagging.

The designer must make due space and capacity allowance in the new main switchboard and main switch room for future installation of the appropriately sized unit.

The designer must make an assessment of the cost of future installation of the power factor correction unit so the University can allow a contingency following review of actual operation of the building.

E 2.9 Lighting

Lighting must be designed and installed in accordance with the recommendations from the AS/NZS1680 unless otherwise directed.

The designer must identify in the Design Report any departures from the AS/NZS1680 recommended illumination levels.

The designer must identify in the Design Report any instances where the lighting design has been based on a maintenance factor greater than 0.8.

The designer must consider the ceiling and wall average illuminances in their design with intent to achieve an average of 30% of the working plane average illumination on the ceiling and walls. The University acknowledges the challenge to achieving these levels where a fully recessed lighting solution is proposed, and the designer must address this in the Design Report.

The designer must identify the major types and specifications of luminaires in the Design Report. The University's preference is to reduce the range of spare parts required for maintenance and the designer must consider this when selecting the type and size of luminaire and lamp source.

The lighting design must be appropriate to the project requirements and the designer must consider the following elements as part of the design process and must address in the Design Report:

- Appropriate equipment selection
- Lighting performance
- Energy efficiency
- Aesthetic performance
- Whole of life cost
- Maintainability

The University reserves the right to require the lighting designer to produce calculations, rendered images, etc. to prove the lighting design.

LED luminaires must have a minimum 5-year manufacturer's warranty and the University reserves the right to require the luminaire manufacturer to provide evidences of IES LM79 and TM21 testing.

Low voltage dichroic luminaires must not be specified or provided.

Unless otherwise directed lamp colour temperature shall be 4000k.

All external luminaires must be appropriately IP rated. Where recessed fittings are proposed to be mounted externally the complete luminaire must be rated to minimum IP65 above and below the mounting. External fittings in publicly accessible areas must be fitted with tamper resistant fixings.

Unless otherwise directed in ground uplights shall not be specified or used due to ongoing maintenance issues.

The designer must identify the lighting control methodology and technology (i.e. DALI, DSI, standalone etc.) in the Design Report. The designer must make an assessment of the appropriate lighting control methodology taking due account of safety, energy performance and cost/benefit.

Generally the University preferred methodology is absence detection i.e. manual switch on/automatic switch off after a predefined period of inactivity. The default minimum time delay is

30 minutes. Where a standard lighting wiring installation is appropriate (i.e. a non-C-Bus type automatic control type solution) the University has identified a suitable product able to provide this functionality – ECS Ex-Or Lightspot. Alternatives providing the same functionality will be considered.

Where presence detectors have been provided they shall include a signal to be provided to the mechanical services / BMS services to facilitate unoccupied mode temperature reset. For further details refer section D3 Automatic Controls.

The University acknowledges this approach is not appropriate to all areas and the designer must make an assessment of the most appropriate solution to each functional area and document in the Design Report.

Where existing office space lighting is upgraded to LED, fittings shall generally incorporate DALI type control gear to enable future dimming provision even if dimming is not a project requirement.

Where an automated lighting control system is proposed, it must be carried out by using a Distributed Intelligence C-Bus 2 Automatic Lighting Control System (ALCS) interfaced, where appropriate, with the site BMS system for time scheduling. Where after hours lighting is required to general areas, these lighting circuits must also be complete with push button control lighting programmed to allow for after hour switching (set to 2 hours operation).

Installation, Programming, Testing and Commissioning of the Clipsal C-Bus ALCS, including any system modifications, must be carried out by one of Clipsal Australia's Accredited Platinum partners.

An electronic copy of the C-Bus Toolkit project back-up file must be included in O&M Manuals (where applicable) and emailed to "maintenance@unisa.edu.au" with the location of the C-Bus installation clearly identified.

Lighting designs must take into account AV systems in the space to ensure suitable visibility of projection screens and display devices.

To be inserted – Clause 1.5 Submissions – Natspec 0951 Lighting

Replace "Samples" section with the following:

"Samples

General: Submit samples of all luminaires and accessories complete with lamp, control gear and three core flex and plug. Obtain approval for sample prior to placing order. Allow sufficient time for review and approval of long lead time selections."

To be inserted – Clause 2.3 Fluorescent Lamp Ballasts – Natspec 0951 Lighting

Replace "Linear and circular lamp types" section with the following:

"Linear and circular lamp types

General: Provide high frequency electronic fluorescent lamp ballasts for fluorescent lamp lighting systems selected for compatibility with the lamp and control method."

Insert the following:

"Dimming Lamp Ballasts

High frequency type compatible with dimming control gear and lamp.""

To be inserted – Clause 2.5 ELV Voltage Transformers or ELV Switch Power Supplies – Natspec 0951 Lighting

Replace the whole clause with the following:

General: Electronic type. Maximum 2 lamps per transformer unless noted otherwise.

Standards: To AS/NZS 61046 and AS/NZS 61047.

Label: Indicate maximum rating of lamp that can be connected.
Dimming: Suitable for leading or trailing edge dimming. Compatible with dimming equipment.
Regulation: Output voltage: Not in excess of the nominal rated lamp voltage at a load of 0-100% of nominal transformer rating"

To be inserted – Clause 2.7 Light-Emitting Diodes (LEDS) Luminaires – Natspec 0951 Lighting
"Selection: The LED luminaire shall be certified to the Lighting Council of Australia SSL Quality Scheme or shall have a minimum 5-year manufacturer's warranty. The manufacturer shall provide evidence of IES LM79 and TM21 testing on request."

To be inserted – Clause 2.8 Control Gear Enclosure – Natspec 0951 Lighting
Insert the following:
"Remote Ballasts
Where ballasts are not contained within the luminaire, install ballasts in purpose built ballast enclosures, with same IP rating, remote from the luminaire. Ventilate and provide labels, hinged doors, plugs and sockets for enclosures. Comply with manufacturer's recommendations for maximum cable length between gear and lamp.
Location: Hidden from normal view and accessible.
Gear tray cover
General: Provide propriety screw fixed gear tray cover to all luminaires. Gear tray is to prevent access to cabling, control gear and terminals"

To be inserted – Clause 2.10 Lighting Control – Natspec 0951 Lighting
Insert the following: "Dimming Systems
Provide individual dimming systems of the same manufacture for either fluorescent and/or incandescent systems at an even rate to the eye.
Range: From 0% to 100% light output to the eye.
Noise: To AS 2107
Electromagnetic compatibility: To AS 1044, and AS/NZS 61000. Must not be increased by the use of dimming equipment compared to luminaires not on dimming control.
Integration: LAN configuration with support protocols – RS232, RS485, LONWorks, BacNet, Modbus and Ethernet.
Operations; Maintain operations in the event of a backbone cable fault.
Training: Proprietary software training at commissioning, fine tuning and at defects liability completion.
Lighting Control Panel: To design selection.
Load controllers: Continuous operation at 100% of rated load.
Network Time Clock: 24 hours, 7 days, year calendar. Timed shut off to incorporate dimming or stage shut off.
User interface: Utilise building layouts.
Cabling: Control / signalling cable for automatic lighting control systems must have pink coloured cable sheath."

To be inserted – Clause 2.11 Accessories – Natspec 0951 Lighting

Replace "Lighting switches" section with the following:

"Lighting switches

General: Provide light switches as documented. Use switches of the rocker type designed for inductive and fluorescent lighting loads generally flush wall mounted.

Standard: To AS/NZS 3133.

Minimum: 15 A, 230 V a.c.

Multi switch/function: Ganged under one cover plate and arranged similar in plan to the lighting controlled.

Multiphase: Separate face plates in lightweight stud walls or demountable partitions. Totally segregate switches in wall boxes by physical barriers

Maintain 150mm clearance or physical barrier between LV and ELV terminations.

Multigang

Where 5 or more switches are located together in cavity walls, install a recess mounted multigang stainless steel cover plate.

Stainless steel cover plates: Flush mounted finished stainless steel equipped with switch mechanisms, matching plastic caps and labelled.

Cover plate fixing to a wall box: Use flush head countersunk stainless steel screws.

Adjustment and alignment: Incorporate fixings that enable alignment and adjustment of the cover plate."

To be inserted – Clause 3.2 Supports – Natspec 0951 Lighting

Replace "Suspended luminaires" section with the following:

"Suspended luminaires

Rods: Steel pipe suspension rods fitted with gimbal joints.

Chains: Electroplated welded link chain. Minimum 4 chains and 4 anchor points (for workshops only).

Levelling wire: Stainless steel. Minimum 4 wires and 4 anchor points.

Levelling: Adjust the suspension system length so that the lighting system is level and even.

Horizontal tolerance: ± 3 mm between luminaires within the one space."

Replace "Recessed luminaires" section with the following:

"Recessed luminaires

General: Install recessed luminaires in trimmed openings in the suspended ceiling. Diffuser to be hinged and supported.

T-Bar ceiling: fittings to be inside T-Bar and provided with hinged framed diffusers. Lay in type diffusers are not accepted.

Fittings in ceiling tile: Where fitting does not completely replace tile provide backing support so that fitting is supported from T-bar not directly from ceiling

Standard: To AS 2946."

E 2.10 Emergency Lighting

Emergency lighting must be designed and installed in accordance with the requirements of the NCC and AS2293 to suit the use of the area.

The University currently uses the Stanilite Nexus LX & RF monitoring and testing systems in the majority of its buildings.

All new emergency lighting systems must be compatible with the Stanilite Nexus RF system. The University acknowledges the provision of the Nexus LX infrastructure is not exhaustive, and the University is moving to the wireless Nexus RF platform.

Unless specifically directed otherwise the designer must specify Nexus RF compatible fittings.

All new emergency lighting and illuminated signs must be LED type.

Notwithstanding the connection to the Nexus system, all emergency lighting must be connected via an emergency lighting test switch. If new lighting is being connected to an existing distribution board without an emergency lighting test switch the designer and/or installer must advise the Contracts Supervisor and await instruction.

Where new Nexus routers are required, provide a single data point adjacent to each Nexus server and ELR, connected to the University's Building Services VLAN #251. Provide the MAC address for each of these items. Coordinate with the University ISTS via the Contracts Administrator for allocation of the static IP addresses.

Whenever a new Nexus RF fitting is provided the electrical contractor must complete the "Nexus RF SPU Data" matrix and provide a copy with the O&M Manual. The contractor must also complete the Excel spreadsheet and email a copy to "maintenance@unisa.edu.au". The designer must ensure this requirement is noted on any lighting drawings which include Nexus RF emergency fittings.

Spitfire type emergency luminaires must be min class D32.

The designer must nominate the type of illuminated exit sign (including directional logo) and confirm with the Contracts Supervisor

To be inserted - Clause 2.2 MONITORING SYSTEM – Natspec 0971 Emergency Evacuation Lighting *Replace "Proprietary systems" section with the following:*

"Proprietary systems

General: Provide Stanilite Nexus proprietary systems with full compatibility between the monitoring system, operating software and the luminaires selected.

Testing facilities: Provide automatic and manual testing facilities for testing lamp condition and for battery discharge testing"

E 2.11 Lightning Protection

For all new building projects the designer must undertake a risk assessment in accordance with AS/NZS1768.

Where required by the risk assessment a lightning protection system must be designed and installed in accordance with AS/NZS1768.

The University's preference is to utilise the metallic structure of buildings as part of the general building construction for the lightning protection system as described in Section 4.16 "Metal in and on a structure" of AS/NZS1768.

The designer must make due allowance for the design of connections between the air termination network (i.e. roofing), down conductors (i.e. structural steel work, reinforcement, etc.) and earth termination network (i.e. footings, earthing rods, etc.) Particular attention is drawn to the installation methodology of reinforcing bars in columns to ensure conductivity is maintained from top to ground level.

The installer must perform tests throughout the construction to prove the electrical continuity of the system before being 'built out'.

The University is aware of other non-conventional lightning protection systems that comprise air terminals that claim enhanced performance. However, as noted in AS/NZS1768 the performance of such systems is outside the scope of the standard and irrespective of claimed performance 'traditional' methods must be used in compliance with AS/NZS1768.

Generally, use of such 'enhanced performance' systems will not be accepted.

E 3 Design Reports

The electrical designer must submit formal Design Report documents as required by the contract for technical review by the University.

In addition to the specific elements discussed in Section C of this document, the electrical services Design Report/s must include, to the extent that they are applicable to the project, but not be limited to the following:

- Completed Design Certificate relevant to the stage of design
- Proposed scope of works and details of the system arrangement
- Schedule of applicable regulations, standards, policies and guidance publications on which the design is based.
- Details of deviations of the above
- Details of any third party and/or record information upon which the design relies
- Assumptions or exclusions
- Safety in Design review
- Sustainability review
- Proposed point of supply for the works including the supply capacity/characteristics/condition assessment, demonstrating adequate capacity is available at the point of supply and in the reticulation system
- Detail of any proposed modifications to existing systems or equipment
- Maximum demand assessment and load characteristics
- Switchboard location, design fault level, voltage drop allocation, circuiting arrangements, earthing arrangements and protection arrangement
- Metering locations
- Standby emergency generator analysis including:
  - Risk analysis to determine the requirement for emergency generation
  - Cost/benefit analysis of emergency generation
  - Detail of the generator and essential reticulation system arrangement including schedule of systems with emergency generator back-up
  - Details of generator noise attenuation requirements
  - Standby emergency generator maximum demand assessment and load characteristics
  - Essential switchboard locations and circuiting arrangements, earthing arrangements and protection arrangement
  - Size and duty of proposed generator
- Uninterruptable power supply (UPS) analysis including
  - Risk analysis to determine requirement for UPS
  - Cost/benefit analysis of UPS provision
  - Detail of UPS and essentials reticulation system arrangement including schedule of systems with UPS back-up
  - UPS supported maximum demand assessment and load characteristics
  - UPS switchboard locations and circuiting arrangements, earthing arrangements and protection arrangement
  - Size and duty of proposed UPS
- Power factor and harmonics correction analysis including
  - Cost/benefit analysis of PFC and/or harmonics correction
  - Detail of proposed size and arrangement of equipment

    - Detail of allowances for future installation of PFC and/or harmonics correction equipment
- Lighting system
    - Proposed lighting system performance including operational considerations and levels of illumination for each area (where these differ from AS/NZS1680 recommendations)
    - Financial assessment and cost benefit studies to justify the chosen lighting systems
    - Detailed description of the control system type and arrangement including justification of the arrangement chosen and detail on the control interfaces (e.g. BMS, AV, C-Bus)
    - Detailed description of the energy management and energy efficiency initiatives
    - Significant luminaire types, manufacture and lamp types
    - Maintenance issues
- EMI analysis
- Lightning protection risk assessment and proposal
- Emergency lighting system detailing type of Nexus proposal i.e. LX or RF and works required to incorporate
- Manufacturer selection of major equipment
- Basis of sizing of major equipment
- Layout drawings and single line diagrams for the proposed arrangement to the level of detail as per the "Electrical Services Design Deliverable" matrix

Table 5 Electrical Services Design Deliverables Matrix:

Design Report Stage		Electrical Service Design Deliverables
End of Schematic Design	General	• Preliminary load estimate based on schedule of accommodation and reasonable allowance. • Awareness of existing site infrastructure to identify connection points and capacities and to determine cost/benefit impact of masterplan options to electrical services
	Reporting	• Preliminary estimated maximum demand • Feasibility of infrastructure connections • Advantages/disadvantages of masterplan options • Understanding of electrical systems requirements • Identify communication system requirements • Confirmation of scope of services • Items requiring further clarification • Information required
	Documentation	• Mark up of masterplan options indicating existing infrastructure and possible connection points
End of Design Development	General	• Developed load estimate based on building form and preliminary information from other services

Design Report Stage		Electrical Service Design Deliverables
		• Preliminary size and location of main switchboards, distribution cupboards, communications room, etc. to inform architectural building development • Preliminary major service routes • Preliminary equipment/lighting selections. • Preliminary external services design • The UniSA Technical Standards reviewed and assessed
	Reporting	• Developed load estimate based on proposed facility/building form and services • Confirmation site infrastructure can accommodate estimated electrical demands • Confirmation of standby power requirements i.e. Generator, UPS • Confirmation of electrical systems provided to individual facilities/buildings • Description of system proposals • Items requiring further clarification • Information required • Preliminary opinion of cost based on square meter rates • Concept Design Certificate
	Drawing	• Preliminary schematic drawings of electrical and communications systems demonstrating connections to infrastructure and nodes • Layout drawings showing preliminary locations of major plant i.e. generator, transformer, main switchboard, distribution boards, communications cupboards, system operating/control panels. • Layout drawings showing preliminary cable tray / ladder and buried service / conduits
50% Documentation Phase	General	• Electrical services design to suit approved building form • Final load estimate based on design equipment / services including diversity • Defined location and sizes of switch rooms, cupboards, etc. to suit designed equipment • Defined size, locations and route of cable trays and buried conduits • Defined sizes of major plant • Draft specification of electrical and communication services
	Reporting	• Final load estimate • Final confirmation of systems being provided • Final confirmation of connections to existing infrastructure • Schedule of selected luminaires • Developed opinion of cost including elemental cost for major plant and equipment

Design Report Stage		Electrical Service Design Deliverables
		• Final minor items requiring further clarification • Final minor items of information required • Statement of any specialist systems requiring design development responsibility by contractor • Schematic Design Certificate
	Documentation	• Compete schematic drawings of electrical and communication systems with cable types and sizes • Layout drawings for power, lighting and communication services showing preliminary outlet locations, lighting arrangements, switching locations, etc. • Final cable tray / ladder and buried conduit routes with numbers, types and sizes • Control schematics • Preliminary Specification
90% Documentation Phase	General	• Final coordinated electrical services design suitable for tender and construction • All systems and equipment fully and clearly defined and specified
	Reporting	• Confirmation of all systems fully designed • Statement of any minor outstanding information and/or assumptions • Elemental opinion of cost • Complete specification for electrical and communication services • Confirmation of any design development of specialist systems by contractor
	Documentation	• Complete schematic drawings including schedules of equipment • Complete power, lighting and communications services layout drawings with locations of outlets, accessories, luminaires, switches, etc. coordinated with building form, furniture, joinery and other services • Controls details complete • Switching and final circuiting complete • Final specification • All documentation fully checked, reviewed and signed-off in accordance with contractual Quality Assurance Requirements • Detailed Design Certification

Where the designer considers an element is not applicable to the project, this must be clearly noted. It is the University's expectation that there will be negligible cost impact/difference between 90% Documentation Phase documentation and Construction Issue documentation. Any elements not fully designed / documented at 90% issues must be clearly identified with an estimate of cost. The University reserves the right to reject the designers 90% Design Documentation should it consider the documentation not satisfactory.

E 3.1 Design Certification

The designer must produce a 'Design Certificate' identifying which codes and standards the design has been based on, including the issue date and version of the code or standard, and certifying compliance with those codes.

The 'Design Certificate' must be signed by the designer responsible for the design, not a delegate, and issued with the documentation issued for pricing.

E 4 Labelling

In ground service pits shall be provided with an engraved brass label indicating the nature and direction of the service.

Identification labels must be provided to indicate the point of access to in-ceiling or hidden services requiring maintenance or adjustment, e.g. at access panels, ceiling tiles, etc.

The labels must be 10mm round, traffolyte type labels, and colour coded to match the type of hidden service as follow:

Table 5 – List of Labels

Label Colour	Type
Blue	Mechanical
Black	Untreated Waste / Sewage
Green	Cold water/hot water/recycled water/drinking water
Yellow	Gasses
Red	Fire
Orange	Electrical Power
White	Electrical Communications

Labels are to be installed as follows:

- In T-Bar Ceilings install centrally on the t-bar frame. An arrow pointing to the tile to be used for access is to be engraved on the marker (refer diagram below, NTS)

- In solid ceilings install in the corner of the access panel

Circuits supplying critical controlled environments shall be clearly identified in the applicable switchboard legend or breaker labelling to mitigate risk of accidental loss of power during maintenance works.

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E 5 Record Drawings

To be inserted – Clause 3.17 Record Drawings – NATSPEC 0171 General Requirements

Refer to the UniSA Technical Standards, Section C, Documents and Drawings for additional requirements

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E 6 Operation and Maintenance Manuals

To be inserted – Clause 3.18 Record Drawings – NATSPEC 0171 General Requirements

Refer to the UniSA Technical Standards, Section C, Operation and Maintenance Manuals for additional requirements

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UNISA TECHNICAL STANDARDS

F

FIRE PROTECTION AND DETECTION SERVICES

	SECTION	
	A	Introduction
	B	Safety in Design
	C	Design Controls
	D	HVAC/Mechanical
	E	Electrical and Lighting
x	F	Fire Protection and Detection Services
	G	Plumbing
	H	Building Management System
	I	Transportation Systems
	J	Security Systems
	K	Audio Visual Technology
	L	Communications Infrastructure
	M	Architectural

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Contents

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F 1 General Requirements

F 1.1 Introduction

It is expected that this section is read in conjunction with all other sections of the UniSA Technical Standards, in order to achieve a fully comprehensive understanding of the University requirements.

All works undertaken at the University must comply with the requirements of NATSPEC specifications and the designers must use this, plus the University specific modified clauses as a basis for their specifications.

The designer shall amplify the NATSPEC requirement where necessary to meet specific project requirements or to provide increased levels of quality and/or performance with approval from the Contracts Supervisor.

The designer may use their own specification, but only with written approval from the University. Where alternative specification is used, it must ensure that the specified standards, quality and outcomes are equivalent to or greater than those specified through NATSPEC. NATSPEC supplementary clauses specified in this document are to be inserted into the designer's specifications.

The designer must not reduce the requirements of NATSPEC and/or the UniSA Technical Standards clauses without written approval from the Contracts Supervisor.

On smaller projects where the scope of work does not justify a full NATSPEC specification the designer may propose a "notes on drawing" type of specification, as long as the pertinent elements of the NATSPEC and supplementary the University clauses are included, with the Contract Supervisors approval

NATSPEC supplementary clauses which are required to be inserted into the designer's specifications have been placed inside a blue box and text has been italicised.

F 1.2 Standards and Regulations

Unless specifically stated, all fire protection services must be designed and installed in accordance with, but not limited to, the following:

Table 1 – List of Standards and Regulations

CODE	DESCRIPTION
NCC	National Construction Code Building Code of Australia, Volume 1
AS 2419.1	Fire hydrant installations — System design, installation and commissioning (incorporating amendment 1)
AS 2441	Installation of fire hose reels (incorporating amendment 1)
AS 2118.1	Automatic fire sprinkler systems — General systems (incorporating amendment 1)
AS 2118.6	Automatic fire sprinkler systems — Combined sprinkler and hydrant systems in multistorey buildings
AS/NZS 2243.1	Safety in laboratories – planning and operational aspects
AS/NZS 2243.2	Safety in laboratories – chemical aspects and storage
AS/NZS 2243.7	Safety in laboratories – electrical aspects
AS/NZS 2243.8	Safety in laboratories – fume cupboards
AS/NZS 2243.9	Safety in laboratories – recirculating fume cabinets
AS 2444	Portable fire extinguishers and fire blankets — Selection and location

CODE	DESCRIPTION
NCC	National Construction Code Building Code of Australia, Volume 1
AS 2419.1	Fire hydrant installations — System design, installation and commissioning (incorporating amendment 1)
AS 2441	Installation of fire hose reels (incorporating amendment 1)
AS 1670.1	Fire detection, warning, control and intercom systems – System designs, installation and commissioning – Fire
AS 1670.4	Fire detection, warning, control and intercom systems — System design, installation and commissioning — Emergency warning and intercom systems
AS 1668.1	The use of ventilation and air conditioning in buildings — Fire and smoke control in buildings (incorporating amendment 1)
AS 1851	Routine service of fire protection systems and equipment
SA 76	Minister's Specification SA 76 – Maintenance and testing of essential safety provisions
AS/ISO 14520.1	Gaseous fire extinguishing systems – Physical properties and system design
-	South Australian Metropolitan Fire Services (SAMFS) Guidelines

Unless specifically stated by the NCC, or otherwise, the design and installation of the fire protection services must be based on the current version of the standard or code at the date of tender.

The above list is not exhaustive and the designer and installer must be responsible for identifying and complying with all standards relevant to the scope of works.

F 1.3 Quality

All fire protection services design works must be carried out by suitably qualified and experienced designers. The University reserves the right to request copies of calculations from the designer for review.

The University reserves the right to request changes to the design personnel to ensure personnel of an appropriate level of experience are engaged.

All fire protection services design works must be checked and reviewed by a suitably qualified and experienced peer prior to issuing for pricing. The designer must have a formal check and review process. The University reserves the right to request evidence of design checking and review.

Where a designer utilises a third-party designer i.e. sub-consultant / specialist contractor / fire protection manufacturer / supplier etc. the designer must retain responsibility for the design and carry out checks and reviews of the design.

F 1.4 Preferred Manufacturers

The University has a number of legacy systems which new equipment must be compatible with:

- Building Management System – Modbus LONWorks. Niagara/Invensys central located server
- Fire Detection and Alarm System – Ampac

While the University does not wish to restrict the designer's ability to select the most appropriate equipment to meet particular project requirements it is the University's strong preference that equipment selection satisfies the following:

- A reputable manufacturer with a proven track record

- Local Adelaide representation and support in design and post installation operation
- Local Adelaide spare parts availability
- Preference for Australian manufacture

The designer / contractor may only deviate from the Universities preference upon review of site-wide holistic master planning requirements and upon receipt of written confirmation from the University.

The following are an indicative list which the University considers represent the desired quality levels:

Table 2 – List of Preferred Manufacturers

Equipment / Component	Manufacturer / Supplier
Fire Detection Control and Indicating Equipment (FDCIE)	AMPAC FIREFINDER model 8651-0110-2.
Emergency Warning Control and Indicating Equipment (EWCIE)	AMPAC EvacU Elite
PE smoke detectors	AMPAC APOLLO XP95 (analogue/addressable) HOCHIKI SIGMA (conventional)
Thermal detectors	AMPAC APOLLO XP95 (analogue/addressable) HOCHIKI SIGMA (conventional)
Manual call points	AMPAC APOLLO XP95 (analogue/addressable) HOCHIKI HCP-E (conventional)
Sounder bases	AMPAC APOLLO XP95 (analogue/addressable)
Strobe bases	AMPAC APOLLO XP95 (analogue/addressable)
Sounder Strobes	E2S SON4B
Ceiling speakers	REDBACK C 2160
Horn speakers	REDBACK CF2053G
Warden intercom points	AMPAC 219-0007
Fire pump sets	Australian Industrial Pumps, BKB Pumps, AllFlo Pumps

Designer / contractor to match existing installations where possible ensuring equipment meets the requirements of a new installation.

F 1.5 Safety In Design

The designer of the fire protection services must undertake the necessary Safety in Design reviews and activities as required by the contract.

Generally the University prohibits any working on energised electrical equipment in accordance with the WHS Regulations. Where isolation of the equipment is demonstrably impracticable the contractor must provide a Safe Work Method Statement (SWMS) fully detailing how risks have been managed as low as reasonably practicable. It shall specifically address why isolation is impracticable and how access to energised electrical parts will be prevented. No working on energised electrical equipment shall proceed without written approval from the University. Approval of the SWMS by the University does not relieve the contractor of primary responsibility for undertaking safe work

Particular items the fire protection designer must consider as part of the Safety in Design review must include, but not be limited to, the following:

- Locations of all plant and other items requiring maintenance i.e. at height, above or adjacent to risk areas, proximity to other plant etc.
- Methods of safe isolation for access and maintenance of switchboards and equipment
- Satisfactory maintenance space around fire protection equipment
- Satisfactory space and access to internal components requiring maintenance and/or replacement
- Noise, fumes and vibration issues associated with fire systems plant and equipment e.g. diesel fire pumps

The Safety in Design aspects must be addressed by the designer in the Design Reports

The installer of the works must review the Safety in Design documentation throughout the works to identify any risks throughout the works and any residual risks to the University on completion.

Liquid piped services, except sprinkler services where required by code, must not be run above electrical switchboards. The designer must liaise with hydraulic, mechanical and electrical trades to coordinate and ensure this does not occur.

F 1.6 Sustainability

The designer must address the Environmental Sustainability of the fire protection services taking account of the whole of life cost and operational benefit.

Particular elements the designer must consider include, but are not limited to, the following:

- Energy efficiency
- Materials Selection
- Decommissioning / disposal of equipment at end-of-life
- Control Methodology including automatic controls
- Equipment selection
- Demand management
- Test water recycling provisions

The Sustainability aspects must be addressed in the Design Reports.

F 1.7 Cost Planning

The fire protection services designer must provide input to project cost planning as required by the contract.

Where the fire protection services designer is required to provide cost planning advice the cost must include supply, installation, associated works, contingencies, overheads etc. to indicate a total cost to the University.

Any element specifically excluded must be clearly indicated so that a total cost to the University can be determined.

F 1.8 Attendance

It is incumbent on the fire protection designer and contractor to make themselves aware of existing conditions as far as reasonably practicable when designing or performing works at the University. The University reserves the right to hold the designer and/or contractor liable for works incurred due to a lack of site investigations and coordination.

The fire protection services designer must attend design and construction meetings as required by the contract and as outlined below.

The University expects the fire protection services designer, not a delegate, to attend at a minimum:

- Technical Review as directed by the Contract Supervisor
- Design team meetings appropriate to the size of the works. The fire protection designer, not a delegate, must attend a minimum of one design team meeting
- Construction phase meetings appropriate to the size of the works. The fire protection designer, not a delegate, must attend a minimum of one construction phase meeting plus any meetings where the Contracts Supervisor considers there is a significant fire protection element that requires the designer's input
- Ongoing site inspections as considered appropriate by the Contract Supervisor (minimum bi-monthly)
- Fire protection services first fix inspection
- Fire protection services final fix inspection
- Fire protection services commissioning where required by the Contracts Supervisor
- Fire protection services final / defect inspection prior to Practical Completion
- Fire protection services final / defect inspection prior to end of Defects Liability Period (DLP). DLP inspection report to be issued to the University five working days prior to end of formal DLP.

The fire protection designer must identify his/her proposed meeting and site attendance in their engagement proposal.

The fire protection installer must attend meetings as required by the contract and considered necessary by the Contracts Supervisor.

F 1.9 Permits, Notices and Inspections

Make applications, obtain all permits, and arrange testing, all as necessary for the installation and placing into operation of the works where required by any Authority including:

SA Water Corporation
Department of Premier and Cabinet – Work Safe SA
The Office of the Technical Regulator
Australian Communications Authority
Site Telecommunications Carrier
South Australian Metropolitan Fire Services (SAMFS)
Energy Retailer

Provide all associated documentation required for the applications. Pay all associated fees.

F 1.10 Retrofitting and Upgrades

Alterations to existing installations must be thoroughly designed, installed and tested, including the re-calculation of power supply requirements, to ensure that there are no detrimental effects to the existing installation and equipment.

All parts of the installation and equipment, including detectors, must be compatible, only used within equipment listing limitations and must satisfactorily perform the required functions.

Consideration must be given to overloading existing circuits with detectors and ancillary devices particularly with conventional style FDCIEs. Alternatives must be sought prior to the installation of any new ancillary device on a detection circuit where the total number of devices on the circuit will exceed 40.

Alternative may include the rationalisation of existing detectors types and numbers, adding an additional circuit or adding the new device to a circuit with adequate capacity. All alternative must include a consultative approach which will ensure system operability, functionality and reliability and does not compromise the requirements of the NCC or AS1670.

Analogue (addressable) systems to be provided with short circuit isolators configured to prevent loop device grouping exceeding 40.

Unless it can be established that the existing fire detection devices within an area being refurbished were upgraded within the last year, all fire detectors, including those above ceiling must be replaced with new approved detectors.

If the refurbishment of a building's floor is greater than 50% of the floor area the entire floor's detection must be upgraded to an addressable design. This may include the installation of an addressable card with the building's existing FDCIE. Where existing FDCIE may not accommodate new addressable provisions, it shall be brought to University's attention for direction.

Where the building refurbishment results in any updating of building's fire block plans, the fire protection services contractor must be responsible for producing these drawings and delivering the final 'as constructed' and updated fire block plans. The designer shall issue to the installer AutoCAD drawings of the building plans and fire services layouts to allow the installer to modify to reflect actual as-built conditions. The installer shall make due allowance in his tender for production of electronic as built fire block plans.

Visual occupant warning shall be provided in accordance with AS 1670.1.

F 1.11 Fire Alarm Block Plans

The design and delivery of the fire alarm block plans must comply with the requirements of AS1670 and SAMFS Guidelines.

Additional copies will be required to form parts of the Operation and Maintenance Manuals and will need to satisfy the quantities of both hard and electronic versions. Block plans must be A3 size, provided within binder complete with plastic sleeves and located within purpose-built holder adjacent FDCIE unless otherwise approved.

F 1.12 Précis of Operation

A précis of Operation will be created for every new development and will follow the UniSA requirements. UniSA will provide an electronic template. For refurbishments, existing précis of Operation will be amended to incorporate all ESP changes.

F 1.13 Essential Safety Provisions

In addition to Fire Services O&M manual, the fire trade will provide a separate ESP/Compliance manual consolidating all documentation and drawings associated with Essential Safety provisions and compliance. Refer Section C9.5.1 "Specific Requirements for Essential Safety Provisions and Compliance Manual" for detailed requirements.

F 1.14 Temporary Works

The fire services contractor shall undertake all works to facilitate temporary fire services provisions to all areas of works including, but not limited to:

- Provision / maintaining of fire hydrant coverage to new and existing areas of works at the earliest opportunity within the construction program.

- Provision / maintaining of thermal detection installations and occupant warning provisions within areas of works throughout construction.
- All works, equipment and costs associated with bypassing / rerouting of fire detection and alarm system, fire hydrant system and fire sprinkler system infrastructure to ensure remaining building / site fire and life safety systems remain operational.

Preparation of temporary block plans and instructions as well as liaison with the SAMFS to accommodate amendment to existing onsite infrastructure during construction works.

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F 2 Technical

F 2.1 Design Criteria

Design criteria associated with an installation are:

Table 3 – Fire Protection Services Design Criteria

Item	Design Criteria
Fire Hose Reels	To the requirements of the NCC and Australian Standard AS 2441
Fire Hydrant systems	To the requirements of the NCC and Australian Standard AS 2419.1
Fire Extinguishers	To the requirements of the NCC and Australian Standard AS 2444
Fire Detection and Alarm Systems	To the requirements of the NCC and Australian Standard AS 1670.1
Emergency Warning and Intercommunication Systems (EWIS)	To the requirements of the NCC and Australian Standard AS 1670.4

F 2.2 Performance Criteria

F 2.2.1 Fire Water Supply

Water supply to serve any proposed new fire services systems must be connected to and supplied via a new valved connection at the Fire Water main and installed within a concrete underground valve pit and cast iron lid. All water supply works are to be in accordance with SA Water Corporation's Conditions of Connection and the Office of the Technical Regulator guidelines.

Only premium range fire pump sets shall be supplied. Fire pump sets shall have a minimum 3-year warranty period for full replacement. Due consideration shall be given to RPMs when selecting the pumps, ensuring low RPM pumps are selected to achieve longer life.

If fire pumps are being installed as part of a project, the fire protection contractor should provide manufacturers datasheets, performance curves and Factory Acceptance Tests (FAT) for the pump(s). Commissioning test should include performance test of each pump with measurements made for flow, discharge pressure, and suction pressure. In the case of a diesel engine driven fire pump, speed readings should also be provided. Measurements should be taken for multiple points in order to review performance but as a minimum should include 0%, 100% and 130% of the pump's rated flow.

F 2.2.2 Fire Hydrant System

An external and/or internal fire hydrant system must be designed and installed to suit the proposed works. The new fire hydrant system must be connected directly to the SA Water town's main or onsite water supply.

F 2.2.3 Fire Hose Reel System

The fire hose reel system must be connected directly to the proposed fire service reticulation mains which must proceed to serve 36m x 19mm type fire hose reels located within four metres of a required exit.

Fire hose reels are to be recessed off a main circulation space but they are not required to be in a specific cupboard.

Each fire hose reel must be fitted with a backflow prevention device.

F 2.2.4 Portable Fire Extinguishers

Portable fire extinguishers and fire blankets complete with signage must be installed in accordance with legislative requirements.

Sizes, ratings, types, spacings and locations to match perceived risks in accordance with AS 2444. Size and rating of equipment may generally be as follows:

Table 4 – General Portable Fire Extinguisher and Fire Blanket Details

Area	Type	Capacity	Rating
General	Air/Water	9L	2A
	Carbon dioxide	3.5kg	80B: (E)
	Dry chemical powder	2.5kg	2A:80B (E)
Plant Areas	Carbon dioxide	3.5kg	80B: (E)
	Dry chemical powder	2.5kg	2A:80B (E)
Server Rooms	Carbon dioxide	3.5kg	80B: (E)
Meal Preparation	Carbon dioxide	3.5kg	80B: (E)
	Dry chemical powder	2.5kg	2A:80B (E)
	Fire blanket	1.8m x 1.8m	-

To ensure consistency with all other existing buildings, all new fire extinguishers must be installed together with disc type identification signage immediately above the extinguisher. All fire extinguishers shall be supported by an appropriate support fitting or bracket including those located in enclosures or cabinets.

F 2.2.5 Automatic Fire Sprinkler System

An automatic fire sprinkler system of the wet pipe type must be provided to serve all new buildings in order to comply with the University's Insurer Requirements. In all cases this should be confirmed with the University at the start of any project, including installations/projects for existing buildings.

To provide adequate protection for the specific hazards present in a building, it is crucial that consultant teams designing fire sprinkler systems classify the hazards based on their level of risk, using relevant standards and guidelines. The consultant team responsible for designing the fire sprinkler system must ensure that the system is designed to the correct hazard class, determined by the hazard classification. Compliance with this requirement will reduce the risk of property damage, injury, and loss of life by ensuring that fire sprinkler systems provide effective fire protection.

cPVC pipework shall not be used. Use of flexible dropper arms only to be undertaken in strict accordance with manufacturer's installation requirements. Should flexible dropper arms be utilised within an existing installation, hydraulic calculations shall be undertaken to ensure the existing system's flow and pressure provisions accommodate the amended installations.

F 2.2.6 Automatic Fire Detection System

Note: whist this document uses FDCIE as the standard industry definition term, University uses FIP (Fire Indicator Panel) for the purposes of asset identification and labelling.

New automatic fire detection systems shall be configured as analogue (addressable) type systems.

For works associated with existing sites proposed to be interconnected to existing infrastructure, a single addressable type sub FDCIE must be installed within the main entry to the building. A weather resistant strobe light complete with statutory signage must be fitted externally to the building in a prominent position to indicate the exact location of the sub FDCIE to the local fire authorities upon

arrival to the building. The sub FDCIE must be directly interfaced with the sites main site FDCIE. The fire protection services designer / contractor shall be considerate of site-wide holistic master planning requirements regarding low or high-level interfacing between FDCIE's.

The automatic fire detection system must be configured such that upon activation of a smoke detector, thermal detector or manual call points a signal must be transmitted to the FDCIE located within the building which in turn must issue an alarm signal at the main site fire indicator panel to alert the local authorities of an on-site fire scenario.

All FDCIE replacements must be based on the same criteria as a new installation ensuring compatibility with all field devices and maintains all existing functionality.

All new FDCIEs must be supplied to accommodate the 'As Built' design load + 30% to support future expansion.

Ancillary Isolations:

It is a requirement with every new fire panel installation that, where needed, allowances must be made for separate, individual key switch isolation facilities to be provided for ancillary functions such as, but not limited to:

- A/C shutdown
- Door strike releases
- Door hold open devices
- Gas supplies
- Plant shutdown
- Gas Suppression

FDCIE Programming:

It is the recommendation of the University that the AMPAC FireFinder brand of FDCIEs be used with all new and replacement installations, it is also the University's recommendation that the AMPAC Config Manager or equal equivalent be used to program each panel. The logic behind each device and associated functionality must meet with the fundamentals of this software. All installing contractors must undertake the appropriate configuration program training provided by AMPAC.

As part of the commissioning process all logic and functionality must be tested in totality using field generated alarms, without the use of simulation and all programming deficiencies to documented and rectified. A copy of the configuration program, including key output functionality must be signed off by the installing contractor upon practical completion as having met the requirements of the tender specification.

Identification of Detectors:

The type of detector information must be permanently provided on the detector head as noted below:

T – Thermal detector, fixed or rate of rise; or

P – Photoelectric smoke detector; or

C – Combustion detector. (CO)

Addressable analogue detection devices shall be provided with identification reflecting the following:

La - AZbb – Dcc d

Where:

- L = Abbreviation for “Loop”
- a = Loop number
- AZ = Abbreviation for “Alarm Zone”
- bb = Alarm zone number
- D = Abbreviation for “Device”
- cc = Alarm zone device number
- d = Detection device type

Example, L2 AZ06 – D07 P

Conventional detection devices shall be provided with identification reflecting the following:

AZee - Dff g

Where:

- AZ = Abbreviation for “Alarm Zone”
- ee = Alarm zone number
- D = Abbreviation for “Device”
- ff = Alarm zone device number (lowest number closest to FDCIE)
- g = Detection device type

Example, AZ04 – D13 P

Where the detector is the last detector on the zone and provided with the end of line device, an addition EOL label shall be provided.

Concealed space detection devices for both conventional and addressable systems shall be provided with remote LEDs complete with labelling detailing detector information at the discretion of the SAMFS.

Temporary Changes to Fire Detectors:

The Consultant Team must identify temporary changes to the fire detector circuits in the Contract Documents as required to minimise the number and extent of circuits affected by the building works and to provide adequate fire protection to the site and adjacent areas for the duration of the works.

Where there is any likelihood of false alarms being activated from dust generated by continuous building works, the Contractor must liaise with the Consultant Team and Contract Supervisor to temporarily replace any smoke detectors with thermal detectors. When smoke detectors are isolated only, the project scope of works must include the requirement to completely seal all smoke detectors within the refurbishment area and adjacent construction access areas which may have been affected by dust migration. All covers must be removed outside of construction working hours and the detectors de-isolated.

The fire detector block plans must be updated as required to show any temporary alterations, in order to keep block plans current at all times. All detectors within the site and adjacent areas must be cleaned by a fire protection subcontractor on completion of the works. Hand mark-ups of temporary fire block plans are acceptable however on completion an electronic copy of the final as built layout shall be delivered as noted above.

It is recommended temporary detector replacement and reinstatement be performed by the existing University Fire Maintenance Contractor. All associated costs must be incorporated within the project scope of works.

All FDCIE and SAMFS Alarm Signaling Equipment (ASE) isolations shall be coordinated with the University.

Where the failure to comply with this requirement results in a false alarm calling out the SAMFS and University fire maintenance contractor, all associated costs will be invoiced to the Contractor.

F 2.2.7 Emergency Warning and Intercommunication System (EWIS)

Note: whist this document uses WECIE (Emergency Warning Control and Indicating Equipment) as the standard industry definition term, University uses EWIS (Emergency Warning and Intercommunication System) for the purposes of asset identification and labelling.

Unless otherwise directed by the Contracts Supervisor an occupant warning system must be provided. Warning sirens must be designed and installed in corridors and specific areas in accordance with the NCC to ensure that the signal is audible to all occupants of the building.

Occupant warning must be provided to alert all building occupants to a fire alarm situation.

The warning system must be one of the following:

- An Emergency Warning and Intercommunication System (EWIS) in accordance with AS 1670.4, initiated by the fire detection and / or fire sprinkler system. The fire alarm system must monitor the sound system for fault signals required by AS 1670.4.
- Electronic sounders, or amplified sound systems producing the evacuation signal (with or without verbal message). The evacuation signal must operate simultaneously throughout the building.

The fire protection services designer / contractor shall be considerate of the University's preference for all new installations to be EWIS. Applicable NCC requirements as well as site-wide holistic master planning is to be assessed when determining application of EWIS.

The evacuation panel must be supplied to accommodate the 'As Built' design load + 30% to support future expansion.

Unless mandated by the NCC or other legislative authorities, the cascade programming of the EWIS must be omitted. Unless directed otherwise by the Contract Supervisor an alert tone must not be provided and the EWIS must provide an immediate evacuation tone throughout the building.

The evacuation signal must trigger a continuous message wording in a female voice:

"Attention, Attention, an emergency exists in the area, please proceed to the nearest exit and evacuate in an orderly manner."

Followed by three (3) off 'whoop' type evacuation tones and the voice message is repeated. This cycle of messages and tones continues until the combined evacuation tone/message is cancelled either by the chief warden or the fire brigade.

Sound systems must comply with the functional requirements of AS 1670.4. Sound levels must be >65dB and >10dB above ambient in each room with doors closed.

An Emergency Warning and Intercommunication System (EWIS) must be installed to serve all new buildings.

The Emergency Warning Control and Indicating Equipment (EWCIE) is to be located adjacent to or as part of the FDCIE. The system must be interconnected to the FDCIE for automatic activation on receipt of a fire alarm and operate as a general "All Out" alarm or as a "Cascade" sequence to meet the individual building requirements. The EWCIE must have installed BGM inputs to broadcast emergency messaging via the University's Mass Notification System.

The EWIS must predominately consist of recessed ceiling speakers, horn speakers and visual alarm facilities as required installed throughout the building to provide clear and audible evacuation tones and messaging at the required sound levels. The EWIS will also have a Public Address facility located

at the EWCIE to provide the ability to produce both Emergency and Non-Emergency paging throughout all or selected areas of the building. Additional features such as Remote microphones or Background music facilities must also be adaptable to the EWIS should they be required.

The Emergency Intercommunication System must be incorporated as part of the EWCIE to provide intercom capabilities between the Panel and each fire compartment area for direct communication with field fire wardens. This will be achieved by the installation of warden intercom point handsets throughout the building and the main handset at the panel. This will provide the ability for the chief warden to talk one on one or have group style communication with the field fire wardens.

Commissioning details indicating measured sound pressure levels and speech intelligibility must be provided for all areas and rooms within a building. Sound levels must be achieved in all rooms with doors closed. A block plan showing the locations and reference identifier or address of all WIP phones must be affixed to the EWIS's front panel.

F2.2.8 Mass Notification System

The Mass Notification System (MNS) has been developed to broadcast messages across a specific area, ensuring that a group of occupants receives important information simultaneously. This system has been implemented at the University of South Australia (UniSA) at the request of the Audit and Risk Committee in response to concerns about mass shootings, terrorism, and severe weather events—issues that have become increasingly relevant in educational institutions.

UniSA selected a networked solution using Intrado Revolution SynApps, with field equipment installed in each building at the EWCIE and interfaced via the Background Music inputs (BGM).

The equipment includes:

- Rittal AE 1032.500 - Compact enclosures AE

(keyed to the appropriate Campus Master System with a P4 keycode)

- Inside the cabinet:
  - Barix Exstreamer M400
  - RDL ST-GLA1 Gated Line Amplifier - Noise Gate
  - Double General Power Outlet (GPO) and data point

A Traffolyte label, as per the example, is to be attached to the external side of the Rittal cabinet (where the cabinet is not on public display)

F 2.2.9 Building Fit Out Works

In the event of building fit-out works, the consultant team must identify temporary changes to the EWIS zones in the contract documents as required to minimise the number and extent of zones affected by the building works and to provide adequate warning to the site and adjacent areas for the duration of the works. Also ensure any additional equipment will be compatible with the system and not exceed the output of each individual EWIS zone amplifier or should this be unavoidable replacement with a larger amplifier that is compatible with the CIE must be sourced.

To be inserted – Clause 2.4 Manual Call Points – NATSPEC 0972 Fire Detection and Alarm
Complete with lift up hinged cover

F 2.2. Brigade Connection

Building alarms must be grouped and relayed to the SAMFS utilising an Alarm Signaling Equipment, (ASE) incorporating dual sim wireless connections.

Where a new slave ASE unit is connected to an existing master ASE, the FDCIE installer is to obtain an internal phone line connection from the University's ISTS Help Desk via the Contract Supervisor and clearly label and document the line and/or MDF details within both the FDCIE panel and the Operation and Maintenance Manual.

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F 3 Documentation / Reporting

F 3.1 Design Reports

Refer general document 'Design Reports'

The fire protection designer must submit formal Design Report documents as required by the contract for University technical review.

In addition to the specific elements discussed in the preceding sections the fire protection services Design Report(s) must include, but not be limited to the following, to the extent they are applicable to the project.

- Completed Design Certificate relevant to the stage of design
- Proposed scope of works and detail of the system arrangement
- Schedule of applicable regulations, standards, policies and guidance publications on which the design is based
- Details of any deviations from the above
- Details of any third party and/or record information on which the design relies
- Assumptions or exclusions
- Safety in Design review
- Sustainability review
- Proposed point of supply for the works including the supply capacity/characteristics/condition assessment demonstrating adequate capacity is available at the point of supply and in the reticulation system
- Detail of any proposed modifications to existing systems or equipment
- Hydraulic calculations and schematics
- Pumped systems calculations for the system resistance and pump selections
- Switchboard locations, design fault level, voltage drop allocation, circuiting arrangements, earthing arrangements and protection arrangement
- Manufacturer selection of major equipment

Table 4 – Fire protection Services Design Deliverables Matrix

Design Report Stage		Fire Protection Services Design Deliverables
End of Schematic Design	General	• Summary of NCC required fire and life safety provisions • Preliminary flowrates, pumps, tanks and other main fire protection plant and system sizing estimates based on schedule of accommodation and reasonable allowances • Determine cost / benefit impact of masterplan options to fire protection services
	Reporting	• Advantages/disadvantages of masterplan options • Understanding of mechanical systems requirements • Identify spatial requirements for fire protection infrastructure • Confirmation of scope of services • Items requiring further clarification • Information required
	Documentation	• Mark up of masterplan options indicating concept layouts and preliminary spatials • Return design brief including design criteria
End of Design Development	General	• Developed hydraulic flow rates, and other main fire protection plant and systems based on building form and preliminary information from other services • Preliminary size and location of main fire protection systems including plantrooms, pumps, tanks, hydrants, hose reels, main pipework reticulation FDCIE's, etc. to inform Architectural building development • Preliminary major service routes • Coordination of preliminary electrical, mechanical, BMS and other services requirements relating to the fire protection plant and systems • Preliminary equipment selection • The UniSA Technical Standards reviewed and assessed
	Reporting	• Confirmation of spatials of main fire protection plant and systems • Confirmation of fire protection systems provided to individual facilities / buildings • Description of system proposals • Items requiring further clarification • Information required • Preliminary opinion of cost based on square meter rates

Design Report Stage		Fire Protection Services Design Deliverables
		• Concept Design Certificate
	Drawing	• Preliminary schematic drawings of fire protection systems • Layout drawings showing preliminary locations of major plant i.e. pumps, tanks FDCIE's, main pipework, hydrants, hose reels etc. • Updated fire protection services brief
50% Documentation Phase	General	• Fire protection services design to suit approved building form • Final plant and equipment sizes based on design • Defined location and sizes of plantrooms, services risers, etc. to suit designed equipment • Defined size, location and route of all ductwork, piping, electrical routes, and underground services • Defined sizes of major plant
	Reporting	• Final hydraulic calculations • Final Confirmation of systems being provided. • Final confirmation/coordination with other services. • Schedule of selected equipment. • Developed opinion of costs including elemental cost for major plant and equipment. • Final minor items requiring clarification. • Final minor items of information required. • Statement of any specialist systems requiring design development responsibility by contractor. • Schematic Design Certificate
	Documentation	• Complete schematic drawings of piping systems with sizes, fire detection systems, EWIS etc. • Layout drawings for fire protection services • Preliminary Fire protection specification
90% Documentation Phase	General	• Final coordinated fire protection services design suitable for tender and construction • All systems and equipment fully and clearly defined and specified
	Reporting	• Confirmation of all systems fully designed • Statement of any minor outstanding information and/or assumptions

Design Report Stage		Fire Protection Services Design Deliverables
		• Elemental opinion of cost • Confirmation of any design development of specialist systems by contractor
	Documentation	• Complete schematic drawings including schedules of equipment • Complete fire protection services layout coordinated with building form, ceiling, furniture, joinery and other services • Complete specification for fire protection services • All documentation fully checked, reviewed and signed-off in accordance with contractual Quality Assurance Requirements • Final Services Brief • Detailed Design Certification

F 3.2 Design Certification

The designer must produce a 'Design Certificate' identifying which codes and standards the design has been based on, including the issue date and version of the code or standard, and certifying compliance with those codes.

The 'Design Certificate' must be signed by the designer responsible for the design, not a delegate, and issued with design documentation issued for pricing.

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F 4 Labelling

Identification labels must be provided to indicate the point of access to in-ceiling or hidden services requiring maintenance or adjustment, e.g. at access panels, ceiling tiles, etc.

The labels must be 10mm round, traffolyte type labels, and colour coded to match the type of hidden service as follow:

Table 5 – List of Labels

Label Colour	Type
Blue	Mechanical
Black	Untreated Waste / Sewage
Green	Cold water/hot water/recycled water/drinking water
Yellow	Gasses
Red	Fire
Orange	Electrical Power
White	Electrical Communications

Labels are to be installed as follows:

- In T-Bar Ceilings install centrally on the t-bar frame. An arrow pointing to the tile to be used for access is to be engraved on the marker (refer diagram below, NTS)

- In solid ceilings install in the corner of the access panel

Labelling for fire protection system's pipework and cabling are to be in accordance with the following:

Table 7 – Fire Protection Services Labelling Criteria

Item	Labelling Criteria
Fire Hydrant and Fire Hose Reels systems	Australian Standard 2419, 2441 and 1345
Fire Detection and Alarm Systems	Australian Standard 1670.1 2018 section 3.24.3
Automatic Fire Sprinkler Systems	Australian Standard 2118.1 2017

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Fire & Smoke Door Signage

UniSA requires all Smoke and Fire Doors to have National Construction code compliant signage.

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F 5 Record Drawings

To be inserted – Clause 2.4 Manual Call Points – NATSPEC 0972 Fire Detection and Alarm

Complete with lift up hinged cover

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F 6 Operation and Maintenance Manuals

To be inserted – Clause 2.4 Manual Call Points – NATSPEC 0972 Fire Detection and Alarm

Complete with lift up hinged cover

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UNISA TECHNICAL STANDARDS

G
PLUMBING

	SECTION	
	A	Introduction
	B	Safety in Design
	C	Design Controls
	D	HVAC/Mechanical
	E	Electrical and Lighting
	F	Fire Protection and Detection Services
x	G	Plumbing
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	K	Audio Visual Technology
	L	Communications Infrastructure
	M	Architectural

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Contents

G 1 General Requirements

G 1.1 Introduction

It is expected that this section is read in conjunction with all other sections of the UniSA Technical Standards, in order to achieve a fully comprehensive understanding of the University requirements.

All works undertaken at the University must comply with the requirements of NATSPEC specifications and the designers must use this, plus the University specific modified clauses as a basis for their specifications.

The designer shall amplify the NATSPEC requirement where necessary to meet specific project requirements or to provide increased levels of quality and/or performance with approval from the Contracts Supervisor.

The designer may use their own specification, but only with written approval from the University. Where alternative specification is used, it must ensure that the specified standards, quality and outcomes are equivalent to or greater than those specified through NATSPEC. NATSPEC supplementary clauses specified in this document are to be inserted into the designer's specifications.

The designer must not reduce the requirements of NATSPEC and/or the UniSA Technical Standards clauses without written approval from the Contracts Supervisor.

On smaller projects where the scope of work does not justify a full NATSPEC specification the designer may propose a "notes on drawing" type of specification, as long as the pertinent elements of the NATSPEC and supplementary the University clauses are included, with the Contract Supervisors approval

NATSPEC supplementary clauses which are required to be inserted into the designer's specifications have been placed in a box, with italic text.

G 1.2 Responsibilities

To be inserted – Clause 1.1 RESPONSIBILITIES – NATSPEC 0801 Hydraulic Systems

The scope of works for the plumbing and hydraulic systems include, but are not limited to, the following:

- *The designer shall insert a bullet point list of the scope of hydraulic works*
- *……*
- *…….*

The contractor shall determine the full scope of the works from review of this specification and all associated contract drawings.

The contractor shall attend site to satisfy himself of the existing systems and site conditions.

No claim shall be entertained for lack of knowledge of the contract documentation or of existing systems which could reasonably have been known from prior investigation

G 1.3 Standards and Regulations

The following table details the Standards and Regulations, which are additional to those referred to in Section C and are specific to the Plumbing Services:

Table 1 – List of Standards and Regulations

CODE	DESCRIPTION
NCC	National Construction Code
SAA MP52	Manual of authorisation procedures for plumbing and drainage products
HB 230	Rainwater Tank Design and Installation Handbook
AS 1170.4	Structural Design Actions – Earthquake Actions in Australia
AS 1172.1	Water closets (WCs) - Pans
AS 1172.2	Water closets (WCs) - Flushing devices and cistern inlet and outlet valves
AS/NZS 1730	Wash basins
AS 1976	Vitreous china used in sanitary appliances
AS 2200	Design charts for water supply and sewerage
AS 2700	Colour Standards for general purposes
AS/NZS 2712	Solar and heat pump water heaters - Design and construction
AS/NZS 2845.1	Water supply - Backflow prevention devices - Materials, design and performance requirements
AS/NZS 2845.2	Water supply - Backflow preventions devices - Registered air gaps and registered break tanks
AS/NZS 2845.3	Water supply - Backflow prevention devices - Field testing and maintenance of testable devices
AS 5200.000	Technical specification for plumbing and drainage products - Procedures for certification of plumbing and drainage products
AS 1432	Copper tubes for plumbing, gas fitting and drainage applications
AS 3795	Copper alloy tubes for plumbing and drainage applications
AS/NZS 4130	Polyethylene (PE) pipes for pressure applications
AS/NZS 4129	Fittings for polyethylene (PE) pipes for pressure applications
AS/NZS 2033	Installation of polyethylene pipe systems
AS/NZS 1260	PVC-U pipes and fittings for drain, waste and vent application
AS/NZS 2032	Installation of PVC pipe systems
AS/NZS 4130	Polyethylene (PE) pipes for pressure applications
AS/NZS 4129	Fittings for polyethylene (PE) pipes for pressure applications
AS/NZS 2033	Installation of polyethylene pipe systems
AS/NZS 3000	Electrical installations
AS/NZS 3500.0	Plumbing and drainage - Glossary of terms
AS/NZS 3500.1	Plumbing and drainage - Water services
AS/NZS 3500.2	Plumbing and drainage - Sanitary plumbing and drainage
AS/NZS 3500.3	Plumbing and drainage - Stormwater drainage
AS/NZS 3500.4	Plumbing and drainage - Heated water services
AS/NZS 3666.1	Air-handling and water systems of buildings - Microbial control - Design, installation and commissioning
HB32	Control of microbial growth in air-handling and water systems of buildings
AS 4041	Pressure piping
AS 4426	Thermal Insulation of pipe work, duct work and equipment – Selection, installation and finish
AS 5601	Gas installations
AS 1345	Identification of the contents of pipes, conduits and ducts

CODE	DESCRIPTION
AS 1482	Electrical equipment for explosive atmospheres – protection by ventilation – type of protection
AS/NZS 2243	Safety in laboratories – all volumes
AS 3892	Pressure equipment – Installation
AS/NZS 2982	Laboratory design and construction – General requirements
AS 4267	Pressure regulators for use with industrial compressed gas cylinders
AS 4289	Oxygen and acetylene gas reticulation systems
AS 4332	The storage and handling of gas in cylinders
AS 4343	Pressure equipment – hazard levels
AS 4484	Gas cylinders for industrial, scientific, medical and refrigerant use - Labelling and colour coding
AS 4706	Pressure gauges for regulators used with compressed gas cylinders
	Guidelines for the Control of Legionella in Manufactured Water Systems in South Australia
	Water Efficiency Labelling and Standards Act 2005
	Office of the Technical regulator Plumbing and Gas divisions (OTR) standards and requirements
	Department of Health guidelines

The above list is not all-inclusive and those associated with the project are responsible for identifying and complying with all standards relevant to the scope of works.

All Plumbing Services installations must comply with the most current version of the standard or code at the time of tender.

G 1.4 Quality

All Hydraulic services design work is required to be carried out via suitably qualified and experienced designers. The University may request copies of the designer's calculations in order 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. All design work must be checked and reviewed by a suitably qualified and experienced peer prior to issuing for pricing. The designer must have a formal check and review process. The University may request evidence of the design checking and review process. On occasion a designer may utilise a third-party designer (sub-consultant / specialist contractor / lighting manufacturer / supplier, etc.) however, the designer retains responsibility for the design and review process. Unless specifically directed otherwise, all equipment designed, specified and installed must be new and of the highest quality.

Unless otherwise directed, lighting and general socket outlet circuits shall not be supplied from trade services switchboards. The only exceptions are socket outlets for supply to small items of trade plant e.g. small pumps, small fans, controllers etc. Where existing supplies are identified as part of a project they must be rewired back to a local general lighting and power distribution board.

G 1.5 Preferred Manufacturers

The University requires that only proven proprietary equipment, with local service availability must be selected. It is a requirement that new equipment associated with the hydraulic Systems must be compatible with systems the University has implemented including:

- Building Management System – Modbus LONWorks – Preferred meters are Schneider A9MEM3275-NMI with 282CTMECH CT isolation links and Circutor CVM-MINI-LON Power Analyser
- Fire Detection and Alarm – Ampac
- Emergency Warning and Intercommunication System - Ampac

Whilst the University does not wish to restrict the designer's ability to select the most appropriate equipment to meet particular requirements it is the University's preference that equipment selected satisfies the following:

- A reputable manufacturer with a proven track record
- Selected from manufacturer's standard product range
- Local Adelaide representation and support in design and post installation operation
- Local Adelaide spare parts availability
- Australian manufacturer is preferred.
- Unrestricted access to system hardware and licensed software

The following is an indicative list, which the University considers to represent the desired quality levels:

Table 2 – List of Preferred Manufacturers

Equipment / Component	Manufacturer / Supplier
Chilled water/boiling water units	Billi
Switchgear and components	Schneider, ABB, NHP
Electrical Accessories	Clipsal, HPM, Legrand
Sanitary Fixtures	Caroma, Enware
Tapware	Enware, Galvin, CB Tapware
Gas fittings	Enware, Galvin
Gas Fixtures	Rinnai, Bosch
Hot water services	Rheem, Bosch
Boiling water/chilled water units	Billi
Pumps	Grundfos
Flow meters	ABB
Isolation and control valves	John valves

The hydraulic services designer and contractor are welcome to propose alternatives, however, they must clearly demonstrate equal or greater technical, cost and/or quality performance.

G 1.6 Safety in Design

Those involved in the design of the Hydraulic services must undertake the necessary Safety in Design reviews and activities as required by the contract.

Generally the University prohibits any working on energised electrical equipment in accordance with the WHS Regulations. Where isolation of the equipment is demonstrably impracticable the contractor must provide a Safe Work Method Statement (SWMS) fully detailing how risks have been managed as low as reasonably practicable. It shall specifically address why isolation is impracticable and how access to energised electrical parts will be prevented. No working on energised electrical equipment shall proceed without written approval from the University. Approval of the SWMS by the University does not relieve the contractor of primary responsibility for undertaking safe work

The hydraulic designer should consider the following particular items as part of the Safety in Design, however they are not limited to:

- Locations of isolators, pump stations, storage tanks, waste water and water pre-treatment systems, gas, reticulation systems, control devices and other equipment requiring access for operational or maintenance procedures. Location specifics to be considered include but are not limited to height, proximity to risk areas, proximity to other plant, proximity to operating vehicles etc.
- Methods of safe isolation for access and maintenance of equipment
- Satisfactory maintenance space around services and equipment
- Satisfactory space and access to internal components requiring maintenance and/or replacement
- Adequate lighting and ventilation

The designer must address the Safety in Design aspects in the Design Reports

The installer of the works must review the Safety in Design documentation throughout the works, to identify any risks throughout the works and any residual risks to the University on completion.

Liquid piped services, except sprinkler services where required by code, must not be run above electrical switchboards or communication cupboards. The designer must liaise with mechanical and electrical trades to coordinate and ensure this does not occur.

G 1.7 Sustainability

The designer must take into consideration the Environmental Sustainability of the Plumbing services taking into account the whole of life cost and operational benefit.

All Buildings must be designed to suit the local environmental conditions. They must be designed to optimise operating conditions using minimum water and non-renewable sources of energy.

Elements that the designer must consider, include, but are not limited to, the following:

- Water and energy minimisation through equipment selections, flow regulation and system design,
- Rainwater/Alternate water supplies,
- Waste water management and treatment,
- Materials selections
- Decommissioning / disposal of equipment at end-of-life
- Control methodology including automatic controls
- Water metering

The sustainability aspects must be addressed in the Design Reports.

G 1.8 Cost Planning

The designer must provide input into the project cost planning as required by the contract.

The designer must provide cost planning advice for the supply, installation, associated works, contingencies, overheads, etc. to indicate a total cost to the University. Cost planning advice must be presented as a minimum based upon relevant historical data and project specific measured quantities.

Any element specifically excluded must be clearly indicated so that a total cost to the University may be determined.

Additionally the designer must identify all elements considered to have a risk of accuracy greater than 25% for any reason along with a description as to how this risk will be addressed.

G 1.9 Attendance

It is incumbent on the Hydraulic designer and contractor to make themselves aware of existing conditions as far as reasonably practicable when designing and/or performing works at the University. The University reserves the right to hold the designer and/or contractor liable for works performed that are of a sub-standard or non-compliant nature.

The designer must attend design and construction meetings as required by the contract and outlined below.

The University expects the Hydraulic services designer, not a delegate to attend at a minimum: -

- Technical reviews as directed by the Contract Supervisor
- Design team meetings appropriate to the size of the works. (Minimum of one meeting)
- Construction phase meetings appropriate to the size of the works. (Minimum of one meeting), plus any meetings where the Contract Supervisor deems there is significant hydraulic services elements that requires the designer's input
- Ongoing site inspections as considered appropriate by the Contract Supervisor (minimum bi-monthly)
- Attendance to a selection of key construction activities in order to set and monitor the standard of the progressive installation including; -
  - Hydraulic services drainage inspection,
  - Hydraulic services first fix sanitary drainage inspection,
  - Hydraulic services first fix reticulation services inspection,
  - Hydraulic services specialist services inspection,
  - Hydraulic services final fix sanitary ware and tapware inspection,
  - Hydraulic services commissioning where required by Contract Supervisor,
  - Hydraulic services final / defects inspection prior to Practical Completion.
- Hydraulic services final / defect inspection prior to end of Defects Liability Period (DLP). DLP inspection report to be issued to the University five working days prior to end of formal DLP.

The Hydraulic designer must identify his/her proposed meeting site attendance schedule in their engagement proposal.

The Hydraulic Contractor must advise the Designer of the commencement of each of the above construction activities within adequate time to permit attendance of the designer. Further the contractor must await the designer and attend meetings to receive approval to continue the works.

The Hydraulic Contractor must attend meetings as required by the contract and considered necessary by the Contracts Supervisor.

To be inserted –NATSPEC 802 Hydraulic Design and Install

Reference the Authority Approvals requirements insert the following-

Make applications, obtain all permits, and arrange testing, all as necessary for the installation and placing into operation of the works where required by any Authority including:

- *SA Water corporation*
- *Department of Premier and Cabinet – Work Safe SA*
- *The Office of the Technical Regulator*

- *SA Fire Services*

Provide all associated documentation required for the applications. Pay all associated fees.

To be inserted –NATSPEC 08 Hydraulic 0171 General Requirements

Delete the existing clause 1.7 Inspection requirements insert the following-

Clause 1.7 Inspection Notice

Inspection: Give notice to the OTR and the Consultant so that inspection may be made of the following:

- *Excavated surfaces.*
- *Concealed services*
- *Underground services*
- *All services positioned under or encased within concrete structures,*
- *Hydraulic services final inspection prior to Practical Completion.*

The Hydraulic Contractor must advise the Designer of the commencement construction activities within adequate time to permit attendance of the designer to key activities. The hydraulic contractor must hold the progression of these key activities and await the designers approval of the installation.

Key construction activities considered hold points in order to set and monitor the standard of the progressive installation include; -

- *External drainage installation,*
- *First fix sanitary drainage installation,*
- *First fix reticulation services installation,*
- *Specialist services installation,*
- *Final fix sanitary ware and tapware installation,*
- *Hydraulic services commissioning where required,*
- *Final / defects inspection prior to Practical Completion.*

In recognition of reduced inspections by the approving authority and OTR inspectors the Hydraulic contractor must maintain an Inspection and Testing Plan (ITP). Such plan must record all bookings numbers and attendance by the approving authority and additionally must be inspected and signed by the head contractor for each aspect/ phase of the works across the site. This plan must be reviewed by the consultant during each site attendance.

Failure by the head contractor to inspect and monitor the works undertaken by the contractor may be considered failure to construct the works correctly in accordance with the brief and the relevant standards and may be considered a non-compliant installation.

G 1.10 Design Conditions

All hydraulic systems must operate under extreme ambient conditions and must be designed to meet the following design criteria:

Table 3 – List of Design Conditions

Item	Design Criteria
Ambient conditions under which all plant shall operate – Adelaide Region	46.0^{o}C dry bulb maximum 22.0^{o}C wet bulb maximum Full Solar Load

Item	Design Criteria	
	0.0°C minimum	
Ambient Conditions under which all plan shall operate – Other Regions	Design Conditions as per AIRAH DA09	
Hours of operation – general	As per project brief	
Acoustic Criteria	As per project brief	
Maximum noise levels at adjoining property boundaries	Not to exceed levels specified for commercial properties and residential properties in the Environmental Protection Act	
Sanitary drainage pipe grades	40mm and 50mm branch	1 in 40
	80mm branch	1 in 60
	100mm main drain	1 in 60
	100mm branch drains for 30 metres downstream of the head of the drain.	1 in 50
	100mm branch drain extending to the man drain of a common branch drain receiving upstream discharges from more than two soil fixtures or three waste fixtures.	1 in 50
	Larger drains 150mm or greater	Comply with the AS 3500
Pressure loss through plant and equipment	Backflow Protection	90 kpa
	Filtration Systems	100 kpa
	Water Reticulation Systems	150 kpa
	Gas Reticulation Systems	30% of the initial pressure
Water pressure and temperature requirements	Domestic Cold Water	20° C
	Domestic water services serving emergency wash facilities	Must not exceed 25° C
	Domestic Hot water flow reticulation	65°C
	Domestic Hot Water Return piping	60°C
	Water Pressures	250 kpa min at the outlet
	Gas	Not to exceed 7.0 kpa with in buildings generally. Typically 2.75 at type 1 fixtures.

Item	Design Criteria	
Water velocity	Cold Water Pipework	1.0 m/s
	Hot water Pipework	1.0 m/s
	Pump Discharge Pipework	1.5 m/s
	Sanitary Drain	1.0 m/s

G 1.11 Hydraulic Services Deemed to Satisfy (DTS) Solutions

The University anticipate that DTS solutions will be adopted. Should the designer wish to depart from these, the University must be consulted on these proposals. Such consultation must be in writing and must describe at the very least the following:

- Details of the departure,
- Reasons for departure,
- Cost implications,
- Benefits to the university,
- Whole of life calculations,
- Examples of where the departure has been successfully adopted,
- Warranty conditions,
- All known problems and issues encountered, if any.

The designer is to await written acceptance from the University before progressing any alternative solutions.

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G 2 Performance Criteria

G 2.1 Infrastructure Drainage and Water Reticulation Systems

Connect sanitary drainage, stormwater and water systems to the adjacent available public infrastructure or interconnect with the existing site private drainage/water system. Where connection is made with an existing drainage/water network assess the current condition and spare capacity. Consider whether a site survey is required of the existing network in order to determine existing conditions, capacity, flows, grades, etc.

The designer is to investigate the existing supply arrangements and discuss and present all options. These options must be discussed with the authority and their opinion, supporting or otherwise be presented to the University.

Preference will be given to sanitary drainage and stormwater systems which employ gravity rather than collection systems which employ pumps and mechanical devices for the transport of drainage waters.

Preference will be given to water reticulation systems that utilise available water pressures over systems which employ pumps, tanks etc. for the reticulation of waters.

Underground sanitary drainage/stormwater/water pipe work may be PVC-U, DWV class, High Density Polyethylene or other materials complying with the statutory requirements. Preference is given to mechanical jointing systems over rubber ring jointing systems. Consideration must be given to imposed structural loads over piping.

Where ground conditions require provide suitable expansion provisions at the entry/exit of buildings and at the connection with large structures such as arrestors, manholes etc.

Provide isolation of water networks which permit the isolation of buildings or sections of the site whilst maintaining supply to other sections and or buildings.

The use of cast iron and or metallic pipes in ground is discouraged. Where employed a suitable system of protection must be applied and may require inclusion of catholic protection of piping, valves and fittings.

Provide detectable marker tape over the full length of inground pipe work to identify the services.

Where dissimilar materials are in contact provide suitable isolation to both surfaces.

Consideration shall be given to climate change impacts in relation to potential future increases in hydraulic “shock loads” to stormwater systems and sizing pipes to meet future demand but which match with municipal infrastructure.

G 2.2 Sanitary Drainage Works

Generally provide floor wastes to all wet areas, plant rooms and adjacent to all Eye Wash Safety Showers.

Locate wet areas and plant rooms away from communications and electrical rooms.

Sanitary drainage systems receiving discharge from plant and equipment with seasonal flows including plant room may suffer water seal loss and resultant odours. Consideration must be given to designs which maintain passive replenishment solutions rather than the use of trap priming devices. Double trapping shall be provided in plenums and air handing plantrooms.

Ensure overflow relief gullies are provided and all differential paving levels are maintained.

Ensure all connections of branch drains to the main drain are constructed invert to overt as a minimum.

All junctions and bends serving soil fixtures must be swept or OB junctions and 45° bends.

Provide spare junctions to all drainage and vent risers to facilitate future flexibility. Demonstrate and agree with the design team the extent of area which can be connected recognizing other service restrictions prior to completion of documents.

G 2.3 Trade Waste Drainage

Trade waste drainage systems are to comply with the following: -

- Requirements of SA Water trade Waste Division and
- this specification in respect of drain grades and
- Relevant Australian Standards

Trade Waste treatment systems will be provided in response to the data presented with the Room Data Sheets. The designer is to undertake interviews with the user group and complete the room data sheets in conjunction with the Design team.

Consult with SA Water for approval of all trade waste pretreatment systems prior to construction commencement.

SA Water Corporation may require the preparation and submission of technical data relating to the discharges along with consultation with the University for Payment of fees. The designer must engage with all parties and manage these approvals on behalf of the University.

Provide inline sink traps to all commercial kitchen equipment.

G 2.4 Domestic Water Reticulation

Generally conceal all hot and cold-water pipes.

Tempering valves or Thermostatic mixing valves will be required to all tap ware serving ablutionary fixtures.

Provide hose taps to wet areas, plant rooms and nominated external locations.

All tapware must comply with WELS legislation and be a minimum 3-star rating.

All tapware shall be manufacturer’s standard chrome finish unless otherwise directed.

All hot water pipe work including branches will be thermally insulated to ensure minimal heat loss through the system.

All hot water reticulation systems will be designed to minimize the length of any “dead legs” in the reticulation system with a maximum length of 6 metres. Where this cannot be achieved provide a hot water flow and return reticulation system.

The maximum length of piping downstream of a temperature-controlled device will be designed to not exceed 3 metres.

Provide spare isolated and capped hot water flow, return and cold-water branches for future flexibility of the piped network.

Ensure the length of each branch (dead water) between the main supply line and the isolation valve are no longer than 2X the pipe diameter. Agree the location of each branch.

Deluge safety shower and/or eye and face wash unit must be complete with audible and flashing alarm and remote alarm indication security via SELV 12V/24V flow switch.

All backflow and TMV boxes are to be keyed to the UniSA master key system (Barrel: Bi Lock P1 Coded to the University's campus master-key system)"

Uni SA is self managed with regards to registration of backflow prevention devices. Contractor shall email registration forms direct to maintenance@unisa.edu.au (instead of OTR).

Water supplies to all hot water units, dishwashers and ice machines shall be fitted with automated leak detection shut off valves (Mildred Valve 2.0 or approved equal).

G 2.5 Fuel Gas Distribution Systems

Connect Natural gas systems to the adjacent available public infrastructure or interconnect with the existing site private gas reticulation system. Where connection is made with an existing gas network assess the current condition and spare capacity. Consider whether a site survey is required of the existing network in order to determine existing conditions, capacity, pressures, etc.

The designer is to investigate the existing supply arrangements, to discuss and present all options. These options must be discussed with the authority and their opinion, supporting or otherwise be presented to the University.

LP Gas cylinders where required will be positioned clear of all ignition sources and will be in close proximity to roadways to facilitate access for re-filling.

Storm water sumps will not be positioned adjacent LPG storage facilities, gas regulators, meters, OPSO valves etc. If unavoidable the sumps will be flame proof.

All underground pipework external of building shall be: -

- fully welded steel construction to AS 1074 and protected from any corrosion by a proprietary sheathing compatible with the surrounding environment or
- polyethylene pressure pipe to AS 4130 joint using electrofusion couplings.

Install all pipe work to the requirements of AS 5601 with marker location requirements as set out previously for Electrical Services.

Provide detectable marker tape over the full length of pipe work to protect the gas services.

The use of metallic pipes in ground is discouraged. Where employed a suitable system of protection must be applied and may require inclusion of catholic protection of piping, valves and fittings.

Provide a gas isolation valve that shuts off the gas supply to each building. Preferably this valve is to be located outside of the building footprint within a covered pit. If this is not possible the valve is to be included within an exposed gas train as close as possible to the pressure reduction valve.

The location of the isolation valve is to be clearly labelled as per the relevant Standards.

Provide an emergency gas shut-off valve within each building or for each zone as applicable. This shall be an electrically operated 240v gas shut off solenoid valve in the gas line downstream of the gas meter. The solenoid valve shall be of the latching type requiring manual resetting. It shall fail closed and be selected for continuous operation. Provide a continuously charging battery back-up system to hold the gas solenoid shut off valve open for a minimum of eight (8) hours upon loss of main electric supply.

The emergency shut off solenoid valve shall be connected to the fire alarm and any other system as specified in order to shut off the gas supply in an emergency.

All laboratories shall be fitted with gas emergency shut off provisions for each of the following gases (where reticulated):

- natural gas
- other flammable gases
- hazardous gases

The designer shall liaise with the user group to determine types of laboratory gases requiring reticulation and their associated classification. It is acceptable for the gas isolation to be integrated with the power isolation such that a common emergency stop button isolates power and gases simultaneously.

All emergency stop buttons shall be shrouded and key resettable using standard Ronin keys as per NHP Sprecher & Schuh range or approved equivalent. Refer to Electrical Section E2.1 for labelling requirements.

G 2.6 Hot Water Systems

Consideration should be given to the installation of gas boosted solar hot water units. Where such systems are not practical alternatives can be considered. Proposed hot water systems and reticulation must be confirmed at an early stage.

Where flow and return circulating hot water loops are employed ensure the circulating pumps are thermally controlled rather than time clock controlled. Do not employ systems which permit circulating temperatures to drop below 45°C.

Generally hot water systems to laboratories should be separate from all other hot water requirements to the remainder of the building. The cold-water supply to the hot water system servicing the laboratories must be backflow protected to suit hazard rating of the laboratory.

Allow for sufficient space around the storage hot water units for maintenance removal of elements and above the unit for the withdrawal of anodes.

Hot water lines should not be directly encased within masonry walls.

All hot water pipes, fittings and valves must be thermally insulated with approved elastomeric preformed pipe installation (not fibreglass or mineral fibre) prior to installation within wall. Insulation must achieve a minimum R rating as follows: -

- Non circulated hot water main supply and branches piping: - R=0.6
- Non circulated hot water branch not exceeding 3 metres total length: - R=0.3
- Circulating hot water systems mains: - R=1.0
- Circulating hot water systems branches: - R=0.6
- Warm water branches not exceeding 3 metres total length: - R=0.3

Polypropylene products, such as Aquatherm brand or similar product, shall not be used for reticulation of hot water.

Where insulation is exposed provide additional mechanical protection.

G 2.7 Sanitary Fittings and Fixtures

Toiler suites and basins shall have stain resistant high gloss enamel finish.

All sinks, troughs and basins shall be fitted with integral overflows. Overflows may be omitted where space accreditation standards require fixtures without overflows for infectious control reasons or similar. In such instances other flood risk mitigation measures will be put in place.

Deluge safety showers shall be hand and foot operated type. Unless otherwise advised, sanitary and tap ware shall be selected from the Preferred Manufacturers (refer Table 2). The following fixture flow rates are indicative of minimum selection requirements.

Table 4 – Fixture Flow Rates

Fixture	Flow
Hand washing basins	4 L/min – combined total flow. Where there is concern about the presence of unequal hot and cold-water pressures and/or where compliance with this flowrate may compromise the operation of water tempering devices submit a recommended alternate flow.
Sinks	6 L/min – combined total flow
Showers	7 L/min – combined total flow
Lab taps	6 L/min – combined total flow
Hose taps	6 L/min – combined total flow
Urinals (wall hung)	Sensor flush 0.8L/flush
Urinals (slab/floor)	Programmable automated flush mechanism to flush 2 to 4 times daily
Water Closets	4.5L full flush / 3.0Lhalf flush

G 2.8 Reverse Osmosis Systems

Where reverse osmosis systems are installed, automatic flushing vales shall be incorporated at the tap outlet and at points of connection to ultrapure units.

Reverse Osmosis circulation pipework is to be constructed of material suitable for this application. Brass copper or uPVC are not to be used.

G 3 Design Reports

The hydraulic designer must submit formal Design Report documents as required by the contract for technical review by the University.

In addition to the specific elements discussed in Section C of this document, the hydraulic services Design Report/s must include, to the extent that they are applicable to the project, but not be limited to the following:

- Completed Design Certificate relevant to the stage of design
- Proposed scope of works and details of the system arrangement
- Schedule of applicable regulations, standards, policies and guidance publications on which the design is based.
- Details of deviations of the above
- Details of any third party and/or record information upon which the design relies
- Assumptions or exclusions

- Safety in Design review
- Sustainability review
- Proposed point of supply for the works including the supply capacity/characteristics/condition assessment, demonstrating adequate capacity is available at the point of supply and in the reticulation system
- Detail of any proposed modifications to existing systems or equipment
- Major plant and riser locations.
- Manufacturer selection of major equipment
- Basis of sizing of major equipment
- Layout drawings and single line diagrams for the proposed arrangement to the level of detail as per the "Hydraulic Services Design Deliverable" matrix

Table 5 Plumbing Services Design Deliverables Matrix:

Design Report Stage		Plumbing Service Design Deliverables
End of Schematic Design	General	• Preliminary demand estimate based on schedule of accommodation and reasonable allowance. • Awareness of existing site infrastructure to identify connection points and capacities and to determine cost/benefit impact of masterplan options to Hydraulic services
	Reporting	• Preliminary estimated demands for sewer, water and gases • Feasibility and preliminary costs of infrastructure connections • Existing services report and condition assessment • Impact on site infrastructure services and suitability for connection • Advantages/disadvantages of masterplan options • Confirmation of scope of services • Items requiring further clarification • Information required • Preliminary Safety Risk matrix • Preliminary Site Risk matrix
	Documentation	• Mark up of masterplan options indicating existing infrastructure and possible connection points
End of Design Development	General	• Developed demand estimate based on building form and preliminary information from other services • Preliminary size and route of hydraulic services complete with spatial data relating to plant and equipment sufficient to inform architectural building development

Design Report Stage		Plumbing Service Design Deliverables
		• Preliminary major service routes • Preliminary piping and fixture selections. • Preliminary external services design • The UniSA Technical Standards reviewed and assessed
	Reporting	• Developed demand estimate based on proposed facility/building form and services • Confirmation site infrastructure can accommodate estimated hydraulic services demands • Description of system proposals inclusive of Early works necessary to maintain project program (if required) • Items requiring further clarification • Information required • Preliminary opinion of cost inclusive of descriptive breakdown based on area or elemental assessment • Preliminary Safety Risk matrix • Preliminary Site Risk matrix • Concept Design Certificate
	Drawing	• Preliminary schematic drawings of drainage and reticulation systems demonstrating connections to infrastructure and inclusive of early works (if required) • Layout drawings showing preliminary locations of major plant i.e. Hot water generation plant, pumps, Storage tanks, plant room, trade waste pre-treatment systems, water conditioning and pre-treatment systems, etc. • Layout drawings showing preliminary drainage and reticulation corridors and spatial data for plant and equipment. Also noting any special exclusion zones for maintenance or the like.
50% Documentation Phase	General	• Hydraulic services design to suit approved building form • Final load estimate based on design equipment / services including diversity • Defined location and sizes of risers, valves and equipment, access panels, etc. to suit designed equipment • Defined size, locations and route of drainage and reticulation services • Defined sizes of plant and equipment

Design Report Stage		Plumbing Service Design Deliverables
		• Draft specification of hydraulic services • Evidence of coordination process with other services relating to access for installation during construction and maintenance, services demands, terminations etc.
	Reporting	• Final demand estimates • Final confirmation of systems being provided • Final confirmation of connections and extent of upgrade if required) to existing infrastructure • Schedule of fixtures and equipment • Developed opinion of cost including elemental cost for major plant and equipment • Final minor items requiring further clarification • Final minor items of information required • Statement of any specialist systems requiring design and/or development responsibility by contractor • Developed Safety Risk matrix • Developed Site Risk matrix • Schematic Design Certificate
	Documentation	• Sketch demonstrating “zones of influence” for future connections • Compete schematic drawings of Hydraulic systems with sizes • Layout drawings for drainage and reticulation services describing the design approach to each service • System schematics showing termination with other services as required • Clear early works description and drawings • Preliminary Specification
90% Documentation Phase	General	• Final coordinated Hydraulic services design suitable for tender and construction • All systems and equipment fully and clearly defined and specified • Evidence of completion of coordination with other services relating to access for installation during construction and maintenance, services demands, terminations etc.
	Reporting	• Confirmation of all systems fully designed

Design Report Stage	Plumbing Service Design Deliverables
	• Statement of any minor outstanding information and/or assumptions • Elemental opinion of cost • Complete specification • Confirmation of any design development of specialist systems by contractor • Completed Safety Risk matrix • Completed Site Risk matrix
Documentation	• Complete schematic drawings including schedules of equipment • Complete Hydraulic services layout drawings with locations of outlets, fixtures, equipment, etc. coordinated with building form, furniture, joinery and other services • Detailed Layout drawings showing locations of major plant i.e. Hot water generation plant, pumps, Storage tanks, plant room, trade waste pre-treatment systems, water conditioning and pre-treatment systems, etc. • Controls details complete • Final specification • All documentation fully checked, reviewed and signed-off in accordance with contractual Quality Assurance Requirements • Detailed Design Certification

Where the designer considers an element is not applicable to the project, this must be clearly noted. It is the University's expectation that there will be negligible cost impact/difference between 90% Documentation Phase documentation and Construction Issue documentation. Any elements not fully designed / documented at 90% issues must be clearly identified with an estimate of cost. The University reserves the right to reject the designers 90% Design Documentation should it consider the documentation not satisfactory.

G 3.1 Design Certification

The designer must produce a 'Design Certificate' identifying which codes and standards the design have been based on, including the issue date and version of the code or standard, and certifying compliance with those codes.

The 'Design Certificate' must be signed by the designer responsible for the design, not a delegate, and issued with the documentation issued for pricing.

G 4 Labelling

Identification labels must be provided to indicate the point of access to in-ceiling or hidden services requiring maintenance or adjustment, e.g. at access panels, ceiling tiles, etc.

The labels must be 10mm round, traffolyte type labels, and colour coded to match the type of hidden service as follow:

Table 5 – List of Labels

Label Colour	Type
Blue	Mechanical
Black	Untreated Waste / Sewage
Green	Cold water/hot water/recycled water/drinking water
Yellow	Gasses
Red	Fire
Orange	Electrical Power
White	Electrical Communications

Labels are to be installed as follows:

- In T-Bar Ceilings install centrally on the t-bar frame. An arrow pointing to the tile to be used for access is to be engraved on the marker (refer diagram below, NTS)

- In solid ceilings install in the corner of the access panel

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G 5 Record Drawings

To be inserted – Clause 3.17 Record Drawings – NATSPEC 0171 General Requirements

Refer to the UniSA Technical Standards, Section C, Documents and Drawings for additional requirements

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G 6 Operation and Maintenance Manuals

To be inserted – Clause 3.18 Record Drawings – NATSPEC 0171 General Requirements

Refer to the UniSA Technical Standards, Section C, Operation and Maintenance Manuals for additional requirements

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G 7 Plant Certification and Registration

Certification and registration of plant/equipment/systems installation and plant/equipment/systems design shall be the responsibility of the installing contractor. This will include but not be limited to all plant requiring certification and/or registration with SafeWorkSA, local councils, OTR and other authorities. All costs associated with such activities shall be the responsibility of the installing contractor.

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UNISA TECHNICAL STANDARDS

H

BUILDING MANAGEMENT SYSTEM

	SECTION	
	A	Introduction
	B	Safety in Design
	C	Design Controls
	D	HVAC/Mechanical
	E	Electrical and Lighting
	F	Fire Protection and Detection Services
	G	Plumbing
x	H	Building Management System
	I	Transportation Systems
	J	Security Systems
	K	Audio Visual Technology
	L	Communications Infrastructure
	M	Architectural

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Contents

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H 1 Introduction

It is expected that this section is read in conjunction with all other sections of the UniSA Technical Standards, in order to achieve a fully comprehensive understanding of the University requirements.

All works undertaken at the University must comply with the requirements of NATSPEC specifications and the designers must use this, plus the University specific modified clauses as a basis for their specifications.

The designer shall amplify the NATSPEC requirement where necessary to meet specific project requirements or to provide increased levels of quality and/or performance with approval from the Contracts Supervisor.

The designer may use their own specification, but only with written approval from the University. Where alternative specification is used, it must ensure that the specified standards, quality and outcomes are equivalent to or greater than those specified through NATSPEC. NATSPEC supplementary clauses specified in this document are to be inserted into the designer's specifications.

The designer must not reduce the requirements of NATSPEC and/or the UniSA Technical Standards clauses without written approval from the Contracts Supervisor.

On smaller projects where the scope of work does not justify a full NATSPEC specification the designer may propose a "notes on drawing" type of specification, as long as the pertinent elements of the NATSPEC and supplementary the University clauses are included, with the Contract Supervisors approval

NATSPEC supplementary clauses which are required to be inserted into the designer's specifications have been placed inside a blue box and text has been italicised.

H 2 Design

The upgrade or design and installation of any new Building Management System (BMS) must be fully compatible with the existing Invensys Building Management System. An overview of the existing BMS system is provided below.

H 2.1 System Networks

The existing BMS comprises of numerous Invensys Universal Network Controllers (UNC) which communicate over the University's data network to each other and to a central Niagara server. The UNC's interface the Niagara server with various building management control systems, such as:

- A Robert Shaw Digital Management System (DMS) together with integrated Microsmart control systems which communicate over various dedicated data trunks
- Daikin BACnet control systems
- RS485 (Modbus) data trunks
- LON controller networks

These different types of control systems are located throughout the various University campuses and each has their own individual sub-networks and communication protocols.

An Interactive Energy Management System (IEMS) is installed and comprises of UNC controllers, which have individual sub-LAN connectors for linking to existing DMS panels. The UNC are designed to interconnect the new Lon controller networks, BACnet, and Modbus networks and protocol technologies.

The UNC controllers communicate to other UNC controllers via the data network. The TCP/IP protocol is used for this data transfer. The University has utilised sub-net with a separate IP range from their existing ISTS computer WAN for this data transfer to occur.

The UNC's are self-booting EPROM type based on the Windows NT/XP platform. There are no hard disks, or graphical user interface in these UNC's. Each UNC has its own individual static IP address. There is also a centrally located Enterprise Server workstation at the City East campus. This workstation also has a static IP address and acts as the supervisor for alarming and logging of data. All UNC's have been set up as slaves for logging purposes only to this supervision workstation.

The Enterprise Server workstation and each UNC have their own internal address book. The relevant IP addresses must be programmed in to these address books to allow any data transfer. The Enterprise Server workstation has a second network card installed with a dynamically assigned IP address. This allows for the workstation to send alarms out via the University's Exchange email system.

H 2.2 Niagara Server

The main Niagara server is located at City East Campus and comprises a web browser-based Graphical User Interface (GUI) to enable viewing of data which has been extracted from the various building management control systems.

The server logs the collected data into a Cloudscape database. The logged data can then be extracted and viewed graphically or if preferred in html table format. The data can also be exported into Excel spread sheets for manipulation.

H 2.3 Work Place Pro Software

As previously mentioned, the UNC's do not have any graphical user interface (GUI) on-board. The GUI is located on the centrally located Enterprise Server workstation at City East (BJ 1-01).

The GUI software utilised is Work Place Pro.

H 2.4 Logging Function

Each UNC has the capability of logging data from any of the connected points.

H2.5 Site Metering

Smart Energy metering has been installed across all campuses and the following electrical power conditions are logged through the IEMS:

- Voltage
- Current
- Maximum demand
- Instantaneous KVA and KW
- Power factor
- Consumption

H 2.6 Electronic Demand Limiting

The IEMS system monitors instantaneous demand.

If the instantaneous demand is at such a level, where the maximum demand may be breached, the DMS system, automatically:

- Raises set points of specific air conditioning systems throughout all campuses
- Resets chilled water set point on Mawson Lakes Chillers
- Limits power consumption by locking out second stage AC compressors at City West, to reduce the connected electrical load.

The designer must identify any proposed Electronic Demand Limiting in the Design Report for approval by the Contract Supervisor.

H 3 General Requirements

H 3.1 Automatic Controls

The automatic control system for each building must be a standalone system, interfaced with the Niagara server to allow remote monitoring and operation of each plant. Exact numbers and types of points to be monitored by the central system will be agreed during the design phase but as a minimum it will include the following for each item of plant:

- Start/stop function supply
- Leaving air temperature sensor
- Room temperature sensor
- Compressor or fan run signal via a current sensing relay
- Set point adjustment
- Status indication
- Fault indication

Each air conditioner must be controlled automatically start up and stop to provide design conditions during normal working hours. Each air conditioner control system must have the ability to set different working hours form other air conditioning system. All air conditioning system must be interlocked with any outside air/extract systems as appropriate.

All air conditioners used for teaching spaces and selected air conditioners as nominated by Technical Reference Group must also be fitted with a push button after-hours control switch, connected through the BMS system to allow operation outside of normal working hours. This control switch shall stop the air conditioner after a pre-determined time (normally two (2) hours) and allow for manual restart by pressing the button again. Air conditioning controls can be paralleled if two room entrances exist.

Push button control to individual rooms are to be provided via a Clipsal switch plate which is made up of the following components:

- Flush surround and two gang grid
- Switch mechanism 250 V 10 A rocker switch, mechanism has ‘PRESS’ engraved on it (note: only rocker switches are acceptable)
- Neon Indicator 24 VAC to be energised via a separate 24 VAC relay slaved off the air conditioning unit BMS start relay to prevent the controller being damaged if the relay 1.5 sq./mm twin cable is damaged (i.e. cut or shortened) in the field by building works between the BMS controller and the push button control.
- Flush surround to be engraved with ‘HOLD FOR 7 SECONDS TO STOP'' above the switch mechanism.

All automatic controls must fail safe with control and operation of all plant being independent of the normal control system for fire mode operation. All controls must be located in separate enclosures mounted in plant rooms or other areas such as electrical switchboard rooms or risers. The location of BMS system equipment in ceiling spaces or other non-readily accessible locations shall not be permitted.

Provide a double data point, connected to the University’s Building Services VLAN adjacent to each BMS Universal Network Controller (UNC) / BACnet Controller, Nexus server and ELR. Coordinate with the University ISTS via the Contracts Supervisor for allocation of static IP addresses.

F 3.2 Control Equipment

Where insufficient DMS points are available, provide new LON technology controllers as necessary. Incorporate a BACnet controller where the Daikin system is used. The controller should be located adjacent and connected to the UNC. Three data point systems are required if using a BACnet controller and a new UNC (the third point is for programming purposes via a laptop). Ensure control systems are wired in the equipment manufacturer's recommended type and size of data cable.

If using VRV or multi head split A/C systems, individual cassette units must have remote manual control to stop and start indoor units in conjunction with Afterhours push button and time schedule. (I.e. if time schedule is commanded on, the unit still requires a start from remote control prior to starting unless specifically requested).

Supply a new Invensys UNC series controller if no UNC is available for connecting to the new system. Provide all necessary UNC drivers to interface with the newly connected equipment. UNC locations are to be approve3d by the Technical Reference Group prior to installation.

H 4 Metering

H 4.1 General

Meters must be installed on all incoming site services and such services within all buildings. Pulse rates of connected meters are to be supplied in writing to BMS.

H 4.2 Responsibilities

The relevant services designer must identify and confirm the correct type of meter to ensure it is compatible with the existing IEMS.

Meters are generally to be supplied wired and connected by the mechanical and electrical subcontractors. Metering cabling both power and data (RS 485 or Lon) is to be the sole responsibility of the electrical subcontractor. The BMS contractor is responsible for the commissioning of the BMS aspect of the meters.

It is the responsibility of the appropriate mechanical or electrical contractor to adjust the required flow rates, and to ensure current transformers and control voltage cables are terminated with correct orientation.

The BMS contractor is responsible for termination only of the RS 485 or Lon data cabling at the designated BMS panel and metering equipment. Installation of the cable is the responsibility of the relevant electrical or mechanical contractor.

H 4.3 Water Meters

The new incoming water to supply a campus or site shall have a water meter supplied by the Supply Authority and fitted with a pulsed output for input into the BMS and energy management programs. Each building and each major water use within a building shall also have a water meter interfacing with the BMS and energy management programs. Excessive water use alarms shall be set up on all main meters.

Water supplied to a cafeteria or café kitchen facility or other tenancy shall have a separately metered and monitored service. The meter shall interface with an energy management program.

H 4.4 Gas Meters

The new incoming gas to supply a campus or site shall have a gas meter supplied by the Supply Authority or retailer and fitted with a pulsed output for input into the BMS and energy management programs. Each building shall also have a gas meter interfacing with the BMS and energy management programs.

Gas supplied to a cafeteria or café kitchen facility or other tenancy shall have a separately metered and monitored service. The meter shall interface with an energy management program.

Gas supplied to each boiler shall have a separately metered and monitored service.

H 4.5 Electrical Meters

The new incoming electricity to supply a campus or site shall have an electricity meter with dual output kWh/KVA meter provided by the Supply Authority or Retailer, and shall be one of their electronic dual output EDMI Mark 6 Smart Meters. The second output is to be Modbus protocol (RS485) or Lon technology, interfaced to the BMS.

Each building and each floor within a building shall also have an electricity meter interfacing with the BMS and energy management programs.

Power supplied to a cafeteria or café kitchen facility or other tenancy shall have a separately metered and monitored service. The meter shall interface with an energy management program.

Smart energy meter interface with the Niagara server for logging and data load shedding purposes shall be provided for all of the following:

- Main building switchboard (MSB)
- Floor/Level Main Distribution Boards (MDB)
- Transport Services Switchboard (TSSB)
- Mechanical Services Switchboard (MSSB)
- Power supplies to each chiller

Exact provision of metering must be noted in the Design Report and agreed with the Contract Supervisor.

In existing buildings, EDMI Mark 6 single RS485 output meters shall be used throughout where a dual output EDMI meter is monitoring the supply. Alternatively Schneider PM500 meters with a Modbus protocol RS485 output may be used. If alternative brand existing meters are already connected to specific UNC, the same type of meter may be installed to ensure data integrity of the Modbus data trunk.

The electrical services designer must confirm the preferred meter type for approval by the Contract Supervisor.

H 5 Interactive Energy Management System

H 5.1 Programming

The energy management system shall be capable of load shedding by duty cycling plant and/or raising temperature set points to remain within the campus agreed maximum demand limit.

Where required, load shedding strategies must be identified in the Design Report and approved by the Contract Supervisor.

The demand limiting is to have set time limits, and pre-set set point offsets to ensure reasonable comfort levels are maintained.

Programming should include, but not be limited to:

- Demand control of connected equipment (load shedding)
- Adjustable individual Time Schedules via Niagara System
- Adjustable Controlling Zone Set Points via Niagara System
- Individual start/stop control via Niagara System for all air handling plant, exhaust fans and ventilation systems
- Status of all outside air and exhaust fans, fan coil units, air handling units and compressors
- Controlling zone temperature sensors
- Temperature sensors for high temperature alarms in all switch rooms and server rooms
- Leaving air temperature sensors on each air handling unit
- Manual override of modulating valves and dampers via Niagara system
- Temperature control of systems via BACnet controllers if using Daikin units
- Utilise Lon controllers if using other brand air conditioning units
- Pressure control all variable speed drives

H 5.2 Graphic Pages

Graphic pages shall include, but not be limited to, the following information:

- Campus map linked from main IEMS map
- Link to each building from the campus map
- Link to metering and individual floor plans from each separate building page, including indication of any equipment in alarm condition
- Each floor to display walls, sensor locations, unit locations, room numbers, and room temperatures. Colour code individual units/zones and link to a separate page displaying the relevant specific unit information
- Link to corresponding item of plant from alarm indicator

Exact extent and content of graphic pages shall be considered in the Design Report and agreed with the Contract Supervisor.

H 5.3 Meter Graphic Pages

Meter graphic pages to display:

- All sub meters connected downstream
- Phase to phase voltage or phase to neutral voltage
- Amperage of each phase

- CT ratio
- Power factor
- Instantaneous kW
- Instantaneous KVA
- Total consumption in KWh and KVAh

Meter logging to incorporate:

- Average voltage and maximum amperage over the last 10 minute period
- Meters to log Peak KVA or KW, maximum demand KVA or KW (depending on tariff)
- Meters to log total KWh and KVAh
- Graphical representation of peak KVA or KW and relevant maximum demand for periods of daily, weekly, monthly, bi-annual and annual
- Links to archived text logs and to the UNC log buffers
- Gas and water meters to display instantaneous consumption and total consumption (gas in cubic metres and water in Kilolitres)

H 5.4 Mechanical Graphic Pages

Mechanical graphic pages to display:

- All temperature sensors connected
- Status of all fans, pumps and compressors, including coloured indication – red in fault and not running / operating as required; amber if in standby and available for operation; green if running correctly as required
- All time schedules, allow for adjusting via web browser
- Adjustable set points, allow for adjusting via web browser
- All Stop/Start Points, allow for overriding via web browser
- All valve and damper positions, allow for manual override of position via web browser
- All available information from BACnet system
- Variable speed drive Operations parameters, allow for manual override of output and set point
- Alarm status – coloured red if in alarm; coloured green if functioning correctly

H 5.5 Lighting Graphic Pages

Where automated lighting control is approved, it must have its own dedicated graphic pages and be fully programmed with a separate password access to ensure complete separation from all other air conditioning controls and their associated graphics.

Graphically represent each lighting circuit with individually block coloured sections to show the areas illuminated. The ALC circuit names should be initially labelled as shown on the electrical drawings, with associated connected circuit numbers and distribution boards.

Liaise with the Contract Supervisor to obtain all normal and holiday lighting control time schedules. Ensure all schedules are programmed as part of the commissioning.

Lighting graphic pages to display:

- Lighting areas served by each time schedule, colour coded separately to limit confusion and labelled accordingly
- Operational status of lighting (where available) i.e. On or Off; Automatic or manual override control

H 5.6 Documentation

AutoCAD or DXF format drawings, displaying individual floor layouts, room numbers and equipment locations to be supplied by the relevant services contractor to BMS contractor for graphic page creation.

Hard colour copies of this detailed lighting ALC graphic showing areas illuminated shall be provided to the Contract Supervisor for distribution to Security and user groups. This will enable users to identify and report faulty ALC lighting circuits or clearly identify lights the occupants may request on temporary switching schedules. Colour graphic copies of the ALC lighting circuits identified by individual coloured floor areas shall be included within the O&M Manuals.

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TRANSPORTATION SYSTEMS

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	F	Fire Protection and Detection Services
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I 1 General Requirements

I 1.1 Introduction

It is expected that this section is read in conjunction with all other sections of the UniSA Technical Standards, in order to achieve a fully comprehensive understanding of the University requirements.

All works undertaken at the University must comply with the requirements of NATSPEC specifications and the designers must use this, plus the University specific modified clauses as a basis for their specifications.

The designer shall amplify the NATSPEC requirement where necessary to meet specific project requirements or to provide increased levels of quality and/or performance with approval from the Contracts Supervisor.

The designer may use their own specification, but only with written approval from the University. Where alternative specification is used, it must ensure that the specified standards, quality and outcomes are equivalent to or greater than those specified through NATSPEC. NATSPEC supplementary clauses specified in this document are to be inserted into the designer's specifications.

The designer must not reduce the requirements of NATSPEC and/or the UniSA Technical Standards clauses without written approval from the Contracts Supervisor.

On smaller projects where the scope of work does not justify a full NATSPEC specification the designer may propose a "notes on drawing" type of specification, as long as the pertinent elements of the NATSPEC and supplementary the University clauses are included, with the Contract Supervisors approval

NATSPEC supplementary clauses which are required to be inserted into the designer's specifications have been placed inside a blue box and text has been italicised.

I 1.2 Standards and Regulations

The following table details the Standards and Regulations, which are additional to those referred to in Section A and are specific to Transportation Systems:

Table 1 – List of Standards and Regulations

CODE	DESCRIPTION
AS/NZS 3000	Wiring Rules
AS 1735	SAA Lift Code
NCC	National Construction Code

Unless specifically stated otherwise, the design and installation of transportation systems must be based on the current version of the standard or code at the date of tender.

The above list is not exhaustive and the designer and installer must be responsible for identifying and complying with all standards relevant to the scope of works.

I 1.3 Quality

All transportation systems design work is required to be carried out via suitably qualified and experienced designers. The University may request copies of the designer's calculations in order 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.

All design work must be checked and reviewed by a suitably qualified and experienced peer prior to issuing for pricing. The designer must have a formal check and review process. The University may request evidence of the design checking and review process.

On occasion a designer may utilise a third-party designer (sub-consultant / specialist contractor / lighting manufacturer / supplier, etc.) however, the designer retains responsibility for the design and review process.

Unless specifically directed otherwise, all equipment designed, specified and installed must be new and of the highest quality.

I 1.4 Preferred Manufacturers

The University requires that only proven proprietary equipment, with local service availability must be selected.

In order to maintain consistency with current assets and maintenance strategies the following manufacturers are designated as the University's preferred lift suppliers:

- Kone
- Otis
- Schindler

Whilst the University does not wish to restrict the designer's ability to select the most appropriate equipment to meet particular requirements it is the University's preference that equipment selected satisfies the following:

- A reputable manufacturer with a proven track record
- Local Adelaide representation and support in design and post installation operation
- Local Adelaide spare parts availability
- Australian manufacturer is preferred.
- Unrestricted access to system hardware and licensed software

I 1.5 Safety in Design

Those involved in the design of the transportation systems must undertake the necessary Safety in Design reviews and activities as required by the contract.

Generally the University prohibits any working on energised electrical equipment in accordance with the WHS Regulations. Where isolation of the equipment is demonstrably impracticable the contractor must provide a Safe Work Method Statement (SWMS) fully detailing how risks have been managed as low as reasonably practicable. It shall specifically address why isolation is impracticable and how access to energised electrical parts will be prevented. No working on energised electrical equipment shall proceed without written approval from the University. Approval of the SWMS by the University does not relieve the contractor of primary responsibility for undertaking safe work

The transportation systems designer should consider the following particular items as part of the Safety in Design, however they are not limited to:

- Size and location of pits
- Maintenance accessibility
- Interfaces to other trade systems
- System alarming and fail safes
- Methods of safe isolation for access and maintenance of equipment

- Satisfactory maintenance space around equipment
- Satisfactory space and access to internal components requiring maintenance and/or replacement.

The designer must address the Safety in Design aspects in the Design Reports

The installer of the works must review the Safety in Design documentation throughout the works, to identify any risks throughout the works and any residual risks to the University on completion.

Liquid piped services, except sprinkler services where required by code, must not be run above electrical switchboards. The designer must liaise with hydraulic and mechanical trades to coordinate and ensure this does not occur.

I 1.6 Sustainability

The designer must take into consideration the Environmental Sustainability of the site infrastructure and site services taking into account the whole of life cost and operational benefit.

Elements that the designer must consider, include, but are not limited to, the following:

- Energy efficiency
- Materials selection
- Decommissioning / disposal of equipment at end-of-life
- Control methodology including automatic controls
- Luminaire selection

The sustainability aspects must be addressed in the Design Reports

I 1.7 Cost Planning

The site infrastructure and site services designer must provide input into the project cost planning as required by the contract.

The site infrastructure and site services designer should provide cost planning advice for the supply, installation, associated works, contingencies, overheads, etc. to indicate a total cost to the University.

Any element specifically excluded must be clearly indicated so that a total cost to the University may be determined.

I 1.8 Attendance

It is incumbent on the transportation system designer and contractor to make themselves aware of existing conditions as far as reasonably practicable when designing and/or performing works at the University. The University reserves the right to hold the designer and/or contractor liable for works performed that are of a sub-standard or non-compliant nature.

The transportation system(s) designer must attend design and construction meetings as required by the contract and outlined below.

The University expects the transportation system(s) designer, not a delegate to attend at a minimum:

- Technical reviews as directed by the Contract Supervisor
- Design team meetings appropriate to the size of the works. (Minimum of one meeting)
- Construction phase meetings appropriate to the size of the works. (Minimum of one meeting), plus any meetings where the Contract Supervisor deems there is significant electrical elements that requires the designer’s input

- Ongoing site inspections as considered appropriate by the Contract Supervisor (minimum bi-monthly)
- First fix inspection
- Final fix inspection
- Commissioning where required by Contract Supervisor
- Final / defects inspection prior to Practical Completion
- Final / defect inspection prior to end of Defects Liability Period (DLP). DLP inspection report to be issued to the University five working days prior to end of formal DLP.

The transportation system(s) designer must identify his/her proposed meeting site attendance schedule in their engagement proposal.

The transportation system(s) installer must attend meetings as required by the contract and considered necessary by the Contracts Supervisor.

I 2 Technical

I 2.1 Passenger Lifts

Machine room-less lifts, with regenerative drives are preferred. Energy efficiency is design priority, and this must be taken into consideration when selecting equipment and control algorithms.

Each lift must incorporate the supply of a protective blanket for the walls of the car. The car interior must be designed to allow easy installation of the blanket.

Each lift must be connected to a Security monitored telephone.

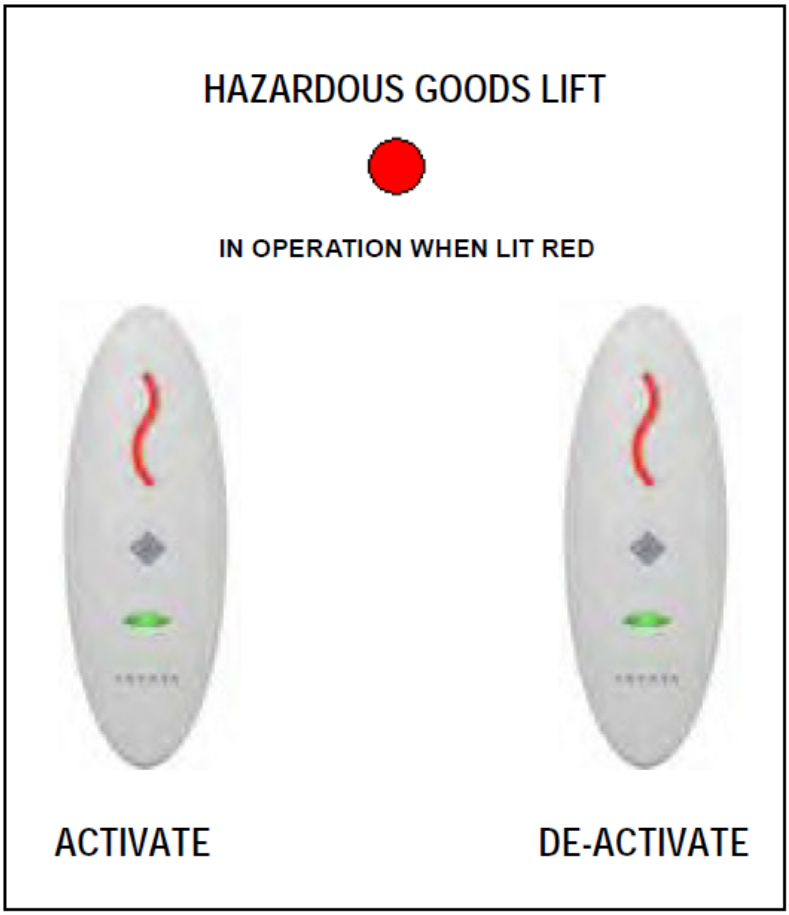
Lift lighting is to be of LED type, with occupancy detectors used to ensure lighting and ventilation fans are shut down when the lift is not in use.

I 2.2 Goods Lifts – Hazardous Mode

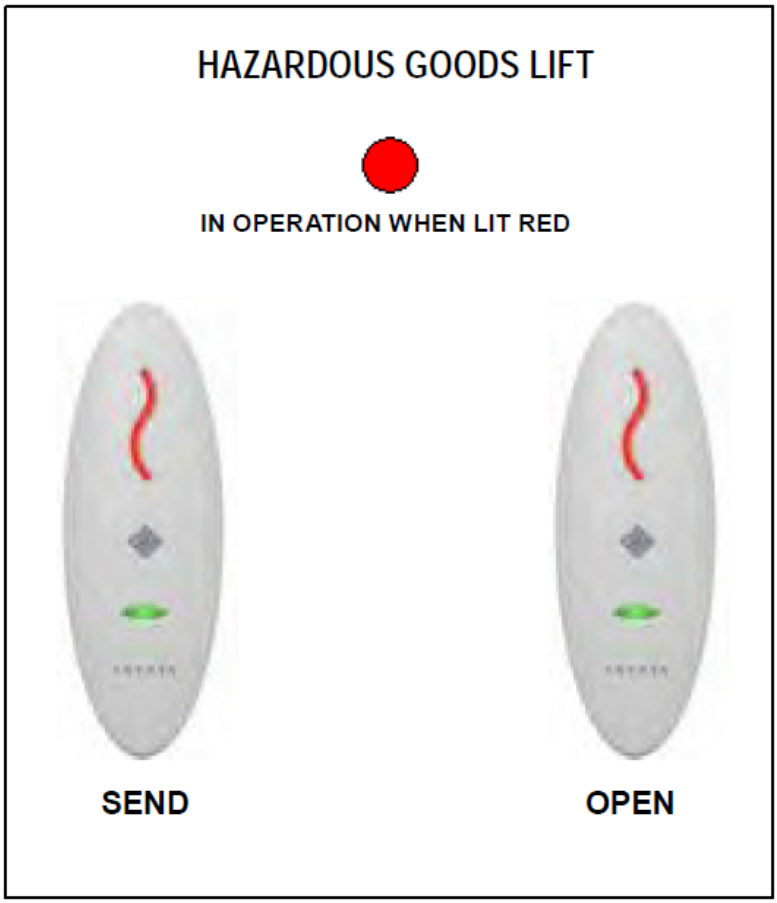
Where a lift is required to be used for hazardous goods transport the design shall incorporate the requirements outlined below.

Hazardous Goods lift mode shall be controlled by UNISA Proximity card readers connected to the UNISA Gallagher access control system. The Gallagher equipment used to control and operate the lift shall be backed up by UPS power. Additionally the Gallagher equipment shall be fitted with onboard standby power and back up batteries. Proximity readers shall be located in the lift car and on each landing as per below graphic. Appropriate permanent labelling and signage shall be provided.

In car readers:



Landing readers:



Lifts shall be programmed to enable the following operating sequence:

Step 1

An authorised cardholder presses the call button outside the lift to summon the lift car to the required floor.

Step 2

The lift car arrives and the doors open as per normal operation. The authorised cardholder then enters the lift car and badges the in-car card reader labelled "activate". The red indicator light located to each unit both within the lift car and on every landing is illuminated red indicating that the hazardous goods lift operation has been enabled. The authorised cardholder sets the required destination by pressing the required in-car call button on the lift control panel.

The above steps will:

- activate the priority service (hazardous goods) mode
- isolate all landing call buttons
- lock the lift doors open to facilitate loading

Step 3

The authorised card holder then loads the lift with the hazardous goods. When satisfied that the goods have been loaded and that all persons are clear of the lift area, the authorised user then proceeds to the landing card readers and badges the "send" reader on the landing.

The above steps will:

- close the lift doors
- send the lift car to the required level
- park the lift car on that level with the doors closed.

Step 4

The authorised card holder proceeds to the required destination level by alternate means (general purpose lift or stairs). When ready to receive the hazardous goods at the required level, the authorised card holder proceeds to the hazardous goods lift landing card reader and badges the “open” card reader on the landing.
The above step will:

- Open the doors whilst retaining the hazardous goods mode to enable the authorised card holder to safely remove the hazardous goods.

Step 5

When the goods have been unloaded, the authorised card holder enters the lift car and badges the “de-activate” card reader to return the lift car to normal operation.
The above step will:

- Release the hazardous goods lift mode
- Unlock the call buttons on each floor
- Return the lift to normal operation

Operation during loss of power:

If the lift is not provided with standby power the following shall occur during a power outage:

- The lift will remain in ‘hazardous goods mode’.
- The lift will park with the doors closed.
- Once power is restored, the lift will be able to receive an open signal from the landing card reader.

Operation in fire mode:

The lift shall be provided with a fire service key as required by the regulatory authorities. Where provided, the key operation will override the operation of the lifts. The key operation shall park the lift on the ground floor with the doors open.

I 2.3 Lift Machine Room

Machine room-less lifts are preferred, however, where this is not feasible, the following conditions must be met:

- The Machine Room is to be fitted with fresh intake and exhaust fans, all fans are to be controlled by VSD’s and thermostat and connected to the BMS
- The Machine Room must be equipped with Emergency Evacuation lighting as detailed in Section L
- Avoiding machine rooms being in subgrade areas where possible.

I 2.4 Escalators

The installation of escalators must only be considered as a last option, and only if considered acceptable by the intent of the Project Brief.

If the installation of an escalator is required to satisfy the intent of the Project Brief, the escalator must maintain compliance with the following standards:

- Building Code of Australia
- Relevant, Current Standards
- Disability Discrimination Act

I 3 Design Reports

The transportation system(s) designer must submit formal Design Report documents as required by the contract for technical review by the University.

In addition to the specific elements discussed in Section C of this document, the transportation system(s) Design Report(s) must include, to the extent that they are applicable to the project, but not be limited to the following:

- Completed Design Certificate relevant to the stage of design
- Proposed scope of works and details of the system arrangement
- Schedule of applicable regulations, standards, policies and guidance publications on which the design is based.
- Details of deviations of the above
- Details of any third party and/or record information upon which the design relies
- Assumptions or exclusions
- Safety in Design review
- Sustainability review
- Detail of any proposed modifications to existing systems or equipment
- Manufacturer selection of major equipment
- Basis for sizing of major equipment
- Layout drawings and schematic diagrams for the proposed arrangement to the level of detail as per the "Transportation Systems Design Deliverables" matrix

Table 2 – Transportation Systems Design Deliverables Matrix:

Design Report Stage		Transportation Systems Design Deliverables
End of Schematic Design	General	• Preliminary traffic analysis and lift car sizes estimate based on a schedule of accommodation and reasonable allowance. • Awareness of existing site infrastructure to identify connection points and capacities • Determine cost/benefit impact of masterplan options to mechanical services
	Reporting	• Preliminary estimated passenger demand • Feasibility of lift locations • Advantages/disadvantages of masterplan options • Understanding of site infrastructure and site system requirements • Confirmation of scope of services • Items requiring further clarification • Information required

Design Report Stage	Transportation Systems Design Deliverables	
	Documentation	• Mark up of masterplan options indicating existing infrastructure and possible connection points and locations
End of Design Development	General	• Developed traffic analysis based on building form and preliminary occupancy levels • Preliminary size and location of lift shafts, motor rooms, lift pits, overruns etc. to inform architectural building and site development • Preliminary major service routes • Preliminary equipment selection • The UniSA Technical Standards reviewed and assessed
	Reporting	• Proposed lift call and control methodology • Developed passenger demand, waiting times, car speeds, etc. based on proposed building facility / building form, use and occupancy levels • Confirmation site infrastructure can accommodate estimated demands • Description of system proposals • Items requiring further clarification • Information required • Preliminary opinion of cost based on square meter rates • Concept Design Certificate
	Drawing	• Preliminary schematic drawings control systems, electrical connections, etc. • Layout drawings showing preliminary locations of major plant i.e. lift motors, system operating / control panels. • Layout drawings showing preliminary lift shaft sizes and connection points
50% Documentation Phase	General	• Transportation systems design to suit approved building form • Final traffic analysis based on building form, use and occupancy including diversity. • Defined location and sizes of shafts, motor room, control panels, etc. to suit designed equipment • Defined size of lift cars • Defined sizes of major plant

Design Report Stage		Transportation Systems Design Deliverables
		• Draft specification of transportation systems
	Reporting	• Final flow rate estimate • Final confirmation of systems being provided • Final confirmation of connections to existing infrastructure • Schedule of selected lift car finishes • Developed opinion of cost including elemental cost for major plant and equipment. • Final minor items requiring further clarification • Final minor items of information required • Statement of any specialist systems requiring design development responsibility by contractor • Schematic Design Certificate
	Documentation	• Complete schematic drawings with material types and sizes • Layout drawings for lift shafts, lift car layouts, call point locations, lift car operating panels • Preliminary Specifications
90% Documentation Phase	General	• Final coordinated mechanical services design suitable for tender and construction • All systems and equipment fully and clearly defined and specified
	Reporting	• Confirmation of all systems fully designed • Statement of any minor outstanding information and/or assumptions • Elemental opinion of cost • Complete specification for Transportation System(s) • Confirmation of any design development of specialist systems by contractor
	Documentation	• Complete schematic drawings including schedules of equipment • Complete coordinated layout drawings coordinated with building form and other services • Controls details complete • Final specification • All documentation fully checked, reviewed and signed-off in accordance with contractual Quality Assurance requirements

Design Report Stage	Transportation Systems Design Deliverables
	• Detailed Design Certification

Where the designer considers an element is not applicable to the project, this must be clearly noted.

I 3.1 Design Certification

The designer must produce a 'Design Certificate' identifying which codes and standards the design have been based on, including the issue date and version of the code or standard, and certifying compliance with those codes.

The 'Design Certificate' must be signed by the designer responsible for the design, not a delegate, and issued with the documentation issued for pricing.

I 4 Plant Certification and Registration

Certification and registration of plant/equipment/systems installation and plant/equipment/systems design shall be the responsibility of the installing contractor. This will include but not be limited to all plant requiring certification and/or registration with SafeWorkSA, local councils, OTR and other authorities. All costs associated with such activities shall be the responsibility of the installing contractor.

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J

SECURITY SYSTEMS

	SECTION	
	A	Introduction
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J 1 Introduction

This Section details the University's requirements with respect to the provision of services related to Security.

These Security Technical Standards should be read in conjunction with the following reference documents:

- NATSPEC Specification
- Section B – Safety in Design
- Section C – Design Controls
- Section E – Electrical and Lighting
- Section H – Building Management System
- Section L - Communications Infrastructure

J 1.1 System Abbreviations and Terminology

Table 1 – Hardware Components Abbreviations

Abbreviation	Terminology
IAS	Intruder Alarm System
IFC's	Intelligent Field Controllers
LED	Light Emitting Diode
LCD	Liquid Crystal Display
Comms	Communications
PSTN	Public Switched Telephone Network
SNA	System Network Architecture
RS485 LAN	Protocol used for LAN Communications
RS232	Common Interface Standard
LAN	Local Area Network

3. Table 2 – Alarm Monitoring Abbreviations

Abbreviation	Terminology
Area	A separate partition of the system
Input/Point	EOL supervised alarm device or contact
Output	Dry contact relay or 50 mA open collector
Secure	Area is armed
Access	Area is disarmed
Alarm	Input has been activated or there is a system alarm
Unsealed	A condition where an input is activated
Sealed	A condition where the input is in normal mode
EOLM	End of Line Module

4. Table 3 – Surveillance Equipment Abbreviations

Abbreviation	Terminology
CCTV	Closed Circuit Television
IPVS	IP Video System
NVMS	Network Video Management System
NVR	Network Video Recorder
PTZ	Pan Tilt Zoom
RVS	Remove Viewing Software

J 3 Gallagher Access Control

J 3.1 General

The system architecture is tiered and consists of the following:

- Head-end software application Operations on a computer server
- Intelligent Field Controllers (IFC's) managing the system in a distributed intelligence format
- Semi-intelligent subunits (outputs, inputs, readers, etc.) which rely on IFC's to function

The system is a Windows-based user interface with site plans and interactive icons representing the location and real-time status of Access Control and Alarm Monitoring equipment.

Electronic Access Control is to be designed in consultation with UniSA. Design shall be based on functional requirements or each space. As a minimum Electronic Access Control will be provided to all External Doors, fire stairs, roof access points, labs, workshops, open plan offices, teaching spaces and other spaces identified as requiring a high level of security.

J 3.2 Central Control and System Management Software

The central control and system management software Operations throughout all the University sites is the Gallagher Command Centre application.

As the system is already embedded as a working platform, programming parameters and system functionality is already established. All programming and functionality requirements when commissioning all new works is to be under the direction and supervision of the Contract Supervisor.

J 3.3 IFC's

The system must incorporate dedicated Gallagher 6000 Series Intelligent Field Controllers (IFC's), which communicate with and control following equipment:

- Card access readers
- Reader, Input and Output
- Elevator access equipment
- Alarm monitoring Input/Output panels and equipment
- Remote Alarming Terminals (Codepad)
- Alarm response equipment

All systems enclosures are to be equipped and configured to detect tampering and report low supply voltage conditions. Gallagher enclosures include tamper protection for the front (open door) and the back (removed from wall) of the panel. Gallagher tamers are optical and mechanical tamper devices are only to be installed on battery / power supply enclosures.

J 3.4 Power Supplies and Batteries

Each IFC must be equipped with a minimum of two (2) ELV Power Supplies and Back-up Batteries. Each IFC is to be powered by an independent 13.8 VDC 8 Amp Regulated Power Supply with a 12 VDC 12 A/H Lead Sealed Battery as the back-up power source.

The power supply and back-up battery are to be contained within a purpose designed and engineered metal enclosure. This power supply is not to the source of power for any other piece of equipment, including electronic locking devices.

A separate 13.8 VDC 6 Amp Regulated Power Supply and 12 VDC 26 A/H Lead Sealed

Battery is to be supplied for each IFC to provide the power requirements to associated electronic locking devices. The Power Supply and Back-up Battery are to be contained in separate metal enclosures. There may be a need to provide more than a single power and back-up battery for each IFC due to the individual power drain requirements for the differing type of electronic locking devices. This would be most prevalent where there is a high number of Electromagnetic Locks on a single IFC. The nominated security contractor is to ensure that sufficient power supplies are provided for reliable operation.

A double 240 VAC outlet is to be supplied by others at each IFC location. The nominated security contractor is to be nominate the number and location of each IFC within their tender submission to ensure due allowance is made by Electrical Contractors.

J 3.5 Access Control Readers

Card Readers to be used throughout the University is Gallagher Multi Tech reader technology and can be specified in two configurations, being:

- Card plus PIN reader – Gallagher T20 Multi Tech reader (black). For use on all external and high Security applications (excluding boom gates)
- Card only reader – Gallagher T15 Multi Tech reader (black). For all other applications

Readers with integrated PIN pads provide an 'Entry under Duress' function. This function is not to be disabled.

J 3.6 Door Control Configurations

The table below shows the typical door configurations and the reference codes used. These should be reflected in the contract documents.

Table 4 - Door Configurations and Reference Codes

	Card Reader Entry	Card Reader Exit	Reed Switch	Electric Strike	Electric Mortice Lock	Cable Transfer	Mag Lock (Double)	Mag Lock (Single)	Auto Door Release Output	Fire Alarm Release	Magnetic Hold Back	Request to Exit Button	Emergency Break Glass	A/V Indicator Unit	Configuration Code
Access and Egress Control to Auto Double Leaf Door	1	1	2	-	-	-	-	-	1	*	-	-	1	-	AEAD2
Access Control to Auto Double Leaf Door	1	-	2	-	-	-	-	-	1	*	-	-	1	-	AAD2
Access and Egress Control to Auto Single Leaf Door	1	1	1	-	-	-	-	-	1	*	-	-	1	-	AEAD1
Access Control to Auto Single Leaf Door	1	-	1	-	-	-	-	-	1	*	-	-	1	-	AAD1
Access and Egress Control to Double Leaf Swing Door	1	1	2	1	-	1	-	-	-	*	-	-	1	1	AESD2
Access Control to Double Leaf Swing Door (Free handle Egress)	1	-	2	1	-	1	-	-	-	*	-	-	1	1	ASD2
Access and Egress Control to Single Leaf Swing Door	1	1	1	1	-	-	-	-	-	*	-	-	1	1	AESD1

	Card Reader Entry	Card Reader Exit	Reed Switch	Electric Strike	Electric Mortice Lock	Cable Transfer	Mag Lock (Double)	Mag Lock (Single)	Auto Door Release Output	Fire Alarm Release	Magnetic Hold Back	Request to Exit Button	Emergency Break Glass	A/V Indicator Unit	Configuration Code
Access Control to Single Leaf Swing Door (Free handle egress)	1	-	1	1	-	-	-	-	-	*	-	-	-	1	ASD1
Access and Egress Control to Double Leaf Swing Door ML	1	1	2	-	-	-	1	-	-	*	-	-	1	1	AESD2M
Access Control to Double Leaf Swing Door ML	1	-	2	-	-	-	1	-	-	*	-	1	1	1	ASD2M
Access Control to Single Leaf Swing Door ML	1	-	1	-	-	-	-	1	-	*	-	1	1	1	ASD1M
Access Control to Cat & Kitten Door Main Leaf Active (Free handle egress)	1	-	2	-	1	1	-	-	-	*	-	-	-	1	AEDK1
Access and Egress Control to Cat & Kitten Door Main Leaf Active (Free handle egress)	1	1	2	-	1	1	-	-	-	*	-	1	1	1	AEDK2
Access Control to Cat & Kitten Door Both Leaves Active ML	1	*	2	-	-	-	-	2	-	*	-	1	1	1	ADK2M
Fire Door Single Leaf (Outer)	*	-	1	-	-	-	-	1	-	✓	-	-	1	1	FD1O
Fire Door Double Leaf (Inner)	*	-	2	-	-	-	1	-	-	✓	*	-	1	1	FD2I
Fire Door Single Leaf (Inner)	*	-	1	1	-	-	-	1	-	✓	*	-	1	1	FD1I
Interlocking Single Leaf Door A (Entry)	1	1	1	-	1	1	-	-	-	*	-	-	1	1	ILDA
Interlocking Single Leaf Door B (Airlock)	*	*	1	-	1	1	-	-	-	*	-	-	1	-	ILDB
Interlocking Single Leaf Door C (Facility)	-	-	1	-	1	1	-	-	-	*	-	-	1	1	ILDC
High Secure Access and Egress Control to Single Leaf Door	1	1	1	-	1	1	-	-	-	x	-	-	1	1	HSAEAD1
Roof Access and Egress Control to Single Leaf Swing Door ML	1	1	1	-	-	-	-	1	-	✓	-	-	1	1	RAESD1M
Roof Access and Egress Control to Double Leaf Swing Door ML	1	1	2	-	-	-	1	-	-	✓	-	-	1	1	RAESD2M
Roof Access and Egress Control to Hatch ML	1	1	1	-	-	-	-	1	-	✓	-	-	1	1	RAEH1M

* Optional depending on operation requirements ✓ Required X Not to be installed

Notes:

The above list is indicative only and there may be variations required for specific doors which should be discussed as part of the Door Hardware Schedule process. Any such variations will be indicated in the contract documents.

Additional Emergency Break Glass Buttons may be required on specific doors where emergency exit traffic flows are required. Any such additions should be indicated in the contract documents.

All access control doors must be monitored for both door open/closed and door unlocked/locked using concealed monitor reed switches appropriate for the door installation.

Contacts on Fire Doors are to be programmed as Type A points and activate the A/V Indicator Unit on any door opening event. All such alarm events are also to be communicated to the Command Centre.

J 3.7 Elevator Control and Management

Where elevator control facilities are required for a project, all elevator control access equipment must communicate with the same central control as the door card readers.

The elevator control architecture must comprise a card reader in each elevator car, reporting to elevator control interface equipment mounted in or near the elevator motor room. Reader type must be the same as that used on access control doors.

The elevator control system must be capable of controlling access independently in a number of elevator shafts simultaneously. Each elevator reader must be independently at the central control by means of a unique plain language descriptor. Each reader head must be capable of raising an alarm if it stops communicating with its elevator controller or is removed from the elevator.

The interface between the access system elevator control equipment and the actual elevator switching control equipment must be via dry relay contacts. Trailing cables and cable interface between the two controllers are to be responsibility of the lift contractor. Termination at the security of IFC can be via a termination block with each contact clearly identified.

The elevator control system must provide one relay contact per elevator shaft per level for the system. This relay contact must be used to interface with elevator switching control equipment.

An input must be provided for each level per elevator to indicate what level the user selected. On activation of this input all relays return to secure state.

A lift card reader may be required on certain levels of the building. These may not need to replace the unrestricted lift call button, but work in conjunction with it (time scheduled). Notes within the contract documents must indicate the lift call requirements.

J 3.7.1 Hazardous Goods Mode

J 3.7.1.1 Method of Operation

Step 1:

An authorised card holder wishing to use the hazardous goods functionality presses the call button outside the lift to summon the lift car to the required floor.

Step 2:

The lift car arrives and the door opens, as per normal operation, the authorised cardholder then enters the lift car and badges the in-car reader marked ‘activate’. The red indicator light located to each unit both within the lift car and on every landing is illuminated red indicating that the hazardous goods lift operation has been enabled. The authorised cardholder sets the required destination by pressing the required in-car floor level button on the lift control panel. The above steps will:

- Activate the hazardous goods mode
- Isolate all landing call buttons
- Lock the lift doors open to facilitate loading

Step 3:

The authorised car holder then loads the lift with the hazardous goods.

When satisfied that the goods have been loaded and that all persons are clear of the lift area, the authorised user then proceeds to the landing card readers and badges the ‘send’ reader. The above steps will:

- Close the lift doors
- Send the lift car to the required level

- Park the lift car on that level with the doors closed.

Step 4:

The authorised card hold then proceeds to the required destination level by alternate means. When any authorised card holder is ready to receive the hazardous goods at the required level, proceeds to the hazardous goods lift landing card reader and badges the 'open' card reader.

The above step will:

- Open the doors whilst retaining the hazardous goods mode to enable the authorised card holder to safely remove the hazardous goods.

Step 5:

With the operation now complete, the authorised car holder enters the lift car and badges the 'de-activate' card reader to return the lift car to normal operation. The above step will:

- Release the hazardous goods lift mode
- Unlock the call buttons on each floor
- Return the lift to normal operation

J 3.7.1.2 Power or System Fails Operation

The goods lift (including hazardous goods functionality) is not fitted with any form of standby power. In the event of a power failure the goods lift will cease to operate. The Hazardous Good lift mode is controlled by Proximity card readers connected to the Gallagher Access Control system, and operated through the presentation of a valid card as described previously. The Gallagher equipment used to control and operate this lift is backed up by UPS power. Additionally, the Gallagher equipment is fitted with on-board standby power and back up batteries.

The following is offered to explain how the lift is likely to operate under the following scenarios and upon return restoration of power following these scenarios:

Scenario 1: – Power Fail to Lift / UPS Operational

In this scenario the lift will cease to function and the Gallagher controller will maintain the selected mode of operation (i.e. Passenger or Hazardous Goods Mode). Upon restoration of power to the lift, lift functionality will be restored in the mode selected prior to the power fail.

In summary this scenario will not affect the Gallagher Control equipment, but will effect lift operation until power is restored.

Scenario 2: - Power Fail to Lift / UPS Fail

In this scenario the lift will cease to function and the Gallagher controller will maintain the selected mode of operation (i.e. Passenger or Hazardous Goods Mode), whilst the on-board battery backup is maintained (up to 12 hours). Upon restoration of power to the lift, lift functionality will be restored in the mode selected prior to the power fail.

In summary this scenario will not affected the Gallagher Control equipment unless the power outage and UPS fail exceeds the Gallagher backup battery lift, but will effect lift operation until power is restored. Should the power and UPS fail exceed the standby battery life the Gallagher Controller will fail (see below).

Scenario 3: - Gallagher Controller Fail

In this scenario the Gallagher Card readers will not operate and it is likely that the lift will be placed into Hazardous Goods Mode. The system has been designed for a worst case scenario, namely the Gallagher Controller failing during Hazardous Goods mode. Should this occur, the Hazardous Goods Mode will be retained to prevent accidental exposure to hazardous materials by members the

public. Should the lift be in passenger mode, a Gallagher Controller failure is also likely to send the lift into Hazardous Goods Mode. In the unlikely event that this occurs while passengers are within the lift car, lift breakdowns procedures are to be observed. Lift car passengers should use the lift car emergency handset to summons external assistance.

J 3.8 Access Cards and Tokens

Access token technology must incorporate dual token technologies combined into a single Card, Magnetic Track Swipe and Mifare Plus (classic – Legacy) technology contact-less 4K Smart Card.

Cards must be of standard credit card size, being no larger than CR-80 and must be direct printable using a dye-sublimation or re transfer print process or be capable of accepting an adhesive label printed through such a process. All cards must meet ISO standards.

The card number must not be the card serial number, it must be a number specifically coded onto the card. The encoding of the Card will be the responsibility of the University.

The University also employs I-Key pendants for access control access. When a button on the pendant is pressed the unique pendant number and site code are sent securely via Radio Frequency to the receiver to be decoded. Once decoded the code is transferred to Gallagher Access Control system via the industry standard wiegand protocol.

J 3.9 Electrical Strikes

Electric Strikes (Padde ES9000 Pre-Load Electric Strike) or (Padde EF934 Series Glass Door Strike) are to be provided for nominated doors (refer to contract documents). The supply of the strike is the security contractor's responsibility with the cut in and fitting to be done by the builder.

J 3.10 V-Locks

V-Locks can only be used in special circumstances with the Approval of the Campus Facilities Manager V-Locks (Padde ES8000 V-Lock) are to be provided for nominated doors (refer to contract documents). The supply of the V-Lock is the security contractor's responsibility with the cut in and fitting to be done by the builder.

J 3.11 Electric Mortice Locks

Electric Mortice Locks are to be (Lockwood 3570 Electric Mortice Lock) are to be provided for nominated doors in lieu of Electric Strikes (refer to contract documents). The supply of the Electric Mortice Lock is the security contractor's responsibility with the cut in and fitting to be done by the builder.

J 3.12 Electromagnetic Locks

Electromagnetic Locks are to be Padde Z8D-HR/EML10 for double doors and Padde Z8_HR/EML6 for single doors. Locks are to operate at 12VDC and be powered by a power supply specifically for this purpose.

The number of locks to be powered from a single power supply will be dependent on the opening draw of the lock and the capacity of the power supply. There is always to be 10% pare capacity from maximum draw calculations.

J 3.13 Magnetic Door Hold Back Lock

Magnetic Door Hold Back Lock mechanisms are predominately employed on fire doors, in various configuration options. These devices are to operate with 12 VDC power supplies. The same conditions apply as for electromagnetic locks.

J 3.14 Request to Exit (REX) Button

Door request to exit are to be of Net Digital IR Touchless Sensor Exit Plate, with Blue LED Status Indicators, Size - Plate 70mm x 115mm. - Sensor 30mm Diameter, IP55, (AW100020) with the words 'Exit' engraved with black prominent writing.

J 3.15 Emergency Door Release Break Glass Button

Emergency Door Release break glass switches are to be manufactured for purpose, have manual key resettable actuator and be green in colour. The words 'Emergency Door Release' embossed in white prominent writing All Emergency break glass buttons installed at the University facilities are to be double polled, the primary poll for the direct door release and the second poll wired back to the IFC and commissioned as an alarm input.

J 3.16 Audio/Visual Indicator Units

An Aritech AR638 (or approved equivalent) Audio/Visual Indicator Unit is to be installed above the headspace of any access-controlled door that requires a 'Door Open Too Long' local alert. All such devices are to be programmed for a 30 second local alert only (Stage 1 alarm) followed by a monitored alert after a further 30 second without a door seal (Stage 2 alarm)

J 4 Alarm Contacts

J 4.1 Overview

Predominately, all alarm points are to be connected to Gallagher IPC's on individual input expanders. The inputs and outputs of the IPC should be left allocated only for access control purposes. This may vary in some instances where the facility is small or has low expectation of security requirements. When in doubt, the Contract Supervisor should be contacted to obtain clarification.

J 4.2 Movement Detectors

All movements must be of dual-/tri- technology and selected suitable for volume and range requirements. Movement detectors are to be capable of LED isolation for periods outside walk testing requirements. All movement detectors are to be connected with 6 Core multi-strand security cable.

J 4.3 Door Contacts

Each door (including each leaf of a double door) nominated to be provided with electronic access control must have commercial grade recessed Reed Switches installed. This is to ensure that both 'Forced Door' and 'Door Open Too Long' functionality is available. These must be of Sentrol 1078 25mm recessed types (or equivalent) in most occasions. Any deviation to the type of detector needs to be approved by the Contract Supervisor.

J 4.4 Alarm Contacts

Remote monitoring of the status of specific alarms via volt-free alarm contacts (normally closed dry contacts) for fixed items of infrastructure e.g. Generator, FIP, BMS, CEMS, Gas Detection, Emergency Showers and Cool Room and Freezer Room - Remote Person Trapped Alarms.

The consultant team should provide an Equipment Schedule, Monitoring and Alarm Matrix for all equipment points required to be monitored into the Security system developed in consultation with UniSA.

The Security contractor to wire to and make final connection to equipment terminals (terminals provided by each trade), for all of the points as listed in the schedule Matrix. Liaise and coordinate with each Trade Installer for the final locations of these points terminals.

J 4.5 Equipment Alarm Contacts

Equipment identified as requiring alarming including CEs (EG. Fridges, Freezers, Incubators and defibrillators), IT workstations, AV equipment (Data projectors and AMX controlled) must be connected via structured cabling double outlet, one being for the actual LAN communications and the other for line resistance monitoring for security. These data points are terminated at a Communications Rack (location to be specified in the contract documents) where the LAN and security connections are separated and terminated on separate Patch Fields.

These works are provided by the Communications Contractor/AV Contractor, separate to the nominated security contractor's responsibility.

The nominated security contractor works include the following:

- Supply and install sufficient twenty-four (24) Point Patch Fields (including Cable Tidies) to account for the number of workstations for the project
- Provide sufficient patch leads between the Communications Contractor Patch Field and the security Patch Field to account for the number of circuits required
- Install a 24 pair multi-core stranded cable from the security patch field to the Gallagher Input Expander Modules (requires one (1) Gallagher Equipment Enclosures, complete with three (3) Gallagher HBUS 8 In Board Modules and one (1) Gallagher HBUS 8 In 4 Out Board) to be located adjacent to the Gallagher 6000 Controller
- Install commercial grade surface mount Reed Switches to projector anti-tamper housing. Any deviation to the type of detector needs to be approved by the Contract Supervisor.

A Gallagher T20 Terminal is to be installed within the Communications room to provide local control and display of alarm points (location to be confirmed with Contract Supervisor).

J 4.6 Critical Alarms via 3rd Party Monitoring Equipment

For critical equipment to be considered Mitigated for insurance purposes e.g. Controlled Environments must be connected to a back to base alarm that is monitored 24 hours a day.

UniSA use Security Monitoring Centres (SMC) is one of Australia's leading providers of alarm monitoring and response services, alarm signals are sent 24/7 to two ASIAL certified Grade A1 monitoring centres. When a Mitigated Device Gallagher alarm is received, a customised response plan is put into action, with calls to each device's specific contact list.

Alarms are to be transmitted via a Permaconn with a 3db High Gain Antenna which is installed adjacent the Gallagher Controllers used for this alarming. A Permaconn is a device that uses GPRS which is a data network that enables always ON connections. The data link between the Critical Equipment is connected through Gallagher to SMC and is always active, allowing the devices to exchange messages at any time. This path provides a Primary alarm path which is separate to the University network infrastructure. Permaconn provides four independent paths from the outstation to the central station, Optus GPRS, Telstra GPRS, IP and PSTN, providing true independent redundancy. The Permaconn system it-self has inbuilt redundancy, the systems servers are

duplicated at different locations. To ensure and end of line CE device are still connected to the alarm input and that alarm transmission devices are online, industry standard checking (polling) of the field controllers and communications devices is in place as per below:

Each Permaconn polls to SMC, If 3 consecutive polls are not received every 120 seconds, this raises an alarm for a communications fault and SMC then contact the relevant Campus Duty Security Officer and advise of a Permaconn fault which is then immediately referred for priority investigation and rectification. Polling rates are to be configured as follows:

P14 (120 Seconds) - Research Mitigated CE Devices

P9 (1Hour) - Security & Fire Alarms, Air Craft Obstacle Avoidance Lights

J 4.7 Stack Light Alarm Towers

All the stack lights are to be located internally and externally to the room in alarm or must be clearly visible so that it was easy for the Security Team and Lab Staff to identify where the incident is occurring.

Towers Stack alarm light Towers are to be provided in the Laboratory areas where required. Towers will generally be wall-mounted adjacent to door entry points located in the Laboratories. Signal Towers shall be manufactured by Mechtric type ELYPSE, suitable in a wall mounting base for a vertical configuration. Light modules shall be LED arrays, 4 off colours, with a flash rate of 1.5Hz and an Audible Module.

Refer to the following Schedule for the requirements of each Tower and the alarms which may be required to be presented at each Laboratory area.

Were provided as part of the project, alarm/stack lights labeling shall be part of the Security package. Where installation is done through a direct engagement of a Security provider, Security provider shall be responsible for signage. Refer to the signage style guide for the format of these labels

IN-FIELD (LABS\WORKSHOPS)

Alarm Type	Lens Colour	Label
OXYGEN **(O_2)** DEPLETION/ ENRICHMENTALARM	Green	Oxygen Depletion Alarm/Oxygen Enrichment Alarm
CARBON DIOXIDE **(CO_2)** EXPOSURE ALARM	Green	Carbon Dioxide Exposure Alarm
ACETYLENE **(C_2H_2)** Lower Explosive Limit	Yellow	LEL (Acetylene) Alarm
HYDROGEN **(H)** Lower Explosive Limit	Yellow	LEL (Hydrogen) Alarm
AMMONIA **(NH_3)**	Yellow	Ammonia Exposure Alarm
SAFETY SHOWER \EYEWASH FLOW	Blue	Safety Shower Alarm
EMERGENCY POWER SHUTDOWN	Amber	Emergency Shutdown Alarm
(Spare not currently in use)	Red	*(Confirm with CFM before use)*
(Spare not currently in use)	White	*(Confirm with CFM before use)*
Wiring Module	Black	*(Where Required - Room Number)-*
AUDIBLE ALARM	Black	

FM ASSIST\SECURITY OFFICE

Alarm Type	Lens Colour
CRITICAL ALARMS	Red
AED ALARMS	Green
EMERGENCY POWER SHUTDOWN ALARMS	Amber
SAFETY SHOWER ALARMS	Blue
GAS ALARMS	Yellow
(Spare not currently in use)	White
Wiring Module	Black
AUDIBLE ALARM	Black

J 4.8 Gas monitoring systems

Where gas monitoring systems are installed, they shall be connected to Gallagher. These include:

- Oxygen depletion
- Oxygen enrichment
- Carbon Dioxide Exposure
- LEL (Acetylene)
- LEL (Hydrogen)
- Ammonia Exposure
- Any other gas monitoring systems resulting from hazardous area classification/risk assessment.

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J 5 Electronic Key Cabinets

J 5.1 Overview

UniSA utilizes the KeyWatcher Illuminated key cabinet solution from Morse Watchmen, which is a modular and scalable system. This solution is seamlessly integrated into the Gallagher Command Centre through the KeyWatcher Software – KMaas, which is a web-based tool that enables real-time monitoring and tracking.

The KeyWatcher hardware provides authorized users with access to specific keys and keeps a detailed record of all key movements. As users are added or modified in the Gallagher software, data is automatically transferred to KMaaS every five (5) minutes to manage the physical keys, key bunches, and user group profiles.

Key groups are created in KMaSS to align with the access groups in the Gallagher Command Centre. This ensures that when data is extracted, the user group and access groups are accurately matched. KMaaS then sends the user information, including the card information, to the KeyWatcher hardware.

All KeyWatcher events and alarms are sent to the Gallagher Command Centre in real-time, and can be monitored by the security teams. Additionally, the system can be programmed to generate alarms at different intervals to alert security personnel of non-returned or overdue key sets.

J 5.2 Cabinets

UniSA employs the KeyWatcher Illuminated range of key cabinets, which are versatile and can be customized with modules to suit specific requirements. These cabinets are specifically designed to restrict access to key sets and provide a detailed record of key movements. Integration with the Gallagher system requires the installation of a T Series Card Reader on each cabinet.

Selection of the cabinet size and location must be made in collaboration with the Campus Facilities Manager. Only key cabinets in the standard portrait orientation are acceptable.

Two standard cabinet sizes are available for use:

- Cabinets with up to 48 key locations. These cabinets have dimensions of 890mm x 520mm x 370mm and weigh approximately 25kg.
- Cabinets with up to 96 key locations. These cabinets have dimensions of 890mm x 700mm x 370mm and weigh approximately 25kg.

It is important to ensure that the appropriate cabinet size and module configuration is selected to meet the specific needs of each location.

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J 6 Closed Circuit Television (CCTV)

J 6.1 Overview

The current authorised CCTV system for use in the University facilities is FLIR's Latitude Digital CCTV system and its associated Network Video Management System (NVMS) integrated to the Gallagher Imaging Interface allowing associated stored video images to be immediately retrieved when linked to events.

J 6.2 Video Management Systems

The preferred solution is an IP CCTV video surveillance system which is capable of 3rd party integration to Gallagher Command Centre (Access Control and Alarms Management System) already in place at the University.

The integration is a critical component as it will allow a single front end to Access Control and video management via the Gallagher Command Centre. Allowing Security Officers to:

- View live and recorded video of Fixed and PTZ cameras from Latitude NVMS in Gallagher Interface
- Control PTZ cameras
- Take snapshots
- Add cameras to a site plan. When clicked, the live video of the camera will be displayed
- Configure Latitude NVMS actions upon Gallagher events
  - E.g. Upon door open event, send a camera to a pre-defined pre-set
- Perform Action in Gallagher based on Latitude events
  - E.g. Latitude NVMS will request Gallagher to raise an alarm or to lock a door

J 6.3 Cameras

- Fixed IP Cameras must be POE internal and external all weather vandal resistant Flexi Dome HD 4k Day/Night Camera
- Pan Tilt Zoom IP cameras (PTZ) Day/Night PTZ dome camera. When PTZ camera is to be installed, it is to be fitted with appropriate PTZ Data Converter / PoE (Power over Ethernet) injector to operate the PTZ drive
- All Camera housings must be tamper proofed, rigidly mounted, corrosions proof and weatherproof rate IP66.

J 6.4 Locations

Camera locations are to be individually determined based on risk factors including required field of view, ease of access for maintenance and difficulty of access for vandal attack purposes. Camera locations will be as determined by the Contract Supervisor following a risk assessment process. Examples of locations that will be considered are external approaches to buildings, entry points to high foot fall afterhours zones, remote sites and areas of security risk.

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J 7 Conduit and Cabling

All cable and conduit is to be installed to meet with the conditions of this Technical Standard and meet all current cabling regulation and standards.

J 8 Labelling

All cables and equipment cabinets must be comprehensively labelled to clearly indicate their function.

Where cables enter or leave trays, racks, troughs or ducts, cables must be labelled according to the cable schedule or as directed with stamped aluminium or brass tags attached with nylon straps, typed Mylar film labels under clear ‘heat shrink’ or other approved means. Nylon straps or ties must be used to tie together single cables of the one circuit or system, to further assist maintenance identification.

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J 9 Records and Installation Changes

During the progress of the works, all changes to equipment, services, layouts, wiring and any other items that are incorporated in these works shall be recorded. All changes, which occur during the construction period, shall be recorded and included on the installation drawings.

J 10 Documentation

Refer to Section C for general requirements. Specific requirements are covered in the following subsections.

J 10.1 General

The nominated security contractor must provide to the Contract Supervisor comprehensive documentation to enable effective operation and routine maintenance of the entire IAS, EACS, EKC and CCTV systems employed at the University.

This must include at least the following:

- Operation handbooks
- Operator instruction manuals and training manuals
- Complete hardware description and installation records
- Maintenance handbook

The requirement on an individual project is to update the above documentation for those aspects directly relating to the individual project. This update information may also need to be supplied to Builders/Electrical Contractors for inclusion in their documentation. This is to be on a case-by-case basis.

J 10.2 Operation and Maintenance Manual

Refer to Section C, Operation and Maintenance Manuals for requirements.

J 10.3 As Built Drawings

Refer to Section C, Documentation and Drawings.

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J 11 System Commissioning and Acceptance Testing

J 11.1 General

The nominated security contractor must be responsible for all system commissioning and acceptance test and/or the provision of sufficient competent personnel, equipment and test instruments necessary for the testing and commissioning of the installation to the satisfaction of the Contract Supervisor.

All system commissioning must be carefully pre-planned and scheduled. System commissioning information must be submitted to the Contract Supervisor for approval not less than two (2) weeks before commencement of system commissioning. The University may elect contractor's staff in undertaking or witnessing the approved system commissioning and any additional system commissioning deemed necessary by the Contract Supervisor.

All system commissioning must be scheduled to be completed one (1) week prior to practical completion.

J 11.2 System Commissioning

All system commissioning procedures, checking and adjustments must be carried out to demonstrate to the satisfaction of the Contract Supervisor that the system as installed complies with the specification.

System commissioning must be by exhaustive testing on a 'point by point' basis for each system function. Each point test may be witnessed by the Contract Supervisor (or nominee) and checked off on a commissioning sheet, prepared by the nominated security contractor. The commissioning sheet must include such information as successful operation, response times, resulting computer messages, etc.

Each possible system event must be simulated and test must include a –full load test in which all alarms are simulated at once and simultaneously all card readers are utilised both with authorised or unauthorised cards.

Should any test fail, cause of failure must be determined and corrected and the test must be repeated.

J 11.3 Training

The contract must include the provision of operator and technical training and instruction in the correct use, maintenance and operation of all equipment supplied and reconfigured under the contract as set out in the Operations and Maintenance Manual Specification. Responsibility for provision of all instruction and full support resources, including course outlines, training materials and instruction notes must form part of these works, as shall the provision of all necessary test equipment and incidental materials necessary to conduct the training and any other item or activity required to properly train the end-users' personnel.

The nominated security contractor is to allow a period of two (2) hours to complete the necessary training. If additional training time is required by the Contract Supervisor, direct negotiation on costs are to be between the nominated security contractor and the Contract Supervisor.

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UNISA TECHNICAL STANDARDS

K

AUDIO VISUAL TECHNOLOGY

	SECTION	
	A	Introduction
	B	Safety in Design
	C	Design Controls
	D	HVAC/Mechanical
	E	Electrical and Lighting
	F	Fire Protection and Detection Services
	G	Plumbing
	H	Building Management System
	I	Transportation Systems
	J	Security Systems
x	K	Audio Visual Technology
	L	Communications Infrastructure
	M	Architectural

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Contents

K 1 General Requirements

K 1.1 Introduction

It is expected that this section is read in conjunction with all other sections of the UniSA Technical Standards, in order to achieve a fully comprehensive understanding of the University requirements.

All works undertaken at the University must comply with the requirements of NATSPEC specifications and the designers must use this, plus the University specific modified clauses as a basis for their specifications.

The designer shall amplify the NATSPEC requirement where necessary to meet specific project requirements or to provide increased levels of quality and/or performance with approval from the Contracts Supervisor.

The designer may use their own specification, but only with written approval from the University. Where alternative specification is used, it must ensure that the specified standards, quality and outcomes are equivalent to or greater than those specified through NATSPEC. NATSPEC supplementary clauses specified in this document are to be inserted into the designer's specifications.

The designer must not reduce the requirements of NATSPEC and/or the UniSA Technical Standards clauses without written approval from the Contracts Supervisor.

On smaller projects where the scope of work does not justify a full NATSPEC specification the designer may propose a "notes on drawing" type of specification, as long as the pertinent elements of the NATSPEC and supplementary the University clauses are included, with the Contract Supervisors approval.

K 2 Audio-Visual Standards & Specifications

K 2.1 Reference document

The Information Strategy and Technology Services (ISTS) unit of the University have published a separate document to ensure that audio-visual facilities within the University are designed and constructed to a consistent standard.

This document is available online at the following hyperlink

https://i.unisa.edu.au/siteassets/askit/audio-visual/unisa-avspec.pdf

University of South Australia

UNISA TECHNICAL STANDARDS

L

COMMUNICATIONS INFRASTRUCTURE

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L 1 General Requirements

L 1.1 Introduction

It is expected that this section is read in conjunction with all other sections of the UniSA Technical Standards, in order to achieve a fully comprehensive understanding of the University requirements.

All works undertaken at the University must comply with the requirements of NATSPEC specifications and the designers must use this, plus the University specific modified clauses as a basis for their specifications.

The designer shall amplify the NATSPEC requirement where necessary to meet specific project requirements or to provide increased levels of quality and/or performance with approval from the Contracts Supervisor.

The designer may use their own specification, but only with written approval from the University. Where alternative specification is used, it must ensure that the specified standards, quality and outcomes are equivalent to or greater than those specified through NATSPEC. NATSPEC supplementary clauses specified in this document are to be inserted into the designer's specifications.

The designer must not reduce the requirements of NATSPEC and/or the UniSA Technical Standards clauses without written approval from the Contracts Supervisor.

On smaller projects where the scope of work does not justify a full NATSPEC specification the designer may propose a "notes on drawing" type of specification, as long as the pertinent elements of the NATSPEC and supplementary the University clauses are included, with the Contract Supervisors approval.

L 2 Communications Standards & Specifications

L 2.1 Reference document

The Information Strategy and Technology Services (ISTS) unit of the University have published a separate document to ensure that communications facilities within the University are designed and constructed to a consistent standard.

This document is available online at the following hyperlink

https://i.unisa.edu.au/siteassets/askit/network/au-comms-standards.pdf

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UNISA TECHNICAL STANDARDS

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ARCHITECTURAL

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Paint specifications are to note that existing signage, barcodes and asst labelling must be masked off and protected during painting works.

M 2 External Walls & Windows

M 2.1 External Finishes

As-constructed finishes that minimise future maintenance shall be the designer's highest priority. Paint finishes to external walls may be acceptable but ease of maintenance, particularly ease of access, must be thoroughly considered and require approval by FMU Maintenance & Technical Services before paint to external walls may be used.

All materials shall be selected for their likely availability and colour consistency over a 15-year building period. All materials and finishes must be approved by Uni SA.

M 2.2 Avoidance of Façade Staining

Facade staining must be avoided by careful design and detailing to shed water clear of the building, clear of lower projections and clear of pathways. Parapet cappings must be designed to ensure facade staining is avoided.

M 2.3 Window Cleaning

All external surfaces of glass must be easily accessible for cleaning from pedestrian areas, by Elevating Work Platform or twin rope access. Details shall be submitted for approval to FM Maintenance & Technical Services.

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M 3 Internal Walls, Partitions & Finishes

M 3.1 Acoustics

Particular attention shall be paid to acoustics and noise transmission (refer Design Controls). Partitions requiring to be insulated shall only utilise 'Dacron' polyester fibre or natural wool batts of thickness and density, and/or double sheeted on one or both sides as necessary to achieve the sound transmission loss between spaces.

Details of intersections of partitions, including window and door openings, shall ensure sound insulation is maintained at that intersection equivalent to the remainder of the partition. Partitions may extend from floor slab to underside of slab above if necessary. All penetrations shall be appropriately sealed to maintain the required sound rating.

M 3.2 Fire Rating

Particular attention must be paid to fire-rated partitions to ensure that any penetrations comply with the manufacturer's recommendations for tested systems.

All cladding products and systems must meet fire safety requirements as specified under the Building Code of Australia. Additional risk mitigation measures shall be considered for any bushfire exposed buildings.

For any fire-rated construction materials such as for cladding or insulation, test certifications should be provided

M 3.3 Operable Walls

The use of operable walls is not favoured. Operable walls may only be used with the express approval of the Capital Projects Director.

Operable walls must be a proprietary system ('Hufcor' or equal approved) and have an acoustic rating equal to the other walls of the room.

Structural support of the tracking is to be overdesigned to prevent sagging, distortion and movement. Consideration is to be given to health and safety risks in the operation of the wall, including pinch points and manual handling.

M 3.4 Toilets

Toilet cubicle doors must have hold open spring hinges (doors to be in open position when cubicle not in use). Hinges must allow the ability to remove shut doors (cubicle occupied) in an emergency where an occupant becomes incapacitated.

Toilet roll holders, paper towel dispensers and soap dispensers are supplied and regularly serviced by a contractor. In women's toilets, provision must be made for sanitary disposal units in all cubicles. The freestanding units are supplied and regularly serviced by a contractor. A shelf must be provided in wash up areas on which to rest books or bags. Hooks and mirrors must also be provided.

M 3.5 Auto Doors

All auto doors must be designed, installed and maintained in accordance with AS5007. Maintenance provisions in accordance with the standard is the responsibility of the contractor during defects liability period.

Unless otherwise approved all auto doors shall have chain drive, not belt drive.

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M 4 Interior Finishes Guidelines

M 4.1 New Buildings

Proposals for new interior schemes are to be approved by the Contract Supervisor before final documentation. New finishes should be compatible with the standards that are already in place on each campus.

M 4.2 Refurbishment or Maintenance Projects

For small refurbishment projects, equivalent in size to two offices, interior finishes selections are to match existing. Where existing products are no longer available, proposed alternatives are to be approved by the Contract Supervisor.

For substantial refurbishment projects, these Interior Finishes Guidelines are to direct the development of a new interior finishes scheme.

M 4.3 Interior Selections

Carpet must be Stella Texas Grey installed monolithic or quarter turn (preferred), unless otherwise approved by the Contract Supervisor.

General interior paint must be Dulux White Swan, unless otherwise approved by the Contract Supervisor.

Long-term interior elements and finishes are to be timelessly classic in their selection. The integration of trend setting finishes is to be limited to finishes which will be upgraded within a 5-year lifespan. All materials, finishes and furniture selected are to be certified as suitable for Heavy Duty Commercial applications.

The choice of finishes and furniture and the detailing of interior schemes are to take into consideration cleanability and maintainability. Finishes that are difficult to clean and maintain, or that require a high level of maintenance are not to be selected. The placement of light fittings must take into consideration the practicality and WHS considerations for lamp replacement.

Highlight / feature / accent interior elements are to be limited to easily and cost effectively renewable and replaceable interior finishes and elements. For example, the selection of laminates with a limited fashionable currency / lifecycle is to be strictly avoided.

M 4.4 Readily Available Ranges

All interior selections are to be made from readily available standard ranges, irrespective of the flexibility that larger projects offer interior design selections. Other than in extenuating circumstances, UniSA will not accept the selection and specification of special runs or one-off items.

All interior selections will be from locally or nationally available ranges. Items with long lead times for supply are to not to be specified. Similarly, items with purchasing constraints such as minimum quantity orders are also to be avoided.

Exceptions to this clause will only be considered when a local alternative cannot be sourced and when accurate information on availability origin, lead-time and cost implications is submitted to the Contract Supervisor for consideration and direction. Exceptions to this clause are only to be specified following receipt of written approval from the Contract Supervisor.

Standard fabrics in general teaching areas so that chairs are easily recognised and replaced to the correct areas as well as to assist in transferring between campuses and matching in replacements.

M 4.5 Interior Finishes Proposals

Proposals for new interior finishes schemes are to be submitted for approval for all new construction projects. These are to include:

- Interior design concept proposal drawings.
- Samples of proposed materials, finishes and colours, with details of their lifecycle and maintainability assessment.
- Proposed interior finishes schemes are subject to approval by the Contract Supervisor.

M 4.6 Interior Finishes & Furniture Schedule

Within one month of the completion of the project, the final Interior Finishes & Furniture Schedules are to be submitted to the Contract Supervisor in hard copy and electronic version.

M 5 Doors and Window Hardware

M 5.1 Door Schedule

A door hardware schedule is a requirement for all UniSA Projects. Doors and doorways are to comply with AS 1428.1, clause 13. The door (complete lock and hardware) schedule with floor plans shall have all the information the contractors will require in selecting the correct door for a designated position, ensuring it meets UniSA's Operating requirements, as well as the correct hardware that must be fitted to each door.

Development of this schedule should commence in the latter stages of design development and involve meetings as required between the Principal Consultant, Services Engineer (Electronic Security), UniSA FMU Campus Facilities Manager or Nominee, and Project Manager. A final review should be undertaken between the 75% & 100% Technical Reference Group reviews.

The final UniSA room numbering system must be established before finalising the lock schedule and floor plans.

Information to be considered and provided on a door schedule:

- Door number -corresponding with the drawings
- UniSA Room Number
- Door to Room: Number
- Door to Room: Name
- Frame Description
- Frame Type
- Frame Finish External
- Frame Finish Internal
- Door Description
- Door Leaf Type
- Leaf Finish External
- Leaf Finish Internal
- Leaf Height
- Leaf Width
- Overall Height
- Overall Width
- Vision Panel

- Glazing
- Fire / Smoke Rating
- Acoustic Rating
- Door Protection
- Door Protection Size (Push Side)
- Door Protection Size (Pull Side)
- Grille
- Lock
- Door Furniture
- Strike
- Closer
- Hinges
- Seals
- Door Stop
- Coat Hook
- Threshold
- Signage
- Film
- FIP Interface
- Plus Entry
- Prox Entry
- Prox Exit
- Mag Lock
- Electric Strike
- Electric Mortice Lock
- REX Push Button Release
- EBG
- REED Switch
- AV (DOTL)
- Bi-Lock Key Code
- Number of Keys Required

See example below

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Example Door Schedule

Door and Window Schedule

Door Schedule	UniSA Room Number	To Room: Number	To Room: Name	Frame Description	Column5	Frame Finish External	Frame Finish Internal	Door Description	Door Leaf Type	Leaf Finish External	Leaf Finish Internal	Height	Leaf Width	Overall Height	Overall Width	Vision Panel	Glazing	Fire / Smoke Rating	Acoustic Rating	Door Protection	Door Protection Size (Pull	Door Protection Size (Pull	Door Protection Size (Pull	Grille	Grille Size	Lock	Door Furniture	Strike	Closer	Hinges	Seals	Door Stop	Coat Hook	Threshold	Signage	Film	FIP Interface	Prox Plus Entry	Prox Entry	Prox Exit	Mag Lock	Electric Strike	Electric Mortise Lock	REX Push Button Release	EBG	REED Switch	AV (DOTL)	Block Key Code	Number of Keys Required	Comment
																		-																													UniSA 'AJS'	New MKB63	
												note: heights & widths of doors are indicative only - refer to drawings																																			MKB.63	4	
DG-01-1			Main Entry	Aluminium Frame	DF-01	PC-01	PC-01	Fully Glazed Double Auto Door - narrow stile	DL-01	PC-01	PC-10	2380.00	1400.00	3020.0	1480.00		GL-01	-								11/13		1	3		5						Y							Y	Y	Y	Y	GGM2	0	auto door. REX push button release at Concierge desk as well To be programmed with longer dwell time than standard.
DG-01A-1		G-01A	Concierge	*no frame*				*Joinery - TF2*	*Joinery - T*	*PT-31*	*PT-31*	2360.00	860.00	2400.0	300.00			-		*N*						8	8/11	1																			B63.1	2	*Joinery Door*
DG-01B-1		G-01B	Waiting Area	*no frame*				*Joinery - TF2*	*Joinery - T*	*PT-31*	*PT-31*	2360.00	*760.00*	2400.0	300.00			-		*N*						8	8/11	1							Y															B63.1	0	*Joinery Door*
DG-01E-1		*G-01E*	*Lift Equipment*	*no frame*				*Joinery - TF2*	*Joinery - T*	*PT-31*	*PT-31*	*2360.00*	*860.00*	*2400.0*	*300.00*											*8*	*8/11*	*1*																					P.5	1	*Joinery Door*
DG-05-1		G-05	Access WC	Aluminium Frame	DF-02	PC-10	PC-10	Solid Core Door	DL-12	PT-08	PT-08	2360.00	860.00	2400.0	1000.00			-		Y	300	300				1/4/5	4	1	1	1	Y	Y		Y													P.1	0	
DG-06-1		G-06	Female Ambulant WC	Aluminium Frame	DF-02	PC-10	PC-10	Solid Core Door	DL-12	PT-08	PT-08	2360.00	860.00	2400.0	300.00			-		Y	300	300				1/4/5	4	1	1	1	Y	Y		Y													P.1	0	
DG-07-1		G-07	Male Ambulant WC	Aluminium Frame	DF-02	PC-10	PC-10	Solid Core Door	DL-12	PT-08	PT-08	2360.00	860.00	2400.0	300.00			-		Y	300	300				1/4/5	4	1	1	1	Y	Y		Y													P.1	0	
DG-08-1		G-08	Bin / Cleaner's Store	Aluminium Frame	DF-02	PC-10	PC-10	Solid Core Door	DL-12	PT-08	PT-08	2360.00	860.00	2400.0	300.00			-		Y	300	300				1/4	4	1	6	1	Y																A2.11	2	
DG-09-1		G-09	Comms	Aluminium Frame	DF-02	PC-10	PC-10	Solid Core Door	DL-12	PT-08	PT-08	2360.00	860.00	2400.0	300.00			-		Y	300	300				1/4	4	1	1	1	Y							Y			Y			Y	Y	GGM2	0	
DG-10A-1		G-10A	Teaching	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Double Door	DL-02	PC-10	PC-10	2660.00	1800.00	2700.0	1920.00		GL-10	-	Rw45							1/4/6	1	1	4	1	Y							Y		Y		Y	Y	Y	Y	GGM2	0	EMHO closer connected to security
DG-10A-2		G-10A	Teaching	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Double Door	DL-02	PC-10	PC-10	2660.00	1800.00	2700.0	1920.00		GL-10	-	Rw45							1/4/6	1	1	4	1	Y							Y		Y		Y	Y	Y	Y	GGM2	0	EMHO closer connected to security
DG-10B-1		G-10B	Events	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Double Door	DL-02	PC-10	PC-10	2660.00	1800.00	2700.0	1920.00		GL-10	-	Rw45							1/4/6	1	1	4	1	Y							Y		Y		Y	Y	Y	Y	GGM2	0	EMHO closer connected to security
DG-10B-2		G-17	Co-working	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Sliding Quadruple Door	DL-03	PC-10	PC-10	2660.00	6000.00	2700.0	6080.00		GL-10	-	Rw45							4/3	1	1		4														Y		-	-	multi-panel bi-parting manual sliding.
DG-10B-3				Aluminium Frame	OW-01	PC-10	PC-10	Operable Partition	OW-01					2700	8380.00			-								P	P	-	-	1	4														-	-	Acoustic operable wall
DG-10C-1		G-10C	Storage	Aluminium Frame	DF-02	PC-10	PC-10	Solid Core Double Cot & Kitten Door	DL-12	PT-08	PT-08	2360.00	320/500	2400.0	1500.00			-		Y	300	300				10/4/6	4	1	-	4		Y						Y				Y			Y		GGM2	0	
DG-11-1		G-11	Quiet Room 01	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Single Door	DL-02	PC-10	PC-10	2360.00	360.00	2400.0	1000.00		GL-10	-	Rw45							-	4	1	-	1	4	Y															-	-	
DG-12-1		G-12	Quiet Room 02	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Single Door	DL-02	PC-10	PC-10	2360.00	360.00	2400.0	1000.00		GL-10	-	Rw45							-	4	1	-	1	4	Y															-	-	
DG-13-1		G-13	Meeting 01	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Single Door	DL-02	PC-10	PC-10	2360.00	360.00	2400.0	1000.00		GL-10	-	Rw50							1/4	4	2	1	1	4	Y							Y			Y			Y	Y	GGM2	0	
DG-15A-1		G-15A	ICC Suite 01	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Single Door	DL-02	PC-10	PC-10	2360.00	360.00	2400.0	1000.00		GL-10	-	Rw45							1/4	4	2	1	1	4	Y							Y			Y			Y	Y	GGM2	0	
DG-15B-1		G-15B	ICC Suite 02	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Single Door	DL-02	PC-10	PC-10	2360.00	360.00	2400.0	1000.00		GL-10	-	Rw45							1/4	4	2	1	1	4	Y							Y			Y			Y	Y	GGM2	0	
DG-17-1		G-17	Co-working	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Double Door	DL-02	PC-10	PC-10	2360.00	1660.00	2400.0	1780.00		GL-10									1/4/6	1	1	-	1								Y		Y		Y	Y	Y	Y	GGM2	0	EMHO closer connected to security
DG-19-1		G-19	Retreat	Aluminium Frame	DF-02	PC-10	PC-10	Solid Core Door	DL-12	PT-08	PT-08	2360.00	860.00	2400.0	300.00			-		Y	300	300				1/4	4	2	1	1	Y																B63.3	0	door to lock when closed; only openable with key
DG-21-1		G-21	Quiet Room 03	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Single Door	DL-02	PC-10	PC-10	2360.00	360.00	2400.0	1000.00		GL-10		Rw45							-	4	1	-	1	4	Y															-	-	
DG-35-1		EX-02	External Fire Booster	Timber Frame	DF-16	refer spec	refer spec	Timber External Doors	DL-16	refer spec	refer spec			2800.0	2800.00											6/8	8	1	-	2														Y		-	-	Rebated meeting stiles. Review door operation with SAMFS
DG-55-1		G-55	Northern Stair	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Double Door	DL-02	PC-10	PC-10	2660.00	1800.00	2700.0	1920.00		GL-10									1/4/6	1	1	1	1	Y						Y	Y	Y		Y		Y	Y	Y	GGM2	0	
DG-55-2		EX-04	External Rear Lane	Steel frame	DF-11	PT-09	PT-09	Solid Core External Door	DL-11	PT-13	PT-13	2360	1858.00	2400.0	1978.00											1/4/6	4	1	1/6	2	1	Y					Y		Y	Y				Y	Y	Y	GGM2	0	
DG-53-1		EX-03	External Existing Basemer	Timber Frame	DF-16	refer spec	refer spec	Timber External Doors	DL-16	refer spec	refer spec			2800.0	2800.00											1/4/6	1	1	1	2	1						Y		Y	Y				Y	Y	Y	GGM2	0	WL-01 to fanlight above door - refer dwg 20238-A4-12
DG-60-1			Existing Lift	Existing	EX	EX	EX	Existing	EX	EX	EX																											Y								-		new prox to existing lift car
																		-																														
D1-01-1		1-01	Boardroom	Aluminium Frame	DF-03	PC-10	PC-10	Fully Glazed Single Door	DL-02	PC-10	PC-10	2360.00	360.00	2400.0	1000.00		GL-10	-	Rw50							1/4	4	2	1	1	4	Y							Y			Y			Y	Y	GGM2	0	
D1-01-2		1-01	Boardroom	Aluminium Frame	DF-03	PC-10	PC-10	Fully Glazed Single Door	DL-02	PC-10	PC-10	2360.00	360.00	2400.0	1000.00		GL-10	-	Rw50							1/4	4	2	1	1	4	Y							Y			Y			Y	Y	GGM2	0	
D1-03-1		1-03	Meeting 01	Aluminium Frame	DF-03	PC-10	PC-10	Fully Glazed Single Door	DL-02	PC-10	PC-10	2360.00	360.00	2400.0	1000.00		GL-10	-	Rw50							1/4	4	2	1	1	4	Y							Y			Y			Y	Y	GGM2	0	
D1-05-1		1-05	Access WC	Aluminium Frame	DF-02	PC-10	PC-10	Solid Core Door	DL-12	PT-08	PT-08	2360.00	860.00	2400.0	1000.00			-		Y	300	300				1/4/5	4	1	1	1	Y	Y		Y													P.1	0	
D1-06-1		1-06	Female WCs	Aluminium Frame	DF-02	PC-10	PC-10	Solid Core Door	DL-12	PT-08	PT-08	2360.00	860.00	2400.0	1000.00			-		Y	300	300				1/4/5	4	1	1	1	Y			Y													P.1	0	
D1-07-1		1-07	Male WCs	Aluminium Frame	DF-02	PC-10	PC-10	Solid Core Door	DL-12	PT-08	PT-08	2360.00	860.00	2400.0	1000.00			-		Y	300	300				1/4/5	4	1	1	1	Y			Y													P.1	0	
D1-10-1		1-10	Workshop	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Single Door	DL-02	PC-10	PC-10	2360.00	360.00	2400.0	1000.00		GL-10	-	Rw45							1/4	4	2	1	1	4	Y							Y			Y			Y	Y	GGM2	0	
D1-15-1		1-15	Workspace 1320	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Double Door	DL-02	PC-10	PC-10	2360.00	1400.00	2400.0	1520.00		GL-10	-								6/8	8/11	1		1					Y													-	
D1-15-2		1-15	Workspace 1320	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Double Door	DL-02	PC-10	PC-10	2360.00	1400.00	2400.0	1520.00		GL-10	-								6/8	8/11	1		1					Y													-	
D1-15A-1		1-15A	Meeting 04	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Single Door	DL-02	PC-10	PC-10	2660.00	360.00	2700.0	1000.00		GL-10	-	Rw45							1/4	4	1		1	4	Y															B63.4	2	
D1-15C-1		1-15C	Meeting 03	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Single Door	DL-02	PC-10	PC-10	2660.00	360.00	2700.0	1000.00		GL-10	-	Rw45							1/4	4	1		1	4	Y															B63.5	2	
D1-20-1		1-20	Workspace 1312	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Single Door	DL-02	PC-10	PC-10	2360.00	360.00	2400.0	1000.00		GL-10	-								1/4	4	2	1	1		Y							Y			Y			Y	Y	GGM2	0	
D1-20-2		1-20	Workspace 1312	Aluminium Frame	DF-02	PC-10	PC-10	Solid Core Door	DL-12	PT-08	PT-08	2360.00	1400.00	2400.0	1520.00			-								6/8	8/11	1		1					Y													-	
D1-20.3		1-20	Workspace 1312	Aluminium Frame	DF-02	PC-10	PC-10	Solid Core Door	DL-12	PT-08	PT-08	2360.00	1400.00	2400.0	1520.00			-								6/8	8/11	1		1					Y													-	
D1-20A-1		1-20A	Meet Room 02	Aluminium Frame	DF-02	PC-10	PC-10	Fully Glazed Single Door	DL-02	PC-10	PC-10	2360.00	360.00	2400.0	1000.00		GL-10	-	Rw45							1/4	4	1		1	4	Y															B63.6	2	
D1-30-1		1-30	Cleaner	Aluminium Frame	DF-02	PC-10	PC-10	Solid Core Door	DL-12	PT-08	PT-08	2360.00	360.00	2400.0	1000.00			-		Y	300	300				1/4	4	1	6	1	Y			Y													A2.11	
D1-40-1		1-40	Corridor 01	Aluminium Frame	DF-03	PC-10	PC-10	Fully Glazed Double Door	DL-02	PC-10	PC-10	2360.00	1800.00	2400.0	1920.00		GL-10	-								1/4/6	1	1	1	1	Y							Y		Y		Y	Y	Y	Y	GGM2	0	
D1-41-1		1-41	Amenities Corridor	Aluminium Frame	DF-02	PC-10	PC-10	Solid Core Door	DL-12	PT-08	PT-08	2360.00	360.00	2400.0	1000.00			-		Y	300	300					6	1	1	1	Y			Y													-	
D1-60-1			Existing Lift	Existing	EX	EX	EX	Existing	EX	EX	EX																																			-	
D2-58-1		R-01	External Roof	Steel frame	DF-12	PT-09	PT-09	Solid Core External Fire Door	DL-13	PT-13	PT-13	2000.00	860.00	2008.8	837.72			-									4	2	1	1	1	Y		Y					Y	Y	Y		Y		Y	Y	Y	GGM2	0	

M 5.2 Master Keying

UniSA's Bi-Lock Master key systems are Security Construction and Equipment Committee (SCEC), rated lock systems. In addition, UniSA, has an agreement with ARA Locksmiths as its Authorised Contractual Locksmiths. This agreement ensures that the authorised locksmiths comply with the manufacturer's requirements (Australian Lock Company) of the high-security locks/products. If a locksmith fails to adhere to the agreement, the locksmith may breach the contract and, therefore, may lose the right to use and sell the locks/product.

UniSA's Master key systems are controlled under high-security practices where keys are supplied strictly on authorised signatures. The Campus Facilities Managers are registered authorised signatories with UniSA's Master Locksmith, ARA Locksmiths, who hold the UniSA Bi-Lock unique (108 Series).

All master keyed locks, cylinders and keys must be supplied through the University of South Australia's nominated locksmith, ARA Locksmiths.

UniSA's FMU Campus Operations Group will assign key codes to each lock based on the master key hierarchy. The Master keying system allows distinct levels of access whilst reducing the risks involved with issuing a large number of keys for each campus.

UniSA will determine the number of individual keys to be issued in consultation with the building occupants, and in accordance with the University's procedure on Key Issue and Control, before issue.

Bi-Lock Quick Change Core Construction cylinders shall be used during the construction of new buildings/fit-outs.
At Practical Completion, the QCC construction cylinders will be removed and replaced by the FINAL Bi-Lock system cylinder.

System Codes:

CEA - ANH

CWE - AJS

MAG - CHE

MLK - CFD
MTG - EAA

WHY - EAB

ARA Locksmiths provide updates directly to the UniSA, WHS PROMASTER 8 MASTER KEYING SOFTWARE PM8.

All door cylinders are to be Bi-Lock QCC 570 MK Oval Cylinder With the appropriate Cam to suit door function unless otherwise approved by UniSA FMU Campus Operations.

M 5.3 Hardware schedule

Lockwood (Assa Abloy) Selector® 3770 MkII Series Cylinder Mortice Locks shall be used in most instances as the standard door hardware; satin chrome will be the finish and installed at 1000mm above-finished floor level.

No locks are to be installed in the bottom rail of doors without approval.

Electric hardware shall be Lockwood PADDE ES9000 Pre-Load Electric Strikes or 3579 Electric Mortice Locks SCEC approved. Hardware shall be supplied by the Electronic Security Contractor with all necessary cut-ins to be provided by the main contractor.

Amended (updated) door hardware schedules should be submitted at key milestones. These should be prepared by the door hardware supplier and show highlighted changes to the contract door hardware schedule.

They should include:

- UniSA approval of hardware samples.
- UniSA acceptance of an equivalent item to a specified item.
- Contract variation to a door hardware requirement

M 5.4 Lock Application for Identified Door Types

All doors shall have mechanical locks/latches installed.

All options below must be keyed to the University's master key system.
Locks and lock furniture shall be LOCKWOOD Brand unless otherwise approved.
The furniture finish shall be Satin Chrome Plated unless otherwise approved.

Example Applications	**Type\Operation**
Office Meeting Rooms Breakout Rooms Electric Strike / Free Egress Doors	3772V Anti-vandal Escape Lock Single cylinder. **Outside**: *Opened by the handle when unlocked. Key locks and unlocks outside handle and retracts bolt after unlocking lock.* **Inside**: *Opened by handles at all times*
Electric Strike Controlled Doors (Electronically controlled without Free Handle Egress)	3774V Anti-vandal Lock Single cylinder. **Outside***: Opened by the handle when unlocked. Key locks or unlocks both handles and retracts bolt after unlocking lock.* **Inside**: *Opened by the handle when unlocked. Key locks or unlocks both handles and retracts bolt after unlocking lock.*
Mag Lock Controlled Doors Lab Doors Cat & Kitten	3772V-H Holdback Anti-vandal Escape Lock# Single cylinder. **Outside**: *Opened by the handle when unlocked. Key locks or unlocks outside handle and retracts bolt after unlocking lock.* **Inside**: *Opened by handle at all times.*
Ground Floor Fire Exits (Electronically controlled without Free Handle Egress)	35791 Escape Deadbolt Single Cylinder and Escape Lever. **Outside**: *Locked or unlocked by key.*

Risers, Ducts, Confined Space Toilet Maintenance lock	**Inside**: *Unlocked only by escape turn. Inside turn will not lock door.*
Plant Room Store Room	3772X Key Entry Escape Lock Single cylinder. (Cam X7) **Outside**: *Opened by key at all times. Handle always rigid.* **Inside**: *Opened by handle at all times. This function requires* the *locking bar to be positioned in the locked position once lock is set.*
Risers, Ducts, Confined Space (Non-Occupiable)	3770 Nightlatch Single cylinder. **Outside**: *Opened by key.* *This function requires the locking bar to be positioned in the locked position once lock is set.*
Non-Locking Door	3774 Passage Latch **Outside**: *Opened by handles at all times* **Inside**: *Opened by handles at all times*
Multi-Access Suite rooms Change Rooms	3772-TA Anti-lockout Escape Privacy Lock Emergency button and turnknob. **Outside**: *Opened by handle when unlocked. Emergency button locks or unlocks outside handle - operated by screwdriver or coin.* **Inside**: *Opened by handle at all times. Turnknob locks or unlocks outside handle*
Shared Sub Station Access & Specified Areas	3777 Dual Entry Lock
Short Backset (Aluminium Doors)	Depending on function 3782 / 3784 / 3787
Distribution Boards	Flush swing handles with Euro Lock or Carbine Carbine C4 T and L Handles.
Joinery	Carbine Cupboard locks for all joinery identified as requiring to be master keyed.
Electric Key Switch	Lock It Well "Auto Series". Or Keyswitch capable of standard 570 Cylinder
Control boxes/Ceiling hatches	BiLock FA32199QCP Camlock 1 1/8" 90' Key Retain, where control boxes, hydraulic, backflow and or ceiling hatches are identified as master keyed.
Auto Doors	All auto doors must have mechanical locking in case of extended power failure. Lock to be only engaged by Campus GGMK externally and able to disengage internally without a key. On frameless glass pivoting or sliding doors use Custom Patch Lock Lockwood

M 5.5 Electronic Lockers

Interloc IL200 locks shall be used on all staff and student common access lockers.

M 5.6 Door Closers

Provide surface-mounted door closers to residential bedrooms, entrance doors, external doors, lecture theatre doors and doors to all teaching spaces, internal offices, toilets, airlocks, fire doors,

and plant rooms. Door closers must be installed on all electronic security-controlled doors and the perimeters of all air-conditioned spaces.

Only door closers from the DormaKaba TS93 Cam Action Closer System should be specified and installed without prior approval from UniSA Campus Operations Group.

When mounting door closers in conjunction with acoustic seals, suitable mounting packers should be provided to keep the arm of the door closer clear of the seal. Screws should not penetrate glazing beads on acoustic seals.

If Hold Open operation is required on doors with electronic security systems, the doors should release when the door is in secure mode. The specified door closer for this purpose is the DORMA EMF SERIES—HOLD OPEN DOOR CLOSER, which must be integrated into the electronic Security System.

Adjustments and Compliance:

Before Practical Completion and when mechanical systems are fully operational and balanced, door closers should be adjusted. The spring strength should be adjusted to the lowest optimal setting for satisfactory closing action.

The project specification should include a requirement that all doors be adjusted to meet DDA (Disability Discrimination Act) force limit requirements before practical completion.

M 5.7 Electro Magnetic Hold-Open Devices

Electromagnetic hold-open devices as required shall be DORMA type, be provided to all fire doors in high traffic areas which the Building Fire Alarm System shall activate and if not, a component of the door closer mounted at 1800mm above-finished floor level near the leading edge of the door. Selectors must be fitted to door pairs with electromagnetic hold-open devices.

M 5.8 Kick Plates

Kick plates are required in the following locations: toilet doors, teaching spaces, circulation spaces and stairs (where no hold-open provision is provided) and plant rooms. Kick plates shall be 150mm high x nominal full door width, 0.9mm thick 304 No 4 satin stainless steel, glued and screw fixed with stainless steel raised head screws to both sides of each door. Where timber doors are subject to excessive damage from trolleys or similar impacts and to doors to sanitary compartments for people with disabilities, the stainless-steel kick plates shall extend to a height of 600mm above the floor level. Verify the requirement for door protection concerning trolleys with UniSA.

Ensure that kickplates and fixings are manufactured and installed to provide smooth surfaces and edges with no sharp edges or protrusions.

M 5.9 Door Stops

To any door where the door may strike a wall, provide an aluminum and rubber door stop, floor (LOCKWOOD A250SC) /or wall (LOCKWOOD A350SC) mounted, in a position that will allow full access to clear of door furniture.

M 5.10 Acoustic and Smoke Seals

Provide RAVEN door seals, selected to suit the application. Where acoustic seals are required to the bottom edge of a door leaf, the seal shall be surface mounted type and not rebated into the face of the door, and threshold fitted across the opening.

M 5.11 Push Plates and Pull Handles (Toilets and Airlocks)

Provide on 1.6mm satin stainless steel push plate (300mm w x 500mm h) fixed with countersunk stainless-steel screws. To pull side, fit EFCO 136 SCP 200mm "D" handle mounted 100mm above the lowest edge of the plate. Mount plate to the opening edge of the door with lowest edge 900mm AFFL. Provide engraved "PULL" to push plates with pull handles.

M 5.12 Striker Plates

Deadlatch striker plates are to be used for mortice dead latches. Correct hanging of the doors is critical for the proper functioning of the lock. All striker plates are to be installed in accordance with the manufacturer's instructions. Welded striker plates are not acceptable. Verify after installation that the required dead latching functionality is met.

M 5.13 Strike Shield (Blocker) Plates

External building perimeter fire exit doors and external building perimeter plant room doors to be fitted with BOYD SS092 or equivalent brushed stainless steel, concealed fix blocker plates covering access to lock tongue and striker plate.

M 5.14 General Guidance

- For refurbishment projects, the existing door hardware and cylinders remain the property of the University of South Australia and, before demolition, must be removed and delivered to the Security office.
- For refreshment projects, furniture and hardware selection shall ensure a consistent approach to all door locks and hardware selection and eliminate the use of non–approved items.
- All automatic door controls, control locks to lifts and roller grilles shall be as per the University's Master Key System.
- Correct strike plates and strike boxes shall be specified for all frames.
- All door furniture shall be specified to have sealed finishes that will not corrode or tarnish.
- For all double doors, the inactive leaf is to be specified to be fitted with top and bottom flush bolts to the leading edge. In addition, where doors exceed 2100mm, (H) extended flush bolts are to be specified.
- All fixing and locking hardware for industrial doors are to be specified to be fitted to the inside of the door, where practicable.
- Where the building entry/exit doors, plant room doors, fire escape doors and other selected internal and external doors are to be provided with electric door strikes., metal mortar guard protection boxes are to be supplied as a component of the door frames. These shall have pre-drilled crop outs provided for future strike plates as part of the manufactured door frames, compatible with receiving the electronic door latch.

Similarly, the doors are pre-prepared to receive the non-strike component of the door hardware.

- Dependent upon the final locking configuration and the hardware selected for access control, there may be a requirement for a cylinder and mortice deadlock for separate physical locking and additional hardware if required for an electronic access control system.

M 6 Equipment

M 6.1 Defibrillators

Automated External Defibrillator (AED) shall be provided in accordance with the requirements of The Automated External Defibrillators (Public Access) Act 2022. As a minimum, one Automated External Defibrillator (AED) shall be installed for every 1,200 square meters of publicly accessible floor area in each building or facility. Publicly accessible spaces are those which sit outside the secure line of each University building. Additionally, all teaching, meeting, and event spaces used for facilities hire or used for corporate events are considered publicly accessible spaces.

Where provided, Automated External Defibrillators (AED) shall be a Defibtech Lifeline View AED with an LCD screen (model DCF-E2310-EN). AEDs will be mounted in a Defibtech AED Wall Cabinets with an alarm (DAC-220). The cabinets shall be installed in compliance with DDA requirements. Appropriate signage shall be provided for each installation. Additionally, each defibrillator wall cabinet shall be connected to a Gallagher system input with reed switches installed on the door. No power or data connection is required.

M7 Labelling

Identification labels must be provided to indicate the point of access to in-ceiling or hidden services requiring maintenance or adjustment, e.g. at access panels, ceiling tiles, etc.

The labels must be 10mm round, traffolyte type labels, and colour coded to match the type of hidden service as follow:

Table 5 – List of Labels

Label Colour	Type
Blue	Mechanical
Black	Untreated Waste / Sewage
Green	Cold water/hot water/recycled water/drinking water
Yellow	Gasses
Red	Fire
Orange	Electrical Power

White	Electrical Communications

Labels are to be installed as follows:

- In T-Bar Ceilings install centrally on the t-bar frame. An arrow pointing to the tile to be used for access is to be engraved on the marker (refer diagram below, NTS)

- In solid ceilings install in the corner of the access panel

All load bearing or supporting systems e.g. gantries, lighting rigs, cranes etc. shall be clearly marked with the Safe Working Load (SWL) and Maximum Rated Capacity (MRC) as per the Structural Engineer's recommendations.