THE GUIDELINES PROVIDE DIRECTION AND GUIDANCE TO ENABLE CONSULTANTS TO MORE EFFECTIVELY TRANSLATE UNISA'S REQUIREMENTS INTO ACCEPTABLE DESIGN SOLUTIONS.

The model shall be drawn at a scale of 1 unit = 1 mm, that is, real world full scale, in the model space. All information pertaining to the model, including annotation, dimensions, block symbols, annotated blocks, etc., shall reside in model space.
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1 Introduction

1.1 From the Director

This Design and Construction Guidelines manual has been developed by the Facilities Management Unit, in conjunction with Information Strategy and Technology Services, 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 guidelines provide direction and guidance to enable consultants to more effectively translate UniSA’s requirements into acceptable design solutions. They should be read in conjunction with the Project Brief and any project specific design requirements provided by the Contract Supervisor.

The guidelines are not intended to replace the level of initiative, competence and care expected of consultants. Consultants are encouraged to carefully consider the merits of the Design and Construction Guidelines in the context of the needs of individual projects. If a consultant considers a particular guideline is not appropriate, or that a more suitable solution is available, proposals to this effect should be raised for consideration by UniSA.

In the absence of written approval for deviation from these guidelines, UniSA will assume that the requirements contained in the Design & Construction Guidelines have been fully addressed and incorporated in the proposed design solution and documentation.

Feedback by users is encouraged as it provides a tool for continuous improvement. Your contribution to future editions, whether brought about by technology, industry acceptance and practice or common sense is requested.

Any queries in regard to these guidelines or UniSA requirements on any project should be directed to the Contract Supervisor.

Philip Clatworthy
Director: Facilities Management
1.2 Design and Construction Guidelines

1.2.1 Purpose
The Design and Construction Guidelines set out UniSA’s minimum standard requirements for the design and construction of its facilities. The manual provides guidance to planners, designers, consultants and staff in the selection of finishes, materials and components which are to be adhered to in all site and building works for UniSA, large or small.

1.2.2 Development
The Design & Construction Guidelines were developed by the Facilities Management Unit in conjunction with Information Strategy and Technology Services and other key stakeholders in order to provide clear and concise direction for the planning, design and construction of new and upgraded facilities. Associated specifications have been developed with the following principles:

All new facilities shall complement the existing buildings. They are to be sympathetic with, and contribute to, the building of the UniSA’s corporate image and market position.

Australian and International Standards will be used as a minimum design and construction standard.

1.2.3 Use of the Guidelines

Structure of the Guidelines
The Design & Construction Guidelines are broken up into five Sections that provide the following information:

Section A—Introduction
Section B—Project Management
Section C—Planning and Design Guidelines
Section D—Special Facilities
Section E—Construction Guidelines.

The Design & Construction Guidelines shall be read in conjunction with the Project Brief and any project specific design requirements provided by UniSA. These guidelines provide a minimum standard for design, construction and maintenance of facilities and shall not be used as substitute for comprehensive specifications and/or for inclusion in tender or construction documentation. The guidelines are not distributed to contractors and should not be referred to or included in contract documentation issued to contractors.
Whilst design innovation is encouraged, and new materials and products will always be considered, any variations from the minimum design standards must be approved by UniSA through the Contract Supervisor.

**UniSA Standards and Reference Documents**

The Contract Supervisor will provide details of UniSA standards and reference documents to be complied with or adhered to at the appropriate stages of the project including the following documents as may be required:

- Relevant UniSA Policies, Procedures & Guidelines, including the UniSA OH&S & W and IM Policy, Equal Opportunity Policy
- Asbestos Management Plan
- UniSA Signage Manual
- UniSA Contractor’s on-line Induction System
- TEFMA Space Planning Guidelines
- Facilities Management Unit Asset Management Plans
- Facilities Management Unit Risk Management Plans
- *UniSA procurement Policy*
- Facilities Management Unit Probity Plan
- Relevant UniSA campus master plans, landscape master plans, building master plans, and space and tenancy master plans.

**Other Reference Documents**

The Consultant Team shall source other relevant documents during the project, including the following:

- South Australian OHS&W 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.

**Distribution Register**

A distribution register shall be maintained by the Facilities Management Unit for all stakeholders who receive a copy of the Design & Construction Guidelines. The guidelines are a ‘quality document’ and as such shall be evaluated and updated at regular intervals to suit the needs of UniSA and its internal and external stakeholders. A formal auditing process shall also form part of the quality process.

Comments and suggestions on improvements to the guidelines are encouraged and should be directed to the Business and Administration Coordinator, Facilities Management Unit. Advice of changes to the document will be circulated to those who hold a controlled copy.
2 Project Management

2.1 University Organisation

2.1.1 About the University of South Australia (UniSA)

UniSA was founded on 1 January 1991 through the amalgamation of the South Australian Institute of Technology and the Magill, Salisbury and Underdale campuses of the South Australian College of Advanced Education. Since then, it has quickly earned a reputation as a national leader in collaborative research, has been recognised nationally for innovation in teaching and has South Australia's largest intake of international students. UniSA is an innovative and successful institution with a distinctive profile. Together we:

- value quality, diversity, sustainability and equality
- create, apply, and communicate knowledge which delivers economic and social benefits through action that is:
  - intelligent in its use of new and emerging technologies
  - innovative, collaborative and enterprising
  - flexible, international and industry focussed
  - student centred, service oriented and multi disciplinary
  - built upon our strengths.

UniSA is committed to educating professionals; creating and applying knowledge; engaging with its communities; maintaining cultural diversity amongst its staff and students; and providing equitable access to education for greater numbers of people. In this way, UniSA continues to build on the long-standing traditions of its antecedent institutions.

2.1.2 About the Facilities Management Unit

The Facilities Management Unit, an administrative unit within UniSA, is charged with the responsibility to deliver all Major, Minor, Maintenance and Building Infrastructure Projects. The Facilities Management Unit was formed in January 2007 as a result of the merger of two major Administrative Units – Services and Property. With this merger, the Facilities Management Unit (FMU) became one of the largest Administrative Units in the University. The FMU comprises 5 functional groups (see links to websites):

- Capital Development Group (CDG)
- Maintenance Operations Group (MOG)
- Campus Operations Group (COG)
2.1.3 About Information Strategy and Technology Services (ISTS)

Role in service provision

Technology Management Services:
- management of core information technology services such as data networks, telephone systems, e-mail, and access to the internet
- computing access points for students in the form of computer pools, barns and walkups
- a range of "help" services to assist students and staff to make best use of the University's IT environment
- policies, procedures and guidelines for the use of information technology within the university
- development and implementation of appropriate information systems security and disaster recovery plans

Management Information Services
- provision of timely and relevant information to support management decision making and to meet statutory requirements
- technical management of the computer systems which facilitate the University's core administrative processes, including the student information system, the human resource system and the finance system.

2.2 Project Personnel

2.2.1 The Principal

The Principal (or Proprietor/Client) is the University of South Australia (UniSA).

2.2.2 UniSA Management Structure

Committee Structure
The University Council is the principal governing body assigned in Part 3 (Division 1) of the University of South Australia Act and is responsible for:
- overseeing the management and development of the University
Design and Construction Guidelines

- approving strategic plans and major policies, devising or approving statues and by-laws for the University
- monitoring and reviewing the operation of the University
- appointing and overseeing the performance of the Chief Executive Officer, the Vice Chancellor.

Finance Committee
The Finance Committee has responsibility for the provision, to University Council, of expert advice on both the University’s financial performance in the current year and the financial implications of any future plans.

Contract and Tender Panel
A Contract and Tender Panel is convened by Director: Facilities Management or Director: ISTS for all tenders where the tender value is $100,000 or over.

The Senior Management/Capital Management Group
The Senior Management/Capital Management Group reports to University Council via Finance Committee

Finance Committee
Finance Committee and retains a role for overview and decision making for all capital and maintenance programs including all management and approvals for major capital projects, including phase signoffs and matters pertaining to timing, cost and design. The Finance Committee acts as the Contract and Tender Panel for all major contracts >$5mil in value.

Campus Management Group
Each campus has a Campus Management Group, which reports to Senior Management Group and is responsible for facilitating the implementation of strategic and campus decisions with respect to prioritisation and planning of capital and maintenance programs, projects and activities.

Campus Advisory Group
Each campus also has a Campus Advisory Group, which reports to the respective Campus Management Group and is responsible for assisting with the facilitation of good communication to campus based groups for capital and maintenance projects and processes. Campus Advisory Group also provides advice to Campus Management Group about issues of potential conflict and variance related to project and activities.
The Executive Director: Finance and Resources is the authorised officer responsible to the Vice Chancellor for physical resources and is supported by the Director: Finance and Director: Facilities Management. The Finance Unit, headed by Director: Finance, provides financial services to the University and is responsible to the Executive Director: Finance and Resources. The University’s financial policies, systems and procedures are developed by the Finance Unit in consultation with users. The Facilities Management Unit (FMU), headed by Director: Facilities Management is the University representative who manages the physical assets of the University, provides infrastructure support for facilities management of physical assets of the University, and is responsible to the Executive Director: Finance and Resources.

Other Administrative Units
Information Strategy and Technology Services (ISTS) is part of the Organisational Strategy and Change Portfolio and is responsible for the implementation and support of...
information technology facilities, including infrastructure and network operations, in the University.

Occupational Health Safety & Welfare Services (OHS & W Services) is a strategic operational team of the Human Resources Unit, also within the Organisational Strategy and Change Portfolio, that provides an Occupational Health, Safety, Welfare and Injury Management (OHSW & IM) consultancy and advisory service to its Clients across the University.

2.2.3 Management Structure for Individual Projects

University Council
Approves the construction of all major projects. It is the final approving body for all major tenders.

Finance Committee
Finance Committee reports to University Council and acts as the Contract and Tender Panel for all major projects with a value greater than $5m on behalf of University Council and recommends tender acceptance to University Council.

Senior Management Group/ Capital Management Group
Provides overview and decision making for all capital and maintenance program, approvals for capital projects, including phase signoffs and all matters pertaining to timing, cost and design. SMG reports to University Council via Finance Committee.

Project Control Group
Project Control Groups are established for all major and complex capital projects. The Project Control Group reports to the Capital Management Group and provides an executive forum for managing the strategic direction, progress and risks of a project. It is the mechanism for controlling the progress and costs of the project together with emerging issues and reviewing general performance including impact on affected groups. The Project Control Group provides recommendation to Capital Management Group for progressive sign-off of project phases.

Contract Supervisor
The Contract Supervisor is appointed by Director: Facilities Management or Director: ISTS for management of an individual project, including liaison and contact with the Project Team. The Contract Supervisor is the only authorised person to issue instructions to the Consultant Team on behalf of UniSA.

The title Contract Supervisor within the UniSA Design & Construction Guidelines, UniSA Contractors Induction Kit and UniSA Contractors Induction Manual is intended to describe all positions within UniSA involved in the management of projects. This includes, but is not limited to:

Facilities Management—Senior Project Manager, Project Manager, Senior Project Officer, Project Officer, Maintenance Contracts Administrator, Asset Planner, Business and Administration Coordinator, Campus Facilities Manager, Campus Facilities
Administrator, Campus Services Coordinator, Facilities Maintenance Coordinator, Technical Services Team Leader, Mechanical Services Officer, Electrical Services Officer

ISTS—Senior Information Technologist, Information Technologist

The Contract Supervisor:

- ensures that stakeholder requirements as set out in the Project Brief are met
- ensures that all information is communicated to the appropriate sections of the University and to receive feedback and relevant comments
- is responsible for coordination and administration of all University activities relevant to the project
- monitors progress during planning and construction phases of the project
- provides financial control of project budgets
- liaises with stakeholders, consultants and statutory authorities.

**Project Team**

The Project Team consists of the Contract Supervisor, the Consultant Team, Cost Consultant, key stakeholder representatives and the Contractor where appropriate. The Project Team is lead by the Contract Supervisor.

The Consultant Team, led by a Principal Consultant, must ensure that the Contract Supervisor is kept fully up to date on all aspects of the project through to the end of the Defects Liability Period. Some consultancy services may be provided by members of the Facilities Management Unit or ISTS, including the Project Manager: Engineering Services and Environment and Maintenance Contracts Administrator, and by the wider University community.

Note: for small to medium-sized projects, the management structure is simplified with Project Teams reporting through the Contract Supervisor to the relevant Director.

**Reference Groups**

The User Reference Groups and Technical Reference Groups report to the Contract Supervisor and meet regularly with the Principal Consultant and Contract Supervisor during the phases of a Project. The Contract Supervisor coordinates all meetings as needed with support from the Principal Consultant to review the Brief requirements, consult with University community, provide presentations on campus and ensure technical responses are coordinated between the sub-consultant team.
2.3  Project Administration

2.3.1  Project Brief

Project Brief
A detailed Project Brief is prepared by the Contract Supervisor in consultation with key stakeholders for each project. It is to be included in the process of project development to aid project control.
The Project Brief shall include a statement of required accommodation, spatial relationships, a financial report identifying funding source(s) and project budget, reference to the special needs of the user groups occupying the building, together with guidance on matters stemming from the building policy and master planning.
No variation shall be made from the Project Brief without the written authority of the Contract Supervisor.

Consultancy Service Brief
The Consultancy Service Brief sets out the scope of service required for the project by the Consultant Team. It outlines the conditions of engagement, selection and appointment process.

Return Brief
Where directed by the Project Brief or Contract Supervisor, the Principal Consultant and Team shall be responsible for development of a Return Brief in response to the Project Brief. This is usually a requirement for all Major Capital projects. The format for the Return Brief shall be as set out in the Consultancy Service Brief or as approved by the Contract Supervisor.
The Return Brief will also set out the designers understanding of the project scope, all matters raised by the user, and the solution with its methodology. This is to be agreed to by all parties, thereby allowing formal documentation to proceed.

2.3.2  Project Budget

Budget Responsibilities
The Contract Supervisor will provide details of the project budget. All budget reporting will be in accordance with the UniSA Budget Breakdown Framework and shall including all budget elements and appropriate contingencies, which reflect the total allocated project budget.
The Contractor Supervisor will manage the total project costs, except for major capital projects where a cost manager is engaged to assist the Contract Supervisor in the total project cost management.
All contingency expenditure, including cost related variations and instructions require the approval of the Contract Supervisor prior to proceeding.
Throughout the project lifecycle it is essential that frequent checks are made by the Project Team to ensure that cost estimates (inclusive of anticipated building cost
variations between time of acceptance of sketch plans, calling of tenders and completion of building) are within budget allocations.

Budget Breakdown Framework

The UniSA Budget Breakdown Framework is to be adopted for all projects. It consists of the following overall budget categories:

1.0. Building Works Cost
2.0. Furniture, Fittings and Equipment (excluding specialist equipment unless otherwise noted)
3.0. Fees
4.0. Commissioning Costs (including decommissioning, relocation, installation and commissioning of specialist equipment to be relocated).
5.0. Corporate Costs
6.0. Escalation

Contingency allowances as appropriate to each of the above elements

Project reporting is to be exclusive of GST

The Principal Consultant is to assume budget responsibility for:
1.0 Building Works Cost,
2.0 Furniture, Fittings and Equipment
4.0 Commissioning Costs (including decommissioning, relocation, installation and commissioning of specialist equipment to be relocated).

The Principal Consultant is jointly with the UniSA Project Manager to assume Cost Management responsibility for:
5.0 Corporate Costs (5.1 only - Refer UniSA Budget Breakdown Framework - Item 5.1 Corporate Signage includes all project building signage, which is to be in accordance with the UniSA Signage Manual.

Other Budget categories (3.0, 6.0 and the remainder of 5.0) are identified for information only and will be managed by the Project Manager. They provide an overview of the financial reporting framework that is to be implemented for this project.

The Cost Manager is responsible for the following items:
- Preparation of preliminary design budgets for the whole project,
- Preparation of preliminary design development budgets for the whole project
- Preparation of tenderer estimates
- Cost management of the Building Works Costs, FFE Costs and Commissioning Costs.

All budget reporting will be in accordance with the UniSA Budget Breakdown Framework and shall include all budget elements, appropriate contingencies, which reflects the total provisional allocated project budget.

For the items outlined above, as being the responsibility of the Cost Manager, the Principal Consultant has an inherent responsibility to ensure that the project is designed and developed within the allocated budget.

The Facilities Management Unit will manage the total project costs.

The following table outlines in principle the cost element of total project budget breakdown framework. It also confirms budget responsibility for each element:
## DESIGN AND CONSTRUCTION GUIDELINES

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<td></td>
<td><strong>Sub total (BWC)</strong></td>
<td></td>
<td></td>
<td>$TBA</td>
</tr>
<tr>
<td>2.0</td>
<td>Furniture Fittings and Equipment (FFE)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Loose Furniture</td>
<td>Refer general requirements for extent</td>
<td>UniSA</td>
<td>TBA</td>
</tr>
<tr>
<td>2.2</td>
<td>Sustainability</td>
<td></td>
<td>PC/CC</td>
<td>TBA</td>
</tr>
<tr>
<td>2.3</td>
<td>Systems Furniture</td>
<td>Refer general requirements for extent</td>
<td>PC/CC</td>
<td>TBA</td>
</tr>
<tr>
<td>2.4</td>
<td>Special Equipment</td>
<td>Generally separately funded unless otherwise noted</td>
<td>PC/CC</td>
<td>TBA</td>
</tr>
<tr>
<td>2.5</td>
<td>FFE Contingency (5% of above)</td>
<td></td>
<td>PC/CC</td>
<td>TBA</td>
</tr>
<tr>
<td></td>
<td><strong>Sub total FFE</strong></td>
<td></td>
<td></td>
<td>$TBA</td>
</tr>
<tr>
<td>3.0</td>
<td>Fees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Consultant Team &amp; Cost Manager</td>
<td></td>
<td>UniSA</td>
<td>Not available</td>
</tr>
<tr>
<td>3.2</td>
<td>Sustainability fees</td>
<td></td>
<td>UniSA</td>
<td>Not available</td>
</tr>
<tr>
<td>Item #</td>
<td>Item Description</td>
<td>Notes</td>
<td>Budget Responsibility</td>
<td>Allocation</td>
</tr>
<tr>
<td>--------</td>
<td>-------------------------------------------------------</td>
<td>--------------------------------------------</td>
<td>-----------------------</td>
<td>------------</td>
</tr>
<tr>
<td>3.3</td>
<td>Statutory and legal fees (1% of BWC &amp; FFE)</td>
<td>Including CITB, Devel Application etc)</td>
<td>UniSA</td>
<td>Not available</td>
</tr>
<tr>
<td>3.4</td>
<td>Miscellaneous Fees (1% of BWC &amp; FFE)</td>
<td></td>
<td>UniSA</td>
<td>Not available</td>
</tr>
<tr>
<td>3.5</td>
<td>Fee Contingency (10% of 3.1 – 3.4)</td>
<td></td>
<td>UniSA</td>
<td>Not available</td>
</tr>
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</table>

**Sub total Fees**

<table>
<thead>
<tr>
<th>Item #</th>
<th>Item Description</th>
<th>Notes</th>
<th>Budget Responsibility</th>
<th>Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>Commissioning Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>Relocation Costs (1% of Building Works Cost)</td>
<td>Includes relocation of furniture &amp; equip1</td>
<td>PC/CC</td>
<td>$TBA</td>
</tr>
<tr>
<td>4.2</td>
<td>IT Infrastructure (1% of Building Works Cost)</td>
<td>Includes all costs associated with misc IT &amp; telephone infrastructure such as supply and install of comms cabinets &amp; hubs, patching of data &amp; phone points, telephone handsets and programming of PABX</td>
<td>UniSA</td>
<td>$TBA</td>
</tr>
<tr>
<td>4.3</td>
<td>Commissioning Contingency (5% of 4.1 and 4.2 generally)</td>
<td></td>
<td>UniSA</td>
<td>$TBA</td>
</tr>
</tbody>
</table>

**Sub total Commissioning**

<table>
<thead>
<tr>
<th>Item #</th>
<th>Item Description</th>
<th>Notes</th>
<th>Budget Responsibility</th>
<th>Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0</td>
<td>Corporate Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>Corporate Signage (1% of Building Works Cost)</td>
<td>Includes building identification signage, directory boards &amp; door signage as per UniSA Signage Manual. Excludes statutory signage</td>
<td>UniSA</td>
<td>$TBA</td>
</tr>
<tr>
<td>5.2</td>
<td>Miscellaneous Costs (1% of Building Works Cost)</td>
<td>Includes all costs associated with FM project support, meeting consumables</td>
<td>UniSA</td>
<td>$TBA</td>
</tr>
<tr>
<td>5.3</td>
<td>Corporate Contingency (5% of 5.1 &amp; 5.2 generally)</td>
<td></td>
<td>UniSA</td>
<td>$TBA</td>
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</tbody>
</table>

**Sub total Corporate**

<table>
<thead>
<tr>
<th>Item #</th>
<th>Item Description</th>
<th>Notes</th>
<th>Budget Responsibility</th>
<th>Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td>Allowance for Escalation to Construction Completion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.1</td>
<td>Escalation to construction commencement</td>
<td></td>
<td>PC/CC</td>
<td>$TBA</td>
</tr>
<tr>
<td>6.2</td>
<td>Escalation to construction completion</td>
<td></td>
<td>PC/CC</td>
<td>$TBA</td>
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</table>

**Sub total Escalation**

<table>
<thead>
<tr>
<th>Item #</th>
<th>Item Description</th>
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<th>Allocation</th>
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<tbody>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>Item #</td>
<td>Item Description</td>
<td>Notes</td>
<td>Budget Responsibility</td>
<td>Allocation</td>
</tr>
<tr>
<td>-------</td>
<td>------------------</td>
<td>-------</td>
<td>-----------------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Principal Consultant = PC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cost Consultant = CC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>UniSA = UniSA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL PROJECT BUDGET</td>
<td></td>
<td></td>
<td>$TBA</td>
</tr>
</tbody>
</table>
2.3.3 Approvals and Sign-offs

UniSA approvals

UniSA requires phase-by-phase sign offs and approvals for all projects. Sign-offs shall be gained for each phase of the project before proceeding into the next phase. The Contract Supervisor shall advise of approval to proceed to the next phase.

The recognised phases of the project are:

1. Schematic Design
2. Design Development
3. Contract Documentation
4. Contract Administration
5. Commissioning.

UniSA reserves the right to terminate a consultancy service at the end of any phase for any reason. Consultancy fees will be paid up to the end of that phase only.

Authority approvals

All new buildings and extensions and/or alterations to existing buildings require permits and approvals in accordance with the Development Act and other statutory regulations. Application for permits and other requirements are the responsibility of the Consultant Team, through the Principal Consultant and the Contract Supervisor.

Should the Local Government Authority advise that planning rules consent is not required; such advice should be in writing and submitted to the Contract Supervisor. If any exemption exists under the building regulations where a building permit is not required, the details are to be confirmed in writing to UniSA stating that no existing or non-services items are affected in the building.

2.4 Consultants

2.4.1 Engagement

Register of Consultants

The Facilities Management Unit maintains a Register of Consultants from which Principal Consultants are generally shortlisted for individual Capital Works and Maintenance projects based upon their specific project requirements. UniSA reserves the right to shortlist consultants not currently on the Register.

Selection of Consultants

UniSA is committed to nominating the most appropriate procurement selection process for the selection of Principal Consultants and Consultant Teams for all Capital Works and Maintenance projects.
For major projects, a true two envelope qualification based selection process is generally adopted. Details of the selection process are set out in the Consultancy Service Brief. For other projects a value based or competitive fee bid process is generally adopted. The procurement process selected is dependent on the complexity/ requirements of the given project. Following successful negotiations, the Facilities Management Unit, on behalf of UniSA, will engage the Principal Consultant.

**Conditions of Engagement**

The Principal Consultant and all other consultants shall be engaged in accordance with Australian Standard AS 4122—General Conditions for Engagement of Consultants with UniSA Amendments, unless otherwise agreed in writing by the Contract Supervisor. The UniSA Amendments are included in the Consultancy Service Brief.

### 2.4.2 Principal Consultant

**Engagement**

A Principal Consultant may be engaged by UniSA for a specific project. The Principal Consultant is responsible for all facets of the project from concept through construction to commissioning.

**Responsibilities**

The Principal Consultant's responsibilities are detailed in the Consultancy Service Brief.

### 2.4.3 Consultant Team

**Engagement**

The Principal Consultant shall nominate and engage the Consultant Team. It is assumed that any submission made by the Principal Consultant will be made on behalf of the whole Consultant Team and will include all relevant information supporting the team submission. It is also assumed that, in any interview, the Principal Consultant will speak on behalf of the whole team.

**Responsibility for Services**

The Principal Consultant will be responsible to UniSA for all services of their Consultant Team. UniSA will, however, make consultancy service payments during the project direct to the sub-consultants, on advice from the Principal Consultant.

**Cost Management**

UniSA may directly appoint a Cost Management Consultant to advise on project budget development, procurement strategies and cost control services appropriate to the project.

**Specialist Consultancy Services**
The Principal Consultant is responsible for determining whether specialist consultants are required for particular aspects of the project. The terms of appointment and an appropriate fee shall be approved by the Contract Supervisor before appointment of specialist consultants.

2.5 Contract Documentation and Tendering

2.5.1 Contract Documents

Agreement with Contract Supervisor

The following subjects shall be discussed with the Contract Supervisor before preparing contract documents for tender:

- method of project delivery
- form of contract
- use of bills of quantities
- allowances for rise and fall
- provisional sums and prime cost items
- contingency sums
- specialist and nominated subcontractors
- preferred sub-contractors
- preferred suppliers
- Client supplied items.

General Conditions of Contract

Standard forms of contract shall be used for all UniSA projects. The following is a list of the standard forms of contract, together with a description of their appropriate application:

AS 4000—General Conditions of Contract is suitable for application in a wide variety of building, construction and engineering projects. This form of contract is generally to be used for all UniSA projects with a value over $1m.

AS 2987—General Conditions of Contract for the Supply of Equipment (with or without installation) is intended to cover contracts for power station plant and similar heavy equipment, especially where there a significant period between placement of order and final delivery or installation

ABIC-SW1 Simple Works Contract is suitable for smaller or simple residential, commercial and industrial projects valued from $50,000 to $3 M. This form of contract is generally to be used for all UniSA projects with a value less than $1m.

AS4902- General Conditions of Contract for Design and Construct- this is to be used for all UniSA Design and Construct Projects.
The form of contract shall be agreed with the Contract Supervisor before calling of tenders.

**Contract Tender Documents**

The Principal Consultant shall include the following documents with every tender:

- UniSA Conditions of Tender
- UniSA Preliminaries
- UniSA Preliminaries Schedule
- UniSA Tender Form
- UniSA advised Annexure/ Schedule pertaining to the relevant form of Contract.

A copy of the latest version of these documents will be provided by the Contract Supervisor.

**Register of Confined Spaces and Restricted Areas**

A copy of the Register of Confined Spaces and Restricted Areas for each campus is available on the UniSA website. Any additional information that applies to the project is available from the Contract Supervisor.

When working in a confined space, the Contractor shall comply with the requirements for risk assessment, control of risks, entry permits, rescue arrangements and training and competency as set out in the relevant statutory regulations and the UniSA OHS&W Procedure—Confined Space Entry.

**Statutory Requirements**

*Requirements of Authorities*

The Principal Consultant/Superintendent will be responsible for arranging Development Approvals and Building Certification. UniSA will be responsible for paying the associated fees, and paying the CITB Levy unless otherwise noted in the Contract Annexure.

*Compliance with Standards, Regulations and Statutory Authority Requirements.*

The Contractor shall comply with all relevant Australian Standards, Codes of Practice and the regulations and requirements of statutory authorities having jurisdiction over the works.

*Aboriginal Heritage*

The Contractor is advised that all Aboriginal archaeological sites, objects and remains in South Australia are protected by the provisions of the Aboriginal Heritage Act 1988. Under this Act it is an offence to collect, damage disturb or interfere with any aboriginal sites, objects or remains without the authorisation of the State Minister for Aboriginal Affairs.
Should the Contractor uncover any Aboriginal sites, objects or remains, the Contract shall immediately cease work in that area and advise the Superintendent without delay. The Contractor shall obtain an instruction from the Superintendent in writing prior to recommencing work in that area.

2.5.2 UniSA CAD Documentation Standard

Introduction

This UniSA CAD Documentation Standard sets out the requirements for all CAD drawings provided to UniSA to ensure that they are fully compatible with the Facilities Management Unit's CAD Model.

All queries relating to this Standard should be directed to the Spatial Information Officer, Facilities Management Unit.

Definitions

The following definitions and acronyms are used in this Standard:

- annotation—text related to the model
- base floor plan—a Building Records Drawing floor plan
- base plan—the electronic representation of an individual floor level within a building which can be used as an external reference
- Building Records Drawings—the floor and site plans of UniSA's buildings and campuses
- CAD—Computer Aided Design or Computer Aided Drafting
- DXF—drawing interchange format, file format for transfer of drawings between AutoCAD and other applications
- ESP Drawing—a CAD drawing containing the necessary symbols to show location of the various ESP items on that level of the building
- floating model space—the view of the model from Paper Space, the Model Space drawing can be edited using a 'floating model space viewport'
- floating viewport—AutoCAD objects which display views of model space in paper space
- frame—the plotted drawing sheet border and title block, containing the UniSA logo and fixed text of the title block, this term does not refer to the annotation in the title block such the drawing number and name, etc
- layer—the logical grouping of data within the drawing, which can be viewed or plotted individually or in combination
- layering system—the method established to retrieve/plot specific data from a drawing file
- layout—AutoCAD paper space environment representing the plotted drawing sheet
Design and Construction Guidelines

- Model—the 2D or 3D representation of an object (in the context of this manual, the building or any part of the building, its services and environs)
- Model space—one of the two primary environments in which AutoCAD objects reside, typically, the AutoCAD environment in which the geometric model is placed in a 3D coordinate space, TILEMODE = 1
- Paper space—one of the two primary environments in which AutoCAD objects reside, Paper Space is used to create the finished layout for the printed or plotted paper drawing, TILEMODE = 0
- PDF—portable document format used to represent documents in a manner independent of the application software
- Supplier—any Consultant or Contractor that supplies CAD drawings to UniSA for integration into the CAD Model
- Title bar—the text (e.g. North elevation, Scale 1:100) under a view of the model
- Title block—the section of the frame containing the annotation relating to the drawing
- X-referenced—a drawing file which is linked (or attached) to another drawing.

Conditions of Compliance

All suppliers are required to meet the requirements of this Standard as part of their Conditions of Engagement or Conditions of Contract. If, in the opinion of the Spatial Information Officer, all or any part of the electronic drawing(s) provided to the Facilities Management Unit fails to comply with the requirements of this Standard, the entire package may be returned for checking and correction before re-submission. Such rectifications and re-submission, and any resultant delays, shall be made entirely at the supplier’s cost. Deviations from this Standard may be necessary under certain circumstances. Prior agreement is required from the Spatial Information Officer before any such deviations from the Standard may be applied.

The CAD Model

The Facilities Management Unit’s CAD Model consists of a CAD database of the physical assets of the University, including buildings, services and site features. The CAD Model forms the basis for the collection, storage, and maintenance of various asset information drawings, including but not limited to Building Records, Essential Safety Provision (ESP), Evacuation Diagrams, the UniSpace database, and various services features. The Building Records Drawings are published on the Facilities Management Unit website in PDF format.

Provided Drawings

Where UniSA 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 the base floor plan file name is AcxxPLnn, where A = architectural, PL = plan, c = campus number, xx = building number, and nn = building level.

AutoCAD Compatibility
CAD drawings supplied to UniSA shall be readily opened and read by the Facilities Management Unit’s AutoCAD software, without requiring modifications or editing to force the drawings to comply with the requirements of this Standard. Do not assume that the Autodesk dxf format will automatically provide seamless data transferral. CAD programs other than AutoCAD may be used. However, the electronic drawings created by such software and supplied to UniSA shall be fully compatible with the Autodesk .DWG file format for AutoCAD.

Please contact the Spatial Information Officer to confirm your intended approach prior to package delivery.

Note that Education versions of Autodesk software must not be used under any circumstances.

Drawing Standards

- All CAD drawings shall conform to the highest level of quality and accuracy. Inaccurate and/or poorly constructed drawings will be deemed not to comply with this Standard.
- The accuracy of the drawing shall be maintained using appropriate object snaps. Drawings containing obvious inaccuracy of line/object placement will be deemed not to comply with this Standard.
- The model shall be drawn at a scale of 1 unit = 1 mm, that is, real world full scale, in the model space AutoCAD environment (TILEMODE=1).
- The colour and line type of all entities are to be created BY LAYER on the appropriate layer, and NOT by entity. Drawings containing incorrectly placed and created entities will be deemed not to comply with this Standard.
- All construction lines, points, etc. shall be erased from the drawing before submission. The drawings are to be appropriately purged of unreferenced blocks, unused layers and linetypes, etc.
- Layout tabs shall contain one plot view only representing one plotted drawing sheet at true paper size at a scale of 1 unit = 1mm. Ensure unused or irrelevant layouts are deleted.
- AutoCAD blocks shall be named to represent the use of the block. Drawings containing a block naming convention that contains numbered blocks or non-descriptive and illogical block names will be deemed not to comply with this Standard.
- Entities shall be rigidly organised into named layers. No drawing entities or referenced drawings are to exist on layer 0 (zero) or def-points (other than dimensioning definition points in the case of layer def-points).

Layer Naming

The convention for layer naming used by the Facilities Management Unit is such that AutoCAD entities representing building, engineering, site or other components and elements are created on layers named to reflect those components or elements. Drawings containing a layer naming convention that contains numbered layers or non-descriptive and illogical layer names will be deemed not to comply with this Standard. The table below is an indicative listing of layers used in the Building Records drawings (architectural and site) and may be followed by suppliers in the provision of drawings to UniSA.
Table 1 – Indicative CAD Drawing Layers

<table>
<thead>
<tr>
<th>Layer Name</th>
<th>Colour</th>
<th>Line Type</th>
<th>Line Weight</th>
<th>Plot Status</th>
<th>Layer Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7 (White)</td>
<td>Continuous</td>
<td>Default</td>
<td>Autocad Default Layer; Use For Block Creation Only.</td>
<td></td>
</tr>
<tr>
<td>BLDG_CEIL</td>
<td>9</td>
<td>Centre</td>
<td>Default</td>
<td>Ceiling Grid.</td>
<td></td>
</tr>
<tr>
<td>BLDG_COLM</td>
<td>3 (Green)</td>
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<td>Default</td>
<td>Column Outline.</td>
<td></td>
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<tr>
<td>BLDG_COLM-H</td>
<td>92</td>
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<td>Default</td>
<td>Column Hatching.</td>
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<tr>
<td>BLDG_DOOR</td>
<td>8</td>
<td>Continuous</td>
<td>Default</td>
<td>Door Symbols (Door Swing, Etc.).</td>
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</tr>
<tr>
<td>BLDG_EXTL</td>
<td>5 (Blue)</td>
<td>Continuous</td>
<td>Default</td>
<td>External Face of external walls</td>
<td></td>
</tr>
<tr>
<td>BLDG_INTL</td>
<td>2 (Yellow)</td>
<td>Continuous</td>
<td>Default</td>
<td>Internal Walls Of Building.</td>
<td></td>
</tr>
<tr>
<td>BLDG_JNRY</td>
<td>22</td>
<td>Continuous</td>
<td>Default</td>
<td>Joinery Fixtures (Fixed Joinery Only)</td>
<td></td>
</tr>
<tr>
<td>BLDG_LEVEL</td>
<td>6</td>
<td>Hidden</td>
<td>Default</td>
<td>Outline Of Building Above Or Below The Current Level.</td>
<td></td>
</tr>
<tr>
<td>BLDG_LINK</td>
<td>72</td>
<td>Continuous</td>
<td>Default</td>
<td>Link Ways Between Buildings; Current Level Only.</td>
<td></td>
</tr>
<tr>
<td>BLDG_SAN</td>
<td>8</td>
<td>Continuous</td>
<td>Default</td>
<td>Sanitary Fittings And Fixtures.</td>
<td></td>
</tr>
<tr>
<td>BLDG_STRS</td>
<td>62</td>
<td>Continuous</td>
<td>Default</td>
<td>Stairs, Incl. Treads But Not Walls.</td>
<td></td>
</tr>
<tr>
<td>BLDG_WIN</td>
<td>8</td>
<td>Continuous</td>
<td>Default</td>
<td>A Single Line Representing The Glass.</td>
<td></td>
</tr>
<tr>
<td>AU_GBA</td>
<td>30</td>
<td>Continuous</td>
<td>Default</td>
<td>Never Plot Gross Building Area Outline.</td>
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<tr>
<td>AU_GFA</td>
<td>132</td>
<td>Continuous</td>
<td>Default</td>
<td>Never Plot Gross Floor Area Outline.</td>
<td></td>
</tr>
<tr>
<td>ROOM_AREA</td>
<td>1 (Red)</td>
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<td>Default</td>
<td>Room Area Attribute</td>
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</tr>
<tr>
<td>ROOM_BDRY</td>
<td>152</td>
<td>Continuous</td>
<td>Default</td>
<td>Never Plot Closed Polyline Outline Of Rooms</td>
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</tr>
<tr>
<td>ROOM_NAME</td>
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<td>Default</td>
<td>Room Name Attribute</td>
<td></td>
</tr>
<tr>
<td>ROOM_NUM</td>
<td>1 (Red)</td>
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<td>Default</td>
<td>Room Number Attribute</td>
<td></td>
</tr>
<tr>
<td>ROOM_TXT</td>
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<td>Default</td>
<td>Room Block Inserted On This Layer</td>
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</tr>
<tr>
<td>SI_PATH</td>
<td>43</td>
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<td>Pathways Not Associated With A Building.</td>
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</tr>
<tr>
<td>SI_BDRY</td>
<td>3 (Green)</td>
<td>Continuous</td>
<td>Default</td>
<td>Site Boundary (Not Necessarily The Allotment)</td>
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</tr>
<tr>
<td>SI_CRPK</td>
<td>35</td>
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<td>Default</td>
<td>Car Park.</td>
<td></td>
</tr>
<tr>
<td>SI_CRPK-LINE</td>
<td>35</td>
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<td>Default</td>
<td>Car Park Line Marking</td>
<td></td>
</tr>
<tr>
<td>SI_FENCE</td>
<td>2 (Yellow)</td>
<td>Continuous</td>
<td>Default</td>
<td>Fences. No Differentiation Of Type.</td>
<td></td>
</tr>
<tr>
<td>SI_RAMP</td>
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<td>External Ramps.</td>
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</tr>
<tr>
<td>SI_STEP</td>
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<td>Default</td>
<td>External Steps, Stairs.</td>
<td></td>
</tr>
<tr>
<td>TTL_TXT</td>
<td>1 (Red)</td>
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<td>Title Bars Etc.</td>
<td></td>
</tr>
<tr>
<td>TTL_BLK</td>
<td>1 (Red)</td>
<td>Continuous</td>
<td>Default</td>
<td>Contains The Sheet Border Frame (And North Point)</td>
<td></td>
</tr>
<tr>
<td>TTL_DATE</td>
<td>161</td>
<td>Continuous</td>
<td>Default</td>
<td>Plot Date Block</td>
<td></td>
</tr>
<tr>
<td>TXT-2</td>
<td>1 (Red)</td>
<td>Continuous</td>
<td>Default</td>
<td>General Text, Notes</td>
<td></td>
</tr>
</tbody>
</table>
Submission Requirements

All supplied electronic drawings are to be provided in two formats: .DWG and .PDF. The PDF files must be named to exactly match the DWG file name (with suffixes as required for layouts) and must be printed to the scale 1:1.

Supplied CAD drawings must be able to be readily incorporated into the CAD Model drawings with minimal modification or editing of the drawing to force the drawing to comply with this Standard.

In addition to any requirements set out in the Consultancy Service Brief, Contract Documents or elsewhere in these Guidelines, a complete set of as-built drawings in the two electronic formats shall be provided to the Facilities Management Unit within one month of Practical Completion of the project as set out in the Specification for Operation and Maintenance Manuals. The Consultant/Contractor shall note that final payment of fees/claims will not be authorised until satisfactory compliance with this clause is achieved.

The ‘as-built’ drawings will include (where relevant):

- Architectural drawings
- Structural Engineering drawings
- Engineering Services drawings
- Essential Safety Provisions drawings
- Survey drawings
- Civil Engineering drawings
- Landscape drawings

In addition, for new buildings and major refurbishments, as-built floor plans must be provided one month prior to anticipated Practical Completion to allow UniSA Building Records to be completed prior to occupation.

The drawing package must be submitted on CD or DVD and must include the following:

- electronic drawings as specified (both DWG and PDF formats)
- a Document Transmittal or index to the electronic drawings contained in the package showing their relevant file names, drawing content, version status and version date.
- all associated or referenced drawings (eg title block drawings)
- all plot style tables (.ctb files), and font shape files if used
- layer name and use list

Specific Requirements – Architectural Drawings

Architectural drawings are to include:

- Floor Plans, Roof Plan (where applicable), Elevations. Sections and Details may also be required (confirm with Contract Supervisor)
- Text clearly showing room name and room number (as previously agreed with UniSA – refer Room 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 a 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 supplied drawings.

**Specific Requirements – Structural Engineering Drawings**

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

**Specific Requirements – Engineering Services Drawings**

Engineering Services drawings are to include:

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

**Specific Requirements – 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 shall provide three (3) sets of either new or appropriately marked up hard copy drawings in colour, two to be placed in the fire indicator panel (FIP) of the building as a temporary measure, the third to be provided to the Contract Supervisor. In both cases, the Facilities Management Unit shall update the current ESP drawing and replace the copies on site.

The various Essential Safety Provision (ESP) Items that are required to be shown on the other supplied drawings are listed below. Some of these items may not be required, the supplier should consult with the Contract Supervisor to ascertain project requirements.

**Table 2 – ESP information**

<table>
<thead>
<tr>
<th>Element</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprinklers</td>
<td></td>
</tr>
<tr>
<td>Exit &amp; Emergency Lighting</td>
<td></td>
</tr>
<tr>
<td>Compartmentation details</td>
<td></td>
</tr>
<tr>
<td>Fire Indicator Panel</td>
<td></td>
</tr>
<tr>
<td>Fire Extinguishers</td>
<td></td>
</tr>
<tr>
<td>Fire Hose Reels</td>
<td></td>
</tr>
<tr>
<td>Fire Doors</td>
<td></td>
</tr>
<tr>
<td>Egress Routes to required exits</td>
<td></td>
</tr>
<tr>
<td>Emergency Alarm Initiating Devices (Manual Call Points, Break Glass Alarms)</td>
<td></td>
</tr>
<tr>
<td>EWIS</td>
<td></td>
</tr>
<tr>
<td>Warden Intercom handsets</td>
<td></td>
</tr>
<tr>
<td>Evacuation refuges</td>
<td></td>
</tr>
</tbody>
</table>
Specific Requirements – Survey Drawings

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

Site surveys shall be carried out by UniSA’s preferred subcontractor. Refer to the Contract Supervisor for details.

All survey drawings are to be based on Australian Height Datum (AHD).

The following information is to be included:

- The exact footprint of the new building or building extension in relation to 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

Specific Requirements – Civil Engineering Drawings

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

Specific Requirements – Landscape Drawings

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

2.6  Tendering and Negotiation

2.6.1  General Principles

UniSA’s Finance Policies and Procedures define the overall protocols for management of all tenders. This section outlines the processes and procedures that specifically govern the guidelines of tendering for the Facilities Management Unit.

2.6.2  Selection of Tenderers

Register of Contractors

The Facilities Management Unit maintains a Register of Contractors. UniSA generally uses this as a basis for the selection of contractors to tender on projects. UniSA reserves the right to invite contractors not on the Register to tender.
Minimum Number of Tender Prices

UniSA requires a minimum of three complying and competitive prices for all contract values over $50,000. A contract and tender process is used for projects with a contract value greater than $100,000. Sufficient tenderers should be invited to tender to ensure that at least three submissions are received for comparison of prices. Tenderers that withdraw from a tender process shall provide confirmation of their withdrawal in writing, stating their reasons for withdrawing. Tenderers that do not submit at tender close, but did not withdraw, shall be contacted to determine their reasons for not submitting a tender.

2.6.3 Tender Basis

Generally UniSA adopts a value based selection process for the tenders associated with major capital projects. For most other capital projects UniSA adopts a competitive lump sum tender. However due to the nature and complexity of some projects other forms of procurement may also be adopted, such as Managing Contractor or Construction Management. The Contract Supervisor will provide further direction on this.

2.6.4 Evaluation of Tenders

General Principles

Tender evaluation is based on the principles of the Code of Practice for the South Australian Building and Construction Industry and AS 4120—1994 Code of Tendering. The code of practice requires that the Principal shall not engage in unconscionable conduct by trading off one tenderer’s price against another tenderer’s price in an attempt to seek a lower price. It requires the Principal to firstly exhaust negotiations with the initially preferred tenderer before negotiating with a subsequent tenderer.

Confidentiality

Information provided in and subsequent to the tender is confidential and shall not be made available to any person other than those directly involved with the tender evaluation. All documents associated with tenders shall be delivered to and from UniSA in a secure manner. All parties directly and indirectly involved in the tender evaluation process must protect the confidentiality of all information presented to them, particularly pricing. Data, trade secrets and similar information included in tender documents will not be released without the written permission of the party who provided that information.

Ethical Conduct

All parties directly or indirectly involved in the tender evaluation process must disclose all conflicts of interest and acted ethically throughout the process.
If a conflict of interest does arise, the conflict situation will be fully recorded and the reasons for choosing a course of action documented, and the relevant individual or party with the conflict will be excluded from the decision-making processes concerning the relevant matter and from any aspect where the member may have the ability to influence the result.

Gifts and Hospitality

All parties directly involved in the tender evaluation process must not receive any gifts or hospitality from tenderers that may be perceived as influencing their decisions. All parties directly involved in the tender evaluation process must not accept money for services or information and not to request any gifts or favours in return for business, services or information about UniSA during the tender evaluation process.

2.7 Construction

2.7.1 General Principles

This Section deals with the responsibilities for Consultants and Contractors with respect to the UniSA requirements in the carrying out of works. This Section is under construction...

2.8 Commissioning

2.8.1 General Principles

This Section deals with the responsibilities for Consultants and Contractors with respect to the provision of ‘As Built’ drawings, Operations & Maintenance Manuals and survey information to the Contract Supervisor, as well as the UniSA requirements with respect to the performance of preventative maintenance during the Defects Liability Period. The responsibility for providing the necessary documentation for projects delivered under traditional lump sum contracts shall be with the Principal Consultant.

2.8.2 Handover post-practical completion.

To be added.

2.8.3 Completion

Final Clean
DESIGN AND CONSTRUCTION GUIDELINES

The site must be cleaned completely on completion of the works and all debris, rubbish and surplus building materials must be cleared away from site to the satisfaction of the Contract Supervisor, leaving the site in a condition suitable for occupation. Should UniSA need to arrange additional cleaning to satisfy the requirements of this clause, the Contractor will be invoiced or the equivalent amount will be deducted from the final progress claim.

Defects Rectification Period

A four (4) week period following the nominated date for Practical Completion must be assigned to the rectification of incomplete and defect items identified at the Practical Completion Inspection. The first 50% of the retention or bank guarantees will be released only when the defects raised at or before Practical Completion and all As-Built Documentation is completed and signed off by the Principal Consultant.

2.8.4 Occupation by UniSA

This Section is under construction...

2.8.5 As–Built Documentation

Requirement for As-Built Documentation

Provide Operation and Maintenance (O&M) Manuals and As-Built Drawings as set out in the Specification for Operation & Maintenance Manuals and CAD documentation standards. This documentation shall be completed to the satisfaction of the Superintendent by the end of the Defects Rectification Period. The first 50% of the bank guarantees will only be released when this clause is satisfied.

As-built drawings include (as directed by the contract supervisor):

- Architectural
- Structural engineering
- Engineering Services
- Essential safety provisions (ESPs)
- Civil Engineering
- Landscape

In addition to the above, the Contractor shall provide a Post Construction Site Survey for any contract involving new buildings and extensions to existing buildings, within four weeks of the date of Practical Completion. All survey work must be carried out by a competent, licensed Surveyor. The Post Construction Site Survey Plans shall meet the requirements for ‘As Built’ Documentation.

Submission of Operation and Maintenance Manuals

Submit Draft O&M Manuals, including preliminary drawings and performance data, at least eight (8) weeks before Practical Completion for review by the Consultant Team. Submit the revised Draft O&M Manuals, incorporating comments by the Consultant
Team, certificates from authorities and warranties if available, no later than two (2) weeks before Practical Completion for review by UniSA.

On completion of commissioning and within one (1) month after Practical Completion, submit two (2) sets of Final O&M Manuals. Incorporate comments from the Consultant Team, review by UniSA and training sessions and include any additional relevant material.

Refer to UniSA Specification for Operation and Maintenance Manuals for further details of submission requirements. It is a requirement that all O&M Manuals follow this specified format.

Training and Induction of UniSA staff

Provide Training as set out in the Specification for Operation & Maintenance Manuals.

Preventative Maintenance During Defects Liability Period

All UniSA contracts require the performance of regular preventive maintenance and servicing of the works during the Defects Liability Period.

Such maintenance shall be in accordance with the manufacturer’s instructions and the requirements of applicable regulations, legislation or codes of practice. With respect to any mechanical or electrical service, fire alarms, hydraulic systems, lifts and the like, maintenance shall be carried out at not less than monthly intervals.

The Certificate of Final Completion will not be issued until such time as all preventive and statutory maintenance requirements have been completed and all Log Books and maintenance records have been provided to the Contract Supervisor.

2.9 Specification for Operation and Maintenance Manuals

UniSA has established the following Specification for Operation and Maintenance (O&M) manuals. Updates to this specification will be available on the Facilities Management Unit website.

2.9.1 All Operation and Maintenance Manuals—General Requirements

The O&M manuals are to be grouped into 3 sets, as follows:

1. Architectural
2. Site Works

Each of these groups are to be broken down into sub-groups, as follows:

**Architectural**
- Roofing
- Windows and Curtain Walls

**Waterproofing**
- Waterproofing
- Finishes and Furniture
O&M Manuals—Common Style Elements

The O&M manuals are to provide concise descriptions, technical details, operation and maintenance instructions and schedules, commissioning records, log books, catalogues, principles of operation, method of operation and other information that will enable the ongoing 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.

Format

In each O&M Manual, provide the specified number of as-built drawings, manuals and test results in hard copy as specified in this section.

O&M Manuals and associated drawings shall be supplied as a quality publication as follows:

- Colour of manuals:
  - Architectural – White
  - Site Works – Green
  - Building Services - Red

- A4 sized hard cover, D ring vinyl covered binder with main title in 30pt font and secondary lettering in 12 and 10 pt upper and lower case as appropriate
Design and construction guidelines

- Cover, spine and drawing title cover to have details of manual content, location (campus and building), and project title including UniSA project number—refer to examples below.

- Durable divider between each separate section, with a typed description of the system and major equipment components on the tab.

- Manufacturer's printed data, including associated diagrams, or typed text, to be in clear, concise English.

- Loose-leaf A4 pages consecutively numbered.

- Drawings to be folded to A4 size in the binders with reinforced punched binder tabs so that they can be unfolded without detaching from the rings.

- Where required, CDs are to be contained within the folders in such a manner as to ensure they are not able to be readily dislodged.

Cover (example):

OPERATION & MAINTENANCE MANUAL
ELECTRICAL SERVICES
UNIVERSITY OF SOUTH AUSTRALIA
MAWSON LAKES CAMPUS—BUILDING T—PROJECT NO. 09-000
(Year of installation)

Spine (example):

UNIVERSITY OF SOUTH AUSTRALIA—MAWSON LAKES CAMPUS—BUILDING T—ELECTRICAL SERVICES

Title cover for drawings (example):

UNIVERSITY OF SOUTH AUSTRALIA
MAWSON LAKES CAMPUS—BUILDING T—PROJECT NO. 09-000
ELECTRICAL SERVICES—DRAWINGS
(Year of installation)

Number of copies

Provide two (2) complete final copies of the O&M Manual, including complete set of drawings. Refer to section on timing and delivery for number of copies and timing of draft manuals.

Drawings

As-Built Drawings

In addition to drawings provided in O&M Manuals, provide one (1) complete set of electronic drawings on CD-ROM in accordance with the UniSA CAD Documentation Standard.

Training

General
Contractors are to specify the information about the specific nature of the training to be provided for each asset group or piece of equipment. This information is to include the:

- maximum number of persons to be trained
- time to be spent in training
- place where training is to be carried out
- number of training sessions to be held
- anticipated training dates
- names of the contractor personnel to be involved in training.

Immediately after Practical Completion, the Contractor shall provide the services of competent staff, including specialist sub-contractors, to instruct the appropriate UniSA personnel, as nominated by the Project Manager, in the operation and maintenance of the installed systems. Training shall be provided by qualified representatives of the manufacturer, supplier or installer (as appropriate) who are knowledgeable about the installations. Training shall be completed within one (1) month of Practical Completion.

**Training Literature**

The items and procedures in the revised Draft O&M Manuals shall be used as the basis of instruction and the contents shall be reviewed and finalised in consultation with the Consultant Team and UniSA. Within one (1) month of Practical Completion, the Contractor shall provide the Principal Consultant with disk copies of all programs relating to the operation and maintenance of the equipment.

**General Content of O&M Manuals**

**Section 1—Contents Page:**
Inside the front cover of each volume, with the title to match the title on the cover and the content of the respective volume.

**Section 2—Directory:**
Names, addresses, telephone and facsimile numbers of the Principal Consultant, Consultant Team, Contractor, sub-contractors and responsible parties.

**Section 3—Asset Register:**
A complete list of all equipment used in the installation, as set out below. The asset hierarchy to be as set out in the outline provided in the Asset Management Planning Template within the UniSA Design and Construction Guidelines. The following asset register specification is to provide a guide to the Principal Consultant, Contractors and UniSA staff, in ensuring that a specification for data can be delivered. Where noted as “Not required”, the data is not to be provided by the builder.

**Table 2-3 - Asset Register Structure**

<table>
<thead>
<tr>
<th>Details</th>
<th>Definition</th>
</tr>
</thead>
</table>

---

**Version 5.1**

**September 2012**
### ASSET DETAILS

<table>
<thead>
<tr>
<th>Details</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Number</td>
<td>Leave blank – by UniSA</td>
</tr>
<tr>
<td>Asset Description</td>
<td>Brief description of the asset</td>
</tr>
<tr>
<td>Model Number</td>
<td>Model # of the asset</td>
</tr>
<tr>
<td>Serial Number</td>
<td>Serial # of the asset</td>
</tr>
<tr>
<td>Essential Service</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Asset Group</td>
<td>Hierarchical code/class to enable rollup of the assets to a parent asset group—table format. See Asset Management Planning Template.</td>
</tr>
</tbody>
</table>

### INSTALL DETAILS

<table>
<thead>
<tr>
<th>Details</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Install</td>
<td>Date installed/acquired.</td>
</tr>
<tr>
<td>Purchase Price</td>
<td>Price at procurement</td>
</tr>
<tr>
<td>Supplier</td>
<td>Vendor details, address, comments</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Manufacturers Name, Country of manufacture/origin, date of manufacture.</td>
</tr>
<tr>
<td>Country of Origin</td>
<td>Country of manufacture</td>
</tr>
<tr>
<td>Warranty details</td>
<td>Name and type of warranty provided</td>
</tr>
<tr>
<td>Warranty date</td>
<td>Date of warranty</td>
</tr>
</tbody>
</table>

### USAGE

<table>
<thead>
<tr>
<th>Details</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Life / Useful life</td>
<td>Useful life from install given normal wear &amp; tear and treatment.</td>
</tr>
<tr>
<td>Condition</td>
<td>Condition rating: 1 (excellent) to 5 (poor) and any relevant comments on the physical condition of the asset.</td>
</tr>
<tr>
<td>Assessment Date</td>
<td>Date assessments are made.</td>
</tr>
</tbody>
</table>

### DEPRECIATION

<table>
<thead>
<tr>
<th>Details</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Capitalised</td>
<td>Date from when depreciation will commence</td>
</tr>
<tr>
<td>Depreciation Rate</td>
<td>Years / months (economic useful life)</td>
</tr>
<tr>
<td>Current Replacement Cost</td>
<td>Current replacement cost</td>
</tr>
</tbody>
</table>

---

Section 4—Description of Complete Installation:

A general description of the installation as required for providing a general understanding of the equipment and its operation. Whilst not intended to replace the technical details provided, this description is to be as comprehensive as is needed to ensure readers can fully understand the nature of the installation. Details should include location, type, size (volume, area, number off), design principles used (where applicable), special features to be noted, operating principles (including any interfaces and interoperability issues).

Section 5—Specific System Description:

A technical description of each system of the installation, written to ensure that it can be clearly understood by persons not familiar with the installation.

Section 6—Performance Data:

Technical description of the mode of operation of each system provided. This section provides functionality details.
Section 7—Equipment Brochures and Technical Data Sheets:
Manufacturer’s technical literature assembled specifically for the project and excluding irrelevant matter. Each product data sheet marked to clearly identify the specific products and components used in the installation and the data applicable. 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.

Section 8—Installation and Dismantling Instructions:
Provide instructions for the proper installation and dismantling of the equipment.

Section 9—Operations Instructions:
Manufacturer’s technical literature as required. For other than common accessories, where no manufacturer’s literature is available, provide a precise and concise description of the operation procedure in plain English. This is to typically include:
- Safe starting, running, operations and shutting-down procedures for the equipment installed including a logical step-by-step sequence of instructions for each procedure.
- Control sequences and flow diagrams for the systems installed.
- A legend for colour-coded services.
- A legend of the symbols used on the drawings, unless included on the drawings.
- 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.

Section 10—Maintenance Instructions:
Essential safety provisions
The ESP maintenance provisions are not to be duplicated in the other maintenance schedules. Where assets are required to be maintained according to the SA76 requirement, these schedules and tasks are to be provided in the separate section 12—Essential safety provisions. This does not include the services provided by the mechanical contractor when carrying out collaborative maintenance with the fire services contractor.
Other instructions include:
- Provide emergency procedures including emergency services contact numbers and procedures for fault-finding
- Provide manufacturers’ technical literature as appropriate.

Section 11—Maintenance Schedules:
Schedule of frequency of required or recommended maintenance, testing or inspection for each type of equipment, other than those classified as Essential Safety Provision (ESP). Schedule to include weekly, monthly attendance times - separate schedule for each type of equipment, other than ESP’s, as outlined below.
Table 2-4 - Maintenance Schedule Example

<table>
<thead>
<tr>
<th>Information/Data Name</th>
<th>Definition Of Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location of the equipment.</td>
<td>Include building number and/or name, level number and/or name, room number and/or name and any other information required for prompt and unequivocal identification.</td>
</tr>
<tr>
<td>Description of equipment</td>
<td>Describe the equipment</td>
</tr>
<tr>
<td>Unique identification label</td>
<td>To be attached to each piece of equipment.</td>
</tr>
<tr>
<td>Inspection type</td>
<td>Weekly, monthly, 6 monthly, annual, 3 yearly etc.</td>
</tr>
<tr>
<td>Maintenance required</td>
<td>Description of tasks.</td>
</tr>
<tr>
<td>Inspection Results</td>
<td>Space to record results of each inspection, with sufficient spare space for not less than two years.</td>
</tr>
<tr>
<td>Comments on each inspection</td>
<td>Space for comments on each inspection.</td>
</tr>
<tr>
<td>Inspection date</td>
<td>Space for the recording of the date and time of each inspection.</td>
</tr>
<tr>
<td>Inspector name, title, address</td>
<td>Name, title, address and signature of the person performing each inspection.</td>
</tr>
</tbody>
</table>

Table 2-5 - Maintenance Frequencies

<table>
<thead>
<tr>
<th>Equipment Description</th>
<th>Weekly</th>
<th>Monthly</th>
<th>Bi Monthly</th>
<th>Quarterly</th>
<th>6 Monthly</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment A</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Equipment B</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Equipment C</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Equipment D</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Table 2-6 - Maintenance Schedules

<table>
<thead>
<tr>
<th>Location (Bldg, level, room)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment description</td>
</tr>
<tr>
<td>Equipment A</td>
</tr>
<tr>
<td>Equipment B</td>
</tr>
<tr>
<td>Equipment C</td>
</tr>
<tr>
<td>Equipment D</td>
</tr>
</tbody>
</table>

Table 2-7 - Maintenance Tasks

<table>
<thead>
<tr>
<th>Building Access And Egress</th>
<th>Service Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check and record in log book:</td>
<td>A</td>
</tr>
<tr>
<td>1</td>
<td>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.</td>
</tr>
<tr>
<td>2</td>
<td>All hold-open devices operate correctly.</td>
</tr>
<tr>
<td>3</td>
<td>Treads are stable and non-slip surfaces are in good condition.</td>
</tr>
<tr>
<td>4</td>
<td>All handrails are in good repair.</td>
</tr>
<tr>
<td>5</td>
<td>Obstructions above the rail which would tend to break a handhold.</td>
</tr>
<tr>
<td>6</td>
<td>Handrail is continuous between stair landings.</td>
</tr>
</tbody>
</table>

Comments |
Building Access And Egress

<table>
<thead>
<tr>
<th>Service Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check and record in log book:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A = Annual, B = Monthly, C = 3 monthly, D = bi-monthly, E = Weekly

Any concern regarding disability access and egress – check with the appropriate authority

Section 12—Essential Safety Provisions:
The following information is required for all Essential Safety Provisions:

- List of equipment identified as being required to satisfy the Essential Safety Provisions of the Ministers Instruction SA76 and the BCA.
- A schedule of frequency of required or recommended maintenance, testing or inspection for each type of equipment classified as Essential Safety Provision.
- A separate list for each type of Essential Safety Provision equipment including:
  - The type of equipment (fire sprinkler system, exit and emergency lights)
  - Unique identification label attached to each piece of equipment.
  - Location of equipment, including building number/name, level number/name, room number/name and any other information required for prompt and unequivocal identification.
  - Type of inspection and maintenance required.

All ESP commissioning and testing/inspecting data is to be provided progressively throughout the construction process, and again at the time of handover of the manuals. A typical format for ESP Inspection Data is shown elsewhere in this section.

Include only the record of tests and inspections of the Essential Safety Provisions as required by the South Australian Development Act 1993, Minister’s Specification SA76 and various Australian Standards and Codes of Practice.

Include all technical data and maintenance instructions for the Essential Safety Provisions in the relevant section of the O&M Manual. The items of maintenance included in the Essential Safety Provisions section are not to be repeated elsewhere in the O&M Manual but shall be supplemented elsewhere as necessary to ensure that all systems are comprehensively serviced and maintained.

The following documentation is to be provided in a consolidated section of the O&M Manual in addition to that outlined above:

1. BCA assessment statement with particular reference to all fire and lift safety requirements, including:
   - Classification
   - Structure
   - Fire Resistance & Compartmentation
   - Access and egress
   - Services & Equipment
2. Copy of ESP Form 1
3. Copy of ESP Form 2
4. Building Occupancy Certificate
5. Where a fire hydrant or sprinkler system is installed, a current certificate of flow test.

6. Where a fire alarm system is connected to the Metropolitan Fire Brigade, copies of all relevant applications and certificate.

7. Where fire extinguishers are installed, provide comprehensive details including all design analysis and calculations as per the requirements of the BCA to identify selection, type and location of all installed portable fire protection equipment.

8. Précis of operation for all fire detection and protection systems.

The following drawings are to be provided in a consolidated section of the O&M Manual in addition to the above:

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.

2. Layout and detail drawings of identifying the full extent and design of all relevant fire safety measures and systems, including:
   - compartmentation, fire wall/separation and fire/smoke doors and/or windows
   - means of egress, detailing paths of travel
   - signs, including lifts and all signage associate with egress paths, etc
   - access for fire appliances
   - emergency Lifts
   - emergency & 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

3. Details of the work to be undertaken (which may be in the form of a specification) stipulating any Australian Standard or other Code to which the work must comply.

Section 13—Specialised Tools and Testing Equipment:
List of specialised tools and testing equipment (refer to later section detailing requirements) - instructions for the use of tools and testing equipment.
At Practical Completion, the Contractor shall provide UniSA 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. Include instructions for use and maintenance of the tools.
Section 14—Spares and Consumables:
Schedule of spares (including bearings) with an expected operations 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 of the installation - schedule of consumable items (oil, grease, belts, bearings) to be used during servicing.

Section 15—Imported Equipment:
Provide a list of all imported equipment, including country of origin, importer details.

Section 16—Drawing List:
One copy of each as-built drawing, including shop drawings, full size as set out later in this section.

Section 17—Certificates, Guarantees and Warranties:
Manufacturers’ warranties and guarantees, certificates from authorities, certificates of Compliance for electrical and plumbing works within the respective O&M Manuals. 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 submit 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 18—Commissioning Data:
Records of test results, records of commissioning data. See Commissioning data provisions provided by Consultants for individual oprojects.

Timing of Delivery of O&M Manuals
There are a number of versions of asset information expected as the project progresses. Submit progressive revisions of the manuals throughout the course of the construction project to ensure the accuracy of content and the familiarisation of UniSA with the installation.

**Preliminary O&M Manuals**

For equipment put into service during construction and operated by UniSA, submit two (2) copies of Preliminary O&M Manuals at least two (2) weeks before handover of responsibility for equipment operation.

**Draft O&M Manuals**

Submit Draft O&M Manuals, 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.

Use the format as for final manuals, with temporary insertions for items that cannot be finalised until the installation is commissioned and tested

Two (2) copies of draft manuals to be submitted.

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

**Final O&M Manuals**

On completion of commissioning and within one (1) month after Practical Completion, submit two (2) sets of Final O&M Manuals. Incorporate any changes from the Consultant Team, review by UniSA and training sessions as set out elsewhere in this section and include any additional relevant material. Each O&M manual is to be provided with a covering signed and dated letter from the appropriate consultant verifying that the consultant has checked the manual contents and considers them to be complete and accurate.

**Revisions**

Submit two (2) sets of loose-leaf amendments for insertion in the manuals within two (2) weeks after completion of the defects liability period and/or maintenance period, incorporating changes and comments.

### 2.9.2 Asset Groups—Special Information Needs

The specialised information requirements for each asset group are to be read in conjunction with section detailing General Requirements. Where general requirements are not applicable, the requirement is to be ignored.

**Windows and Curtain Walls - 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**
On completion of the curtain wall installation, submit one set of the original shop drawings and in computer readable CAD format on compact disc, marked up or otherwise modified to show departures or additions incorporated in the work-as-executed.

Identify site-glazed panels.

**Door and Window Hardware – Special Information**

**Hardware schedule:**
Where applicable, submit an amended schedule, prepared by the door hardware supplier showing changes to the contract door hardware schedule caused by:
- approval of hardware samples
- acceptance of an equivalent to a specified proprietary item
- contract variation to a door hardware requirement.

**Waterproofing – 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 shall 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.

**Finishes and Furniture – Special Information**

Divide the Finishes and Furniture section of the Architectural Manual into sub-sections as required to provide for quick reference to the various sections of the installation.

**Floor Coverings Schedule:**

Submit a room schedule, showing the rooms fitted out, quantity (sqm), product type (floor covering name/proprietary badge), colour, manufacturer, estimated useful life (under normal wear and tear)

A typical Floor Coverings Schedule is shown in table 2-3. below.

<table>
<thead>
<tr>
<th>Location</th>
<th>Quantity</th>
<th>Product Type</th>
<th>Colour</th>
<th>Manufacturer</th>
<th>Estimated Useful Life (yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Paint Schedule**

Submit a paint schedule, showing location, element, product type and finish/colour. A typical Painting Schedule is shown below.

<table>
<thead>
<tr>
<th>Location: Site, Building, Floor, Room</th>
<th>Product Type</th>
<th>Finish—Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>External free standing walls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External walls, shade structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External walls (general)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External walls (feature)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal walls (general)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal walls (feature)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doors (including toilet partitions)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frames and stair balustrades</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceilings and bulkheads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floors (if painted)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete sealer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line marking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clear penetrative sealer</td>
<td>Clear</td>
<td></td>
</tr>
<tr>
<td>Other painted surfaces</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2-8 - Floor Finishes Schedule

Table 2-9 - Painting Schedule
Internal furniture and built-in joinery

- internal furniture
- Built-in joinery
- Fabrics.

Submit the manufacturer’s recommendations for demounting and relocation, and recommendations for service use, care and maintenance of all furniture and built-in joinery.

*Internal Furniture Schedule:*

Submit a schedule, showing location, element, product type, finish/colour and size/quantity. A typical Internal Furniture Schedule is shown below.

**Table 2-10 - Internal Furniture Schedule**

<table>
<thead>
<tr>
<th>Location: Site, Building, Floor, Room</th>
<th>Element</th>
<th>Product Type</th>
<th>Colour</th>
<th>Size—Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fabrics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fabrics General 1, 2, 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fabrics Feature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pinboard Fabrics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Joinery Finishes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Joinery Laminate 1, 2, 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Window Treatments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blinds 1, 2, 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Furniture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chairs 1, 2, 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tables 1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Plantings – 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.

**Irrigation – Special Information**

**As-built drawings.**

As-built drawings for irrigation installations shall be accurate within 500 mm for all irrigation components installed and detail any changes made during installation from the initial design.
The drawings must be in hard copy (A3 set) and electronic format in accordance with the drawing specifications located elsewhere in this section.

**Laminated plan and schedule.**

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

**Paving – Special Information**

**Paving Schedule:**

Provide a paving schedule, outlining the following detail.

<table>
<thead>
<tr>
<th>Table 2-11 - Paving Schedule Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precinct / Location</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Urban Elements – Special Information**

**Schedule**

Provide a list of all street furniture or urban elements as per the attached schedule.

<table>
<thead>
<tr>
<th>Table 2-12 - Urban Elements Information Schedule Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
</tr>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Quantity</td>
</tr>
<tr>
<td>Model No or Name</td>
</tr>
<tr>
<td>Special finishes</td>
</tr>
<tr>
<td>Manufacturer</td>
</tr>
<tr>
<td>Supplier Details</td>
</tr>
<tr>
<td>Warranties</td>
</tr>
<tr>
<td>Special treatments needed</td>
</tr>
<tr>
<td>Comments</td>
</tr>
</tbody>
</table>

**Pest Control Systems – Special Information**

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

<table>
<thead>
<tr>
<th>Table 2-13 - Pest Control Schedule Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
</tr>
<tr>
<td>All slab penetrations</td>
</tr>
</tbody>
</table>
2.9.3 Manual Items Delivery Checklist

The following checklist is intended to provide a guide to the Principal Consultant, Contractors and UniSA staff, in ensuring that the O&M Manuals have 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.

<table>
<thead>
<tr>
<th>Table 14 - O &amp; M Manual Deliverables Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action Item</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>As-Built Drawings</td>
</tr>
<tr>
<td>Training</td>
</tr>
<tr>
<td>Directory of contacts (preliminary)</td>
</tr>
<tr>
<td>Preliminary Manuals</td>
</tr>
<tr>
<td>Draft Manuals</td>
</tr>
<tr>
<td>Revised Draft Manuals</td>
</tr>
<tr>
<td>Final Manuals</td>
</tr>
<tr>
<td>Tools and Instruments</td>
</tr>
<tr>
<td>ESP Schedules (preliminary)</td>
</tr>
<tr>
<td>Schedules— Finishes, etc (preliminary)</td>
</tr>
</tbody>
</table>
3 Planning and Design Guidelines

3.1 Planning Guidelines

3.1.1 Introduction

Purpose
This section outlines the principles and controls that govern the planning of all UniSA Capital Works and Maintenance projects. UniSA Planning Guidelines are governed by the following:

- Master Plans
- General Planning Principles
- Accessibility Guidelines
- Environmental Sustainability Guidelines
- Heritage Guidelines.

Reference Documents
The Planning Guidelines outlined in this section must be read in conjunction with the following sections within the UniSA Design and Construction Guidelines:

- Design Guidelines
- Space Management Guidelines
- Room Numbering Guidelines
- Section D—Special Facilities
- Section E—Construction Controls.
- The following Reference Documents are to guide detailed design, documentation and construction and are available on request:

- UniSA Standard Interior Finishes Schedule.
3.1.2 Master Plans

Application of Guidelines

The Planning Guidelines outlined in this section must be read in conjunction with the relevant Master Plans as listed below. Consultants must follow the principles established in the relevant Master Plans.

Where a project is not specified in a Master Plan or a particular Master Plan does not exist or give guidance for a project, master planning principles to be applied in the project design must be approved by the Campus Project Manager, Facilities Management Unit.

Campus Master Plan

The Facilities Management Unit maintains a Campus Master Plan for each campus in drawing and report format. Campus Master Plans strategically define where all the groups on campus are located and conceptually map out master plan notions for urban spaces across the campus.

The Campus Master Plan is presented in drawing and report format, identifying:
- potential campus improvements, both planned and desired future development opportunities, thereby forming a planning framework
- current locations of all groups on a campus site plan
- location of all groups following consolidation on a campus site plan
- concepts of urban spaces and their relationship to buildings and groups
- concepts and elevations related to building exteriors and/or urban spaces.

3.1.3 Campus Landscape Master Plan

The Facilities Management Unit maintains a Campus Landscape Master Plan for each campus in drawing and report format. Campus Landscape Master Plans strategically define landscape concepts for the campus and include:
- conceptual landscape plans
- detailed plans of particular feature urban spaces
- schedules of appropriate species, materials, furniture, shade structures, etc.

3.1.4 Building Master Plans

The Facilities Management Unit maintains Building Master Plans for most buildings. Building Master Plans cover amenity, accommodation, master planning principles for various types of spaces, accessibility, services infrastructure, structure, OHS&W, and fire safety, as well as providing concept plans for future development or refurbishment of each building.
3.1.5 General Planning Principles

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 enhancing and complementing the existing streetscape and environment. Selection of proposed materials and finishes is to be sympathetic to the surroundings, aesthetically pleasing and functional.

Maintenance
Maintenance of UniSA’s facilities is funded from its recurrent resources and normally bears little relation to the Capital Program. It is therefore imperative to ensure that all facilities are constructed with life-cycle costing and maintainability in mind. Buildings should be designed to be maintenance free as far as possible. Where periodic maintenance will be required, consideration should be given to issues such as access, disruption to use and cost. Standard, established products with a known long life span are to be specified. Wherever possible, services are to be located in service ducts with easy access through lockable doors. Piped services must not be built or chased into walls and partitions.

Amenity and simplicity
Planning solutions should be approached with amenity and simplicity in mind. Considerations should include:

- provide an environment within which teaching, learning, research, administration and recreation can take place successfully and in a sustainable manner
- all classrooms and seminar rooms must employ natural light and ventilation in preference to artificial systems unless otherwise instructed by the Facilities Management Unit
- avoidance of complex articulation and building footprints
- minimisation of building perimeters
- avoidance of complex roof forms and junctions
- build ability issues including site access and trade sequencing.

Flexibility
All planning should seek to provide for the maximum degree of flexibility. This should include:

- sensible placement of toilets, stairs and plant rooms
- use of lightweight internal walls where security and acoustic requirements permit
- sensible fenestration design
- 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.
Efficiency and 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 undercroft areas
- double volume spaces and large circulation areas kept to functional minimum
- service areas concentrated in central locations.

Functionality

All spaces must be designed to optimise their functionality and usefulness for academic and administrative 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. 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. 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.

Safety

The Public areas shall be designed with child safety in mind. Stairs and balconies will need special attention. The distance between vertical railings shall be no more than 125 mm. Horizontal railings shall not be used where they allow a child to climb a dangerous situation. Concrete paths should be finished in such a way that they have adequate slip resistance and low maintenance. Steel trowelled finish is not acceptable.

Security

UniSA aims to obtain a safe, secure building in the simplest, yet most effective way, involving practical and cost considerations. The options of a manual key system or an electronic card access system shall be evaluated for each project with the Technical Reference Group, and be designed to link in and complement the existing systems.

Vertical transport

Vertical transport shall be provided in the design of all multi-level buildings. Lifts shall conform to all relevant Codes and requirements for people with disabilities. External ramps as a means of interconnecting floors are not an acceptable alternative to providing a lift.

Weather tightness

UniSA buildings are to be designed to provide adequate protection from rain, hail, wind and dust penetration.

Design features should include:
DESIGN AND CONSTRUCTION GUIDELINES

- Conservative detailing of elements involved in weather tightness to reduce the risk of penetration.
- Sealants not used as a primary barrier, e.g. where structure penetrates sheet metal.
- Tanking kept to minimum for below ground construction. Gravity drained cavities, large enough for inspection, are to be preferred wherever practical.
- Floor levels to be designed to be above flood levels and stormwater levels.

**Plant and equipment**

Sufficient space must be allocated to the provision of plant rooms at the design stage. Careful consideration should be given to providing adequate space for possible future expansion of the building, including additional plant and equipment requirements. This must include access for additional plant installation.

**Ventilation**

UniSA air conditioning requirements are detailed elsewhere in these guidelines. Site-specific requirements may be described in the Provisional Project Brief. The following general considerations should also be included in the planning process:

- maximisation of natural ventilation
- cross-ventilation to be provided in double-loaded corridor situations where possible
- roof ventilators to be provided where appropriate, e.g. industrial or workshop buildings, care to be taken to avoid introduction of dust into building
- eaves ventilation in association with roof ventilators to be considered
- clear story windows to be avoided where prevailing breezes likely to blow in heat loads from adjoining roof areas.

**Communication cabling**

Adequate future provision shall be made for both vertical and lateral ducting to accommodate data and phone cables. This also applies to cabling for audio visual equipment. Ducts shall be easily accessible so that the covers can easily be removed and reinstated. Where possible, new buildings should be connected to adjoining buildings by crawl culverts or tunnels for the distribution of services.

**Clearance**

For new construction or refurbishment of existing buildings greater than one rise in level, allow three metres of clear space around the base of the building for access by cherry-pickers, mobile scaffolding and scissor-lifts.

**3.1.6 Heritage**

**Heritage buildings**

UniSA has two buildings on its current Heritage Listing. These heritage buildings are listed on either National or State Heritage Registers, or are considered by UniSA to have
sufficient architectural and/or historic significance that they should be retained and restored. The relevant authorities must approve any alterations or refurbishment works proposed for these heritage buildings and all work shall comply with the relevant Conservation Plan established for the building. Copies of the Conservation Plans are available on request.

Table 3-1 - University of South Australia—Heritage Listing

<table>
<thead>
<tr>
<th>Name of Building/Location</th>
<th>Owner</th>
<th>Heritage listing status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brookman Building</td>
<td>University of South Australia</td>
<td>Australian Heritage Commission Register of National Estate Registered &quot;Historic&quot; Database No: 006382 File No: 3/02/001/0046 Heritage SA State Heritage Register Registered: Date not sourced File No: 10877, Item No: 539 City of Adelaide Heritage Survey Item No: 325 National Trust of South Australia Item No: 1536 &quot;Classified&quot; status</td>
</tr>
<tr>
<td>Murray House</td>
<td>University of South Australia (Registered proprietor in fee simple on Certificate of Title is Minister for Education and Children’s Services of Adelaide)</td>
<td>Heritage SA State Heritage Register Registered: Date not sourced File No: 14717 City of Campbelltown Heritage Survey (Nov 1996) Nominated for registration as Local Heritage Place Building No: MAG: 030 (List of Local Heritage Places submitted to Planning SA for public comment and approval) National Trust of South Australia Item No: 515 “Classified” status</td>
</tr>
</tbody>
</table>

Significant trees

UniSA currently has two significant trees identified at City East Campus.

3.2 Accessibility Guidelines

UniSA has established the following Accessibility Guidelines (Version 3B—2 March 2007). Updates to these guidelines will be available on the Facilities Management Unit website.

3.2.1 Purpose

The Accessibility Guidelines have been established to:

define overall objectives and strategies for all UniSA projects and programs
DESIGN AND CONSTRUCTION GUIDELINES

outline UniSA’s expectations for consultants and contractors involved in projects.

3.2.2 Objectives

Overall accessibility objectives are:

- to ensure equitable access is provided to and within all UniSA facilities for everyone, including people with disabilities, older people and other campus participants
- to promote and implement equitable, inclusive and accessible environments in response to the Disability Discrimination Act (DDA), relevant legislation, codes and requirements.

3.2.3 Strategies

Strategies to meet these objectives for individual projects and programs include:

- planning of campuses and buildings to address accessibility issues
- incorporation of proven design features and details and selection of appropriate materials, features and equipment
- consultation with key stakeholders to ensure adopted accessibility initiatives meet user requirements and expectations (wherever possible)
- engagement of specialist access consultants on all major projects
- integration of provisions for access and facilities for people with disabilities, in almost all cases, with those for able-bodied people, thus minimising feelings of segregation that may otherwise be experienced
- incorporation of non-statutory provisions in new buildings and major building refurbishments as far as is practicable, and provision of statutory requirements as a minimum on all minor works projects.

3.2.4 Legislative Requirements

Building Code of Australia

Under BCA 96, new buildings are required to provide access to people with disabilities in accordance with the Australian Standard on Design for Access and Mobility AS1428.1. General requirements for access—New building work, and AS1428.4 Tactile ground surface indicators for orientation of people with vision impairment. BCA 96 states where access must be provided and the Australian Standard states how it is to be provided. General building access requirements under BCA 96 Part D3 and SA Part D3 are:

- building must be accessible as required in Table D3.2 for class of occupancy
- parts of building that are required to be accessible must comply with BCA 96 Part 3, AS 1428.1, AS 1428.4 and access must be provided:
- from the allotment boundary at the main points of entry; and
While BCA 96, AS 1428.1 and AS 1428.4 are the minimum legislative requirements, it should be the objective of design for all new buildings to provide access in a manner to minimise the likelihood of a complaint lodged under the Disability Discrimination Act.

**Australian Standards**

AS 1428.1 2001 General requirements for access—New building work is the standard for access for people with disabilities and defines the minimum standards of provision. It is designed to provide independent access for 80% of people with physical disabilities. This is a legislative requirement under the BCA.

AS 1428.2 1992 Enhanced and additional requirements—Buildings and facilities covers items additional to those in Part 1 and provides a greater level of accessibility than the minimum requirements of Part 1. It is designed to provide independent access for 90% of people with physical disabilities. The provision of access for 100% of people with disabilities is seldom possible, because of the severity of some disabilities, and the greater spatial requirements.

The Human Rights and Equal Opportunity Commission (HREOC) uses AS 1428.2 1992 as the benchmark for access in relation to complaints lodged. It is this Standard that forms the basis of the Advisory Notes on Access to Premises developed by HREOC to assist designers, architects, builders while the DDA Standards on Access to Premises are being developed. AS 1428.2 1992 has been used and is referred to in the Draft DDA Standards on Access to Premises. Therefore it must be considered in the design process.

AS 1428.3 1992 Requirements for children and adolescents with physical disabilities sets out requirements for the design of buildings and facilities to suit children and adolescents with physical disabilities in the age range from 3 to 18 years.

AS/NZS 1428.4 2002 Tactile indicators covers the design of tactile ground surface indicators for the orientation of people with vision impairment and is a legislative requirement of the BCA. It defines the location of indicators at hazardous locations internally and externally, such as steps, stairs, kerbs and ramps.

AS/NZS 2890.1 2004 Parking facilities—Off-street car parking provides recommendations and guidelines for the design and layout of off-street parking facilities, including parking spaces for people with disabilities.

**Disability Discrimination Act**

The Disability Discrimination Act (DDA) places obligations on building owners and designers to ensure that there is no discrimination against people because of any disability as far as it is reasonable. The main objective with regard to access is to provide safe, equitable and dignified access to buildings, services and facilities as far as is reasonable, and to eliminate discrimination on the basis of disability as far as it is practical to do so.

This DDA is human rights-based, Federal legislation and overrides BCA 96 and AS 1428. Compliance with BCA 96 and AS 1428 can still leave building owners liable under the DDA to a complaint of discrimination. Being complaint-based legislation, it is not possible
to provide information that will guarantee that no complaint of discrimination will be made. The DDA makes no distinction between new, old or heritage buildings. The Disability Rights Unit of HREOC administers the DDA. It has published ‘Advisory Notes on Access to Premises’, which can be found under Disability Rights at http://www.humanrights.gov.au.

3.2.5 New Developments in Legislation

Disability Standards for Access to Premises (Premises Standard)

In February 2004, the Australian Building Codes Board (ABCB) released for public comment the draft Disability Standards for Access to Premises (Premises Standard). Public consultation closed on 30 April 2004 following a national round of awareness sessions. The ABCB have now considered all submissions resulting from the public consultation period on the draft Premises Standard. During this process, consultation with various respondents was undertaken to further clarify their submissions and discuss options to progress the draft Premises Standard. The submissions received were generally supportive of the development of new provisions, but opposing views were expressed on the stringency of the proposals. The results of consideration of public comment have been considered by the Board and preliminary advice has been provided to the Federal Minister for Industry, Tourism and Resources and the Federal Attorney-General. Further consideration of the revised proposal will be informed by a revised Regulation Impact Statement, currently under preparation, that estimates the costs and benefits likely to accrue from the proposal. For further information on the Premises Standard, contact the ABCB Office on 1300 857 522, email abcb.office@abcb.gov.au or website http://www.abcb.gov.au/content/access/.

Access Code for Buildings (Access Code)

In January 2004, the ABCB released the Draft Access Code for Buildings for comment. The objectives of the draft code are to:

- remove discrimination on the basis of disability from access to and uses of premises
- specify how objectives of the DDA are to be achieved on accessibility of premises
- prescribe the national minimum requirements for new building work which must be complied with to meet DDA requirements
- give certainty to building developers and building managers, so that premises which comply with access standard provisions will not be unlawful under the DDA.

Proposed revisions to the BCA as related to typical UniSA projects are summarised below:
Table 3-2 - Proposed BCA Revisions

<table>
<thead>
<tr>
<th>Provision</th>
<th>Current</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrances</td>
<td>Access required through the principal public entrance.</td>
<td>Access through all pedestrian entrances in buildings with a floor area greater than 500 m² Access through 50% of all pedestrian entrances for buildings with a floor area less than 500 m².</td>
</tr>
<tr>
<td>Ramps/stairs</td>
<td>Where access is required to the entrance floor but not to other levels and a passenger lift is not installed, at least one required ramp must have handrails complying with Clause 5.3 (e) of AS 1428.1 and one required stair must comply with Clause 9 of AS 1428.1.</td>
<td>All ramps (excluding fire-isolated ramps and ramps covered in D3.4) must comply with Clause 5 of AS 1428.1 and be suitable for use by people with a disability. All stairs (excluding fire-isolated stairs and stairs covered in D3.4) must comply with Clause 9 of AS 1428.1 and be suitable for people with a disability.</td>
</tr>
<tr>
<td>Extent of access</td>
<td>Upper levels in some buildings not required to be accessible</td>
<td>Upper levels of most buildings are required to be accessible with specific limitations in some Classes of building.</td>
</tr>
<tr>
<td>Exemptions</td>
<td>Concessions are provided for access to some buildings and parts of buildings. The list of areas exempted is not extensively defined.</td>
<td>Exemptions provided for access to specific areas that the public is generally not entitled to enter.</td>
</tr>
<tr>
<td>Lifts</td>
<td>All passenger lifts required to be accessible are to comply with the specified sections of AS 1735.12.</td>
<td>Passenger lifts can be installed to comply with a range of specified AS 1735 type lifts, however specific limitations apply to each lift type.</td>
</tr>
<tr>
<td>Hearing augmentation</td>
<td>Hearing augmentation is to be provided in any conference room, meeting room or the like with an inbuilt amplification system and a floor area of more than 100 m².</td>
<td>Hearing augmentation is to be provided in a meeting room, conference room or the like with an inbuilt amplification system regardless of floor area. Additional options for hearing augmentation included.</td>
</tr>
<tr>
<td>Sanitary facilities</td>
<td>A ratio of accessible unisex sanitary facilities in unspecified locations. One accessible unisex facility counts as one male and one female facility.</td>
<td>Accessible unisex sanitary facilities at every bank of sanitary facilities containing male and female facilities. One accessible unisex facility counts as one male and one female facility.</td>
</tr>
<tr>
<td></td>
<td>Ambulant accessible sanitary compartment only in Class 10a buildings (toilet blocks).</td>
<td>An ambulant accessible sanitary compartment required, wherever more than one sanitary compartment is provided in addition to any accessible unisex sanitary compartment.</td>
</tr>
<tr>
<td>Passing space</td>
<td>-</td>
<td>Passing and turning spaces for people using wheelchairs in corridors (2 options proposed).</td>
</tr>
<tr>
<td>Signage</td>
<td>-</td>
<td>Signage to indicate whether an accessible unisex sanitary facility is suitable for left or right handed transfers.</td>
</tr>
<tr>
<td>Wheelchair seating</td>
<td>-</td>
<td>Both grouped and additional numbers of wheelchair seating space requirements in Class 9b assembly buildings such as theatres and stadiums.</td>
</tr>
</tbody>
</table>

Currently, AS 1428.1 2001 makes provision for integrated seating in Clause 15.

Proposed Requirements of Referenced Australian Standards

As part of the draft documents released for comment in February 2004, Australian Standards also released draft standards for design for access and mobility DR 04019 General requirements for access—new building work and DR 04020 Tactile indicators. Proposed revisions to referenced Australian Standards are summarised below:
### Table 3-3 - Proposed Revisions to Referenced Australian Standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Current</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 1428.1</td>
<td>80th percentile wheelchair spatial dimensions.</td>
<td>90th percentile wheelchair spatial dimensions.</td>
</tr>
<tr>
<td></td>
<td>All access ways to be not less than 1000 mm in width.</td>
<td>All access ways to be not less than 1200 mm in width.</td>
</tr>
<tr>
<td></td>
<td>Ramp landings to be not less than 1200 mm in length.</td>
<td>Ramp landings to be not less than 1500 mm in length.</td>
</tr>
<tr>
<td></td>
<td>Door widths on an access way to be not less than 800 mm.</td>
<td>Door widths on an access way to be not less than 850 mm.</td>
</tr>
<tr>
<td></td>
<td>Minimum accessible unisex sanitary facility circulation space 1600 mm x 2000 mm.</td>
<td>Minimum accessible unisex sanitary facility circulation space 1900 mm x 2300 mm.</td>
</tr>
<tr>
<td>AS 1428.4</td>
<td>No specific requirements for the measurement of luminance contrast.</td>
<td>Specific requirements included for the measurement of luminance contrast.</td>
</tr>
<tr>
<td>AS 2890.1</td>
<td>All car parking spaces are to be not less than 3200 mm in width.</td>
<td>All spaces to be not less than 2400 mm with an additional 'shared' space of 2400 mm.</td>
</tr>
</tbody>
</table>

As you can see the above table uses the dimensions of AS 1428.2 1992, hence the need to consider this standard in all design.

### 3.2.6 New Buildings

New buildings shall be designed for access and use by people with disabilities in accordance with AS1428.1 2001, AS1428.4 2002, BCA and the Access Criteria detailed in these guidelines. Some sections of AS 1428.2 may be applicable where referred to elsewhere in these guidelines.

### 3.2.7 Existing Buildings

Major refurbishment projects (more than 50% of floor area) and extensions to existing buildings shall be designed for access and use by people with disabilities in accordance with AS1428.1 2001, AS1428.4 2002, BCA and the Access Criteria detailed in these guidelines. This provision will apply to the extension/refurbished area and any existing major path of entry to the extension/refurbished area.

Under the draft ABCB proposals, where existing buildings undergo more than 50% refurbishment (by volume) over a 3-year period, then the whole building must be brought into compliance with the Access Code.

Minor building projects shall meet the statutory requirements for the affected area as a minimum and the above requirements as far as practicable. The following criteria should be applied in determining the extent to which provisions for people with disabilities will be incorporated.

- nature of building work required—upgrading toilets should include provision of suitable accessible facilities, upgrading a foyer or reception area should include access features and appropriate joinery, e.g. lowered section of the reception desk with an underneath space to enable front approach by persons using mobility aids
- current access provisions on site – providing appropriate access to the building generally
DESIGN AND CONSTRUCTION GUIDELINES

- feasibility of achieving satisfactory and economic solution
- refurbished lecture theatres and teaching spaces should address requirements relating to fixed seating, joinery, fittings and furniture outlined in the Access Criteria.
- Site works and services upgrade projects must make appropriate site access provisions where they impact on public access to and within buildings and campuses.

3.2.8 Access during Building Works

Building works must be scheduled and managed to minimise disruption to access to premises and facilities. Appropriate alternative access routes to UniSA facilities must be maintained during building works. Communication protocols should ensure that appropriate temporary signage is installed and that users are notified of alternative access routes.

3.2.9 Access Criteria

The following provides criteria for required features in facilities. They meet the requirements of BCA 96, AS 1428.1 2001 and AS 1428.4 2002, and include additional features which replicate requirements of AS 1428.2 1992 and AS 1428.3 1992. This is not intended to cover all requirements of BCA 96 and AS 1428. Reference must be made to those documents to ensure all aspects are adequately covered.

Dimensions:

The dimensions for a range of requirements are important and compliance with them must be confirmed on site. All critical dimensions must be shown on the drawings. Elevations must also be provided, particularly for sanitary facilities, reception areas, and ramp/stairway handrails.

Minimum clearance dimensions must not be intruded upon by projecting skirtings, handrails or other fixtures.

Continuous accessible path of travel (CAPT):

Continuous accessible path of travel should be the most commonly used and direct path of travel, if for any reason this is not possible clear signage of the alternative route must be provided.

Circulation space egress path clear minimum unobstructed width to be 1200 mm and vertical clearance of 2 m.

Walkways, ramps and landings:

ABCB Draft Access Code for Buildings limits the use of ramps to a maximum rise of 3.5 m, threshold ramps to be used only at external entrances, and landings to be a minimum length of 1500 mm.

Ramps are preferred to be at 1:16 grade or greater.
Ramps in buildings to be between 1:16 and 1:20.

Ramps of 1:8 maximum are acceptable for distances up to a maximum of 450 mm, such as at door thresholds. (TGSI hazard tiles do not need to be installed on 1:8—1:8.5 ramps).

Minimum unobstructed width between handrails of 1200 mm, to be installed on both sides.

Level landings are required at each door opening before any ramps commence.

There should be adequate space for wheelchair users to manoeuvre in circulation areas and to access doorways.

Ground and floor surfaces:

Provide slip resistant floor surfaces, especially in wet areas.

Curved thresholds and naplock trim no higher than 3 mm are acceptable.

Carpet must be fixed, with a firm surface and pile not exceeding 6 mm.

Mats should be secured in place and not providing a barrier. No matwell recesses should be provided.

30% colour contrasts should be used on stair nosings and change of grade, and between different floor finishes for easy identification.

Tactile ground surface indicators to AS 1428.4 should be provided for those with vision impairment, at beginning and ends of steps, ramps and changes of grade or direction.

Handrails and grab rails:

Handrails on both sides should be provided at all steps, landings and ramps

Handrails to be 30-50 mm diameter with an anti-slip finish with 300 mm extension at landings, and with tactile indicators (domed buttons) located 150 mm from end

The ends of handrails must be returned to the wall face or turned down 180º.

Doorways, doors and circulation space at doorways:

Viewing panels in doors (where required) to be not more than 1000 mm AFL.

Lever type door handles having a return to the door face.

Kick plates on doors will reduce the incidence of damage from wheelchairs.

The minimum clear opening of all doors shall be 850 mm.

Doors should open more than 90° to enable easy unrestricted access. Double doors are not favoured unless one leaf gives a clear opening width of 850 mm.

Lifts:

Passenger lifts are preferred

ABCB Draft Access Code for Buildings E3.6 and Table E3.6(a) require lift floor dimensions not less than 1400 mm x 1700 mm

Minimum clear width of car door opening shall be not less than 900 mm.

Stairways:

Risers to be closed

Contrasting strip 25—50 mm wide to be applied to riser at nosing
handrails both sides and where handrails can be continuous, there is a reduced need for TGSI hazard tiles

where landings are open, and there are breaks in the handrails, TGSI hazard tiles must be installed.

Site access and parking:

Car parking spaces for visitors and staff to be provided in accordance with BCA D3.5 and Table D3.5 and in consultation with UniSA.

Parking spaces to be adjacent the principal entrance to the building.

Access to buildings for those with disabilities must be available through the principal entrance.

At grade access to and between all buildings and site facilities must be provided.

Walkways are preferable to ramps wherever possible. Walkways have gradients of less than 1:20 and do not need handrails, kerbs or TGSI hazard tiles.

Steps should be associated with ramps as an alternative means of access.

Plant growth must be kept back from walkways and paths and to 2 m clear above the ground.

Toilets and showers:

ABCB Draft Access Code for Buildings requires:

- Accessible unisex toilet facilities to be located adjacent to every toilet block. Where male and female facilities are separated, the unisex facility can be located at one of the facilities. If there is more than one accessible toilet provided, the number of left and right hand mirrored configuration must be evenly dispersed and appropriately signed.

- Facilities for those who have disabilities and are ambulant are to be provided at each bank of toilets where two or more toilets are provided.

Accessible toilets are to be to the size required in AS 1428.2.

Toilets to include continuous grab rails, 30-40 mm diameter, grab rail at side of pan to be angled type AS 1428.1 Option A, hand basins with lever operated taps (single lever and preset mixing valve), sensor operated hand driers, and single leaf toilet paper dispensers. Hand driers should be located in close proximity to wash basin.

Toilet to have outward opening doors. Inward opening doors may be installed provided they can be opened outwards in an emergency by means of approved hardware. Privacy latches to have large turn handles on the inside, and a knob on the outside for emergency access.

All toilets are to have ‘spitfire’ emergency lights fitted in both the toilet and the air lock where specified.

All shower facilities provided shall be accessible (or at least one accessible shower where multiple showers are provided in an area) and have continuous handrail and folding seat. Avoid set downs to accessible showers.

Signage:
Braille and tactile signs are required from the entrance of the building where a feature of facility is not apparent to occupants.

Location of Braille and tactile signs to comply with BCA Specification D3.6:
- Where sufficient space, sign to be located on wall latch side of door between 1400-1600 mm AFL and from architrave 50-300 mm.
- Signs identifying paths of travel, located directly ahead in the direction of travel, where one wall continues in the direction of travel and the other forms a corner, the sign must be placed on the continuing wall.

International symbol for access (ISA) should be used where possible and comply with AS 1428.1.

Preferred height above floor level (AFL) is 1200-1600 mm. If space is not available within this region then sign may be placed at 1000 mm AFL or, if sign may be obscured by crowd, it may be located not less than 2 m AFL. Signage at 90° to the wall is preferred.

Listening system for hearing augmentation:
- provide hearing loop system as set out in AV Specification unless otherwise approved
- system shall be available where sound amplification is provided or public announcements are made with appropriate signage

ABCB Draft Access Code for Buildings requires inbuilt amplification system to have induction loop provided to not less than 80% of floor area

where hearing systems are in place signage must indicate the area covered and type of device.

Fixed seating:
- a range of choices of seating in location, level and price shall be allowed
- consideration given to providing some adjustable seating

ABCB Draft Access Code for Buildings requirements for Class 9b in accordance with Table D3.9:
- <300 seats wheelchair seating spaces must not be located in front row of seats
- >300 seats wheelchair seating not less than 75% of required wheelchair spaces must be located in rows other than front row and location representative of range of seating provided

provide an adjustable pedestal type wheelchair table with a folding pallet table to each wheelchair space.

Joinery, fittings and furniture:
- Reception counters to have low level sections and recess clearance under to suit wheelchair users as set out in AS 1428.2.
- Consider different heights and design of chairs to suit particular requirements.
- Consider a range of seating choices in teaching spaces with > 10 seats. (LH and RH pallet arm chairs, allow variation in size, cushioning and seat height)

Minimum clearances as required by AS 1428.2 under worktops are required.
At least one accessible chilled water drinking fountain shall be provided wherever drinking fountains are provided. Drinking fountains to be provided at 700 mm AFL, with a clear space underneath.

All taps should have capstan style handles with one lever-operated tap to one sink, in every wet activity space.

Rounded corners and edges to joinery.

Lecterns to be adjustable and accommodate wheelchair users.

Controls

Controls for equipment such as lecterns, drinking fountains, taps, telephones, switches and handles must be accessible.

Controls that need to be grasped or turned must be located 900-1100 mm AFL.

Controls that need to be pushed must be located 900-1200 mm AFL.

Switches and general-purpose outlets preferred height is 1000 mm AFL.

Taps shall have lever or sensor plate control. Where hot water is provided a mixing spout is required.

Emergency buttons, door releases and security pads and all other controls need to be placed no closer than 500 mm from a corner and in common reach zone of 900-1100 mm.

Checklist of Features to Avoid

Ensure that the following features are always avoided:

- steps at entrances and doorways including egress doors
- lips at change of floor materials
- steps at entrances and doorways
- step-ups at urinals in male toilets
- long and difficult routes to toilets
- slippery and high glare floor surfaces
- small, or streamlined and ‘hard to grab’ tap handles
- large diameter highly polished hand rails
- highly reflective surfaces
- inadequate lighting
- drainage grilles in paving with large openings
- sharp corners on joinery and furniture
- tripping hazards in paving and on floors
- sliding doors (non-automatic) are not favoured as they can be hard to operate, are difficult to maintain and are a security risk
- door knobs
- narrow hallways and turning spaces
- overhangs in walkways.
3.3  Environmental Sustainability Guidelines

UniSA has established the following Environmental Sustainability Guidelines (Version 2A—1 January 2007). Updates to these guidelines will be available on the Facilities Management Unit website.

3.3.1  Environmental Sustainability Policy

The aim of the Environmental Sustainability Policy is to ensure that the future development of UniSA campuses is based on environmentally sustainable principles. “Sustainability is the ability to maintain a high quality of life for all people, both now and in the future, while ensuring the maintenance of the ecological processes on which life depends and the continued availability of the natural resources needed.” The Institution of Engineers, Australia—Policy on Sustainability.

All stages of building projects including master planning, urban design, external works, new buildings and refurbishment works, and furniture and equipment selections, shall be based on environmentally sustainable principles.

3.3.2  Environmental Sustainability Guidelines

The Environmental Sustainability Guidelines list environmental sustainability objectives for incorporation into the future development of UniSA campuses. The guidelines are the performance objectives for the following:

- all new building work (internal and external), furniture, fittings, finishes and equipment
- assessing existing buildings and external areas, furniture, fittings, finishes and equipment.

Amendments

The guidelines shall be reviewed and amended to adopt new practices as they are developed and at the time amendments are made to statutory regulations.

3.3.3  Process

The following procedures shall be used to ensure environmental sustainability is addressed in each project type:

- Environmental Sustainability Guidelines as part of the UniSA Design and Construction Guidelines will be issued to all project teams by the Project Manager
- The Principal Consultant, as part of the project team, is responsible for addressing sustainability issues in each project and determining the extent of the application of the Environmental Sustainability Guidelines
- The Principal Consultant, as part of the project team, is responsible for monitoring the Contractor’s compliance on site with Waste Management Plans and Environmental Management Plans.
3.3.4 Environmental Management

Consideration shall be given to the appropriateness of alternatives to development such as the ‘no development’ option and non-structural alternatives. Where appropriate, evaluate site and local ecosystems using structured Environmental Impact Assessment Processes.

For projects over $1 M, the project team shall be responsible for preparing and adopting Environmental Management Plans through all phases of the project.

For projects over $0.5 M, the Contractor shall be responsible for preparing and adopting a Waste Management Plan for the construction process. Reference should also be made to the criteria of local councils which establish when Waste Management Plans are required.

3.3.5 Recycle Buildings, Use Existing Infrastructure

Assess thoroughly the opportunities to reuse existing facilities and the long-term viability of new facility proposals as a first option. Select and use appropriate assessment procedures such as economic appraisals, value management and master-planning.

Assess the heritage significance of proposed sites and implement preservation or risk education programs where appropriate. Ensure that there is no loss of significant heritage items. Restore and reuse such items wherever possible. Where demolition of buildings is required, individual items of heritage significance are to be saved and made available for public view.

3.3.6 Maximise Life Cycle and Future Adaptability of Building

Design for ease of future adaptability taking into account design and planning principles for durability, versatility, access, redundancy, simplicity, upgradeability, independence.

Ensure retention of full as-built-documentation to assist effective decision making and prevention of costly probing exercises.

Maximise the potential life cycle length of facilities to reduce energy costs in demolition, and reconstruction. The durability of materials and so the maintenance required to extend its life can also significantly affect both the resources and energy use of a building.

3.3.7 Protect and Enhance the Site

Preserve and protect the physical viability of natural ecosystems by ensuring systems are retained intact, uninterrupted and unified. Seek to provide wildlife corridors between fragmented ecosystems in co-operation with neighbouring properties. Re-establish the widest possible range of indigenous plant and animal communities, in appropriate habitats, to restore the site to its potential diversity of species.

Conserve viable site populations of all native species and maintain their habitats. Protect natural habitats from the adverse effects of settlement such as stormwater runoff, erosion and invasion by exotic species. Support the maintenance of biodiversity with site remediation activities such as regeneration and revegetation.
Site the building for minimum impact on ecosystems by minimising cut and fill. Preserve appropriate existing landscape features where possible as a first option. Landscape design of built areas should reflect the inherent natural patterns of a site (the result of natural processes that have shaped it), as well as the human modifications of these patterns. Minimise the use of chemicals (pesticides, herbicides and fertilizers) by designing for diversity, careful species selection and using thoroughly researched planting details and specifications. Protect the water quality of adjacent environments during construction by effective erosion and run-off controls.

3.3.8 Design and Build Energy Efficient Buildings

Minimise energy demand by adopting passive design solutions, e.g. exploiting local climate and intrinsic properties of the design and materials, as a first priority, before resorting to active design solutions, e.g. energy-consuming engineering services or systems. Apply this approach in conjunction with optimising user amenity and comfort. Good passive building performance results in the active systems, where required, using less energy and often being of a smaller capacity, thereby also saving capital costs. Optimise energy outcomes by considering and selecting design options on the basis of lowest life cycle cost. Where life cycle costs are within 10% of each other, select the option with the lowest greenhouse gas emissions. Minimise energy demand by taking maximum advantage of site selection and planning, by:

- Giving preference, if possible, to a site with suitable shape, orientation and topography that allows building design and placement to optimise passive attributes.
- Locating the building with due consideration to orientation, solar gains, daylight access, overshadowing within and outside the site, while also meeting functional needs.
- Minimising energy requirements by optimising building design, while also meeting functional needs, by means such as:
  - Selecting building form (shape, shallow or deep plan, single or multi-storey) that best provides for daylight access and control of heat gain and loss. Avoid causing undesirable overshadowing within and outside the site.
  - Orientating building to optimise solar control. Generally, preferred orientation is an east-west long axis for ease of controlling solar gains through north and south facing windows, to maximise daylight opportunities, and to minimise solar loads on east and west elevations.
  - Planning layout of internal spaces to maximise opportunities for and to fully exploit passive design measures such as day lighting strategies and passive heating from controlled solar access. Minimise effects of undesirable heat gains by arranging ‘buffer zones’ between the source and the occupied zone: for example, locating service cores, stores, plant rooms or toilets on western side of building.
Optimising thermal resistance of building envelope to optimise heat gain or loss, and to minimise consequential thermal discomfort and cooling/heating energy use. Use insulation.

Controlling solar access and optimising use of daylight to minimise need for energy consuming mechanical cooling / heating and artificial lighting. Optimise solar control to minimise summer heat gains, and if appropriate, benefit from passive heating of winter sun (note—winter solar gains may be undesirable in some cases), use external sun shades.

Maximising use of local resources, where possible, to reduce transportation energy.

3.3.9 Optimise Engineering Services Design

Minimise energy consumption by optimising the engineering services design. As a priority, integrate engineering services to gain maximum benefit from the passive attributes of the building, e.g. artificial lighting and daylight.

Engineering services design should include:

Dividing building into zones according to function and operational needs, cooling and heating load profiles, occupancy patterns and densities, out-of-hours use, and local emissions. Identify zones for special uses that require special or more stringent environmental conditions, and treat them separately rather than raise servicing and energy consumption levels of building as a whole.

Selecting system types, e.g. central plant or distributed discrete plant, combination ambient-task lighting or general lighting, most appropriate for zones and building as a whole, to ensure optimum Operations efficiency and minimum energy wastage from unnecessary operation.

Selecting control systems most appropriate for zones, engineering services or systems, and building as a whole, ranging from simple local controls, e.g. local switches, time switches, occupancy sensors, to fully integrated building management and control systems (BMCS), to ensure optimum Operations efficiency and minimum wastage from unnecessary operation.

Providing metering and monitoring systems to a level commensurate with complexity of building, as energy management tools to ensure efficient building operation. Such systems can be set up to track systems or sub-systems for heating, cooling, ventilation, lighting, general power and water heating.

Designing lighting systems to ensure optimum efficiency under all conditions of buildings expected usage. Maximise efficiency and minimise unnecessary energy use by means such as:

- Choosing most efficient lighting system design and minimum lighting level appropriate for required application.
- Using most efficient luminaries appropriate for required application. High efficiency luminaries reduce energy use and heat generated, which also means lower air conditioning loads or lower impact on comfort in naturally ventilated buildings.
Designing heating, ventilation and air conditioning (HVAC) systems to ensure optimum efficiency under all expected building operations conditions, from part load to full load conditions. Maximise efficiency and minimise unnecessary energy use by means such as:

- Providing zones with different cooling/heating demands, operations hours or more stringent temperature / humidity requirements with separate HVAC systems.
- Minimising conflicting cooling and heating demands, and avoid reheat systems, which waste energy in simultaneous cooling and heating.
- Limiting outside air quantities to meet code and dilution needs, to minimise unnecessary heating and cooling of unconditioned air.
- Comfort air conditioning should not have humidity control.
- Including automatic start/stop controls, e.g. time switches, after-hours switches for limited out-of-hours use, to limit unnecessary HVAC operation.
- Using building’s thermal mass to delay and reduce peak loads, thereby achieving reduced plant size and energy consumption.
- Adopting energy-saving devices and systems such as variable speed drives for fans and pumps, waste heat recovery to pre-heat incoming air or water.

Considering the use of energy cogeneration principles.

Selecting most appropriate hot water units for the building, e.g. electric, gas, solar with electric/gas boost, heat pump. Minimise heat and energy loss by locating units close to areas of greatest demand. Centralised systems with recirculating closed loop reticulation are generally less efficient than decentralised discrete units at points of use with minimum dead legs of pipework. Recirculating pumps should be thermostatically controlled to limit unnecessary operation.

Energy-efficient lifts should include intelligent controls to optimise operational efficiency against occupant movement patterns, and to minimise unnecessary travel.

Selecting energy efficient equipment and appliances based on their rated performance or recognised star rating scheme.

On completion of installation, ensure engineering services and energy efficiency measures are properly commissioned and are operations as design intended.

During building’s operations life, carry out programmed preventative maintenance on all systems to ensure they continue to operate efficiently.
As part of managing building operation, monitor its energy use to ensure it is within acceptable limits (such as the forecast energy consumption from Energy Efficiency Statement, a benchmark for this type of building or a pre-determined target). Account for any overruns and take corrective actions. Implement further opportunities to improve operational efficiency as building usage changes over time.

3.3.10 Make the Building Healthy

Consider holistically, the common denominators of Sick Building Syndrome, including temperature and air velocity, fresh air ventilation rates, relative humidity, lighting, noise, micro-organisms, respirable particulates, volatile organic compounds, gaseous pollutants, tedious work schedules, control by occupants and negative ions.

Avoid the use of polluting substances by selecting low impact construction materials and providing high indoor air quality. Provide appropriate lighting for different uses and maximise use of daylight. Minimise unacceptable noise.

3.3.11 Select Low Impact Construction Materials

Consideration is to be given to the ‘cradle to grave’ implications of material choices, the implications of the materials’ extraction, manufacture, use and disposal.

Subject building material selections to systematic consideration of whole of life environmental impacts. Avoid the use of hazardous or suspected materials or only use them with adequate safety devices and precautions.

Impacts that should be considered are:
- impact on natural ecosystems from which the material was extracted/grown
- amount of energy required in production / transportation
- environmental impacts generated by construction activities
- amount of toxin waste generated in production
- potential of material to be recycled
- amount of recycled material used in production
- life space and durability of product
- effectiveness of product
- any threat to human health from deterioration of the product
- nature of waste generated by disposal of the product.

Adopt life cycle costing principles for materials and systems selection that includes capital, recurrent and disposal costs. Co-ordinate criteria used for calculations with methodology used for LCA.

Use recycled and recyclable building materials, where fit-for-purpose, in walls, roofs and floors and demolition materials in fill and hardcore. This may include the re-use of materials or components from existing site facilities that are to be demolished. Investigate local facilities for receiving recyclable materials and establish a policy for the construction phase to be written into specifications. There will be a cost and potential environmental penalty if the specification makes unrealistic demands through additional transport for
recycling. Also, landscape design should include provision for the recycling of green and organic waste during establishment and facility operation. Avoid use of rainforest timber and timber from Australian high conservation forests. Balance consideration of environmental impacts of use of treated plantation timbers against use of untreated timbers from natural growth forests. Design for use of timber substitutes or engineered wood products in preference to solid wood. Consider appropriate design detailing for engineered products to avoid any off-gassing potential.

3.3.12 Provide High Air Quality

Internal Air

All new and refurbished buildings shall comply with AS 1668.2 Mechanical Ventilation and Air Conditioning.

Maximise effectiveness of ventilation through careful consideration of integrity of fresh air intake, provide filtration of fresh air, and due regard to internal building divisions and configuration.

Use local exhaust ventilation for specific indoor sources such as wet areas, photocopier and printer locations, etc.

Consider adoption of a building flush-out immediately prior to occupancy. Sustaining a period of full ventilation using 100% outdoor air for at least one week will reduce levels of residual volatiles. This can be a useful strategy to improve indoor air quality in high-risk situations.

Control humidity in mechanically ventilated buildings to 40-70% RH by steam (not water spray) humidification.

Protect against release of microbial hazards such as legionella bacteria into ambient air by proper design and maintenance of air conditioning and ventilation systems.

Specify fit-out and management procedures to minimise toxic fume emission from adhesives, sealants, paints, coatings, carpets, and pest control practices etc. Emissions from materials can be quite high at fit-out time but then decline rapidly. Use of vapour barriers and lack of ventilation tends to permit build-up of chemical vapour in a space. Materials of high sink capacity (carpets, fabrics, upholstery, etc.) absorb and then slowly emit chemical concentrations. Avoid these installations while major emissions are still occurring.

Avoid use of air polluting materials.

Ensure reduction of construction contaminants in buildings prior to occupancy such as dust, particulates, water infiltration related contaminants, volatile organic compounds, etc. Specify appropriate protocols.

Make good un-flued gas heaters.

External Air
Minimise air pollution and emissions from buildings. Specify refrigerants and processes that minimise ozone depleting potential and greenhouse warming potential. Abandon use of chlorination of water on sites and use ozone or UV instead.

3.3.13 Reduce Impact of Materials on Indoor Air Quality

Maintain a high level of indoor air quality by designing to avoid in new buildings or monitor for presence in refurbished buildings potential air quality hazards such as:
- formaldehyde from building boards and UF insulation
- contamination from some soils or fill
- carbon monoxide from motor fuel
- volatile organic compounds from some building products.

Specify fitout and management procedures to minimise toxic fume emission from adhesives, sealants, paints, coatings, carpets, pest control practices, etc. Emissions from materials can be quite high at fitout time but then decline rapidly. The use of vapour barriers and lack of ventilation tends to permit the build-up of chemical vapour in a space. Materials of high sink capacity (carpets, fabrics, upholstery, etc.) absorb and then slowly emit chemical concentrations. Avoid these installations while major emissions are still occurring.

Use building materials such as insulations and carpet backings free of CFC and HCFC. Avoid use of hazardous materials such as asbestos and lead-containing products. For all glass and mineral fibres a policy of care needs to be adopted. Masks should always be used, and batts should be isolated in bags. Select building materials to avoid pollutant release during fires.

The following table gives some alternative products that may be chosen when building or renovating to provide a healthier environment. Refer to the Project Manager for approval for the use of the “safer product”.

<table>
<thead>
<tr>
<th>Potentially Hazardous Product</th>
<th>Safer Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical termite treatment</td>
<td>Barrier methods made from granite or stainless steel</td>
</tr>
<tr>
<td>Carpets</td>
<td>Hardwood timber</td>
</tr>
<tr>
<td>Synthetic carpet underlay</td>
<td>Jute or wool/jute mix underlay</td>
</tr>
<tr>
<td>Petrochemical paints and varnishes</td>
<td>Plant chemistry-based paints and varnishes</td>
</tr>
<tr>
<td>Pressed wood cupboards and furniture</td>
<td>Hoop pine plywood</td>
</tr>
<tr>
<td>Pressed wood sub-flooring</td>
<td>Solid timber</td>
</tr>
<tr>
<td>Glues and adhesives</td>
<td>Use physical methods e.g. nailing, cementing of floor tiles. Use rubber latex, casein or PVA glues sparingly</td>
</tr>
<tr>
<td>Un-flued gas heating and cooking</td>
<td>Electric heating and cooker, Flued gas heating and install range hood above stove vented to outside.</td>
</tr>
</tbody>
</table>

(Source: Klymenko, P., 1996, Indoor Air Quality: Selecting products for cleaner air, Green Games Watch)
3.3.14 Reduce Noise

Protect sites from noise pollution from local features such as traffic, industry and entertainment venues. Provide screening or appropriate earth mounding to control noise. Design site layout to separate noise generating activities from quiet activities. Minimise noise transmission from space to space within multiple-occupancy buildings. Minimise noise emitted from external equipment such as fans, air-conditioners, compressors, and from other noise generating sources.

3.3.15 Optimise Light

Design and site buildings to avoid hazardous or undesirable glare to pedestrians, motorists, people using open spaces and those in other buildings. Avoid overshadowing and visual intrusion of adjoining sites. Design to minimise the impact of night lighting on adjacent areas.

3.3.16 Save Water

Use water efficient equipment, e.g. toilets, taps, showers, appliances. Design landscape to minimise water use, e.g. select plants that require minimal watering, maximise rainwater infiltration, and slow peak stormwater velocities which may cause erosion. Measures may include minimising paved areas and increasing permeability to increase absorption, conveying stormwater via grassed swales rather than gutters or drains. Control stormwater runoff from parking areas to prevent oil and grease runoff entering nearby waterways. Prevent any discharge of stormwater into the sewerage system. Consider measures to reduce pollutant loads entering the sewer system.

3.3.17 Minimise Waste

Design for minimum wastage in construction and demolition by:

Formally applying dimensional co-ordination where it will practically assist efficiency of material use, particularly for modular components and materials supplied in set sizes or dimensions or where high levels of wastage may occur.

Giving design consideration to future ability and ease of recycling construction materials and components at time of refurbishment or completion of facility’s life.

Preparing and implementing waste management project plans during project in construction phase for construction and demolition wastes. Plans should identify alternatives to landfill and describe procedures and management practices.

Making provision in project programming for recovery, storage and transfer of re-useable materials from demolition works, including their transport from site to recycling and re-use stations; specify accordingly and supervise during construction. Consider use of separable or early works packages where this is of advantage to project.
Adopt special procedures for disposal or recycling of hazardous materials in refurbishing existing buildings.

3.4 Green Star Requirements

3.4.1 Introduction

It is the intent of the University to adopt the ideology of the Green Star environmental rating system for all new facilities and for the refurbishment of existing facilities. This requirement is designed to compliment and be used in conjunction with the ESD section of this document. Documents that provide guidance for design teams on how to achieve this objective include:

- Building Code of Australia
- Green Building Council of Australia (GBCA) technical manuals
- National Australian Building Energy Rating System (NABERS).

These documents have been used to create a platform to generate recommendations for costing design options. However, the responsibility rests with the design team to introduce initiatives other than those noted within these documents to test whether they too should be included in the environmentally sustainable design solution for the project.

3.4.2 What is Green Star?

Green Star Rating System Star is an industry recognised technical design guide to promote sustainable development. Green Star technical manuals have been developed by the Green Building Council of Australia (GBCA). There are several technical manuals published that can provide guidance for the design of various types of buildings. The GBCA provides opportunities to building owners to ratify their designs in accordance with the various design manuals. This ratification (certification) permits the building owner to publicly state that the building is a Green Star rated building. Ratification can be completed for both the design and as-built stages of a project.

Green Star Ratings

The Green Star system is based on 100 points and uses categories to provide weighted scores as follows:

<table>
<thead>
<tr>
<th>Overall Score</th>
<th>Rating</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-19</td>
<td>One Star</td>
<td>Not eligible for formal certification</td>
</tr>
<tr>
<td>20-29</td>
<td>Two Star</td>
<td>Not eligible for formal certification</td>
</tr>
<tr>
<td>30-44</td>
<td>Three Star</td>
<td>Not eligible for formal certification</td>
</tr>
<tr>
<td>45-59</td>
<td>Four Star</td>
<td>Eligible to apply for a Four Star Green Star Certified Rating that</td>
</tr>
</tbody>
</table>
Categories

Within the Green Star framework, there are a number of categories to be aware of when costing, planning and implementing a project. It is important to understand these categories and their individual requirements in order to meet the requirements of the University.

The Green Star categories environmental impact categories are as follows:
- Management
- Indoor Environment Quality
- Energy
- Transport
- Water
- Materials
- Land Use and Ecology
- Emissions
- Innovation

3.4.3 University of South Australia Requirements

For any given project, it is the prerogative of the University to stipulate whether a project is to be ratified (design and/or as-built), and to which Green Star rating, or if self-assessed equivalency is sufficient. It is the responsibility of the contractor to find out the Green Star requirements of the project prior to commencing the works (design or construction).

More information can be sourced at [www.gbca.com.au](http://www.gbca.com.au) which also provides a list of accredited professionals (people who have undertaken Green Star training and passed a competency exam) who may be contacted for guidance at the contractor's expense.

3.5 Design Guidelines

3.5.1 Introduction

Purpose

This section outlines the principles and controls that govern the design of all UniSA Capital Works and Maintenance projects. UniSA Planning Guidelines are governed by the following:

General Design Principles

General Facilities
Interior Finishes Guidelines.

**Reference Documents**

The Design Guidelines outlined in this section must be read in conjunction with the following sections within the Design and Construction Guidelines:

Planning Guidelines

Space Management Guidelines

Section D—Special Facilities

Section E—Construction Controls.

The following Reference Documents are to guide detailed design, documentation and construction and are available on request:

UniSA Standard Interior Finishes Schedule

UniSA OHSW Procedure—Design and construction of new and refurbished buildings.

### 3.5.2 General Design Principles

**Occupational Health Safety and Welfare Requirements**

All Occupational Health, Safety and Welfare legislative requirements, including Schedules 1 and 2 of the OHS&W Regulations, must take into account in the design and construction of new buildings, additions and refurbishments.

Consultation with key stakeholders in relation to OHS&W issues must be undertaken in accordance with UniSA OHSW Procedure—Design and construction of new and refurbished buildings. UniSA OHSW&IM Services will also be invited to participate during the consultation process as required.

**Building Efficiency**

Building efficiency should not be less than the following:

<table>
<thead>
<tr>
<th>TYPE</th>
<th>EFFICIENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science type</td>
<td>60%</td>
</tr>
<tr>
<td>Humanities and Administrative types</td>
<td>65%</td>
</tr>
<tr>
<td>Library type</td>
<td>75%</td>
</tr>
<tr>
<td>Art type</td>
<td>70%</td>
</tr>
</tbody>
</table>

**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 3-7 - Space Utilisation Factors

<table>
<thead>
<tr>
<th>Type</th>
<th>Room Frequency</th>
<th>Seat Occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture theatres</td>
<td>75%</td>
<td>75%</td>
</tr>
<tr>
<td>Seminar and tutorial rooms</td>
<td>75%</td>
<td>75%</td>
</tr>
<tr>
<td>Laboratories and special use rooms</td>
<td>50%</td>
<td>75%</td>
</tr>
</tbody>
</table>

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

### Room design

The shape of all room types shall be designed according to the number of occupants and their furniture. Rooms tending to be square, rather than rectangular, provide greater flexibility.

### Arrangement of rooms

The detailed arrangement of rooms shall be development with the Contract Supervisor and in consultation with the key stakeholders. Generally, it is desirable in any vertical arrangement of accommodation, to locate the most populated rooms (usually undergraduate areas) at ground floor level and quieter, less populated spaces, at higher levels.

### Solar control, sun shading and screening

Sun shading and screening shall be included in the building design and provided by features such as slab projections, overhangs, fins and blades. Applied reflective film to glass shall not be used. Windows on western facades are generally to be avoided and eastern facing windows shall be minimised. Northern glass shall be adequately shaded against summer sun. All external doorways, entrances and porches shall have protection from the weather.

The control of solar impact must form an integral part of the building design. Important issues to be addressed include:

- provision of adequate and appropriate screening against solar heat gains and glare and to avoid reflection problems for surrounding buildings and spaces
- design of control devices to ensure they do not hinder window cleaning and periodic maintenance
- provision of blackout curtains in nominated teaching spaces.

### Covered links

Covered walkways and links to adjoining buildings shall normally be provided. Building lines, levels and entrance points shall be determined in consultation with the Contract Supervisor.

### Wind control

Individual buildings or groups of buildings must be designed in accordance with AS 1170 and must avoid the problems associated with wind turbulence, particularly at building entries and public spaces.

### Acoustic control
The ultimate utility and function of teaching, academic and staff support areas is highly dependent on the control of external and internal noise. External ambient noise from traffic, aircraft and adjacent buildings should be considered in determining details and materials of external facades, windows, roofs, etc. Choice of special layout, construction, materials and finish should be carefully guided by the need to provide spaces with acceptable acoustic performance. In general, the recommended Design Sound Levels and Reverberation Times for Building Interiors as set out in AS 2107 must be adopted. 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.

<table>
<thead>
<tr>
<th>Privacy Class</th>
<th>Objective Values of Sound Reduction (Averaged 125-4000 Hertz)</th>
<th>Subjective Impression of Sound Reduction (under normal conditions—background noise level 40 dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1—teaching areas, seminar and meeting rooms, and executive offices.</td>
<td>Sound reduction through walls and ceilings 40 dB Sound reduction through walls containing doors 35 dB Sound insertion loss specification for doors only 25 dB Through walls and ceilings High degree of privacy. Voices in next room may be just audible but not intelligible.</td>
<td>Through doors Voice audible but conversation generally unintelligible unless speaker or listener close to door.</td>
</tr>
<tr>
<td>Privacy Class</td>
<td>Sound reduction through walls and ceilings Sound reduction through walls containing doors Sound insertion loss specification for doors only Through walls and ceilings Through doors</td>
<td></td>
</tr>
<tr>
<td>Class 2B—academic offices, senior admin offices</td>
<td>Sound reduction through walls and ceilings 35 dB Sound reduction through walls containing doors 30 dB Sound insertion loss specification for doors only 20 dB Through walls and ceilings Above average standard of sound separation for normal offices. Possible to understand some normal conversation from adjacent space, but generally not distracting.</td>
<td>Through doors Voice audible but conversation generally unintelligible unless speaker or listener close to door.</td>
</tr>
<tr>
<td>Class 3—admin offices, technicians' offices, student offices, store rooms.</td>
<td>Sound reduction through walls and ceilings 30 dB Sound reduction through walls containing doors 20 dB Sound insertion loss specification for doors only No spec Through walls and ceilings Voices audible and conversation intelligible unless persons speaking in subdued voices. Although privacy not good, the reduction of office noise is well worthwhile.</td>
<td>Through doors Voice audible and conversation intelligible. Although privacy not good, the reduction of office noise is well worthwhile.</td>
</tr>
</tbody>
</table>

The class of insulation to be used between spaces of different classes shall in general be that of the higher class. The class of insulation to be used for plant rooms will depend on the type of plant in the rooms, the location of the rooms in the building and the nature of adjacent rooms.

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
DESIGN AND CONSTRUCTION GUIDELINES

objectionable, nor so low that the resulting quiet causes intruding speech and other activity noise to be objectionable.

Preferred values are shown in the table below. The level of noise is described here by the Noise Rating, as defined by AS 2107.

<table>
<thead>
<tr>
<th>Room Use</th>
<th>Noise Rating</th>
<th>Subjective Impression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture theatres, large meeting rooms and</td>
<td>NR 30</td>
<td>Barely audible and very unobtrusive.</td>
</tr>
<tr>
<td>specially designated areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private offices</td>
<td>NR 35</td>
<td>Audible, not noticeable only in absence of activity noise.</td>
</tr>
<tr>
<td>Tutorial rooms and small meeting rooms</td>
<td>NR 30</td>
<td></td>
</tr>
<tr>
<td>General offices</td>
<td>NR 40</td>
<td>Audible, but noticeable only when there is little activity noise.</td>
</tr>
<tr>
<td>Corridors</td>
<td>NR 45</td>
<td></td>
</tr>
<tr>
<td>Laboratory—fume cupboard without scrubber</td>
<td>NR 45</td>
<td>Noise level to be measured 1500 mm from fume cupboard opening.</td>
</tr>
<tr>
<td>Laboratories—fume cupboard with scrubber</td>
<td>NR 50</td>
<td></td>
</tr>
</tbody>
</table>

Vibration Controls

Mechanical equipment must be of such type, quality and condition of balance, and so supported and mounted, that there will be no perceptible vibration of the building. The vibration transmitted into the building must not cause sound levels to exceed the requirements described elsewhere.

3.5.3 General Facilities

Stairs

Stairs must be designed to conform to the requirements of all relevant Acts and Codes of Practice. In general, treads and risers must be in accordance with the Building Code of Australia. The needs of people with disabilities should also be carefully considered. UniSA will not accept designs which combine maximum height risers with minimum width treads.

Step Ladders

UniSA will not accept designs that incorporate the use of step ladders. This especially relates to plant rooms, where service staff may have to access plant or service areas at a high-level. Alternative safety provisions are to be made for high-level access, or alternatively the need for high-level access in order to service plant is to be designed out. Refer to AS 1657 – Fixed platforms and walkways.

For any designs of fixed platforms or walkways which contribute to evacuation routes, the corresponding as-built drawings shall be prepared and forwarded to Facilities Management Maintenance Operations as per the as-built requirements. This is of particular importance where evacuation provisions may have been altered after the construction drawings have been issued.

Kitchenette/Tea-making facilities

Where possible and practical a kitchenette 7m² is to be provided on each level of a building or for each functional group as set out in the Project Brief or directed by the
Contract Supervisor. Tea making facilities may be required in service cores, common rooms, etc. When provided in carpeted areas, such as common rooms, sink benches must be surrounded by an area of impervious flooring.

Toilets
Assessment of toilet, urinal and hand basin requirements for a project is to be made in the context of the following:
- total campus requirements
- total building requirements
- existing facilities within the building
- existing facilities on campus

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.

In women’s toilets, provision must be made for sanitary disposal units. 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. Mirrors must be properly copper-backed and ventilated.

Toilets to have emergency lights fitted.

Cleaners’ rooms
A dedicated cleaners’ room shall be located on each level of a building for the storage of cleaning equipment and consumables (minimum size 6 m²) and contain a power point, a cleaners’ sink with tiled splashback and hot and cold water supply. Floors to cleaners’ rooms shall be finished with non-slip low maintenance finish.

Valve rooms
All main service isolation valves, meters and the like must be accessible from outside the building wherever possible. These should preferably be located at ground level in an accessible service duct.

Minimum, number and location of rooms to be determined in consultation with Information Strategy & Technology Services (ISTS).

Rubbish removal
Easy removal of rubbish and waste from the building is mandatory. An adequate storage space must be provided for refuse bins in locations as directed by the Contract Supervisor.

Parking and access
Adequate parking must be provided to comply with statutory requirements. Careful consideration must also be given to the provision of parking and access for people with disabilities.
3.6 Interior Finishes Guidelines

3.6.1 General Principles

These guidelines form the basis for the interior finishes selections for all UniSA new construction, refurbishment and maintenance projects. It is intended that the application of these guidelines will ensure a long-term, consistent, cost effective, maintainable and non-discriminatory solution to the delivery of finishes in all UniSA buildings.

New Construction Projects

The interior design and selection of finishes and furniture for all new construction projects are to meet the requirements outlined in these Interior Finishes Guidelines. Proposals for new interior schemes are to be approved by the FMU Project Manager before final documentation. New finishes should be compatible with the standards that are already in place on each campus- Refer UniSA Standard Interior Finishes Schedules.

Refurbishment Projects

The interior design and selection of finishes for refurbishment projects is to be guided by the UniSA Standard Interior Finishes Schedule relevant to the respective building, floor level and campus.

Where a UniSA Standard Interior Finishes Schedule does not exist for a building or floor level, the following is to guide the approach to interior selections:

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 FMU Project Manager.

For substantial refurbishment projects, these Interior Finishes Guidelines are to direct the development of a new interior finishes scheme.

Maintenance Projects

The selection of finishes for maintenance projects is to be guided by the UniSA Standard Interior Finishes Schedule relevant to the respective building, floor level and campus.

Where a UniSA Standard Interior Finishes Schedule does not exist for a building or floor level, the following is to guide the approach to interior selections:

For minor maintenance projects, interior finishes selections are to match existing. Where existing products are no longer available, proposed alternatives are to be for approved by the FMU Maintenance Manager.

For substantial refurbishment projects, these Interior Finishes Guidelines are to direct the development of a new interior finishes scheme.

Fashion Trends and Timeless Choices

Long-term (life cycle >10yrs) interior elements and finishes are to be timeless 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. Also refer to Feature Elements.
Standard Ranges Only

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.

Readily Available Ranges

Unless directed otherwise by the Design and Construction Guidelines or the Contract Supervisor 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, lead-time and cost implication are 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.

Feature Elements

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.

Health and Well Being

Interior selections are to consider the health and well being of the future project users. This consideration is to extend to the following:

toxicity of material selections
acoustic comfort
psychological consideration in the use of colour.

- DDA requirements for sight impaired – contrast and luminescence

Durability

All materials, finishes and furniture selected are to be certified as suitable for Heavy Duty Commercial applications.

Maintainability

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 OHS perspectives of lamp replacement.

Environmental Sustainability

The use of environmentally sustainable materials is encouraged. This consideration should be extended to the use of:

- recycled materials wherever possible,
- plantation grown timber,
3.6.2 Documentation Required

New Interior Design/Finishes Schemes

Proposals for new interior finishes schemes are to be submitted for all new construction projects. These are to include:
- Interior Design Concept proposal drawings
- samples of proposed materials, finishes and colours
- Interior Design report outlining proposed selections their lifecycle and maintainability issues.
- Proposed Interior Finishes schemes are subject to approval by the FMU Project Manager.

As-constructed Interior Finishes Schedule

Within one month of the completion of the project, the final Interior Finishes and Furniture Schedules are to be submitted to the Facilities Management Unit in hard copy and electronic version. The format of that information is to match the following:

Table 3-10 - Example Finishes and Furniture Schedule

<table>
<thead>
<tr>
<th>Element</th>
<th>Product Type</th>
<th>Finish—Colour—Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Name (and level if applicable)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paint Finishes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall Colour (General)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall Colour (Feature)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doors and Toilet Partition Doors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frames and Stair Balustrades</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceilings and Bulkhead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor Finishes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vinyl Tiles (General)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vinyl Tiles (Feature)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet Area Floor Tiles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet Area Wall Tiles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stair Tiles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skirtings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skirtings (Carpet Areas)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skirtings (Vinyl Areas)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skirtings (Tile Areas)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabrics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabrics General 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabrics General 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Interior Maintenance Manual

Prior to the completion of construction two (2) copies of an Interior Maintenance Manual outlining all the interior selections and their associated cleaning, maintenance and any other special requirements is to be submitted to the Contract Supervisor.

### 3.7 Space Management

#### 3.7.1 Space Management Guidelines

UniSA has developed Space Management Guidelines. The latest version of these guidelines will be available on the Facilities Management Unit website.

#### 3.7.2 Room Numbering Guidelines

**Numbering system**

From the Design Development phase of all projects, UniSA’s numbering protocols are to be applied to the project plans. At the end of the Schematic Design Phase the project floor plans together with the proposed allocated numbering are to be submitted to the Facilities Management Unit for review, potential amendment and approval.

**Level Numbering Protocols**

Level numbering typically commences with “01” at the ground level, with the next level as “02”, etc.

Basements are numbered as “00”.

Exceptions to this are level numbers which are maintained across buildings along a sloped site, which may mean that the ground floor is not level “01”. This is to be confirmed with the FMU before level numbering for new buildings is initiated.

UniSA does not use “G” to denote Ground Floor.

**Room Numbering Protocols**
The following protocols guide and govern the allocation of room numbers to specific spaces. These protocols are to be adhered to unless directed otherwise by the Facilities Management Unit:

Room numbering typically commences at “01” for the main space for the primary entrance to a building.

All rooms off main corridors or primary spaces should be given a double digit numerical identity (“02”, “03”, etc).

Rooms off main rooms (i.e. without main corridor access) should be given an alpha numerical identity (“01A”, “01B”, etc).

Whenever possible, where rooms are off long corridors, they should be numbered in a left to right sequence down the corridor.

Where rooms are off short corridors they should be numbered in a consecutive order around the corridors in a clockwise direction.

Room numbering should be considered from a ‘way-finding’ point of view. Each area should be considered from the point of view of someone with no local knowledge, attempting to find a room within that area.

**Format**

Rooms are numbered in accordance with the following format:

**BBBLL—RRR**

where:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBB</td>
<td>Building Descriptor Prefix</td>
<td>Up to three alpha characters; uppercase; no numeric allowed. Refer to attached list of Building Prefixes.</td>
</tr>
<tr>
<td>LL</td>
<td>Building Level Number</td>
<td>Up to two numeric characters.</td>
</tr>
<tr>
<td>RRR</td>
<td>Room Number</td>
<td>Two numeric characters, third optional alpha character; uppercase.</td>
</tr>
</tbody>
</table>

**Examples:**

<table>
<thead>
<tr>
<th>Building Name</th>
<th>Level</th>
<th>Number</th>
<th>Room Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sir Charles Todd</td>
<td>2</td>
<td>06A</td>
<td>SCT3—06A</td>
</tr>
<tr>
<td>Yungondi</td>
<td>4</td>
<td>43</td>
<td>Y4-43</td>
</tr>
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<td>Building X</td>
<td>2</td>
<td>35B</td>
<td>X2-35B</td>
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</tbody>
</table>

**Table 3-13 - List of Building Prefixes**

<table>
<thead>
<tr>
<th>Building Number</th>
<th>Campus Description</th>
<th>Campus Code</th>
<th>Building Prefix</th>
<th>Building Name</th>
</tr>
</thead>
<tbody>
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<td>CEA</td>
<td>R</td>
<td>Reid</td>
</tr>
<tr>
<td>102</td>
<td>City East</td>
<td>CEA</td>
<td>BJ</td>
<td>Bonython Jubilee</td>
</tr>
<tr>
<td>103</td>
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<td>CEA</td>
<td>P</td>
<td>Playford</td>
</tr>
<tr>
<td>104</td>
<td>City East</td>
<td>CEA</td>
<td>C</td>
<td>Centenary</td>
</tr>
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<td>Building Number</td>
<td>Campus Description</td>
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<td>Building Prefix</td>
<td>Building Name</td>
</tr>
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<td>--------------------</td>
<td>-------------</td>
<td>----------------</td>
<td>--------------</td>
</tr>
<tr>
<td>105</td>
<td>City East</td>
<td>CEA</td>
<td>A</td>
<td>Cafeteria and Bar</td>
</tr>
<tr>
<td>106</td>
<td>City East</td>
<td>CEA</td>
<td>B</td>
<td>Brookman</td>
</tr>
<tr>
<td>107</td>
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<td>CEA</td>
<td>H</td>
<td>Basil Hetzel</td>
</tr>
<tr>
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<td>MAG</td>
<td>A</td>
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</tr>
<tr>
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<td>MAG</td>
<td>B</td>
<td>Building B</td>
</tr>
<tr>
<td>303</td>
<td>Magill</td>
<td>MAG</td>
<td>C</td>
<td>Building C</td>
</tr>
<tr>
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<td>MAG</td>
<td>D</td>
<td>Building D</td>
</tr>
<tr>
<td>306</td>
<td>Magill</td>
<td>MAG</td>
<td>G</td>
<td>Building G—De Lissa</td>
</tr>
<tr>
<td>307</td>
<td>Magill</td>
<td>MAG</td>
<td>MH</td>
<td>Murray House</td>
</tr>
<tr>
<td>308</td>
<td>Magill</td>
<td>MAG</td>
<td>E</td>
<td>Building E—Gymnasium</td>
</tr>
<tr>
<td>309</td>
<td>Magill</td>
<td>MAG</td>
<td>F</td>
<td>Building F—Pool Workshops</td>
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<td>TH</td>
<td>Building TH—Grounds</td>
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<td>Q</td>
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</tr>
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</tr>
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</tr>
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</tr>
<tr>
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<td>MAG</td>
<td>K</td>
<td>Bldg K—Child Care Centre</td>
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<tr>
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<td>MAG</td>
<td>MC</td>
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</tr>
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</tr>
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</tr>
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</tr>
<tr>
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<td>MAG</td>
<td>MHA</td>
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<td>MAG</td>
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</tr>
<tr>
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<td>MAG</td>
<td>TM</td>
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</tr>
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<td>MAG</td>
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<td>MAG</td>
<td>H</td>
<td>Amy Wheaton</td>
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</tr>
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<tr>
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<td>C</td>
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<td>K</td>
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<tr>
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<td>Building Prefix</td>
<td>Building Name</td>
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<td>SF</td>
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<td>SPRI Building</td>
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<td>E</td>
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<td>Building G—Garth Boomer</td>
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<td>MB</td>
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<td>Campus Code</td>
<td>Building Prefix</td>
<td>Building Name</td>
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<td>Student Unit N</td>
</tr>
<tr>
<td>701</td>
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<td>CWE</td>
<td>WL</td>
<td>Way Lee</td>
</tr>
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<td>704</td>
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<td>BH</td>
<td>Barbara Hanrahan</td>
</tr>
<tr>
<td>705</td>
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<td>CWE</td>
<td>RR</td>
<td>Rowland Rees</td>
</tr>
<tr>
<td>706</td>
<td>City West</td>
<td>CWE</td>
<td>GK</td>
<td>Sir George Kingston</td>
</tr>
<tr>
<td>707</td>
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<td>CWE</td>
<td>HH</td>
<td>Sir Hans Heysen</td>
</tr>
<tr>
<td>708</td>
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<td>CS</td>
<td>Catherine Helen Spence</td>
</tr>
<tr>
<td>709</td>
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<td>G</td>
<td>Child Care Centre</td>
</tr>
<tr>
<td>711</td>
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<td>Liverpool Street</td>
</tr>
<tr>
<td>714</td>
<td>City West</td>
<td>CWE</td>
<td>SM</td>
<td>27-29 North Terrace (leased)</td>
</tr>
<tr>
<td>715</td>
<td>City West</td>
<td>CWE</td>
<td>BE</td>
<td>189 Hindley St (leased)</td>
</tr>
<tr>
<td>716</td>
<td>City West</td>
<td>CWE</td>
<td>AU</td>
<td>101 Currie St (leased)</td>
</tr>
<tr>
<td>717</td>
<td>City West</td>
<td>CWE</td>
<td>DP</td>
<td>David Pank Building</td>
</tr>
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<td>Kaurna</td>
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<td>Hawke</td>
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<td>CWE</td>
<td>X</td>
<td>Building X – Underdale</td>
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<td>CWE</td>
<td>LB</td>
<td>Law Building</td>
</tr>
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<td>724</td>
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<td>CWE</td>
<td>N</td>
<td>Building N – Student Lounge</td>
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<tr>
<td>901</td>
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<td></td>
<td></td>
<td></td>
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<tr>
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<td>Ernabella</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>903</td>
<td>Port Lincoln</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>904</td>
<td>Mt Gambier TAFE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.8 Asset Management

3.8.1 Asset Management Planning Template

Introduction
The intent of this document is to deliver, as part of an overall construction project plan, an asset management planning template that can be used by the Principal Consultant to deliver an Asset Management Plan for new or redeveloped assets. The template is intended to guide and in some cases direct the creation and delivery of data and information, which can be used in the on-going management of the asset. It is intended that the information provided in the asset management plan will be specifically used in establishing budgets and for maintenance contracting. To this end, it is expected that the asset planners will demonstrate evidence in the plan that consideration has been given to Total Life Cycle Costing, asset maintainability, asset replacement schedules, environmentally sustainable development, operational issues, disposal programs and occupational health and safety for the asset operators, maintainers and users.

The asset management information requested should be delivered at three stages of the project:

Stage 1—during the Value Management process
Stage 2—when final design documents are delivered
Stage 3—post construction.

The information is to be delivered in hard copy and in Microsoft Word format.

Structure for the Asset Management Plan
The Asset Management Plan will consist of the following sections:

Asset Description: Provides a definition of the site and definition of the specific objectives to be met by the new or redeveloped asset.

Asset Service Delivery: Describes the reason that the asset exists, and makes the links to the management regimes associated with it. Each asset has attributes that are governed by the role that the asset serves within the organisation and are defined by the current purpose, criticality, presentation/aesthetics, value, operational cost, anticipated life, potential future use, and disposability of the asset.

Environmental Management: Incorporates environmental policies and practical requirements of the site that impact upon the environment.

Heritage Management: This section will describe any heritage issues that are impacted upon by this development. This should include Aboriginal heritage as well as European heritage.

Maintenance Management: The Maintenance Management Plan for any asset is bound up by external influences (e.g. government policy, legislation, codes of practice), service delivery needs (see Asset Service Delivery Plan details above), economic useful life (see...
depreciation cycles), failure modes (e.g. change of business needs, capacity, obsolescence, normal wear and tear, corrosion, vandalism) and current industry maintenance standards. The Maintenance Management Plan will define items that require maintenance, the appropriate maintenance schedule and the consequent maintenance tasks.

Asset Operations: Provides documentation assisting in the delivery of:
- Safe access and egress.
- Safety Management.
- Fire prevention.
- Electrical Safety.
- Noise management.
- Emergency facilities and procedures.
- Lighting levels.
- Ventilation levels.
- Hazardous substances management.
- Pest control.

It is not the intent of this documentation project to create an Operations Plan, rather to acknowledge the need for such a Plan, and to consider operational issues during the design process.

Alternative Use: Describes the future modifications that assets may need in order to meet the future requirements of the asset users. It also takes into consideration and discusses the changes the assets may need to undergo in order to accommodate these future requirements.

Asset Description

This section of the plan describes the location, size, capacity, fabric and services, year built and legislative framework of the asset in technical terms. This means that Asset Planners must define the asset by:

- Its address and/or its location.
- The site upon which it sits, or in which it is located. E.g. A new building at the Mawson Lakes Campus.
- Its’ broad structural fabric.
- The services to which it is connected (electrical, water, sewer, non-potable water etc).
- What is it e.g. a three level building, or a recreation hall.
- Any constraints that may be attached to the design, construction, operation, and use of the asset i.e. environmental issues, heritage issues.
- Ownership issues, i.e. BOOT etc.
- Constraints in selling the asset.

Use profile—who the users are, what they do, when do they do it, how often do they do it, between what hours etc.
Provide a complete asset list based on the asset hierarchy provided (refer Asset Register). The asset list is to include data items as follows: Location (site, building no, level no, room no), asset description, quantity, unit (sqm or each), purchase date, purchase cost, replacement cost, anticipated useful life, actual remaining life, comments/notes.

**Asset Service Delivery**

**Asset Drivers**

Describe the Corporate and Community Drivers for the new or redeveloped asset. These may in particular be derived from the programs to be delivered (for example recreation, research, and education). The drivers may be already described in the corporate plans that have determined that the asset is to be built in the first place.

**Corporate Drivers**

Describe the drivers that have been used to justify the existence or development of the asset. These drivers will be those that have established the asset outcomes. Typical corporate asset drivers may include:

- UniSA Corporate Plan
- Master Plans
- Heritage Conservation Plan
- UniSA Sustainable Development Strategy.

**Community Drivers**

Describe the Community needs and expectations that the asset seeks to fulfil. The Community Drivers are usually derived from market research and other community based documents such as newspaper articles, petitions and magazine articles.

Example:
The gardens are a focal point for visitors to the University of SA, and provide a recreation focus for a significant number of staff, students and general public. They also provide public amenities. Consequently, they should be maintained and operated in a manner that the visitors expect, reflecting a high degree of presentation, reflecting their aesthetic value, cleanliness and functionality.

**Asset Objectives**

An Asset Objective is determined by the broad outcomes of the organisation. Assets generally exist in order to deliver the overall outcomes of the corporate goals that are described in annual reports, corporate planning documents etc. In this section describe those parts of the Corporate Plan that have been used to justify the procurement and provision of the asset, and to then describe the objectives of the asset that will satisfy this part of the corporate plan.

Example:
The corporate plan may specify that the University aspires to deliver “world’s best practice in health science facilities”. In order to satisfy this corporate requirement the University has determined that the existing facilities are not suitable, and a new building is needed. The objectives for this building are described in the University briefing documents, and are to be responded to by the architects. Typical examples are as follows:
The construction and availability of the new research building is intended to fulfil the following objectives:

- ensure that it will be recognised an important public building at the University
- have a minimum life of 50 years and a minimum life cycle cost
- be a low maintenance building
- will use only materials that meet the environmentally sustainable development criteria for the University
- provide the highest available quality science lecturing facilities at all times
- be able to be refitted and reconfigured easily, to accommodate technology changes
- be available at all times that the University is open for business.

**Environmental Management**

Describe those elements of the project that will have an environmental impact. What is the cause, effect and remedy of each of the environmental issues. The environmental issues are not those normally dealt with during the construction phase (e.g. dust, noise, light, and traffic). Rather, they are operational issues associated with (typically) long term issues such as noise abatement, storm water management, water quality, light spill, long term traffic management, protection of species, hazardous chemicals management, soil erosion.

The information can normally be sourced from an Environmental Management Plan (EMP). The Asset Management Plan is not intended to quote the contents of the entire EMP, in chapter and verse. It is rather intended to describe in broad terms what the issues are and how they are being dealt with. As the University is currently drafting an EMP, then broad issues should be discussed.

Organise the information in a table as shown below. The table is to be in landscape format.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Cause</th>
<th>Effect</th>
<th>Suggested Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection of species—endangered species of tree, bird, etc</td>
<td>Lack of management planning can destroy habitats of endangered species that have been identified in this local area.</td>
<td>Loss or serious diminution of species</td>
<td></td>
</tr>
<tr>
<td>Soil erosion</td>
<td>Improper planting’s and watering patterns can assist the erosion of valuable top soils</td>
<td>Loss of top soil, plants and breeding habitats</td>
<td></td>
</tr>
</tbody>
</table>

**Heritage Management**

Describe any heritage issues that are impacted upon by this development. This should include Aboriginal heritage as well as European heritage. Describe the issues in terms of the cause, effect and remedy, in a table laid out in landscape form.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Cause</th>
<th>Effect</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Heritage management—associated with early settlement in this region</td>
<td>Poor management planning and ignorance of heritage matters</td>
<td>Loss of heritage items</td>
<td>Strict adherence to the heritage management plan</td>
</tr>
</tbody>
</table>
**Maintenance Management**

Use the Asset Hierarchy in Asset Register to develop a list of maintainable assets, and then create a maintenance management strategy. This strategy is to be used as the basis of a maintenance management plan for the asset, and should consider breakdown (corrective) maintenance and routine (preventative) maintenance issues.

Issues to be determined for the maintenance plan include:

- legislated maintenance requirements for the asset (e.g. those mentioned in the BCA Essential Services Section)
- asset criticalities (what happens if the asset is not available, or is Operations at reduced capacity)
- what is the relative importance to stated service delivery objectives of the outcomes that each asset may deliver
- the maintenance service frequencies (e.g. daily, weekly, monthly, three monthly, six monthly, annual, two yearly etc)
- maintenance schedules (which day, which month(s), are the services to be done)
- maintenance tasks.

Produce a table which depicts the forecast failure date and cost of the building elements (at level 3 in the asset hierarchy—Asset Register) over a twenty year life cycle commencing from practical completion of the building works. The summary table should be in landscape format.

Produce a line graph, which depicts the total forecast expenditure per year over the twenty-year life cycle. Calculate the average yearly expenditure over this time horizon.

**Operations**

The Operations Plan provides documentation assisting access and egress, safety, fire prevention, electrical safety, noise management, emergency facilities, lighting levels, ventilation levels, hazardous substances management and pest control. Any other operational issues not mentioned above but that are peculiar to this asset should also be included.

**Table 3-16 - Operations Plan Outline**

| Access and egress | Outline the measures that have been taken to ensure safe access and egress to the site and buildings for employees, contractors, people with a physical disability, and the general public.
|                  | Describe the signage that is to be provided internally and externally. |
| Electrical safety | Outline the measures that have been taken to ensure electrical safety on the site during the operational phase. |
| Emergency provisions | Describe the emergency facilities (e.g. emergency vehicle access, emergency lights, and warning alarms) that have been provided, the broad operational guidelines to be adopted and the legislative guidelines that apply (e.g. the section of the OHS Act and the Australian Standards that apply). There is no need to describe the actual sections of the Acts. |
Fire prevention

Describe the fire prevention provisions (e.g. sprinklers, extinguishers, hose reels), and how they are to be implemented. This includes the types of systems, the broad operational guidelines to be adopted and the legislative guidelines that apply (e.g. the section of the OHS Act and the Australian Standards that apply). There is no need to describe the actual sections of the Acts.

Lighting levels

Describe the different lighting provisions in each work area (e.g. offices, plant rooms) and the Acts that apply. There is no need to describe the actual sections of the Acts.

Workplace cleanliness and hygiene

Describe the provisions made to ensure appropriate levels of cleanliness, including window washing, floor cleaning, and wall cleaning. This is to include consideration of types of finish, installation methods, access for cleaners, cleaners closets, sluices, provision of lights, power points etc.

Describe the provisions that have been made to ensure appropriate levels of workplace hygiene. This includes staff washing facilities, toilet facilities, kitchen cleaning provisions, dishwashers in tea making areas etc.

Security

Describe the security measures for the site and building. This is to include alarms, detection devices etc.

Maintainability

Describe the measures taken to ensure maintenance staff and contractors have appropriate provisions for maintenance of all aspects of the site and building. This includes service areas, lighting levels, storage, cranes, lifting devices, anchor points, ventilation, communications, and contractor access.

Describe measures taken to ensure that minimal specialised equipment is needed for maintenance of lights, lifts, air conditioning equipment etc.

Describe measures taken to ensure availability of spares, tools and manuals for maintenance purposes.

Hazardous materials

Where hazardous materials may be used on the site, describe the provisions for management. Describe the legislation that applies.

Waste Management

Describe the provisions for management of rubbish, including internal and external provisions.

Asset Register

It is important to list all components that comprise the new asset. This must be done in a manner that suits the asset register structure, and that also suits the chart of accounts for asset maintenance management. To this end an asset hierarchy has been provided, and all set lists must be described at the level indicated in this hierarchy. The asset value for each line item must be greater than $5,000.

Describe the assets to be maintained in a hierarchical manner. The asset hierarchy should resemble the method of describing assets as described by the Quantity Surveyor method of measurement. A typical asset hierarchy is described below.

<table>
<thead>
<tr>
<th>Level 1 Major Group Elements</th>
<th>Level 2 Group Elements</th>
<th>Level 3 Individual Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substructure</td>
<td>A10 Foundations</td>
<td>A1010 Standard Foundations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A1020 Special Foundations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A1030 Slab on Grade</td>
</tr>
<tr>
<td></td>
<td>A20 Basement Construction</td>
<td>A2010 Basement Excavation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A2020 Basement Walls</td>
</tr>
<tr>
<td>Shell</td>
<td>B10 Superstructure</td>
<td>B1010 Floor Construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B1020 Roof construction</td>
</tr>
<tr>
<td></td>
<td>B20 Exterior enclosure</td>
<td>B2010 Exterior Walls</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B2020 Exterior Windows</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B2030 Exterior Doors</td>
</tr>
<tr>
<td></td>
<td>B30 Roofing</td>
<td>B3010 Roof coverings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B3020 Roof openings</td>
</tr>
<tr>
<td>Interiors</td>
<td>C10 Interior construction</td>
<td>C1010 Partitions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C1020 Interior doors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C1030 Fittings</td>
</tr>
<tr>
<td>Level 1 Major Group Elements</td>
<td>Level 2 Group Elements</td>
<td>Level 3 Individual Elements</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>C20 Stairs</td>
<td>C2010 Stair construction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C2020 Stair finishes</td>
<td></td>
</tr>
<tr>
<td>C30 Interior finishes</td>
<td>C3010 Wall finishes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C3020 Floor finishes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C3030 Ceiling finishes</td>
<td></td>
</tr>
<tr>
<td>Services</td>
<td>D10 Conveying</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D1010 Elevators and lifts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D1020 Interior Doors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D1030 Fittings</td>
<td></td>
</tr>
<tr>
<td>D20 Plumbing</td>
<td>D2010 Plumbing fixtures</td>
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<td>D2020 Domestic water distribution</td>
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<tr>
<td></td>
<td>D2030 Sanitary waste</td>
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<tr>
<td></td>
<td>D2040 Rain water drainage</td>
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</tr>
<tr>
<td></td>
<td>D2090 Other plumbing systems</td>
<td></td>
</tr>
<tr>
<td>D30 HVAC</td>
<td>D3010 Energy supply</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D3020 Heat generating systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D3030 Cooling generating systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D3040 Distribution systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D3050 Terminal and package systems</td>
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</tr>
<tr>
<td></td>
<td>D3060 Controls and instrumentation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D3070 Systems testing &amp; balancing</td>
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</tr>
<tr>
<td></td>
<td>D3090 Other HVAC systems and equipment</td>
<td></td>
</tr>
<tr>
<td>D40 Fire protection</td>
<td>D4010 Sprinklers</td>
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<tr>
<td></td>
<td>D4020 Standpipes</td>
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</tr>
<tr>
<td></td>
<td>D4030 Fire protection specialties</td>
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<tr>
<td></td>
<td>D4090 Other fire protection systems</td>
<td></td>
</tr>
<tr>
<td>D50 Electrical</td>
<td>D5010 Electrical service and distribution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D5020 Lighting and branch wiring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D5030 Communications and security</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D5090 Other electrical systems</td>
<td></td>
</tr>
<tr>
<td>Equipment and Furnishings</td>
<td>E10 Equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E1010 Commercial equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E1020 Institutional equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E1030 Vehicular equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E1090 Other equipment</td>
<td></td>
</tr>
<tr>
<td>E20 Furnishings</td>
<td>E2010 Fixed furnishings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E2020 Movable furnishings</td>
<td></td>
</tr>
<tr>
<td>Special Construction and Demolition</td>
<td>F10 Special Construction</td>
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<tr>
<td></td>
<td>F1010 Special structures</td>
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</tr>
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<td></td>
<td>F1020 Integrated construction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F1030 Special construction systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F1040 Special facilities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F1050 Special controls and instrumentation</td>
<td></td>
</tr>
<tr>
<td>F20 Selective building demolition</td>
<td>F2010 Building elements demolition</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F2020 Hazardous components abatement</td>
<td></td>
</tr>
</tbody>
</table>
4 Special Facilities

4.1 Lecture Theatres

4.1.1 General Principles

Lecture theatres are generally single function spaces with fixed seating and writing furniture on a terraced or sloping floor surface with a seating capacity of 60 or more and provided with a dedicated teaching wall. Each seat should have a clear unobstructed view to the presenter and to all boards and screens located on the presentation wall. These spaces are generally well equipped for visual communication, with all required audio visual equipment installed. Equipment and lighting is generally operated via an integrated electronic control system.

4.1.2 Room Size

The capacity shall be as set out in the Provisional Project Brief. The size of lecture theatres should be determined in accordance with the Building Code of Australia (BCA) and seating manufacturer’s specifications. Additional space would be required for specialist AV equipment and user-specific demonstration, presentation or conferencing requirements.

4.1.3 Requirements

Fitout

General finishes:
- all finishes in accordance with Finishes Schedule—Lecture theatres in this section
- flush plasterboard painted wall finish, back wall painted in feature colour
- suspended ceiling system
- carpet floor finish
- lectern to be located at side of theatre, positioned to prevent blocking view of screen
- custom made computer housing required to secure AV PC tower
- rear doors to lectern to be lockable, keyed to appropriate master.

Furniture and joinery:
- fixed lecture theatre seating in accordance with Finishes Schedule
- lectern design in accordance with UniSA standard detail
design and construction guidelines

- provision should be made in the seating plan for wheelchair seating spaces and for access to the lectern
- overhead projector trolley as specified in AV Equipment.

Whiteboards, pinboards and screens:
- ceramic whiteboards on teaching wall, typically two (2) 1200 mm high x 2400 mm wide, M20 aluminium frame, full length pen tray, fitted to UniSA approved display rail
- pinboards to non-teaching walls, typically two (2) 1200 mm high x 2400 mm wide, fabric covered in accordance with Finishes Schedule, M20 aluminium frame, fitted to UniSA approved display rail
- whiteboards and pinboards to be securely screw fixed to walls (not on hanging rail)
- projection screens to be mounted as specified in AV Equipment
- projection screen as specified in AV Equipment.

Signage:
- blade signage in accordance with the UniSA Signage Manual
- door signage in accordance with the UniSA Signage Manual
- “No eating and drinking” and hearing loop installation signage in accordance with the UniSA Signage Manual.

Equipment

AV Equipment:
- audio Visual fitout shall comply with UniSA Audio Visual Equipment Standard
- the equipment standard shall be AV4 unless otherwise specified in Provisional Project Brief or advised by the Contract Supervisor.

Miscellaneous equipment:
- clock—to be supplied and installed by UniSA.

Services

Air conditioning:
- rocker-type push button controls to be provided at front of theatre (adjacent internal phone) and at back of theatre adjacent entry door (as required)
- push button to be set to 90-120 minute run time for air conditioning on demand only
- air conditioning and controls to UniSA specifications.

Power, security and communications:
- data points to be provided to front two rows of seating such that one double data point is provided for every four seats
- where seating rows finish on lecture theatre side walls, a double data point may be provided to every other row for the full extent of seating rows in lieu of the above provision to the front two rows
- power points to be provided to front 50% of seating such that one double power point is provided for every four seats.
DESIGN AND CONSTRUCTION GUIDELINES

Fire protection:
- fire extinguishers and detectors to UniSA specifications.

Lighting:
- fittings and controls to UniSA specifications
- controls as specified in AV Equipment.

Power, security and communications:
- data, power and security alarming wiring to UniSA specifications
- access control to UniSA specifications
- internal phone with associated signage to UniSA specifications.

4.1.4 Finishes Schedule—Lecture Theatres

Finishes for all lecture theatres shall be consistent with UniSA Interior Finishes Schedule for building and/or campus.

For new buildings, proposed Interior Finishes schemes are subject to approval by the Facilities Management Unit as set out in Interior Finishes Guidelines.

UniSA has selected a standard lecture theatre seating style that incorporates fold down seating and fold up individual tables. Approved lecture theatre seating systems are:

Camatic Pty Ltd—Quantum Seating System with Lectra Tablet—SA Distributor
Innerspace, 101 Flinders St, Adelaide SA—Paul Johnson Ph 8223 7373, Fax 8223 7375, Email: paul@innerspacesa.com.au

Deko Pty Ltd—Copernico Seating System—No SA Distributor. Factory Direct Deko
Collezioni, Via Pattigna 5, 43040 Felegara (PR) Italy Ph +39 0525 432111 Fax +39 0525 431275, Email: info@deko.it

Maxwood Manufacturing Pty Ltd—G2 Seating System—No SA Distributor. Factory Direct
PO BOX 31-202, Christchurch 8030, New Zealand. Contact John McFedries Ph/Fax 1800 884 800, Email: john@maxwood.co.nz

Alternative seating systems must be of the standard lecture theatre seating style and be approved by the Facilities Management Unit.

4.2 Tutorial/Seminar rooms

4.2.1 General Principles

Tutorial/seminar rooms are flat floor multi-function spaces with a seating capacity of less than 60, provided with loose furniture, natural lighting where possible and a dedicated presentation wall.
4.2.2 Room Size

The capacity shall be as set out in the Provisional Project Brief. The size of tutorial/seminar rooms should be suitable for capacity with a planning figure of 2 m\(^2\) per student. Additional space would be required for specialist AV equipment and user-specific demonstration, presentation or conferencing requirements.

4.2.3 Requirements

Fitout

General finishes:
- all finishes in accordance with Finishes Schedule—Tutorial/seminar rooms in this section
- flush plasterboard painted wall finish
- suspended ceiling system—ceiling tiles as set out in Ceilings
- carpet floor finish.

Furniture and joinery:
- standard chairs in accordance with Finishes Schedule, four leg stackable, seat and back pad upholstered, number to suit room capacity
- optional—standard chairs to have pallet arms
- individual tables, 700 mm x 500 mm, or seminar tables, 1500 mm x 750 mm, in accordance with Finishes Schedule, number to suit room capacity—excluding rooms with pallet arm chairs
- one (1) seminar table, 1500 mm x 750 mm, and standard chair in accordance with Finishes Schedule for teaching end of room
- overhead projector trolley in accordance with AV Equipment.

Windows:
- large extent of glazing to corridor/foyer walls to establish visual links.
- slim-line venetian blinds to all external windows.

Whiteboards, pinboards and projection screens:
- ceramic whiteboards centrally to teaching wall(s), typically two (2) 1200 mm x 2400 mm, M20 aluminium frame and full length pen tray, fitted to UniSA approved display rail
- pinboards to non-teaching walls, typically two (2) 1200 mm x 2400 mm, fabric covered in accordance with Finishes Schedule, M20 aluminium frame, fitted to UniSA approved display rail
- whiteboards and pinboards to be securely screw fixed to walls (not on hanging rail)
- projection screens to be mounted as specified in AV Equipment
- projection screen to teaching wall in accordance with AV Equipment.

Signage:
Design and construction guidelines

- Blade signage in accordance with UniSA Signage Manual
- Door signage in accordance with the UniSA Signage Manual
- "No eating or drinking" signage in accordance with UniSA Signage Manual.

Equipment

AV equipment:
- Audio Visual fitout shall comply with UniSA Audio Visual Equipment Standard
- The equipment standard shall be AV2 unless otherwise specified in Provisional Project Brief or advised by the Contract Supervisor.

Miscellaneous equipment:
- Clock—to be supplied and installed by UniSA.

Services

Air conditioning:
- Rocker-type push button controls to be provided at front of room (adjacent internal phone)
- Push button to be set to 90-120 minute run time for air conditioning on demand
- Air conditioning and controls to UniSA specifications.

Fire protection:
- Fire extinguishers and detectors to UniSA specifications.

Lighting:
- Fittings and push button timer controls to UniSA specifications
- Lighting control zones to enable the separate switching of light fittings directly above the teaching wall.

Power, security and communications:
- Data, power and security alarming wiring to UniSA specifications
- Access control to UniSA specifications
- Internal phone with associated signage to UniSA specifications.

4.2.4 Finishes Schedule—Tutorial/Seminar Rooms

Finishes for all tutorial and seminar rooms shall be consistent with UniSA Interior Finishes Schedule for building and/or campus.
For new buildings, proposed Interior Finishes schemes are subject to approval by the Facilities Management Unit as set out in Interior Finishes Guidelines.
4.3 Meetings Rooms

4.3.1 General Principles

Meeting rooms are spaces designed for meeting usage, provided with loose furniture, natural lighting where possible and a dedicated presentation wall. Where meeting rooms are dedicated to a particular group, that group will be responsible for the provision of furniture and joinery, whiteboards, pinboards and projection screens, signage, AV equipment and miscellaneous equipment unless otherwise directed by the Contract Supervisor.

4.3.2 Room Size

The capacity shall be as set out in the Provisional Project Brief. The size of meeting rooms should be suitable for capacity with a planning figure of 2.25 m² per occupant. Additional space would be required for specialist AV equipment and user-specific demonstration, presentation or conferencing requirements.

4.3.3 Requirements

Fitout

General finishes:
- flush plasterboard painted wall finish, one of walls painted in feature colour
- optional—feature wall with UniSA logo
• suspended ceiling system—ceiling tiles as set out in Ceilings
• carpet floor finish
• all finishes in accordance with Finishes Schedule—meeting rooms below.

Furniture and joinery:
• standard chairs in accordance with Finishes Schedule, four leg stackable, seat and back pad upholstered, number to suit room capacity
• seminar tables, 1500 mm x 750 mm, in accordance with Finishes Schedule, number to suit room capacity
• overhead projector trolley in accordance with AV Equipment below.

Whiteboards, pinboards and projection screens:
• ceramic whiteboard centrally to presentation wall, typically 1200 mm x 2400 mm, M20 aluminium frame and full length pen tray, fitted to UniSA approved display rail
• optional—electronic whiteboard in accordance with UniSA specification
• pinboards to non-presentation walls, typically two (2) 1200 mm x 2400 mm, fabric covered in accordance with Finishes Schedule, M20 aluminium frame, fitted to UniSA approved display rail
• whiteboards and pinboards to be securely screw fixed to walls (not on hanging rail)
• projection screens to be mounted as specified in AV Equipment
• projection screen to presentation wall in accordance with AV Equipment.

Signage:
• blade signage in accordance with UniSA Signage Manual.

Equipment
AV Equipment:
• audiovisual fitout to Standard AV 2 as outlined in UniSA Audio Visual Equipment Standard.

Miscellaneous equipment:
• clock—to be supplied and installed by UniSA.

Services
Air conditioning:
• rocker-type push button controls to be provided at front of room (adjacent internal phone)
• push button to be set to 90-120 minute run time for air conditioning on demand
• air conditioning and controls to UniSA specifications.

Fire protection:
• fire extinguishers and detectors to UniSA specifications.

Lighting:
• fittings and push button timer controls to UniSA specifications
• lighting control zones to enable the separate switching lighting to parts of room.
Power, security and communications:
- data, power and security alarming wiring to UniSA specifications
- internal phone to UniSA specifications.

4.3.4 Finish Schedule—Meeting Rooms
Finishes for all meeting rooms shall be consistent with UniSA Interior Finishes Schedule for building and/or campus.
For new buildings, proposed Interior Finishes schemes are subject to approval by the Facilities Management Unit as set out in Interior Finishes Guidelines.

4.4 Laboratories

4.4.1 Laboratory Design
Laboratory—any building or part of a building used or intended to be used for scientific or technical work which may be hazardous, including research, quality control, testing, teaching or analysis. Such work may involve the use of chemicals including dangerous goods, pathogens and harmful radiation, or processes including electrical or mechanical work which could also be hazardous. The laboratory includes such support areas as instrument and preparation areas, laboratory stores and any offices ancillary to the laboratory.
The design of laboratories is to comply with the provisions of AS/NZS 2982, AS 2243, AS1940, AS 4432, AS 2430 and referenced and related documents, including the OHS&W Act and regulations and the Building Code of Australia.

4.4.2 Requirements

Fitout
General finishes:
- Sheet vinyl floor finish—Tarkett ‘Emminent’ or similar approved.
Furniture and joinery:
- Laboratory benching and under bench units to UniSA specification.
- All benchtops to be acid resistant unless otherwise specified.
- Sinks to UniSA specification.
Whiteboards, pinboards and screens:
- Whiteboards and pinboards to be securely screw fixed to walls (not on hanging rail)
- Projection screens to be mounted as specified in AV Equipment.

Equipment
Safety isolators:
- Safety isolators for power, gas and other services as required by relevant standards and regulations
- Position isolators adjacent to doors and away from light switches if possible.

Safety showers:
- Safety showers and eyewash stations provided in accordance with AS/NZS 2982.1
- Install the safety shower and eyewash station in a location that will not cause a slip hazard for others — they should not be located in main exit from laboratory.
- Install a floor trap with grate beneath each safety shower and eyewash station to ensure that water released from the shower will drain away and not cause a hazard to others, or cause damage to the building by flooding the surrounds.

AV Equipment:
- project should allow for services to audiovisual fitout that complies with UniSA Audio Visual Equipment Standard—equipment to be funded / provided by School
- the equipment standard shall be AV 2 unless otherwise specified in Provisional Project Brief or advised by the Contract Supervisor.

Miscellaneous equipment:
- clock—to be supplied and installed by UniSA, funded by School.

Services
Air conditioning:
- push button controls to be provided adjacent main entry door.
- push button to be set to 90 – 120 minute run time for air conditioning on demand.
- air conditioning and controls to UniSA specifications.

Fire protection:
- fire extinguishers and detectors to UniSA specifications.

Fume exhaust systems:
- fume cupboards shall be single-sided, of proprietary manufacture and based on a proven standard design.

Lighting:
- fittings and controls to UniSA specifications.

Power, security and communications:
- data, power and security alarming wiring to UniSA specifications
- access control to UniSA specifications.
4.5 Finishes Schedule—Laboratories

Finishes for all laboratories shall be consistent with UniSA Interior Finishes Schedule for building and/or campus. For new buildings, proposed Interior Finishes schemes are subject to approval by the Facilities Management Unit as set out in Interior Finishes Guidelines.

Laboratory benchtops
Note that as a general principal all laboratory benchtops are to be acid-resistant.

4.6 Computer Pools and Associated Facilities

4.6.1 General Principles

UniSA has computer pool facilities for students on each of its campuses. Its remote area centres also provide some computer access. A typical computer pool is set up to suit 20 computer stations. This figure of 20 stations is particularly linked to UniSA Syllabus Plus booking standards and norms. The following guidelines represent baseline standards and have been based on the recent refurbishment of Computer Pools across all campuses. The Facilities Management Unit and Information Technology and Strategy Services have agreed that the design, detailing, finishes and colours of the Computer Pools shall be consistent across all campuses.

4.6.2 Requirements

Fitout

General finishes:
- all finishes in accordance with Finishes Schedule—Computer pools in this section
- flush plasterboard painted wall finish, one of walls painted in feature colour
- suspended ceiling system—ceiling tiles as set out in Ceilings
- carpet floor finish.

Furniture and joinery:
- Twenty-one (21) joinery work-stations (ideally 1200 mm wide x 900 mm deep) set out in rows focused towards a designated teaching wall, designed and constructed to typical detail, laminate finish in accordance with Finishes Schedule.
- One of the work stations, on row central to teaching wall to be set up as a teaching station to standard details. Location of teaching station to be confirmed by ISTS.
- Set out joinery with minimum of 1800 mm aisle widths and 1800-2000 mm from end of central benched to teaching wall.
- Twenty-one (21) ergonomic and tamper resistant task chairs with UniSA logo and “ISTS” marked on the backs, fabric covered to Finishes Schedule.
Windows:
- Solar control film to north facing external windows.
- Slim-line venetian blinds to all external windows in accordance with Finishes Schedule.
- Rectangular vision panel to door.
- Reasonable extent of glazing to corridor wall(s) to establish visual links. Pattern of glazing panels to be consistent with that of City East Computer Pools.

Pinboards, whiteboards and projection screens:
- ceramic whiteboard centred on teaching wall, typically 1200 mm high x 2400 mm wide, M20 aluminium frame, full length pen tray, fitted to approved display rail
- pinboards to non-teaching walls, typically four (4) 1200 mm high x 2400 mm wide, fabric covered to Finishes Schedule, M20 aluminium frame, fitted to approved display rail
- whiteboards and pinboards to be securely screw fixed to walls (not on hanging rail)
- projection screens to be mounted as specified in AV Equipment
- projection screen, pull down type, mounted on teaching wall to line with central benches/teaching work station.

Signage:
- door signage in accordance with UniSA Signage Manual
- “no Eating or Drinking in This Room” sticker to be installed on glazing adjacent entrance to Computer Pool
- booking sheet sleeve mounted to outside of Computer Pool doors.

Equipment

AV equipment:
- audiovisual fitout to Standard AV2 as outlined in UniSA Audio Visual Equipment Standard or as advised by the Contract Supervisor.

Computers:
- twenty (20) computers with monitors – to be supplied and installed by ISTS.

Miscellaneous equipment:
- clock—to be supplied and installed by UniSA.

Services

Air conditioning:
- rocker-type push button controls to be provided adjacent door for after hours control
- push button to be set to 90-120 minute run time for air conditioning on demand only
- air conditioning and controls to UniSA specifications.

Fire protection:
- fire extinguishers and detectors to UniSA specifications
- replace older style and thermal type fire detectors with new smoke detectors
Design and Construction Guidelines

- provide 3.5 kg CO2 Extinguisher.

Lighting:
- fittings and push button timer controls to UniSA specifications for after hours control
- anti-glare diffusers to flush mounted fluorescent diffusers.

Power, security and communications:
- data, power and security alarming wiring to all work-stations to UniSA typical detail and specifications
- teaching station to have double data and power outlet bench mounted
- microphone and headphone wiring and outlets to all work-stations to UniSA specification
- double data point adjacent entry doors to serve new internal phone
- internal phone to UniSA specifications
- two (2) double power points to teaching wall, mounted 300 mm above floor level, either side of white board
- one (1) double power point adjacent opening leaf of door.

4.6.3 Finishes Schedule—Computer Pools

The detailing, finishes and colours of Computer Pools shall be consistent across all campuses and in accordance with the following schedule:

<table>
<thead>
<tr>
<th>Table 4-1 - Finishes Schedule for Computer Pools</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Element</strong></td>
</tr>
<tr>
<td>Computer Pool Paint Finishes</td>
</tr>
<tr>
<td>Wall Colour (General)</td>
</tr>
<tr>
<td>Wall Colour (Feature)</td>
</tr>
<tr>
<td>Doors</td>
</tr>
<tr>
<td>Frames</td>
</tr>
<tr>
<td>Ceilings and Bulkhead</td>
</tr>
<tr>
<td>Floor Finishes</td>
</tr>
<tr>
<td>Carpet</td>
</tr>
<tr>
<td>Skirtings</td>
</tr>
<tr>
<td>Skirtings (Carpet Areas)</td>
</tr>
<tr>
<td>Fabrics</td>
</tr>
<tr>
<td>Fabrics General</td>
</tr>
<tr>
<td>Pinboard Fabrics</td>
</tr>
<tr>
<td>Joinery Finishes</td>
</tr>
<tr>
<td>Joinery Laminate</td>
</tr>
<tr>
<td>Joinery Laminate</td>
</tr>
</tbody>
</table>
### DESIGN AND CONSTRUCTION GUIDELINES

<table>
<thead>
<tr>
<th>Element</th>
<th>Product Type</th>
<th>Finish/Colour/Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joinery Laminate</td>
<td>Formica</td>
<td>Dark Mettaline</td>
</tr>
<tr>
<td>Joinery Veneer</td>
<td>-</td>
<td>European Beech</td>
</tr>
<tr>
<td>Window Treatments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blinds—Slimline</td>
<td>Verosol</td>
<td>‘Slate’</td>
</tr>
<tr>
<td>Optional Slimline</td>
<td>Rundle Blinds</td>
<td>‘Ebony’</td>
</tr>
<tr>
<td>Blinds—Vertical</td>
<td>Rundle Blinds</td>
<td>Vanilla 928</td>
</tr>
<tr>
<td>Furniture</td>
<td>Sebel Tempo</td>
<td>Beech finish with upholstered seat and pad</td>
</tr>
</tbody>
</table>

#### 4.6.4 Associated Facilities

**Corridor to Computer Pool**

General finishes
- all finishes in accordance with Finishes Schedule—Computer pools above
- flush plasterboard painted wall finish
- vinyl or concrete floor finish
- no ceiling required—retain existing ceilings.
- Pinboard, whiteboards and projection screens:
  - pinboard adjacent to each pool entry door, typically 400 mm wide x 500 mm high, fabric covered in accordance with Finishes Schedule, M20 aluminium frame.

Signage:
- door signage to UniSA Signage Manual standards
- computer Pool Identification Sign, to UniSA Signage Manual standards, the Facilities Management Unit to organise through UniSA Signage Officer, location to be confirmed
- computer Pool Amenity Blade Signs, to UniSA Signage Manual standards, located adjacent to each Pool entry door
- booking Sheet Sleeve mounted to outside of Pool doors.

Fire protection:
- replace older style and thermal type fire detectors with new smoke detectors.

Power, security and communications:
- Phone point for Security linked phone to be located central to the Pools, in an easily accessible location. Phone organised by the Facilities Management Unit through the ISTS Help Desk. Phones to be fitted with tamper switches and wired back to security alarm point.
- Double power points, mounted 300 mm above floor level, located not more than 13 m apart for cleaners use.
• Security Alarm light/strobe and siren connected to the computers’ security alarm system. Security alarm light should be located outside each computer pool door. Siren(s) located to ensure audibility in all Pools.

4.6.5 Printer Room

Typical room size: 3700 mm x 3500 mm.

General finishes:
• all finishes in accordance with Finishes Schedule—Computer pools above
• flush plasterboard painted wall finish
• carpet floor finish
• replace ceilings with suspended ceiling system complete with CSR Super-D ceiling tiles as for Computer Pool.

Furniture and joinery:
• Two Slots in wall to Printing Alcove for printers to output to student accessible area. Trim to slots to be flush to wall on Printer Alcove Side and to project 70 mm into Printer Room on sides and base. Laminate finish to match wall colour.
• 1200 mm long x 700 mm wide loose desk (finish to UniSA Finishes Standards) for 2 computers and monitors.
• Whiteboards, pinboards and projection screens pinboard, typically 400 mm high x 300 mm wide, fabric covered to Finishes Schedule, M20 aluminium frame.

Equipment:
• two printers supplied and installed by ISTS. Note Printers are left hand feed and so need adequate space for access.

Lighting:
• anti-glare diffusers to flush mounted fluorescent diffusers.

Air conditioning:
• Separate 24 hour air conditioning unit (inverter type cassette) with thermostat sensor linked to Building Management System for monitoring/alarm purposes. Air conditioning to printer rooms should only be installed where the room heat loads are excessive and abnormal room temperatures affect the performance of the printing operation.

Fire protection:
• replace older style and thermal type fire detectors with new smoke detectors

Power, security and communications:
• Four service clusters, 2 off located adjacent printers to the RH side of each printer. Remaining 2 service clusters located on wall opposite printers adjacent to each corner (exact location to be confirmed). Note service cluster consists of 1off double data point and 2 off double power points.
Double Data Point adjacent entry door for Internal Phone organised by the Facilities Management Unit through ISTS Help Desk. Phone should be located to allow for supervision sightlines to Pools when door is open.

Security alarm system keypad(s), located adjacent to entry door, locate next to phone.

**Printing Alcove**

Location:
- to be located off/on central pool’s corridor.

Furniture and joinery:
- 1 off bench/table fixed to wall, located between printer slots
- two Slots in wall to Printer Room for printers to output to student accessible area
- 1 recycling bin to be organised by ISTS.
- Whiteboards, pinboards and projection screens:
- pinboard, typically 1200 mm high x 1500 mm wide, fabric covered to Finishes Schedule, M20 aluminium frame, above Printer Slots.

Signage:
- Door signage for Printer Room to UniSA Signage Manual standards, Facilities Management Unit to organise through UniSA Signage Officer.
- Signage above slots to denote Printer Names. Signage to comply with UniSA Signage Manual, organised by Facilities Management Unit, through UniSA Signage Officer.

Fire protection:
- replace older style and thermal type fire detectors with new smoke detectors.

Power, security and communications:
- double data Point for Internal Phone organised by Facilities Management Unit through ISTS Help Desk.

**Comms Room**

Typically room size: 2000 mm x 2300 mm.

Location:
- to be located in an area reasonably adjacent to the Computer Pools.

General finishes:
- all finishes in accordance with Finishes Schedule—Computer pools above
- flush plasterboard painted wall finish
- carpet floor finish
- optional—replace ceilings with suspended ceiling system complete with CSR Super-D ceiling tiles as for Computer Pools.

Signage:
- door signage for Printer Room to UniSA Signage Manual standards.
Air conditioning:
- Separate 24 hour air conditioning unit (inverter type cassette) with thermostat sensor linked to Building Management System for monitoring and alarm purposes. Air conditioning to printer rooms should only be installed where the room heat loads are excessive and abnormal room temperatures affect the performance of the printing operation.

Fire protection:
- replace older style and thermal type fire detectors with new smoke detectors

Power, security and communications:
- Communications wiring cabinets/racks as required with 1 off single power point per cabinet/rack. Located cabinet to provide adequate access to the back.
- 1 off service cluster located.

Computer’s Security Alarm System Control Panels.
- 1 off single power point per Computer Pool plus 1 extra single power point to serve Security Alarm System Control Panels.

4.7 Computer Barns and Associated Facilities

4.7.1 General Principles

The Computer Barns are designed for informal student computing only; it is not a teaching space. The Computer Barn is typically open 24 hours a day, seven days a week, and hence should have access to other facilities as nominated below. A typical Computer Barn is set up to suit 20 computer stations. The Facilities Management Unit and Information Technology and Strategy Services have agreed that the design of Computer Barns will that of an identifiable signature space. Hence the detailing, finishes and colours shall be consistent across all campuses.

4.7.2 Requirements

Location

Location of Computer Barn to have access to the following facilities:
- toilet facilities for females, males
- accessible (disability access) toilet facilities
- food and drink vending machines
- main building foyer area (ideally)
- printing alcove.
4.7.3 Fitout

General finishes:
- all finishes in accordance with Finishes—Computer Barn below
- flush plasterboard painted wall finish, one of walls painted in feature colour
- suspended ceiling system complete with CSR Super-D ceiling tiles
- carpet floor finish.

Furniture and joinery:
- twelve (12) sit down joinery work-stations 720 mm AFL (ideally 1200 mm wide) set out informally, designed and constructed to typical details, laminate finish
- twelve (12) ergonomic and tamper resistant task chairs with UniSA Logo and ISTS label to the backs, fabric covered
- eight (8) sit up joinery work stations to be at 1200 mm AFL designed and constructed to typical details, laminate finish
- eight (8) ergonomic and tamper resistant stool-type swivel chairs with UniSA Logo and ISTS label to the backs, fabric covered.

Windows:
- large extent of glazing to corridor/foyer walls to establish visual links
- slim-line venetian blinds to all external windows.

Pinboards, whiteboards and projection screens:
- pinboards, typically two (2) 1200 mm x 2400 mm, fabric covered to Finishes Schedule, M20 aluminium frame, fitted to UniSA approved display rail, to non-teaching walls.

Signage:
- computer Barn Identification Sign, in accordance with UniSA Signage Manual, Facilities Management Unit to organise through UniSA Signage Officer.

4.7.4 Equipment

Computers:
- twenty (20) computers with monitors supplied and installed by ISTS.

4.7.5 Services

Air conditioning:
- air conditioning and controls to UniSA specifications
- rocker-type push button controls to be provided adjacent door for after hours control
- push button to be set to 90-120 minute run time for air conditioning on demand only.
Fire protection:
- fire extinguishers and detectors to UniSA specifications
- replace older style and thermal type fire detectors with new smoke detectors.

Lighting:
- fittings and push button timer controls to UniSA specifications
- anti-glare diffusers to flush mounted fluorescent diffusers
- lighting control zones to enable the separate switching lighting to parts of room.

Power, security and communications:
- Data, power and security alarming wiring to all work-stations to typical detail.
- Double data point adjacent entry doors to serve new internal phone. Phone organised by Facilities Management Unit through UniSA Telephone Help Desk.
- Microphone and headphone wiring and outlets to all work-stations to UniSA specification.

4.7.6 Finishes Schedule—Computer Barn

Facilities Management Unit and ISTS have agreed that the design of Computer Barns will that of an identifiable signature space. Hence the detailing, finishes and colours shall be consistent across all campuses and in accordance with the following schedule:

<table>
<thead>
<tr>
<th>Element</th>
<th>Product Type</th>
<th>Finish/Colour/Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Barn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paint Finishes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall Colour (General)</td>
<td>Dulux</td>
<td>White Swan' 60YY83/062</td>
</tr>
<tr>
<td>Wall Colour (Feature)</td>
<td>Dulux</td>
<td>‘Salsa 10YR141348</td>
</tr>
<tr>
<td>Doors</td>
<td>Dulux</td>
<td>As per level selection</td>
</tr>
<tr>
<td>Frames</td>
<td>Dulux</td>
<td>‘Burmese Beige’ 40YY 51/084</td>
</tr>
<tr>
<td>Ceilings and Bulkhead</td>
<td>Dulux</td>
<td>White Swan' 60YY83/062 (1/2 strength)</td>
</tr>
<tr>
<td>Floor Finishes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpet</td>
<td>Godfrey Hirst Kingsgate Town</td>
<td>‘Slate’ 790</td>
</tr>
<tr>
<td>Skirtings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skirtings (Carpet Areas)</td>
<td>Armstrong Nylex Flat Skirting</td>
<td>‘Dark Grey’</td>
</tr>
<tr>
<td>Fabrics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabrics General</td>
<td>Svenska Nebula</td>
<td>07</td>
</tr>
<tr>
<td>Pinboard Fabrics</td>
<td>Melcor Prelude</td>
<td>‘Cobalt Blue’ (with integral step tread tile)</td>
</tr>
<tr>
<td>Joinery Finishes</td>
<td></td>
<td></td>
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<tr>
<td>Joinery Laminate</td>
<td>Formex</td>
<td>Pomegranite</td>
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<td>Formex</td>
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<td>Formica</td>
<td>Dark Mettaline</td>
</tr>
<tr>
<td>Joinery Veneer</td>
<td>-</td>
<td>European Beech</td>
</tr>
</tbody>
</table>
### 4.7.7 Associated Facilities

**Printing Alcove**

Refer to Printing Alcove guidelines in Computer Pools and Associated Facilities.

### 4.8 Campus Central

#### 4.8.1 General Principles

Campus Central is a one-stop shop that aims to promote positive learning experiences for students and contribute to an integrated service environment for staff. A wide range of information and services are provided by Campus Central which is the first place to go for matters relating to study life, advice about enrolments, payments, withdrawing from a program, finding a timetable or making a room booking.

A signature identity has been established for service delivery and fitout. The design, detailing, finishes and colours of Campus Central shall be consistent across all campuses.

#### 4.8.2 Requirements

**Fitout**

General finishes:
- all finishes in accordance with Finishes—Campus Central below
- flush plasterboard painted wall finish, one of walls painted in feature colour
- suspended ceiling system complete with acoustic ceiling tiles
- carpet floor finish.

Furniture and joinery:

Windows:
- large extent of glazing to corridor/foyer walls to establish visual links
DESIGN AND CONSTRUCTION GUIDELINES

- slim-line venetian blinds to all external windows.

Pinboards, whiteboards and projection screens:
- pinboards, typically two (2) 1200 mm x 2400 mm, fabric covered to Finishes Schedule, M20 aluminium frame, fitted to UniSA approved display rail, to non-teaching walls.

Signage:
- Campus Central Identification Sign, in accordance with UniSA Signage Manual, Facilities Management Unit to organise through UniSA Signage Officer.

Equipment
Computers:
twenty (20) computers with monitors supplied and installed by ISTS.

Services
Air conditioning:
- air conditioning and controls to UniSA specifications.

Fire protection:
- fire extinguishers and detectors to UniSA specifications
- replace older style and thermal type fire detectors with new smoke detectors.

Lighting:
- fittings and push button timer controls to UniSA specifications
- anti-glare diffusers to flush mounted fluorescent diffusers
- lighting control zones to enable the separate switching lighting to parts of room.

Power, security and communications:
- Data, power and security alarming wiring to all work-stations to typical detail.
- Double data point adjacent entry doors to serve new internal phone. Phone organised by Facilities Management Unit through UniSA Telephone Help Desk.
- Microphone and headphone wiring and outlets to all work-stations to UniSA specification.

4.8.3 Finishes Schedule—Campus Central
Finishes shall be consistent with the following schedule:

<table>
<thead>
<tr>
<th>Table 4-3 - Finishes Schedule for Campus Central</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element</td>
</tr>
<tr>
<td>Campus Central</td>
</tr>
<tr>
<td>Paint Finishes</td>
</tr>
<tr>
<td>Wall Colour (General)</td>
</tr>
<tr>
<td>Wall Colour (Feature)</td>
</tr>
<tr>
<td>Doors and Toilet Partition Doors</td>
</tr>
<tr>
<td>Frames</td>
</tr>
<tr>
<td>Bulkhead</td>
</tr>
</tbody>
</table>
4.9 Multi-Access Suites

4.9.1 General Principles

Multi access suites (MAS) are available to all members of the University community and provide a dignified, private and appropriate space that supports the needs of parents, breastfeeding mothers, and people with disabilities or medical conditions who need an area to rest or to conduct disability-related cares.

4.9.2 Requirements

Location

A multi-access suite is located in the library at each UniSA metropolitan campus and a modified version is located in designated off-campus locations such as 101 Currie Street.

Fitout
Each multi-access suite provides:

- a quiet place to breastfeed, bottle feed, or express milk
- a quiet place to attend to disability or medical condition related cares
- a partitioned off area for those requiring extra privacy
- comfortable seating
- a baby change table in each section
- a height adjustable hydraulic table in the main room
- hot and cold water
- microwave
- waste disposal
- appropriate publications.

- A private partitioned area has been provided for patrons including nursing mothers or people with disabilities or medical conditions who choose this level of privacy and their privacy should be respected.

4.10 Adaptive Technology Suites

4.10.1 Introduction

The Adaptive Technology Suites (ATS) in each Library at the UniSA metropolitan campuses are designed to provide equitable access to computing facilities for students with disabilities who cannot access existing computing labs and pools.

4.10.2 Requirements

Location

An adaptive technology suite is located in the library at each UniSA metropolitan campus.

Fitout

Each ATS provides:

- An ergonomic chair that may be moved aside for those who require wheelchair access.

- A push button height adjustable desk to accommodate wheel chairs and motor buggies. A staff member from the Disability Service at Learning Connection, a personal helper or Library staff can assist with the adjustment of the desk if required.

- A lockable equipment storage cabinet.

- An internal phone for contacting the library loans desk, the IT Help Desk or Learning Connection.
5 Construction Guidelines

5.1 Construction Guidelines

5.1.1 Introduction

Purpose
This section outlines the principles and controls that govern the construction of all Facilities Management Unit Capital Works and Maintenance projects.

Reference Documents
The Construction Guidelines outlined in this section must be read in conjunction with the following sections within the Design and Construction Guidelines:
Section C—Planning and Design Guidelines
Section D—Special Facilities.
The following Reference Documents shall guide detailed design, documentation and construction and are available on request:
UniSA Preliminaries document (including associated Schedules)
UniSA Contractors Induction Kit or Manual
UniSA Occupational Health, Safety, Welfare and Injury Management Policy
UniSA OHS&W Procedure—Design and construction of new and refurbished buildings
UniSA OHS&W Procedure—Contractor Management
UniSA Equal Opportunity Policy
UniSA Evacuation Procedures
UniSA Asbestos Management Policy.

5.1.2 Materials and Standards of Work

Standards
The Design and Construction Guidelines set standards of work and specify the selection of materials and components, which shall be adhered to on all building works for UniSA, large or small.
Unless otherwise specified in this document, the requirements of the relevant Australian Standards and Codes of Practice shall be deemed the minimum standards for the design. Notwithstanding any of these requirements, safety shall be paramount.
The design shall comply with the requirements of the relevant Australian Standards, the Building Code of Australia, and any other Federal, State, or Local Statutory Authority having jurisdiction over the works. Where reference is made to an Australian Standard within this document, the most current standard shall always apply. It is the Consultant’s responsibility to ensure that any approved departure from these Design and Construction Guidelines is confirmed in writing by the Contract Supervisor.

**UniSA-approved Materials & Components**

In all trades there are materials and components that have been approved by UniSA, as outlined in the relevant sections of the Design and Construction Guidelines. These items shall be used unless prior approval for substitution is obtained from the Contract Supervisor.

Materials that put the environment or the UniSA community at risk during the works shall be avoided. Equipment shall not be used unless spare parts are currently available within Australia and such supply may reasonably be expected to be ongoing. UniSA has a policy of incorporating Australasian-made products into its buildings as far as is practicable. Local products shall be specified in preference to imported materials, fixtures and finishes wherever a comparable local product is available.

**Brand Names**

Where any reference is made to product brand names in these guidelines, this is done in the interests of product continuity and ease of maintenance. The Consultant Team may recommend new or alternative products for use in building projects. Alternative products should not be specified unless it is approved in writing by the Contract Supervisor.

The existence and specification of a product referred to by brand name will not relieve the Consultant Team from any duty of care in the assessment of suitability of the product for its proposed purpose. Where a product is considered unsuitable, a recommendation for substitution of the product must be submitted to the Contract Supervisor, together with reasons for the recommendation.

**Supply of Material by UniSA**

UniSA maintains certain elements of its infrastructure using its own staff and maintenance contractor. As a result, some material may be purchased and/or installed by UniSA staff. All such items shall be established at Consultant Team meetings and included in the Project Budget as separate contracts.

### 5.1.3 Existing Buildings and Services

**Drawing Records**

UniSA shall provide to the Principal Consultant where possible a set of drawings comprising a contour and feature survey and location, type, size and invert levels (where relevant) of all underground services where known with the proposed project site boundaries.

The Consultant Team shall transfer the information contained on UniSA’s site and services drawings onto a contract document and the Contractor shall be responsible to
repair and reinstate the existing service if damaged by them or their sub-contractors or agents at no cost to UniSA.

**Protection of Trees and Shrubs**

Retain as many of the existing trees and shrubs on site as possible. No trees or shrubs are to be removed, lopped or trimmed without the approval of UniSA. Any trees or shrubs that remain within the site area shall be fenced or otherwise protected during the works. The storage of materials and the dumping or stacking of building materials or plant is not permitted.

**Register of Confined Spaces and Restricted Areas**

A copy of the Register of Confined Spaces and Restricted Areas for each campus is available on the Facilities Management Unit website. Any additional information that applies to the project is available from the Contract Supervisor. When working in a confined space, the Contractor shall comply with the requirements for risk assessment, control of risks, entry permits, rescue arrangements and training and competency as set out in the relevant statutory regulations and the UniSA OHSW Procedure—Confined Space Entry.

**Isolation of Existing Services**

UniSA requires at least 72 hours notice before any existing services, including electricity, water, gas, telephone, and data, are interrupted due to building works as set out in UniSA Preliminaries. Modifications to the hydrant system requiring interruption to the fire water supply must be advised at least 24 hours in advance. Isolation of fire detectors and security alarms as required to prevent false alarms must be arranged with UniSA Security each day as set out in UniSA Preliminaries. No welding or other heat or dust producing work is to be carried out in any internal area before the fire detectors are isolated. Failure to comply with this requirement may result in a false alarm calling out the SAMFS, the cost of which will be invoiced to the Contractor.

**Temporary Changes to Fire Detectors**

Temporary changes to the fire detector circuits may be 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. All detectors within the site and adjacent areas shall be appropriately cleaned by a fire protection subcontractor on completion of the works. Failure to comply with this requirement may result in a false alarm calling out the SAMFS, the cost of which will be invoiced to the Contractor. Refer to Section 11 – Engineering Services for further details.

**Use of Existing Services for Building Works**

Existing services may be used to provide temporary services for the works subject to the conditions set out in the UniSA Preliminaries.

**Use of Lifts**

Where available, lifts in the building may be used for transporting clean and dry materials as set out in UniSA Preliminaries. Exclusive use of a lift requires at least five (5) working days notice. Appropriate protection must be provided to the lift car to prevent damage and any damage made good.
Lift keys for independent operation of the lift are available from UniSA Security for daily use as set out in UniSA Preliminaries. All costs incurred for callouts to the lift maintenance contractor as a result of the key becoming locked in the lift will be invoiced to the Contractor.

5.2 Demolition

5.2.1 General

Dilapidation Record
Where agreed with the Contract Supervisor, a formal photographic and written record is to be made before demolition to record the condition of existing structures, adjoining and adjacent structures and external areas (including walls, fences, gates, roads, kerbs, gutters and pavement). The record will be used amongst other things as a means of assessing the responsibility for damage and/or making good. Copies of the record shall be lodged with the Principal Consultant who shall check and endorse the copies as being a true and accurate description. An endorsed copy shall then be lodged with the Contract Supervisor.

Survey of Adjacent Premises
Before commencing any excavation or demolition on site where a Dilapidation Record is not required, the Contractor shall:
- carry out a detailed survey of all buildings and other works adjacent to the site of the works as detailed in the contract
- record the condition of all visible defects of each building by means of photographs, drawings and description as necessary.
A copy should be lodged with the Principal Consultant who shall check and endorse the copy as being a true and accurate description.

Damage to Adjacent Property
Any damage to adjoining surfaces, finishes, buildings, grounds, roads, footpaths, street channels and kerbs, crossovers or any other adjoining property that arises out of or is attributable to the works shall be made good by the Contractor at their expense.

5.2.2 Hazard Management

General
All demolition works shall comply with the UniSA Asbestos Management Policy and associated Standard Operations Procedures.

Asbestos Register
The Facilities Management Unit maintains an Asbestos Audit Report and Register for all campuses. Copies of the extracts of the Register are available on request or can be accessed via the Facilities Management Unit website. A copy of the Asbestos Register for each campus is available on the UniSA website. Any additional information that applies to the project is available from the Contract Supervisor. The Contractor shall refer to the relevant statutory regulations and the UniSA Asbestos Management Policy for standard Operations procedures in the event of asbestos being identified on a site. The UniSA Asbestos Management Policy is available on the UniSA website.

**PCB Storage & Disposal**

PCBs (polychlorinated biphenyls) were commonly used in electrical equipment, including fluorescent light fittings, manufactured in the 1950s—1970s. A copy of the EPHC document Identification of PCB-Containing Capacitors is available on the UniSA website. The Contractor shall refer to this document and the relevant statutory regulations in the event of PCB-containing components being identified on a site. UniSA has arrangements in place for collection and periodic disposal of PCB-containing components. The Contractor shall make arrangements for removal of the components and transport to the collection point at Mawson Lakes campus in accordance with the relevant statutory regulations.

### 5.2.3  Waste Management

**Environmental Sustainability**

Minimise wastage in demolition by:

Preparing and implementing waste management project plans for demolition wastes. Plans should identify alternatives to landfill and describe appropriate procedures and management practices.

Making provision for recovery, storage and transfer of re-useable materials from demolition works, including their transport from site to recycling and re-use stations.

Adopt special procedures for disposal or recycling of hazardous materials in refurbishing existing buildings.

Refer to the UniSA Environmental Sustainability Guidelines for further information.

**Salvaged Items**

Prior to commencement of any demolition works, a list of items to be salvaged and handed over to UniSA shall be prepared by the Principal Consultant in conjunction with the Contract Supervisor for possible reuse in this or other projects. Items to include: whiteboards, pinboards and projection screens (not blackboards).

The following items shall generally remain the property of UniSA. The Contract shall allowing for recovering them intact, cleaning them, storing them as directed by the Contract Supervisor and protecting them from damage until the end of the contract or until removed by UniSA, whichever is sooner.

Works of art and pictures.
Lock cylinders (keying system is controlled). Door hardware and furniture where consistent with current standards and suitable for reuse.

All signage where consistent with current standards and suitable for reuse.

Dispensers, racks, shelves and compactuses where consistent with current standards and suitable for reuse.

Fire extinguishers, generally all fire fighting equipment.

Light fittings and electrical accessories where consistent with current standards (intact fittings only as suitable for reuse).

Room air conditioners, generally all mechanical services equipment including push buttons, controllers and thermostats where consistent with current standards.

Exit and emergency light fittings where consistent with current standards and suitable for reuse (intact fittings or diffusers only).

Plumbing fixtures, tap ware, outlets, etc where consistent with current standards and suitable for reuse.

This list is not exhaustive and will vary from project to project. Consult with the Contract Supervisor at site establishment. Items marked with a sticker and the words “dispose” will not be retained by UniSA.

5.3 External Walls and Windows

5.3.1 External Walls

Materials

Material selection for new buildings must be compatible with proposed finishes and facilitate future expansion or upgrading. Materials should as far as possible be selected to match existing forms of construction when refurbishing existing buildings. The colour, materials and texture of external walls shall be approved by the Contract Supervisor at schematic design phase to ensure the design reflects materials and systems that are acceptable to UniSA.

Finishes

Finishes to walls shall be waterproof and be selected to minimise future maintenance. Brickwork should not be painted. Applied finishes may be used to obtain the required colouring and texture. They shall be a full system, similar to that manufactured by Granosite Coating Systems, and have a 10 year unconditional guarantee. All materials must be selected for their likely availability and colour consistency over a 20 year building period. Paint finish to trims, downpipes, and the like may be used in specific areas, subject to approval by the Contract Supervisor. All proposed finishes must be approved by UniSA at an early stage of design development.

Colour Schemes
All proposed colour schemes are to be approved by the Contract Supervisor prior to presentation to key stakeholders and inclusion in the specification.

Construction

External walls must be designed with particular care and consideration given to the possible future effects of shrinkage and cracking. Galvanising to structural reinforcement shall be considered in locations exposed to salt water or chemical attack. Mortar joints to face brickwork and face blockwork shall be ironed to a half round radius. The design of the walls must ensure that the cavities between the inner and outer walls are suitably flashed and the cavities are closed with the wall material and not aluminium angles. Appropriate drainage (and where required insulation) of window sections and spandrels must be provided.

Sealants

Approved sealants shall be selected to be appropriate for their application and shall be colour matched to the finished surface. Under no circumstances may sealants be used as the primary waterproofing barrier.

Corner Protection

Provide approved bollard or other protection to all corners and other external areas of buildings susceptible to vehicle damage or in high traffic areas.

Anti-graffiti Protection

Provide approved anti-graffiti protection to brick and concrete surfaces as directed by the Contract Supervisor.

5.3.2 External Stairs and Balconies

Balustrades

All balustrades to external stairs (except fire stairs), ramps and level changes shall be stainless steel or powder coat finish steel. Balustrades to fire stairs not used for general circulation shall be galvanised steel with paint finish. Proposed materials and finishes must be discussed with the Contract Supervisor. Handrails/Balustrades on roofs are to have a minimum height of 1200mm and a maximum height of 1400mm.

5.3.3 External Windows

Construction

All external windows shall be sliding or pivot hinge aluminium frame windows of commercial quality designed in accordance with all relevant codes. Louvre windows shall be avoided. All openable windows accessible from ground level must be factory fitted with window locks, all keyed alike. All aluminium must be anodised or powder coated. The minimum
thickness of anodising must be not less than 20 microns. All exposed screw fixings, rivets and cut edges, and the like must be coloured to match the frames. The window system must be designed in accordance with the requirements for acoustic control set out in Section C—Planning and Design Guidelines where the building, space or room is adjacent to an incompatible noise source.

**Installation**

Aluminium windows must be installed in accordance with AS 2048.

**Solar Control**

The use of solar or coloured glass is preferred in areas where heat and glare may be a problem. Applied solar control film to glass shall be used where appropriate and approved by the Contract Supervisor. Reflective films shall not be used. If windows require blinds for sun control or privacy, these must be specified for supply and installation under the building contract. Requirements for blinds are to be clarified at an early design stage with the Contract Supervisor, such that window frame and reveal detailing is compatible with optimum sun control or screening system.

**Cleaning**

All external surfaces of glass must be easily accessible for cleaning from the inside. If this is not possible, provide safe access to safety hooks and runners. Details shall be discussed with and approved by the Contract Supervisor.

### 5.4 Internal Walls and Partitions

#### 5.4.1 Internal Walls

**Flexibility**

Buildings shall be designed to be as flexible as possible internally. Load bearing walls shall be minimised and restricted to areas such as the building core for stairwells, lift shafts and toilets. All other internal walls and partitions must be non-load bearing and able to be readily removed or altered at minimum cost.

**Materials**

Partitions and internal walls shall be of plasterboard on metal stud, or equivalent as required by the application. Partitions and openings must be designed and installed to comply with the requirements of AS/NZS 2589, and AS/NZS 1905 where appropriate. Villaboard or equivalent shall be used in heavy use and wet areas. Anodised aluminium angle protection (38 mm x 38 mm) shall be provided to external corners of all partitions. Any exposed concrete finishes shall be Class 2 or better. All internal wall surfaces including those in plant rooms, but excluding service ducts, shall be painted.

**Acoustics**
Particular attention shall be paid to acoustics and noise transmission. Partitions and internal walls must be designed in accordance with the requirements for acoustic control set out in Section C—Planning and Design Guidelines. Partitions must be insulated with ‘Dacron’ or wool batts and/or double sheeted on one or both sides as necessary to achieve the required sound transmission loss between spaces. Details at intersection of partitions and external windows must ensure sound insulation is maintained at that intersection equivalent to that of the remainder of the partition. Partitions shall extend from the floor slab to underside of slab above if necessary to achieve the required STC rating. All penetrations in partitions must be appropriately sealed to maintain the required STC rating.

Security

For security purposes, all corridor partitions must extend to the underside of slabs and be sheeted on at least one side above the ceiling line.

Services

Services are to be located in service ducts easily accessible through lockable doors. No piped services are to be built or chased into partitions and walls. Where not located in service ducts, pipe work shall be incorporated into the wall framing by use of a top hat section. Proposed routes of service pipes are to be approved by the Contract Supervisor at design development phase.

Expansion joints and sealants

All control and expansion joints are to be caulked with approved sealants to prevent water penetration. Sealants must be selected to be appropriate for their application and must be colour matched to the finished surface.

Adhesives

Adhesive materials such as construction adhesive are not to be used in high-risk environments where they may fail, and create a hazard for occupants. A risk-based approach is to be taken at all times, and where designers identify issues, positive fixings such as nails or screws are to be used. This applies especially to places where panels are fixed to high walls or ceilings, and where adhesives fail, panels may fall.

Insulation

Wall insulation is to be 100% polyester (e.g. Dacron).

5.4.2 Skirtings

Vinyl Skirtings

Vinyl skirtings must be provided to all internal partitions irrespective of type except where metal skirting duct is used, where walls are tiled, or where other floor finishes are turned up walls. Vinyl skirtings shall be of minimum 100 mm height or as required to match existing skirtings. Painted skirtings are not permitted in any new areas. Vinyl skirtings shall be as
specified in the UniSA Standard Interior Finishes Schedule or approved by the Contract Supervisor.

5.4.3 Skirtings

Ducted skirtings where required shall be 150 x 50 mm 3 channel aluminium, equivalent to Moduline T5150, finish as approved by the Contract Supervisor.

5.4.4 Walls in Wet Areas

Toilet and shower areas

Walls in toilet and shower areas, including airlocks, shall extend full height and be finished with ceramic tiles from floor to partition height (1800 mm generally). Tile selections shall be as set out in the UniSA Standard Interior Finishes Schedule or approved by the Contract Supervisor. Tiling to extend to partition height within cubicles with tiled skirting to airlocks and general areas as a minimum provision. Partition walls to toilet cubicles must be a proprietary brand cubicle system with a laminated finish and be supported clear of the floor on stainless steel feet. Proprietary system may have approved paint finish in lieu of laminate as approved by the Contract Supervisor. All other fixing brackets, including acorn nuts, must be stainless steel or chrome-plated brass.

Splashbacks

Where sink units, tea-making facilities, cleaners' sinks or hand basins are specified, a tile splashback must be provided. The splashback must extend 200 mm minimum above the fixture, to the bottom edge of the fixture and 200 mm past each side or full return to depth of basin unit against side walls. All substrate material must be water resistant. Laminate splashbacks are acceptable in lieu of tiled splashbacks.

5.5 Floors and Floor Finishes

5.5.1 Floors

Design

Floor slabs shall be designed for the most economical construction and flexibility of use, with due consideration to long-term deflections and the need to provide for penetrations, both initially, and over the building life. Pre- and post-stressing may only be used if prior approval has been obtained from the Contract Supervisor. This aspect must be clarified early in the design stage. The need to core holes up to 200 mm diameter or to provide penetrations up to 1200 mm square in selected areas at a later date should be taken into account during design. All floors are to be finished with a maximum tolerance of ± 3 mm in a 3000 mm straight edge.

Floor Loads
All buildings must be designed for floor loadings generally in accordance with AS1170 unless otherwise specified. Floor loads for special areas must be determined in consultation with the Contract Supervisor and key stakeholders. Provision must be made for the installation of compactus shelving in areas nominated in the Project Brief.

**Termite Control**

Anti-termite treatment must be provided to all new buildings. All workmanship and materials must conform to the requirements of AS 3660.1 for protection of buildings from subterranean termites. All tree roots, which have been exposed during excavation, tree stumps, logs and timber must be removed and disposed of appropriately off-site. Stainless steel mesh barriers as specified in Appendix D of AS 3660 are to be used to provide protection against termite entry. For slab constructions, stainless steel mesh is to be installed under the whole of the slab or may be used to form barriers over cracks, joints and imperfections in the concrete and around service pipes. Stainless steel mesh must also be used between the slab edge and the wall, and across wall cavities in masonry wall structures.

Termite caps or strip shielding must be installed on all foundation walls, piers, stumps and other substructures in such a manner that the structure is isolated by the barriers from the substructure. Details for the manufacture and installation of termite caps and strip shielding are given in Appendices C and D of AS 3660. The Contractor is responsible for installing the physical barrier and shall provide the Contract Supervisor with a Certificate of Compliance with AS3660. The certificate shall include the following:

- details of termite prevention work undertaken, including a diagram as appropriate
- areas of building protected against termite entry
- any limitations of the procedures for termite protection, which may be due to the design of the building or the requirements of UniSA.

**Membrane**

All internal ground slabs shall have, as a minimum, a membrane equivalent to 300 micron Forticon, turned up at the perimeter and with all joints taped in accordance with good building practice. Floors and walls must be fully tanked where below ground or subject to hydrostatic pressure, and have adequate provision for relief of hydrostatic pressure and subsoil drainage.

**Stairways**

All internal and external stairways shall be designed to comply with the requirements of AS1428.2.

**Floor Penetrations**

All floor penetrations and associated service pipes must be sealed to control noise and water penetration between levels. Where floors are fire rated, the proposed detail shall comply with the required rating. Penetrations of any surface must maintain the fire rating of the material being penetrated. Any sealant used must comply with the fire rating. Floor wastes shall be provided within all wet areas and care must be taken to ensure that adequate falls to these points are specified and achieved. Where appropriate, bunding shall be installed to contain spillages and flooding.
5.5.2 Floor Finishes

Slip Resistance – General Principles

Finishes to all floor surfaces must comply with the AS/NZS4586 - 2004 Slip Resistance Classification of New Pedestrian Surface Materials and/or AS/NZS4663 - 2004 Slip Resistance Measurements of Existing Pedestrian Surfaces. Refer to Standards Australia Handbook HB197-1999 for details of minimum ramp test ratings for each application of floor covering before specifying any product.

Examples of floor ratings are as follows:

<table>
<thead>
<tr>
<th>Floor Type</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Foyers – wet</td>
<td>R10</td>
</tr>
<tr>
<td>Entry Foyers – dry</td>
<td>R9</td>
</tr>
<tr>
<td>Internal ramps &gt;2degrees – dry</td>
<td>R10</td>
</tr>
<tr>
<td>Lift lobbies above external entry level</td>
<td>R9</td>
</tr>
<tr>
<td>Toilet facilities in offices</td>
<td>R10</td>
</tr>
<tr>
<td>General work rooms and work areas – entrance, stairs</td>
<td>R9</td>
</tr>
<tr>
<td>General work rooms and work areas – toilets and washrooms</td>
<td>R10</td>
</tr>
<tr>
<td>Catering establishments – fast food kitchens and snack bars</td>
<td>R12</td>
</tr>
</tbody>
</table>

Colour Scheme

Colours for all floor finishes shall form part of the overall colour scheme and maintainability for the building. Light colours should not be used in high traffic areas or adjacent to external entries.

Colour selections shall be generally as nominated in the UniSA Standard Interior Finishes Schedule or Section D—Special Facilities or approved by the Contract Supervisor.

Carpet

Carpet finishes shall be used generally throughout UniSA's facilities. Carpet selections shall be as nominated in the UniSA Standard Interior Finishes Schedule or Section D—Special Facilities or as approved by the Contract Supervisor. Refer also to Interior Finishes Guidelines in Section C – Planning and Design Guidelines.

Carpet selection and installation of all carpeting shall comply with applicable portions of the relevant standards including AS1385, AS2454 and AS2455. Where appropriate, carpeting should be laid continuously over full floor areas. Partitions should be fixed after the carpeting to retain maximum flexibility.

Sheet Vinyl or Linoleum

- Sheet flooring shall be used in those areas noted in the Project Brief.
- Vinyl or linoleum selections shall be as nominated in the UniSA Standard Interior Finishes Schedule or Section D—Special Facilities or approved by the Contract Supervisor.
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- Special consideration shall be given to the selection of floor finishes where damage to the floor finish is likely due to the spillage of water, chemicals or other materials likely to be used in laboratory classes or research spaces.
- Approved anti-static materials shall be installed in all areas subject to static electricity discharge, e.g. data rooms, bio-boxes.
- Adhesives used in fixing sheet flooring shall be solvent free and compatible with the material selected.
- All joints shall be welded.
- Sheet flooring to wet areas such as cleaners’ rooms, tea rooms and isolated basins must be an approved non-slip sheet flooring coved up the walls to a height of 150mm.
- Coving up walls may be reduced to 100mm or vinyl skirting used where appropriate for area it is being used in.

Ceramic Tiles

Ceramic tiles must be used on floors of all toilet areas and showers, including air-locks, and in fire-rated stairs. Tile selections generally shall be as nominated in the UniSA Standard Interior Finishes Schedule or Section D—Special Facilities or approved by the Contract Supervisor.

Non-Slip

Special consideration shall be given to the appropriateness of the nominated tile in areas where a non-slip surface is required. Alternative tile selections must be approved by the Contract Supervisor.

Floor tiles to toilet and shower areas shall be non-slip semi-glazed with matching or dark coloured grout and finish level with adjacent finishes.

Tiles to stair treads must be non-slip to suit the application with tread nosing tile of a contrasting colour and matching grout.

Stair landings

Tiled stair landings must have a matching skirting tile, minimum 100mm high.

Expansion Joints

Appropriate caulked expansion joints must be provided as required including at the junction of tile floors with walls. All base substrate and tile layout designs to be approved by the Contract Supervisor.

Tactile Indicators

Type B tactile indicators as described in AS1428.4 are to be provided at the top, bottom and any mid entry point of all stairs and ramps with a grade greater than 1:20. Tactile indicators shall be positioned as shown in Figure 4, AS 1428.4.

Sealants

Sealants must be selected to be appropriate for their application and must be colour matched to the finished surface.

Junctions and Thresholds

Junctions of dissimilar floor finishes shall be achieved using brass angles or strips set into the slab. Separation strips are not required between vinyl and carpet finishes. Provide a tapering clear anodised threshold at all external doors. Junctions and thresholds must be designed so as not to create a tripping hazard nor to inhibit wheelchair access.
Stair Nosings
Stair nosings generally shall be aluminium nosing with contrasting rubber insert. In all
cases nosings shall be contrasting to the general colour of the stair and be the
dimensions described in Section 13, AS 1428.2.

Door Mats
Door mats shall be provided at each external access to the building. Mats must be rubber
backed indoor/outdoor carpet or similar design approved by the Contract Supervisor.
Where provided, mat recesses must be formed by brass angles set into the concrete. Mat
recesses for fire-isolated areas must be external and must be adequately drained if
exposed to weather. Mats made from rubber stripping are not acceptable.

Plant Room Floors
All plant room concrete floors shall be painted with an approved non-slip finish. Floors
may be concrete in lieu of non-slip finish.

Access Floors
Access floors where required by the Project Brief shall be a ‘Unistrut MK.25A’ gridless
system or equivalent approved by the Contract Supervisor as required for the room
function.

5.6 Ceilings and Ceiling Finishes

5.6.1 Ceilings

Suspended Ceilings
Suspended ceilings must be provided in all occupied areas unless noted otherwise in the
Project Brief, instructed by the Contract Supervisor, or where suspended ceilings are
deemed inappropriate by the Facilities Management Unit.
Ceiling systems shall generally be an approved two-way grid system with rigid hangers
and exposed tee-bar with 1200 mm x 600 mm or 600 mm x 600 mm module unless
specified otherwise in the Project Brief or directed by the Contract Supervisor.
All suspended ceilings must be designed in accordance with AS/NZS 2785 and AS 2946.
Wall angles shall be of a shadow line type.

Ceiling Tiles
Ceiling tiles shall be approved mineral fibre, fine fissured, 99% humidity resistant with
tegular or square lay-in edge, suitable for air conditioned and non-air conditioned areas.
Ceiling tiles to public areas shall be Armstrong Dune 1200 mm x 600 mm or
600 mm x 600 mm. Ceiling tiles to general areas shall be Armstrong Fine Fissured
1200 mm x 600 mm or 600 mm x 600 mm.
Acoustic ceiling tiles shall be Armstrong Optima (NRC 0.85) 600 mm x 600 mm or
Armstrong Fine Fissured High NRC/CAC (NRC 0.70) 600 mm x 600 mm (or similar
approved by the Contract Supervisor), including where plaster acoustic tiles may be
nominated in the Finishes Schedule. The acoustic properties of the tiles must be considered in relation to the acoustic requirements of the space(s).
In wet areas, water-resistant fibre cement or water-resistant plasterboard tiles shall be used. Fibreglass ceiling tiles shall not be used.

**Plasterboard Ceilings**

Screw-fixed flush plasterboard ceilings and bulkheads shall be provided with an adequate number of access panels. This type of ceiling should be avoided unless required for specific purposes.

**Ceiling Height and Ceiling Space**

In general, the minimum acceptable ceiling height throughout UniSA buildings is 2700 mm. In existing buildings where the floor levels and structure do not allow a ceiling height of 2700 mm, written approval must be obtained from the Contract Supervisor. The clearance between the top of the ceiling system and the underside of any slab or beams in new buildings shall be not less than 600 mm.

**Insulation**

Ceiling insulation to be 100% polyester (e.g. Dacron).

## 5.7 Other Ceilings and Linings

**Soffit Linings**

Soffit linings must be pre-finished materials such as ‘Colorbond’ metal sheeting or ‘Alumped’. Painted fibrous cement, adequately fixed and sealed against the ingress of moisture and corrosion is only acceptable for soffits not more than eight metres above the ground.

**Plant Room Ceilings**

No ceilings are to be provided to plant rooms unless required for a specific purpose. Structural elements and all piped services to be painted and left exposed. Where ceilings are provided, they shall be painted, irrespective of type.

### 5.7.1 Ceiling Fixtures and Details

**Ceiling Fixtures**

Where fixtures or fittings such as light fittings, speakers, thermal alarms, are to be mounted on the ceiling tiles, approved backing pieces must be provided which must span the full width of the tile to provide bearing on the ceiling grid. Timber backers are not to be bonded to tiles.
Careful consideration must be given to the fixing of heavy equipment such as video monitors and projection equipment. Adequate structural support to the structure above the ceiling must be provided to facilitate secure installation.

**Equipment Access**

Wherever access is required to the ceiling to service or remove equipment, the ceiling must be designed for easy removal including removal of tee-bars. In flush ceilings, access panels shall be an approved proprietary hinged metal panel with concealed frame for flush set finish, opening downward, size to suit the functional requirements.

**Recessed Pelmets**

Recessed pelmets must be provided to all perimeter windows and wherever else required by the design to allow the installation of vertical blinds or curtains.

### 5.8 Roofs

#### 5.8.1 Roof Design

**Pitch**

Care shall be taken in the design and specification of roofs to avoid rain penetration. Pitched roofs shall be used in preference to flat roof systems. Building users may require some useable roof area for experimental or other purposes as specified in the Project Brief. Minimum pitch must be not less than manufacturer's recommendations and an appropriate safety margin provided to suit prevailing conditions.

**Materials**

Material selection for new buildings must be compatible with proposed finishes and facilitate future expansion or upgrading. Materials should match existing forms of construction when refurbishing existing buildings. All roofing materials used shall be compatible to avoid electrolysis. Metal tray roofs must be continuous over ridging. Roofing materials shall be approved by the Contract Supervisor at schematic design phase to ensure the design reflects materials and systems that are acceptable to UniSA.

**Membrane Roofs**

Membrane type, trafficable roofs will not be approved except to suit specific functional requirements. Membrane roofs must be the water shedding type and be protected against penetration.

**Roof Flashings**

Roof flashings generally must be designed to minimise the reliance and use of sealants. Flashings shall be fabricated and installed in accordance with the manufacturer's written instructions, including fixing types. Flashings to penetrations for roof access hatches, skylights and the like must incorporate a soaker flashing which must extend to the roof ridge whenever possible.
Flashings to all roof penetrations must be designed to minimize the collection of leaves and debris. ‘Decktite’ flashing are acceptable for penetrations. All box gutters must have over flashings taken up over the bottom purlin and folded down into the gutter. The chemical reaction of metals interfacing with other metals in any exposed situation must be avoided.

5.8.2 Guttering and Downpipes

Gutters
Eaves gutters should be used in preference to box gutters and be self-cleaning. Internal and box gutter design shall be avoided where possible but, where included, shall clearly demonstrate the inclusion of controlled overflow to prevent flooding in the event of a blockage.

Box gutters, gutters and downpipes must be fabricated from stainless steel, ‘Colorbond’, copper, zinc or PVC. All gutters must be easily accessible for servicing. All box gutters must be fixed with leaf guards to prevent blocking during storms. For maintenance purposes, a minimum width of 450 mm and a minimum depth of 200 mm are required.

Overflows
Overflow relief pops must be provided to all roofs and gutters as a safeguard against flooding caused by downpipe or drain blockages. Overflows are to discharge clear of building lines and pedestrian bridges or paths. Discharge from overflows must be visible and horizontal outlets must discharge a minimum of 150 mm from the face of the building. Overflows must be designed so that the combined clear outlet area of the overflow exceeds the clear outlet area of downpipes serving the gutter. They must be positioned so that in the event of a gutter flooding the risk of flooding to the building is minimal.

Leaf Guards
Leaf guards must be provided on all sumps. Material shall be stainless steel and/or compatible with gutter and other roofing materials. All guards shall be removable. Leaf guards shall project above the top of the sump not less than half the depth of the gutter.

Downpipes
All exposed downpipes shall generally be constructed of materials compatible with the gutters that they service. The location of all downpipe discharges and sumps must be carefully planned to avoid inconvenience during operation and maintenance.

Insulation
Insulation shall be provided to any downpipe where unacceptable water noise will result or where condensation on the exterior of downpipes located internally is likely to occur and cause nuisance. Insulation to roof spaces must be provided as required to achieve the required level of acoustic and thermal performance.

Testing
Internal downpipes and all gutters must be hydrostatically tested to the maximum head possible prior to the issue of the Certificate of Practical Completion.
5.8.3 Roof Access

**Roof Access Hatches**

Provide safe roof access from a service area or room or by means of an openable roof hatch or door. A permanent steel ladder should be provided where necessary to gain access to roofs, preferably located in a plant room or a separately enclosed space. A hot dipped galvanised roof ladder must also be provided at changes in roof levels.

**Roof Walkways**

Roof walkways of approved construction shall provide access to all equipment on roofs and in ceiling spaces. Catwalks on roof and in ceiling spaces to be Lysaght Unitrak 2. Other materials may only be used if approved by the Contract Supervisor. Installation shall be in accordance with UniSA Standard Catwalk Detail. Galvanised ball stanchions to be manufactured by Weldrite or Haldwell Bennett and installed with base-plate reversed. Installation to be bolted not welded, fully removable and relocatable. Generally, catwalks to be installed around the edge of all low pitched roofs, to all services, equipment and access hatches. All roof services and alterations to be more than 900 mm from the edge of the roof. Air conditioning unit and condenser platforms to be Lysaght Unitrak 2 to match into new or existing catwalks.

**Roof Spaces**

All roof spaces must have permanent, fixed, adequate access. They must be provided with catwalks and be sufficiently lit to enable the roof space to be traversed without danger, 24 hours a day.

**Roof Safety System**

Where required by the provisions of the Occupational Health Safety and Welfare Act and associated Regulations, a fall-arrest safety cable installation complete with all accessories and a harness must be provided.

5.9 Doors, Hardware and Locks

5.9.1 Doors and Frames

**External Doors**

Sliding doors should be used for all main automatic entry/exit doors. All external doors to be recessed into foyers sufficient to provide protection from prevailing wind pressure when opened. Canopies may be provided for additional protection. Provision for access and egress by persons with disabilities to be in accordance with AS 1428. Double action swing doors shall not be used.
Glass doors shall be clearly marked, such that they are visible to all users of the building with either push/pull or sliding signs, and include an intermediate rail or decals as set out in Decals and Signage to Glazed Doors & Panels to prevent people walking into them.

**External and Internal Aluminium Doors**

Doors shall be anodised or powdercoated aluminium doors (refer to Finishes Schedule) to approved design. Anodising shall be not less than 20 microns to both doors and frames. Aluminium doors larger than standard size shall have accompanying hinges, closers, etc. design to prevent movement and misalignment.

**5.9.2 Specification for External Aluminium Doors**

Door construction must withstand the rigours of operation in a university environment, where the door may be subject to several thousand cycles a day. Operation will be under Cardax access control which means the door could be in secure mode up to 24 hours every day. Locking will be via either magnetic lock or electric strike. Under the operation of a magnetic lock, the door is subjected to significant bending stress and possible abuse as a result of persons pulling on the door whilst the magnetic lock (at the head of the door) is still powered up.

Profile Specification:

Doors shall be constructed of the Capral 249 Superline extrusion profile.

Top and bottom rail shall be a minimum 140 mm deep. Mid rail shall be a minimum of 190mm deep.

Wall thickness of all extrusions shall be submitted for approval to the Contract Supervisor and Campus Facilities Administrator. Typically 3.2 mm minimum.

Reinforced fixing to the door stiles shall be provided.

Construction Specification:

The mid rail shall also have a 10mm threaded rod (with a galvanic coating to avoid electrolysis) through its centre attaching it to the stiles via threaded lock nuts. The nuts shall have a washer of suitable size and thickness beneath it. Tensioning the access shall be provided via access holes (of a size suitable for a socket head wrench) in the edge of each stile. The access hole shall be covered with a press in plastic plug of neutral colour.

A minimum of three (3) hinges shall be used per door leaf on swinging doors. Hinges shall be McCallum 104 type.

Reinforcing plates shall be provided in the jambs for attachment of the hinges.

The top and bottom rail shall be bolted to the door stiles using nylon lock nuts and the bolt reinforcing shall fit snugly within the rail extrusion.

Dorma TS83F hydraulic door closers shall be used and fitted to the internal side of the door.

Contractors who have not supplied a door of this specification to UniSA previously shall provide a sample of their construction quality for approval.

A completed door shall be viewed by the Contract Supervisor, prior to installation.
Automatic Sliding Aluminium Doors

All doors and control systems shall be installed in accordance with AS 4085. The following additional standard elements and features shall apply to all automatic sliding aluminium doors unless otherwise specified:

Aluminium tapered threshold to door opening to suit height of the adjacent floor covering or tiles and meet the requirements set out in AS 1428.

Glazing colour to match existing (unless otherwise specified) and shall comply with the requirements of AS 1288.

An indicator arrow sign on the door glazing (in accordance with AS 4085) with the head of the arrow pointing in the direction of door leaf travel, when opening.

Back of door operator/pelmet shall be anodised or powder coated to match frame colour if it can be seen externally through the top window light.

Installation of 240 V/10 A GPO outlet (complying with AS 3000) for the door actuator, drawn from a dedicated circuit of the building supply. The position of the electrical cable supplied with the door actuator track should be checked before determining the location of the GPO. Battery backup for failsafe operation.

Motion detectors to activate the doors operation, both internal and external. Safety beam sensors within the doorjambs.

Internal emergency egress break glass alarm with appropriately engraved plate.

Installation height shall be in the range of 900 mm to 1100 mm above the plane of the finished floor.

Connection to the fire alarm failsafe relay, to ensure the door opens upon activation of the fire alarm. Contact details for UniSA’s Fire Maintenance contractor are available from the Contract Supervisor.

After hours electronic/key activated lock to the outside of the door. Four position electronic/key activated mode switch to the inside and engraved to show key operation position. All key switch locations shall be determined in consultation with the Contract Supervisor.

All key operated cylinders used for the purpose of locking the door or mode of door operation, shall match existing door locks (unless otherwise specified).

Where electronic security facility is required, four position switch to the inside shall be deleted from the requirements.

Replacement of Existing Doors with Automatic Sliding Doors

The scope of works shall include all materials and labour costs associated with the removal of existing frames, doors, supply and installation of new doors as per the nominated locations. All doors and control systems shall be installed in accordance with AS 4085.

The Contractor shall take particular care to ensure the adjacent floor coverings are protected from swarf particles, etc and that all glazing and associated work areas are thoroughly cleaned upon completion. Disposal of existing doors and removal of all materials and rubbish shall occur upon completion.

Timber External Doors
All timber external doors shall be sheeted in marine grade ply with mitred edge strips to top and vertical edges unless required to be fire doors. Timber doors shall be painted with a full gloss finish. All timber external doors shall be solid core and have metal head flashings on the frame. The glue to the edge strips and the ply to the door carcase shall be Type A bond, i.e. waterproof, not water-resistant, glue.

**Internal Doors**

Internal doors shall be plywood faced solid core not less than 40 mm thick, mitre edge stripped all round. Doors in high traffic areas and where allowed by fire regulations, shall have a viewing panel of an approved design. Provide a viewing panel to all laboratory doors, including fire doors, to comply with the requirements of AS 2982. Foam core doors with MDF face may be used for offices. Doors to lecture theatres, seminar rooms and similar teaching spaces and plant-rooms must be designed to match the acoustics of the room and must include seals and double glazing where required. Return air grilles in doors must be fixed with concealed screw fixings. Particular attention must be given to acoustic requirements to ensure that the acoustic integrity of the door is not compromised.

**Door Frames**

Door frames must be anodised or powdercoated aluminium or zinc-chromate primed 1.6 mm gauge steel with hinges and specification to suit the particular application required in the Project Brief. All doors other than aluminium glazed doors shall be hung in a one piece fully welded metal door frame, which shall wrap fully around wall linings. All metal frames shall be fully grouted into the opening or acoustically sealed to the partition framing. Aluminium door frames shall be sufficiently rigid to avoid distortion by the door weight or the twisting action of the door closer. Generally, all door frames shall have three hinges per leaf.

**Door Size and Swing**

All plant-room, seminar and laboratory doors must be minimum leaf and one-half construction and must open outwards taking care not to swing across traffic paths. Doors to cleaners’ rooms, service ducts and small storage cupboards must open outwards. Door sizes must generally be of a standard size, not less than 2040 mm high x width as required unless required to be larger for particular purposes or to meet statutory requirements.

**Toilet Doors**

Cubicle doors must be faced both sides and on all edges with laminate to match proprietary cubicle partitions. Hardware must be ‘Efco’ or approved equivalent with stainless steel spring hinges. Doors to fully enclosed sanitary compartments for persons with a disability must comply with the relevant parts of the BCA and AS 1428.

**5.9.3 Door Furniture**

**Furniture Generally**
Furniture for each lock must be selected to match each application. Lever type handles only may be used and the implications of electronic security access where required must also be considered. Refer also to AS 1428.

Door furniture must be Lockwood 1000 Series or an approved equivalent with handles to match existing adjacent handle types in refurbishment projects except at City West Campus where Lockwood 2000 Series with “D-type” handles is used. On smaller projects, it may be appropriate to match existing adjacent hardware. Lockwood 1080 or 1070 door hardware in the 572 series is used extensively in older buildings. Satin chrome is the preferred finish. Alternatively, match existing adjacent hardware finishes where appropriate.

**Door Closers**

Door closers must be provided to entrance doors, doors with keypads, external doors, internal doors from general office space to public corridors, lecture theatre doors and doors to all teaching spaces, plant-rooms, toilets, air-locks and fire doors. Type must be Dorma or equal approved by the Facilities Management Unit with hold open and delayed action controls as directed. Door closers must be provided between all air-conditioned spaces. Refer also to AS 1428.

**Kick Plates**

Kick plates must be 150 mm high x 0.9 mm satin stainless steel; screw fixed to outside face of all inward opening heavy duty doors. Kick plates to be minimum 100 mm high.

**Electromagnetic Hold-Open Devices**

Electromagnetic hold-open devices and sequence closures must be provided to all fire or smoke barrier doors in high traffic areas which must automatically release the door, allowing closure, in the event of any smoke or fire alarm activated at the Fire Indicator Panel.

**Door Stops**

To any door where the door or furniture may strike a wall or other object, and where a combination coat hook/door stop is not provided, provide an aluminium/rubber door stop.

**Acoustic Seals**

Where acoustic seals are required, they must be recessed into the door jambs, head and the bottom of the door wherever possible.

**5.9.4 Locking**

**Locks**

Locks must generally be Lockwood 570 Series except where nominated otherwise, with construction cylinders, and keyed to UniSA’s grand master key system. Locks in external aluminium glazed doors must be Lockwood 3582 Series. Locks must be mounted such that strike is 1000 mm above finished floor level. No locks are to be mounted in the bottom rails of doors. External locks must have vandal proof covers to prevent jemmying of the lock.

**Keys**
Only master keying shall be used. Maison keying will not be approved. All keying is to use specific UniSA Restricted Bi-Lock ‘U’ profile under the UniSA keying plan. The keying schedule is to be agreed with the Campus Services Coordinator, through the Contract Supervisor. The number of keys required is normally three per lock. Construction cylinders shall be used during the construction of new buildings. At Practical Completion, the construction cylinders will be removed and replaced by the Bi-lock system. This will be done by UniSA’s Locksmith and arranged for separately by UniSA. Key cylinders must be stamped with a numbering system by the manufacturer.

**Electronic Access Control System**

Refer to Security Alarm, Access Control and CCTV Specification in this Section.

**Snibs**

Snibs should not be provided to internal doors. All doors should be freely operable from inside and only lockable from outside.

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**5.10 Painting**

**5.10.1 General**

**Preferred Brands**

Paint brands shall be as specified in the UniSA Standard Interior Finishes Schedule or approved by the Contract Supervisor. There shall be no substitution of specified or approved brands.

**Paint Systems**

The manufacturer’s recommendations with regard to the number of coats and type of paint for each coat must be strictly adhered to for the location and surface to be painted. Paint systems shall include the use of non-solvent-based paints and low-ammonia acrylics as much as possible. Proposed paint systems shall be approved by the Facilities Management Unit.

**5.10.2 Colour Schemes**

**Standard Colours**

A number of standard colours have been adopted by UniSA. The Contract Supervisor will provide copies of the UniSA Standard Interior Finishes Schedule applicable to the building. Refer also to Interior Finishes Guidelines in Section C—Planning and Design Guidelines and Finishes Schedules in Section D—Special Facilities.

**Approval**

Proposed colour schemes must be approved by the Contract Supervisor at an early stage. Refer to Interior Finishes Guidelines in Section C—Planning and Design Guidelines for guidelines in developing interior finishes for new buildings.
5.11 Furniture, Fittings and Equipment

5.11.1 Furniture & Equipment

Built-in Furniture

UniSA has a preference for the use of loose furniture to provide future flexibility. The use of built-in furniture should therefore be approved by the Contract Supervisor at an early stage of the design and must allow for cable reticulation where required. Built-in furniture such as cupboards and laboratory benches must be supplied as part of the Contract. All built-in furniture units must have a recessed base. Where abutting walls, provide an integral splashback not less than 150 mm high caulked to the wall. All cupboards and drawer units where required must be lockable and master keyed (not keyed alike). All built-in furniture, other than in laboratories, must be an approved finish. Laboratory furniture must comply with AS 2982 and Section D—Special Facilities. All electrical or electronic equipment housed inside joinery units must be adequately ventilated and accessible for maintenance, servicing and replacement.

Work Stations

Where work stations are required in the Project Brief, they must be supplied under the Contract, together with all required services including adequate lighting, power and data and communication connections. Work stations must be designed and installed in compliance with all relevant standards including AS 2466, AS 1680, AS 2713, AS 3000, AS 3080 and AS 3084. All workstations must comply with all current Workcover requirements and recommendations.

Compactus Units

Compactus units, incorporating shelving or hanging rails, must be supplied and installed under the Contract when required by the Project Brief. Consideration must be given to structural design of the floor to support compactus storage units.

Provision for Equipment

Consultant drawings must clearly identify all furniture and equipment requirements. Schedules listing types, finishes and quantities required shall be produced as directed by the Contract Supervisor to enable UniSA to purchase the required items. Where appropriate, the Contract must include taking delivery and placement of furniture and fittings as the Contractor’s responsibility.

Furniture and Equipment Provided by UniSA

Generally, all items of loose furniture will be provided by UniSA unless stated otherwise in the Project Brief or approved by the Contract Supervisor. Equipment such as computers, urns, cutlery/crockery, and scientific equipment will be supplied by UniSA unless otherwise stated in the Project Brief.
5.11.2 Fixtures and Fittings

**Whiteboards**

Whiteboards shall be have vitreous porcelain enamel surface and M20 aluminium frame with mitred corners, screws to be countersunk and supplied with a full length pen tray. The centre of the board to be made lightweight with a steel backing and supplied with polyglides. Size shall suit wall dimensions. Whiteboards shall be provided in all seminar and tutorial rooms, meeting rooms, computer pools and lecture theatres as part of the Contract. Refer to Section D—Special Facilities. Whiteboards for other areas shall be in accordance with the Project Brief or as approved by the Contract Supervisor.

**Pinboards**

Pinboards constructed from ‘Frontrunner’ fabric over 13 mm Canite and finished with an M20 aluminium frame with mitred corners. All screws to be countersunk. Dimensions to suit wall area. Fabric as specified in the applicable UniSA Standard Interior Finishes Schedule. Pinboards shall be provided in all seminar and tutorial rooms, computer pools, lecture theatres, etc as part of the Contract. Refer to Section D—Special Facilities. Pinboards for other areas shall be in accordance with the Project Brief or as approved by the Contract Supervisor.

**Projection Screens**

Projection screens for slides, overhead projection or film shall be provided in all seminar and tutorial rooms and lecture theatres as part of the Contract. Projection screens must be installed such that the concurrent use of whiteboards in a room is not unduly impeded. Refer to Section D—Special Facilities.

**Curtains and Blinds**

Confirm requirements for curtains/blinds and if they are to be supplied and fitted under the Contract with the Contract Supervisor. Provision must be made in the Contract for all battens, pelmets, curtain tracks, etc required for fixing.

**Toilet Fixtures**

To all toilet washbasin areas provide:

- vanity bench with semi-recessed basins or a wall shelf where wall-hung basins are used
- mirror above each washbasin
- hand dryer(s)
- soap dispenser over each basin—supplied under contract by UniSA.

In each toilet cubicle provide:

- toilet roll holder—supplied under contract by UniSA (generally jumbo roll type holder to cubicles, double open roll type holder to access toilets)
- coat hook (chrome plated) with door stop to back of door.

Additionally, to cubicles in women's or unisex toilets:

- hygiene bins—supplied under contract by UniSA
- shelf over cistern.
In each shower recess, provide:
- built-in soap holder to match wall tiles
- two (2) coat hooks (chrome-plated)
- fixed bench seat minimum 600 mm wide made from timber slats
- shower screen door or curtain rail where required.

**Coat Hooks**

In addition to those required in toilet areas, a combination coat hook/doorstop must be provided on the back of all doors to individual offices in the building and coat hooks to all laboratories, at 1800 mm above the floor.

### 5.11.3 Signage

**Standard**

All signage shall be in accordance with the UniSA Signage Manual.

**Directory Boards and Other Signage**

Provision must be made in the design to allow space for information and directional signage including directory boards in lobbies, etc.

**Signage to Glazed Doors & Panels**

Provide signage to glazed doors, sidelights and other glazed panels to UniSA details.

### 5.12 Engineering Services

#### 5.12.1 Introduction

The following guidelines identify the design requirements and engineering standards to be used in designing new facilities and upgrading existing facilities for UniSA. The aim of these guidelines is to achieve comfort and functionality with cost effective solutions. These solutions take into account capital expenditure, life cycle costing, ongoing recurrent costs such as energy, maintenance and repairs, the use of resources and environmental impact.

The method of application of the parameters will be different for each project and there may be a number of ways of applying any one principle to a given building or project. Hence, consultants will need to determine the best method of applying the principles in each specific case.

#### 5.12.2 Services in Buildings

**Performance Guarantee**
Guarantee the services and systems to provide the specified capacities, performance and automatic operation of all plant and services throughout an installation. Ensure all connected systems operate in a stable safe and automatic manner to provide optimum efficiency at both part and full load.

Select all system components for continuous, safe, unattended operation at the specified design criteria conditions. Commission and test the services and systems to ensure compliance with the performance and guarantee requirements.

Quality Assurance

Carry out a quality assurance program for all design work undertaken for UniSA, which is to include the following as a minimum:

- on completion of preliminary design, provide documentation for review and approval by the Technical Reference Group (to be convened by the Contract Supervisor)
- prior to issue of documents for tender, a suitably qualified internal person, not involved in the actual project, shall carry out an internal design review
- prior to issue of documents for tender, provide documentation for review and approval by the Technical Reference Group

Coordinate all documentation prior to issue of documents for construction.

Where Consultant Teams are engaged to carry out contract administration, they shall undertake a quality assurance program to ensure the completed works comply with the documents.

Prior to Practical Completion and acceptance by UniSA, a written statement from the Consultant Team must confirm they have undertaken this quality assurance program and that the installation complies with the documentation and requirements of UniSA. In some cases, UniSA may require evidence of the quality assurance program prior to acceptance of Practical Completion.

Standardisation

The Consultant Team shall recognise the UniSA’s requirement for standardisation of mechanical, electrical, and BMS controls equipment. Where necessary, the Contract Supervisor will convene a Technical Reference Group to discuss standardisation, in the form of the utilisation of existing infrastructure, new and more modern technology and make recommendations based upon all avenues of consideration including life cycle costing with the Principal Consultant and Consultant Team.

Environmental Sustainability

All buildings shall be designed to suit local environmental conditions. They shall be designed to optimise thermal and lighting conditions using minimum non-renewable sources of energy. Refer to the UniSA Environmental Sustainability Guidelines.

Life Cycle Costing

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

All new equipment installed and work carried out shall be compatible with the existing installed systems and comply with the current requirements of the relevant statutory authorities, Australian Standards and Codes of Practice.

Metering

Refer to Building Management System for details of all metering.

Installation Requirements

Engineering services installations must comply with or provide for the following:

- Plant is not to be mounted on the roof unless otherwise approved by UniSA
- Plant is not to be installed in ceiling spaces unless otherwise approved by UniSA
- Combine cables and pipes in common accessible service ducts and shafts where ever possible, with sufficient clearance for future replacement, with valves and other equipment requiring maintenance grouped in accessible locations
- Utilise a common and sequential system of nomenclature, numbering and colour coding of all service systems complying with the UniSA master numbering system
- 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 15% 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 of UniSA is granted for plant attendance, excluding normal daily start/stop and inspection functions.

Plant Rooms and Access

Plant rooms shall be designed to enable safe and easy access to all equipment for maintenance purposes. Considerations include (but are not limited to) the following:

- Walkways and equipment layouts are to be designed with safe access for maintenance of the largest equipment in mind. Ease of equipment replacement is also to be considered.
- Plant room lighting is to be designed to enable maintenance to be carried out safely
- Enclosed spaces (such as large air handling units) are to incorporate internal luminaires
- Exposed hazards are to be appropriately protected i.e covers on drains

It is a requirement of the University that all maintenance can be carried out in a safe manner. The design of the plant room must facilitate this requirement.
Building Services

Service installations in buildings, not otherwise provided through site services, shall be included in building contracts in full. Wherever practicable, related equipment which requires routine service or regeneration at less than monthly intervals shall be installed and grouped in plant rooms at ground level and provided with appropriate easy access to roads and to main service ducts.

Site Services

The Consultant Team shall investigate and assess the existing site services (i.e. capacity for future load, location, etc) and determine their suitability for increase loads and usage resulting from the new or renovated building. Proposals for upgrade or installation of site services shall be approved by the Technical Reference Group. All site services are intended for connection to each building. Precise termination points for each will be defined when designs are developed. Definition of termination points will include physical location, level, Operations characteristics and capacities.

Construction Services

Existing services may be used to provide temporary services for the works subject to the conditions set out in the UniSA Preliminaries.

Requirement for As-Built Documentation and Training

Provide Operation and Maintenance (O&M) Manuals, As-Built Drawings and Training of UniSA Staff as set out in the Specification for Operation and Maintenance Manuals. All drawings and drawing symbols shall comply with Australian Standards requirements. Absolute correction of all defects other than “fair wear and tear” at the end of the contract maintenance period and acceptance by UniSA before final payment is made. Refer to UniSA Specification for Operation and Maintenance Manuals (available from UniSA website) for the format and timing of submission of O&M Manuals and As-Built Drawings. It is a requirement that all documentation follow this specified format.

5.12.3 Mechanical Services Design Criteria

Design criteria associated with an installation are:

<table>
<thead>
<tr>
<th>Table 5-1 - Mechanical Services Design Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
</tr>
</tbody>
</table>
| Extreme ambient conditions under which all plant shall operate | 46.0 °C dry bulb maximum.  
24.0 °C wet bulb maximum.  
Full solar load.  
0.0 °C dry bulb minimum. |
| External ambient conditions for air conditioning plant full load performance | 38.0 °C dry bulb maximum.  
21.0 °C wet bulb maximum.  
Full solar load.  
4.0 °C dry bulb minimum.  
Zero solar load. |
| External ambient conditions for refrigerative cooling system full load performance | 38.0 °C dry bulb maximum.  
22.5 °C wet bulb maximum. |
<table>
<thead>
<tr>
<th>Item</th>
<th>Design Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal conditions for evaporative cooling plant full load performance</td>
<td>24.0 ºC dry bulb maximum. 60.0% relative humidity maximum with humidity varying depending on ambient and internal loads. 20.0 ºC dry bulb minimum.</td>
</tr>
<tr>
<td>Internal conditions for evaporative cooling plant full load performance</td>
<td>30.0 ºC dry bulb maximum—student union kitchen 35.0 ºC dry bulb maximum—lift machine rooms relative humidity varying depending on ambient wet bulb temperature.</td>
</tr>
<tr>
<td>Controls tolerance for air conditioning plant performance</td>
<td>± 2.0 ºC dry bulb.</td>
</tr>
<tr>
<td>Outside air, supply air, exhaust air, mechanical smoke venting and infiltration of air in perimeter areas</td>
<td>To the requirements of the Australian standards and the Building Code of Australia.</td>
</tr>
<tr>
<td>Internal heat gains—people</td>
<td>70 W per person, sensible—general. 60 W per person, latent—general. 75 W per person, sensible—restaurants/bars. 95 W per person, latent—restaurants/bars.</td>
</tr>
<tr>
<td>Internal heat gains—lighting</td>
<td>12 W/m³—offices, seminar, CAD rooms, library. 50 W/m³—retail. 15 W/m³—student union refectory/bar. 15 W/m³—lecture theatres</td>
</tr>
<tr>
<td>Internal heat gains—power</td>
<td>25 W/m³—offices, studios. 125 W/m²—CAD rooms. 20 W/m³—seminar rooms. 10 W/m³—library, lecture theatres. 25 W/m³—retail.</td>
</tr>
<tr>
<td>Internal heat gains—special equipment</td>
<td>10 W/m³—lecture theatres.</td>
</tr>
<tr>
<td>Air filtration</td>
<td>Dry media disposable filters, average filtration efficiency of F5 to Australia Standard 1324</td>
</tr>
<tr>
<td>Maximum noise levels at adjoining property boundaries</td>
<td>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.</td>
</tr>
<tr>
<td>Maximum vibration levels in occupied areas</td>
<td>Vibration levels (acceleration m/s²) not to exceed in Curve 1 vibration levels indicated in Australian Standard 2670-1990 (Evaluation of Human Exposure to Whole Body Vibration).</td>
</tr>
<tr>
<td>Equipment balancing criteria—maximum allowable vibration levels (maximum peak to peak displacement mm)</td>
<td>0.10—under 10 r/s fans. 0.075—10—16 r/s fans. 0.050—17-35 r/s fans. 0.025—over 35 r/s fans. 0.025—compressors. All other 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.</td>
</tr>
</tbody>
</table>
### DESIGN AND CONSTRUCTION GUIDELINES

<table>
<thead>
<tr>
<th>Item</th>
<th>Design Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air diffusion equipment</td>
<td>0.25 m/s maximum terminal velocity in occupied zone.</td>
</tr>
<tr>
<td>Duct Sizing</td>
<td>Air Velocities</td>
</tr>
<tr>
<td></td>
<td>Main duct - 5 m/s</td>
</tr>
<tr>
<td></td>
<td>Branch - 3.5 m/s</td>
</tr>
<tr>
<td></td>
<td>Terminal - 2 m/s</td>
</tr>
<tr>
<td></td>
<td>Maximum pressure drop - 1 Pa/m</td>
</tr>
<tr>
<td>Electricity supply — present</td>
<td>415 volts, +4% -6% 3 phase, 50Hz and otherwise.</td>
</tr>
<tr>
<td>Electricity supply — future</td>
<td>In accordance with ETSA utilities Services Rules and Conditions of Supply.</td>
</tr>
<tr>
<td>Domestic water</td>
<td>Adelaide mains water supplied by South Australian Water Corporation</td>
</tr>
<tr>
<td></td>
<td>Distribution pressure from SA Water mains:</td>
</tr>
<tr>
<td></td>
<td>Nominal supply pressure 490kPa.</td>
</tr>
<tr>
<td></td>
<td>Maximum pressure 800kPa.</td>
</tr>
<tr>
<td></td>
<td>Minimum pressure 300kPa.</td>
</tr>
<tr>
<td>Gas supply</td>
<td>Natural gas calorific value 39.2 MJ/m³, specific gravity 0.6.</td>
</tr>
<tr>
<td></td>
<td>Supply pressure at consumer side of meter:</td>
</tr>
<tr>
<td></td>
<td>Maximum pressure 3.0kPa.</td>
</tr>
<tr>
<td></td>
<td>Minimum pressure 1.0kPa.</td>
</tr>
</tbody>
</table>

5.12.4 Mechanical Services

**General**

Air conditioning services shall be designed to provide the minimum life cycle cost to UniSA. Evaluation of various alternatives shall be presented to the Technical Reference Group prior to commitment to the final design.

To achieve better control over operation, unitary type air handling systems serving a single room or small number of similar rooms are preferred over large central station air handling systems. Air handling systems serving more than one floor generally should not be used and constant volume systems with terminal reheat should be avoided.

The use of zoned variable air volume systems in conjunction with variable speed drives and the use of economy cycles would be the preferred choice. Server rooms and Communication rooms shall have a high efficiency separate self contained inverter type system.

All air handling systems shall provide minimum outdoor air ventilation rates in all modes of operation in accordance with AS 1668.2. Each individual room shall be considered an enclosure for calculation purposes. The design of extraction systems shall comply with the requirements of the above standard.

The equipment shall 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 shall 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 drain pipe, (lowest point).
Only proven proprietary equipment with local service availability shall be selected. Where built-up plant or equipment is required, standards of construction shall not be less than accepted industry standards, shall comply with all statutory requirements and shall be designed and constructed for a life of not less than 20 years with minimum service and maintenance requirements. Particular attention shall be given to ease of access to items requiring replacement or routine service procedures. Special consideration shall be given to the location of all plant in relation to accessibility, noise and vibration and visual impact. Plant shall be readily accessible via permanent roadways, corridors or permanent fixed stairways or ladders complying with statutory requirements.

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

Design Conditions

Air conditioning systems shall be designed to maintain the following internal room conditions for all air conditioned areas, during occupancy times unless otherwise specified while the outdoor conditions are with the range 38 °C DB/21 °C WB with full solar load to 4 °C DB and no solar load.

<table>
<thead>
<tr>
<th>Air Conditioner Mode</th>
<th>Room Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigerated cooling mode</td>
<td>24-26 °C DB</td>
</tr>
<tr>
<td>Economy cycle (if fitted)</td>
<td>22-24 °C DB</td>
</tr>
<tr>
<td>Heating mode</td>
<td>20-22 °C DB</td>
</tr>
</tbody>
</table>

All air conditioning plant shall continue to operate normally when outdoor temperatures are within the following limits:

Summer—46 °C DB / 22 °C WB and full solar load

Winter—0 °C DB.

Note the above outdoor conditions assume a free field environment and any local conditions, which may reduce performance, must be accounted for in the system design.

Population Densities

If not specified in the project brief or agreed otherwise with UniSA, the requirements of AS 1668.2 shall apply.

Noise and Vibration

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

Economy Cycle

In principle, each air conditioner shall be fitted with an independent modulating economy cycle. This economy cycle shall incorporate air relief via openable dampers to the outside. Dedicated extraction fans shall not be used for this purpose. Where it is not
considered economical to fit an economy cycle to an air conditioner agreement shall be obtained from the Technical Reference Group.

**Duct Work and Registers**

All fans and motors shall be selected to allow an additional increase of 10% in the specified air quantity with the associated increase in system resistance. Ceiling mounted supply air diffusers shall be metal square louvred face type adjustable or linear slot type each fitted with an acoustically insulated cushion box. Wall or duct mounted supply air diffusers shall be adjustable louvre type. Exhaust and return air grilles shall be metal egg crate type with removable core. Where practicable all air diffusers and grilles shall be connected to duct work via acoustically insulated flexible ducts not exceeding 3m in length. Branch take-offs shall be mitred type and fitted with an adjustable stream splitter damper. All terminal branches shall be fitted with an opposed blade damper. Fibreglass duct work and supply air type light fittings shall not be used.

**Filtration**

Air filters shall comply with the requirements of AS 1668.1. Air filters shall be dry media disposable type complying the AS 1324 and installed to comply with AS 3666. Air filters shall be selected for a minimum assistance efficiency of 85% to AS 1324.4 and dust holding capacity at 125 Pa increase in resistance suitable for 3500 hours of operation.

**Piping Valves and Fittings**

Chilled and heating water pipe work can be copper tube to AS 1432 or steel to AS 1074. Rolled grooved couplings are acceptable provided they meet the specified Operations conditions and are installed in accordance with manufacturer’s recommendations. 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. Where pipes pass through fire barriers, they shall be isolated and the penetrations sealed so as not to reduce the overall fire rating. Statutory authorities should approve the method used to achieve this. All pipe work shall have isolating valves/drain points at regular intervals for ease of maintenance.

**Automatic Controls**

UniSA’s buildings are monitored by a Niagara/Invensys centrally located server. Refer to Building Management System for clarification. The automatic control system for each building shall be a stand alone system, interfaced with the Niagara server to allow remote monitoring and operation of 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 shall be controlled to automatically start up and stop to provide
design conditions during normal working hours. Each air conditioner control system shall
have the ability to set different working hours from other air conditioners. All air
conditioning systems shall be interlocked with any outside air/extract systems as
appropriate.
All air conditioners used for teaching spaces and selected air conditioners as nominated
by the Technical Reference Group shall 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 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 controls to individual rooms are to provided via a Clipsal C2000 or SC2000
series switch plate which is made up of the following components:
flush surround and two gang grid
switch mechanism 250 V 10 A Bell press 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 shorted) in the field by building works between
the BMS controller and the push button control
flush surround to be engraved with “AIR CONDITIONING” above the switch mechanism.
All automatic controls shall fail safe with control and operation of all plant being
independent of the normal control system for fire mode operation. All controls shall 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 readily accessible locations shall not be permitted.
Provide a double data point, connected to UniSA’s Building Services VLAN adjacent to
each BMS Universal Network Controller (UNC)/BACnet Controller, Nexus server and
ELR. Coordinate with UniSA ISTS via the Contract Supervisor for allocation of static IP
addresses.

Air Conditioning Operations Hours

All air conditioning services are generally restricted to Monday to Friday (excluding public
holidays). Operations hours for individual facilities are as below:

- offices—8 am to 6 pm Monday to Thursday, 8 am to 5 pm Friday
- campus Central—8 am to 6 pm Monday to Friday
- computer pools and barns—capable of 24 hour operation, 7 days per week, operation
  by timed push button for room occupancy only (90-120 minutes)
- lecture, tutorial and meeting rooms—push button operation (90-120 minutes)
- laboratories—push button operation (90-120 minutes)
theatres—push button operation (90-120 minutes) or local on/off operation
main IT computer rooms (not server rooms)—capable of 24 hour operation, 7 days per week
libraries—in accordance with Library timetable issued at beginning of each year.

5.12.5 Electrical Services Design Criteria

The design criteria associated with an installation:

<table>
<thead>
<tr>
<th>Item</th>
<th>Design Criteria</th>
</tr>
</thead>
</table>
| Extreme ambient conditions under which all services and systems shall operate | 46.0 °C dry bulb maximum.  
24.0 °C wet bulb maximum.  
Full solar load.  
-2.0 °C dry bulb minimum.  |
| Ambient conditions within ventilated non air-conditioned spaces under which all services and systems shall achieve full load performance. | 38.0 °C dry bulb maximum.  
21.0 °C wet bulb maximum.  
4.0 °C dry bulb minimum.  |
| Isokeraunic level | 15. |
| Earth resistivity | 100 ohm – metres nominal. |
| Hours of operation | 24 hour operation.  
Continuous Operations duties applicable.  |
| Protective earthing system | In accordance with AS/NZS 3000 — Wiring Rules and ETSA Utilities Services Rules and Conditions of Supply.  |
| Lightning protection system | In accordance with the BCA and the design recommendations of AS 1768—Lightning Protection Systems.  |
| Electrical supply—present | 415/240 volts, +6%, -4%, 3 phase, wire, 50Hz in accordance with ETSA Utilities Services Rules and Conditions of Supply  |
| Electrical supply—future | 400/230 volts, +10%, -6%, 3 phase, 4 wire, 50 Hz in accordance with ETSA Utilities Service Rules and Conditions of Supply.  |
| Tariff | AGL agreed maximum demand.  |
| Electrical reticulation | In accordance with AS/NZS 3000 — Wiring Rules and AS 3008—Electrical Installations – Selection of Cables.  |
| Electrical capacities | Equipment and cable capacities calculated to achieve spare capacity as follows:  
Mains and Submains 25%.  
Main Switchboards 25%.  
Distribution Switchboards 50%.  |
| Voltage drop | Voltage drop at LV switchboards limited to 2.5% (maximum) of nominal LV supply voltage of 400V, 3 phase.  |
| Illuminance levels | In accordance with the minimum requirements of the following:  
General building interiors – AS 1680 – Interior Lighting Parts 1 and 2.  
Circulation spaces—AS 1680.2.1—Interior Lighting for Circulation Spaces and Other General Areas.  |
5.12.6 Electrical Supply

**General**

Electricity will generally be supplied at 400/230 V, 50Hz in accordance with ETSA Utilities supply conditions at the agreed termination point.

**Spare Capacity**

Design and build in spare capacity in all new electrical services systems for future expansion, generally a minimum of 25% except where noted or otherwise approved.
New Supplies
Generally new power supply facilities should only be arranged where there is no existing suitable supply adjacent. New electricity supplies must be shown to be cost effective to the University for the life of the facility served, including analysis of demand and other standing costs, compared to the diversity obtained from a combined supply.

Where it is agreed that a new supply is required, make formal application to ETSA Utilities on behalf of the University. Details of predicted energy consumption to be provided in order to obtain the appropriate DUOS rebate. Negotiate the DUOS on behalf of the University to obtain the correct rebate. Review the costs involved in augmentation proposed by ETSA where applicable and endeavour to minimise these costs.

Base maximum demand figures on similar facilities wherever possible to reduce ongoing reservation costs and Utility fees. Obtain information regarding the likely electricity consumption from the intended users and/or those of other similar facilities. Review the proposed tariff connection and obtain approval from the University for the tariff.

Energy Tariff
The energy tariff will normally be dictated by the University supply contract. Generally the tariff type will be 2-rate with a demand factor for larger power supplies. For smaller power supplies, consideration of the tariff with regard to predicted energy consumption is required.

Existing Supplies
Where it is proposed to utilise an existing supply the capacity and condition of all components of the supply require formal review and life cycle costing to ensure their suitability.

Underground Services
All underground services shall be installed in high density UPVC conduit. All cabling shall be XLPE insulated PVC served copper conductors. The routes of underground cables shall be accurately surveyed prior to backfilling and documented on a survey plan to be provided to the Contract Supervisor. The plan shall identify cable locations in relation to other underground services and permanent site features. Install marker tape to AS 1345 for the continuous length of conduits. A photographic record shall be provided of all underground services after approval and before backfilling.
Accurately locate underground cables using proprietary cast aluminium route markers placed at intervals of not more than 50 m for straight distances, and at joints, route junctions, changes of direction, terminations and entry points to buildings.
Mark the direction of cable routes with appropriate marker plant direction indicators. A group of two or more plates may be required at some route junctions. Set markers flush to the surface in footpaths, roadways, paved areas, etc. Markers at roadways shall be located on both sides where cable crosses and shall be not less than 1 m on either side.
**Power Factor Correction**

Power factor correction equipment shall be installed for the campus or site switchboards (SSB) or building main switchboard (MSB) as applicable to the project. The minimum power factor figure that shall be achieved is 0.9.

**Harmonic Distortion**

Harmonic distortion shall be limited in accordance with ETSA Utilities Service and Installation Rules. Harmonic filtration equipment shall be installed for the campus or site switchboards (SSB) or building main switchboard (MSB) as applicable to the project.

### 5.12.7 Electrical Installations

**General**

**Compliance**
As a minimum requirement, the whole electrical installation shall comply with the statutory requirements that exist in South Australian at the time of construction, and the relevant Australian Standards. This means in particular AS/NZS3000, the SA OHS&W Act of 1986 and the SA Electricity Act 1996.

**Required Current**
All sub-mains to mechanical equipment shall not be de-rated in accordance with AS/NZS3000 but shall be selected for the required current with the plant operations at its specified ratings.

**Switchboards – New or Replacement of Existing**

**Redundancy**
Electrical wiring systems servicing electrical switchboards shall provide a minimum of 25% spare capacity for future increase in electrical demand. The spare capacity allowance shall be applied after de-rating of wiring systems as prescribed in AS3008. Electrical switchboards providing Combined Fuse Switches (CFS) or Moulded Case Circuit Breakers (MCCBs) shall provide a minimum 30% spare capacity for future increase in electrical demand and the connection of additional circuits. Electrical switchboards shall provide a minimum of 25% spare capacity for the increase of electrical demand. Switchboard pole capacity shall provide a minimum of 50% spare capacity for the connection of additional circuits. Spare pole spaces shall be provided with individual pole fillers.

Switchboard spare capacity allowance shall be applied to all switchboard elements including main switch rating, busbar rating, pole capacity and other items deemed obvious by the University.

**Switchboards - Design**

- Switchboard design and installation locations shall be compliant with the requirements of AS3000.
- The designer shall access the installation environment for specification of switchboard IP ratings. IP56 rated switchboards shall be provided for external installations and plant rooms alike.
DESIGN AND CONSTRUCTION GUIDELINES

- Electrical switchboards shall generally provide circuit breaker technology for circuit protection. Formal approval is required form the University to deviate from this requirement.
- Moulded Case Circuit Breakers shall be "electronic trip" unit type.
- Merlin Gerin Isobar chassis shall be provided for all distribution boards.
- Separate chassis and power monitoring shall be provided for outgoing sub-circuits where required by the Building Code of Australia requirements.
- Power monitoring devices shall facilitate connection to the University Building Management System (BMS). It is the designer’s responsibility to confirm the BMS communications protocol for connection of power monitoring.
- Surge protection shall be provided in accordance with AS1768 and in areas where isolation of the electrical system will present an elevated risk to the University operations.
- Ducting shall be provided within the switchboard enclosures for the installation of wiring systems. Wiring systems shall be installed neatly within ducting and duct covers are expected to fit securely and be removable for future wiring installations.
- Switchboard escutcheons shall be “hinged” removable type. IPA studs shall be provided for circuit identification.
- Gland plates and cable bushes shall be provided for all cable entry/exit. Cable glands shall provide a close fit around bunched cables.

Switchboards - Locking
Switchboard handles are to be the Carbon T-handle and the barrel is to be Bi Lock GGME coded to the university's master-key system.

Switchboard Metering
Switchboards being retro-fitted or new switchboards with metering facilities shall have CT shorting links installed. Metering works including change over, maintenance and new installations shall include the installation of CT shorting links where required.

Retro-Fitting Switchboards
Any existing switchboard being considered for retro-fitting will be required to comply with all the requirements for the new switchboard DNC guidelines. Unless all these requirements can be adhered to, the switchboard will require replacing with a new switchboard.

Cabling Capacity
All sub-main cabling to floor/level distribution boards shall have 25% spare electrical capacity and 50% spare physical space for additional circuit breakers.

Consistency
All distribution boards are to use the type of circuit breakers to match those in use on that campus.

Flexibility of Design
The layout of light fittings and power outlets and associated cabling should allow flexibility, such that spaces can be subdivided into separate areas.
Lightning Protection

Lightning protection must be provided to all buildings where required by AS1768. Copper or stainless steel conductors must be used.

Lighting

The lighting systems shall comply with AS1680 and AS2713. The lighting system shall generally be fluorescent and luminaires shall be fitted with low glare large cell type ‘MIRO’ louvres, high frequency electronic DALI ballasts and 28 watt T5 lamps (Philips TLD 33 or equivalent colour performances).

Linear fluorescent lamps shall be Philips Alto New Generation or Osram Lumilux Plus Eco lamps with a colour temperature 4000-4500 °K and colour rendering index not less than 85. The fluorescent tube is to be a recyclable, non-hazardous fluorescent tube, suitable for safe disposal within ordinary waste.

All fluorescent lights shall utilise one ballast per single fluorescent tube. Other lamp systems such as architectural lighting shall minimise radiant heating of occupants and shall take account of maintenance, energy efficiency and specific usage requirements.

Any specific lighting requirements such as special maintenance illuminance, maximum glare index or colour rendering requirements shall be detailed in the Project Brief.

All lighting installations shall be designed in accordance with current Building Code of Australia (BCA) requirements with respect to energy consumption.

Standard Luminaire Selections

The following luminaires shall be incorporated in the specification and read in conjunction with the Consultant Team’s standard luminaire specification. The luminaires shall be generally used in suspended ceilings for the areas specified.

Corridors, general offices, tutorial rooms and meeting rooms:

2 x 28W 1200 mm x 300 mm recessed inside T-bar T5 fluorescent fitting with electronic control gear and complete with K12 diffuser in torsion spring aluminium frame. Seal rear of fitting for dust protection to IP4X. Selection: Thorn Chameleon series, Moonlighting ITB series, Pierlite Futcha series or approved equivalent.

2 x 14W 600 mm x 300 mm recessed inside T-bar T5 fluorescent fitting with electronic control gear and complete with K12 diffuser in torsion spring aluminium frame. Seal rear of fitting for dust protection to IP4X. Selection: Thorn Chameleon series, Moonlighting ITB series, Pierlite Futcha series or approved equivalent.

Intensive VDU screen based activities including large open plan offices, computer pools and barns, CAD drawing areas:

2 x 28W 1200 mm x 300 mm recessed inside T-bar T5 fluorescent fitting with electronic control gear and complete with back reflector and semi-specular ultra low brightness diffuser in torsion spring aluminium frame. Seal rear of fitting for dust protection to IP4X. Selection: Thorn Cinqueline series, Moonlighting 05 series, Pierlite Futcha series or approved equivalent.

2 x 14W 600 mm x 300 mm recessed inside T-bar T5 fluorescent fitting with electronic control gear and complete with back reflector and semi-specular ultra low brightness diffuser in torsion spring aluminium frame. Seal rear of fitting for dust protection to IP4X. Selection: Thorn Cinqueline series, Moonlighting 05 series, Pierlite Futcha series or approved equivalent.
Lighting Controls
Luminaires shall be individually switched for each room. Where DDC control, dimming control or occupation detection control is required this shall be detailed in the Project Brief.
For manual switching, Clipsal 16 amp “Impress” C2000 or SC2000 switches and plates shall be utilised.
A separate switch shall be installed to switch the luminaire nearest the door, this shall be engraved “SAFE LIGHT” and be totally independent of any timer function.

Automated Lighting Control
Automated lighting control shall 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.
Prior to final design, obtain written approval from the Technical Reference Group to implement an automated lighting control system (ALCS) via the Building Management System. Refer to Building Management System Specification for details.
Where required, an automatic lighting control system complete with all switching modules, dimmers, switches and other control devices, control panels, power supplies, wiring and other equipment shall be provided as necessary for a complete and operational installation.
The lighting control system shall be a Distributed Intelligence C-Bus 2 Automatic Lighting Control System (ALCS).
Installation, Programming, Testing and Commissioning of the Clipsal C-Bus ALCS shall be carried out by one of Clipsal Australia’s Accredited Platinum partners.
Where after hours lighting is required to general areas, these lighting circuits shall also be complete with push button control lighting programmed to allow for after hour switching (set to 2 hours operation). Obtain approval for the positioning of push-button lighting switches.

Exit and Emergency Lighting
Install a single point unit system in compliance with AS 2293. Provide the Stanilite Nexus type luminaires complete with batteries, chargers, inverters and changeover devices integral within the luminaire. Light emitting diode lamps shall be used within the luminaires. Servers and routers shall be provided.
The system shall incorporate all Stanilite Nexus equipment for remote monitoring including server software and hardware (to the manufacturers specification) and be totally integrated with other Stanilite Nexus systems installed across UniSA.
Provide a single data point, connected to UniSA’s Building Services VLAN #251 adjacent to each Nexus server, and adjacent to each ELR. Provide the MAC address for each of these items. Coordinate with UniSA ISTS via the Contract Supervisor for allocation of static IP addresses.

General Purpose Outlets
All general purpose outlets shall be Clipsal C2000 or SC2000 Series in white. All power outlets shall be Clipsal ‘ID’ type with printed labelling inserted under the ‘ID’ window on the face plate, with coloured lettering as follows:
Table 5-4 - General Purpose Outlet Identification Requirements

<table>
<thead>
<tr>
<th>Usage</th>
<th>Engraved Lettering</th>
<th>Lettering Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer</td>
<td>Computer Only</td>
<td>Blue</td>
</tr>
<tr>
<td>Emergency Power</td>
<td>Emergency Power</td>
<td>Red</td>
</tr>
<tr>
<td>Cleaners</td>
<td>Cleaner</td>
<td>Green</td>
</tr>
</tbody>
</table>

Each power outlet shall have ‘ID’ labels for circuit referencing under the ‘ID’ window on the face plate with the details replicated under the removable face plate in permanent ink. A separate circuit shall be provided for computer only general purpose outlets to ensure that computers are not affected by any disturbance induced by general appliances. All circuits shall be RCD protected in accordance with AS/NZS 3000.

**General Purpose Outlets to Offices & Workstations**

Each workstation shall be provided with two double power outlets—one outlet exclusively for computer usage only, the other for general usage—supplied by separate circuits (i.e. one for computers only, one general). A maximum of five workstations shall be connected to each circuit for a maximum load of 500 W (3A) per workstation.

Where offices are in partitioned spaces there must be at least 1 double power outlet (not computer power outlets) at desk top level for each desk. The intent is to eliminate the need for under desk access to power minor appliances such as mobile phones.

**Emergency Alternators**

Unless otherwise specified, emergency alternators are to be sized according to the load calculations for emergency power requirements only. Sizing should not be based on the maximum demand for the building. The alternator should be sized to provide a minimum of 25% and a maximum of 50% redundancy. The fuel tank should be double skinned and/or appropriately bunded, so as to ensure environmental protection for waterways and drains. Provision should be made for keyed alike lockable filler and drainage caps. Unless otherwise approved, emergency alternators should be mounted external to the building, so as to minimise access and noise issues. Generators are not to be roof mounted. Where approval is granted to install generators inside, appropriate noise attenuation is to be installed to limit noise transmission to 70dbA.

Load banks should be provided to enable at least 75% loading of the generator. The load bank is to be manually switch operated, so that the generator can be loaded during normal test procedures, rather than only when specified during major maintenances. Switching should be provided to enable live testing of the generator to only those circuits that are designated as essential services without having to isolate power to all of the building. Unless otherwise specified, generator motors are to be diesel fuelled. Those circuits connected to the emergency supply are to be labelled as being “Supplied by Essential Services Generator”.

**Telecommunications**

Refer to Telecommunication Infrastructure Specification.
5.12.8 Vertical Transportation Design Criteria

The design criteria associated with an installation are:

<table>
<thead>
<tr>
<th>Item</th>
<th>Design Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental sustainability</td>
<td>Options of environmental sustainable plant shall be submitted for consideration on all new and refurbishment works.</td>
</tr>
<tr>
<td>Lifts compliance - General</td>
<td>Building Code of Australia AS1735 - All parts</td>
</tr>
<tr>
<td>Lifts compliance - Access and Disability</td>
<td>AS1735: Part 12</td>
</tr>
<tr>
<td>Electrical compliance</td>
<td>AS/NZS3000</td>
</tr>
<tr>
<td>Minimum rated load and maximum passenger capacity</td>
<td>AS1735.2 Table 221.2</td>
</tr>
<tr>
<td>Drive system</td>
<td>Variable frequency drive AC system with microprocessor control.</td>
</tr>
<tr>
<td>Floor levelling accuracy</td>
<td>Plus or minus 6mm under all load conditions.</td>
</tr>
<tr>
<td>Maximum lift deceleration rate of</td>
<td>1.0 m/s2.</td>
</tr>
<tr>
<td>Maximum lift deceleration rate of</td>
<td>1.0 m/s2.</td>
</tr>
<tr>
<td>Maximum jerk rate of</td>
<td>1.0 m/s3.</td>
</tr>
<tr>
<td>Maximum horizontal acceleration inside lift car measured both front to rear and side to side</td>
<td>15 Milli-g in the frequency range to 1 to 10 Hertz (mean) and 20 Milli-g (peak).</td>
</tr>
<tr>
<td>Rated number of starts</td>
<td>180 per hour.</td>
</tr>
<tr>
<td>Maximum noise levels at a lift lobby background noise level of 45 dBA</td>
<td>50 dBA—inside car at contract running speed.</td>
</tr>
<tr>
<td>Maximum noise levels at adjoining property boundaries</td>
<td>Not to exceed levels specified for commercial properties and residential properties in the Environmental Protection Act.</td>
</tr>
<tr>
<td>Maximum vibration levels in occupied areas</td>
<td>Vibration levels (acceleration M/s2) not to exceed in Curve 1 vibration levels indicated in AS 2670—Evaluation of human exposure to whole-body vibration.</td>
</tr>
<tr>
<td>Equipment balancing criteria—maximum allowable vibration levels (maximum peak to peak displacement mm)</td>
<td>All equipment not to exceed limits set in AS 1359—Rotating Electrical machines—General requirements and AS 2625—Rotating and reciprocating machinery—Mechanical vibration.</td>
</tr>
<tr>
<td>Item</td>
<td>Design Criteria</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Environmental sustainability</td>
<td>Options of environmental sustainable plant shall be submitted for consideration on all new and refurbishment works.</td>
</tr>
<tr>
<td>Car Operations Panels</td>
<td>Car Operations Panels, hall panels and landing/directional indicators comply with AS 1428 in all respects. Use Dewhurst US 91-15 or OTIS 2000 or similar LED illuminated push buttons mounted at a disabled height. UniSA master key switching on, off and park facility on car control panel. Car can be locked ‘off’ with door in open position. The control panel shall include identification plate identifying lift by the following minimum criteria – University, Campus and Building name.</td>
</tr>
<tr>
<td>Landing/Directional indicators</td>
<td>Landing/Directional indicators are to be a scrolling dot matrix type indicating a new landing and the direction of travel. These are to be of the same manufacture as the type of push button offered.</td>
</tr>
<tr>
<td>Door dwell times</td>
<td>6.0 seconds in response to a landing call or combined car and landing call 3.0 seconds in response to a car call.</td>
</tr>
<tr>
<td>Door protection monitoring</td>
<td>Dwell time to be reduced to 1.0 seconds after re-establishment of passenger protection devices or operation of door close button.</td>
</tr>
<tr>
<td>Door/Passenger Protection</td>
<td>To comply with AS 1735.12 and DDA. This is to be achieved by OTIS LAMBDA 3D Infra Red non contact door protection or equivalent.</td>
</tr>
<tr>
<td>Maximum door opening time</td>
<td>2.4 seconds.</td>
</tr>
<tr>
<td>Minimum door opening time</td>
<td>1.8 seconds.</td>
</tr>
<tr>
<td>Minimum door closing time</td>
<td>2.2 seconds.</td>
</tr>
<tr>
<td>Maximum door closing time</td>
<td>2.5 seconds.</td>
</tr>
<tr>
<td>Lighting - Landing entrance (min average)</td>
<td>40 lux</td>
</tr>
<tr>
<td>Lighting - Car internal (min average)</td>
<td>100 lux Passenger lift 30 lux Goods lift</td>
</tr>
<tr>
<td>Lighting - Type</td>
<td>36 Watt fluorescent</td>
</tr>
<tr>
<td>Landing indication</td>
<td>Visible and audible announcement 5.0 seconds prior to arrival of lift car or at commencement of slow down sequence.</td>
</tr>
<tr>
<td>Electricity supply</td>
<td>400/230 volts, +10%, -6%, 3 phase, 4 wire, 50 Hz in accordance with ETSA Utilities Service Rules and Conditions of Supply.</td>
</tr>
<tr>
<td>Voltage drop</td>
<td>Design and utilise only systems and equipment to be capable of guaranteed rated performance supply voltages.</td>
</tr>
<tr>
<td>Voltage drop at switchboards</td>
<td>Voltage drop at switchboards limited to 2.5% (maximum of nominal LV supply voltage of 400 volt, 3 phase.</td>
</tr>
<tr>
<td>Voltage drop at final distribution points</td>
<td>Voltage drop at final distribution points limited to 5% (maximum) of nominal LV supply voltage of 400 volt, 3 phase.</td>
</tr>
<tr>
<td>Electromagnetic emission</td>
<td>In accordance with AS/NZS4251.1—Electromagnetic compatibility (EMC)—Generic emission standard—Residential, commercial and light industry.</td>
</tr>
<tr>
<td>Electromagnetic compatibility</td>
<td>In accordance with AS/NZS61000.6.1—Electromagnetic compatibility (EMC)—Generic standards—Immunity for residential, commercial and light industrial environments.</td>
</tr>
</tbody>
</table>
### Environmental sustainability
Options of environmental sustainable plant shall be submitted for consideration on all new and refurbishment works.

### Lift Car Communication
- Lift communication to comprise intercom type microphone and speaker device and utilise a designated UniSA PABX line. Lift installer to obtain PABX line number from the Contract Supervisor. The line number shall be clearly labelled and documented within both the lift motor plant room (within main control switchboard for lifts without motor rooms) and the Operation and Maintenance Manual.
- PABX line shall have battery backed up facility.

### Vertical Transportation - General
As much as possible, lift installations should be standardised and any new lift system must be meet the following requirements as a minimum:

- Lifts must be safe and comply with all relevant codes and standards
- Lifts must be easily maintained, with minimal problems, by multiple (other than the original manufacturer) lift maintenance contactors
- Lifts are to be as flexible and versatile in operation as possible
- All controls and car finishes must be robust and vandal resistant
- Lift manufacture must have a proven, local history of reliability
- Lifts must meet minimum requirements of handling capacity and waiting time for passenger lifts and materials for goods lifts as set out in Design Criteria
- Lifts must meet the minimum requirements for use of persons with disabilities as defined by the Building Code of Australia.

### Standard Requirements
Any new installation shall only be installed by a competent, well-established, lift contractor with at least 10 years local lift installation experience. Only well-established lift systems that have a proven local track record of reliability and ease of maintenance should be considered.

Lifts must comply fully with all local rules, regulations and codes of practices, as well as gain approval and certification from the local lift inspectorate prior to the lift being placed into service.

All lifts shall be, as a minimum, user friendly to people with disabilities and in compliance with the Building Code of Australia. Only lifts complying with AS 1735 Parts 2 or 3 shall be used for providing access for people with disabilities. Lift car control buttons shall have tactile labelling in accordance with AS 1735.12.

 Provision shall be made for the use of stretchers and emergency lifts in accordance with the Building Code of Australia.

Consideration should be given to lift power systems that are energy efficient and environmental friendly. Any lift power system that can be proven to be more efficient or
less power consuming and/or environmental friendly shall have preference over a less efficient system.

As numerous high passenger two-way traffic peaks will be placed on the lift system throughout each day, the system must be able to provide a very high level of service at all times particularly during these peaks.

**Minimum Vertical Transportation Services**

For 2 and 3 storey buildings, there is a minimum requirement to provide a lift for the vertical movement of furniture, goods and persons with disabilities. Where the height of a building exceeds 10.5 m or there are more than 3 floors served, consideration should be given to more than one lift being installed.

**Type of Lift Drive**

The type of lift drive shall be based on the following:

- **Geared Traction—Machine Roomless** to be used for all applications from 3 floors and higher, and for speeds of 1 m per second up to 2.5 m per second.

- **Gearless Traction—Machine Roomless** to be used for lifts requiring a speed of 2.5 m per second and higher.

**Lift Car**

Lifts shall be suitable for people with disability access and use and dimensions shall be accommodate stretcher access. Minimum clear door opening width shall be 1200 mm unless otherwise approved in writing by the Contract Supervisor. Goods lifts are to be sized and have features as required for their particular application and usage.

Proposed lift car dimensions and requirements must be confirmed with the Technical Reference Group at an early stage.

Car lighting shall be 36 watt fluorescent type minimum 100 lux. The make selected for the tubes, ballasts and starters shall enable easy and quick replacement from within the lift car. Alternative “decorative” lighting can be approved by the relevant Project Manager.

Maintenance of lighting systems must be easily accessible from within the lift car.

Lift doors and frames must be satin stainless steel to approval for both car and landings.

Internal car finish must be textured stainless steel or similar approved finish to minimise the possibility of damage.

Each car lift must be supplied with a protective blanket to protect all finishes.

**Lift Operation**

All controls and communication systems are to be vandal resistant. On sensing of loss of electrical supply, the lift shall start up and run to the lowest level and open the doors. A fire service key switch shall be provided to all cars.

The lift car emergency phone system is to be auto dialling and hands free. It shall be directly connected to the maintenance contractor for 24 hour monitoring via the UniSA PABX. Lift car lighting shall be LED and emergency lighting shall be provided. Provide a fan to ventilate the car to Australian Standard requirements.

Safety of operation shall be provided by both door edge pressure strips and photo electric sensors. Door open and door close buttons shall be provided.

Direction indicators shall be provided at each landing and inside the car. Level indicators shall be provided on each landing.
Lift Motor Rooms and Pits

Where possible, new buildings shall have machine roomless lifts. Where lift motor rooms are necessary, rooms shall have durable finishes to walls, floor and ceiling and fully painted for easy cleaning. Control and hoisting equipment shall be well lit by room lights and emergency lighting. Lift motor rooms shall have alarms as required by the relevant Australian Standard or the Code. Alarms shall be connected to the BMS.

Lift pits shall be fully tanked and provided with a dry sump.

Security

All lifts must be able to be parked with the doors closed at the ground floor and the means provided to lock off access to and from any floor by means of a key switch.

5.12.9 Hydraulic Services Design Criteria

The design criteria associated with an installation are:

<table>
<thead>
<tr>
<th>Item</th>
<th>Design Criteria</th>
</tr>
</thead>
</table>
| Extreme ambient conditions under which all plant shall operate | 46.0 ºC dry bulb maximum.  
24.0 ºC wet bulb maximum.  
Full solar load.  
-2.0 ºC dry bulb minimum. |
| General | In accordance with the Building Code of Australia. In accordance with AS 1428—Design for Access and Mobility. |
| Materials | Products used in water supply systems and plumbing systems shall be of an approved type as specified in:  
SAA MP52—Manual of authorisation procedures for plumbing and drainage products  
AS 5200.000-2006 - Technical specification for plumbing and drainage products - Procedures for certification of plumbing and drainage products  
Plumbing, water and gas  
Copper and copper alloy—in accordance with AS 1432—Copper tubes for plumbing, gas fitting and drainage applications and AS 3795.  
Water, pumped waste water and gas (below ground and external of building only)  
Polyethylene pressure pipe (PE) pipes and fittings—in accordance with AS 4130 and AS 4129, and shall be installed in accordance with AS 2033.  
Sanitary drainage and stormwater  
Unplasticised polyvinyl chloride (UPVC) pipes and fittings in accordance with AS/NZS 1260, and shall be installed in accordance with AS 2032.  
Trade waste  
High Density Polyethylene (HDPE) pipes and fittings—in accordance with AS 4130 and AS 4129, and shall be installed in accordance with AS 2033.  
Stormwater  
AS 4139 - Fibre reinforced concrete pipes and fittings |
<table>
<thead>
<tr>
<th>Item</th>
<th>Design Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stormwater</td>
<td>AS/NZS 4058 - Precast concrete pipes (pressure and non-pressure)</td>
</tr>
<tr>
<td>Pipe sizing Design Criteria</td>
<td>AS 2200—Design charts for water supply and sewerage.</td>
</tr>
<tr>
<td></td>
<td>The Institute of Plumbing Australia—Selection and sizing of copper tubes for water piping systems.</td>
</tr>
<tr>
<td>Water</td>
<td>In accordance with the AS/NZS National Plumbing and Drainage Code AS/NZS 3500 Part 1—Water Services and Part 4—Heated Water Services and the SA Water Corporation requirements.</td>
</tr>
<tr>
<td>Sanitary Plumbing and Drainage</td>
<td>In accordance with the AS/NZS National Plumbing and Drainage Code AS/NZS 3500 Part 2—Sanitary Plumbing and Drainage and the SA Water Corporation requirements.</td>
</tr>
<tr>
<td>Trade waste</td>
<td>In accordance with the AS/NZS National Plumbing and Drainage Code AS/NZS 3500 Part 2—Sanitary Plumbing and Drainage and the SA Water Corporation Trade Waste Branch requirements.</td>
</tr>
<tr>
<td>Stormwater</td>
<td>In accordance with the AS/NZS National Plumbing and Drainage Code AS/NZS 3500 Part 3—Stormwater Drainage and local council requirements.</td>
</tr>
<tr>
<td>Gas</td>
<td>In accordance with the AS 5601 – Stormwater Drainage and the Office of the technical Regulator (Gas) requirements.</td>
</tr>
<tr>
<td>General Pipe Identification</td>
<td>In accordance with AS 1345—Identification of the contents of piping, conduits and ducts.</td>
</tr>
<tr>
<td>Acoustic Insulation</td>
<td>Acoustic insulation comprising foam underlay with loaded vinyl over-wrap. Manufactured according to AS/NZS ISO 9001 and tested to AS/NZS 1530.3— Methods for fire tests on building materials, components and structures - Simultaneous determination of ignitability, flame propagation, heat release and smoke release</td>
</tr>
<tr>
<td>Thermal Insulation</td>
<td>Thermal pipe work insulation to AS 4426 - Thermal insulation of pipe work, ductwork and equipment - Selection, installation and finish. Insulation ‘R’ values to AS/NZS 3500.4 requirements for climate zones.</td>
</tr>
<tr>
<td>Backflow Protection Devices to Water Supply</td>
<td>In accordance with the AS/NZS National Plumbing and Drainage Code AS/NZS 3500 Part 1—Water Services and Part 4—Heated Water Services and the SA Water Corporation requirements Manufactured in accordance with AS 2845—Water Supply—Mechanical backflow prevention devices. Backflow prevention devices for hydraulic systems are to be specified and installed in accordance with Section 4 of the Australian Standard AS/NZS3500 Plumbing and Drainage. Designers are to take a prudent approach to the specification of maintainable backflow prevention devices, so that the University’s maintenance liabilities are minimised. Where appropriate, and in accordance with the risk management hazard ratings outlined in Section 4.3. of the Standard, non-maintainable devices are to be specified wherever possible. The intent is to not over-specify the need for a high-risk device in order to ensure risks are eliminated. Backflow prevention devices are to be installed in a position that makes them easily accessible for maintenance. Access hatches and doors are to be clearly marked as “Backflow Prevention Device above” or otherwise as appropriate Backflow prevention devices are to be appropriately labelled at the point of installation so that the system that they isolate can be easily identified.</td>
</tr>
</tbody>
</table>
### DESIGN AND CONSTRUCTION GUIDELINES

<table>
<thead>
<tr>
<th>Item</th>
<th>Design Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanitary Plumbing Fittings and Fixtures</td>
<td>In accordance with:</td>
</tr>
<tr>
<td></td>
<td>AS 1172—Water closets of 6/3 L capacity.</td>
</tr>
<tr>
<td></td>
<td>AS 1172:1—Pans.</td>
</tr>
<tr>
<td></td>
<td>AS 1172:2—Cisterns.</td>
</tr>
<tr>
<td></td>
<td>AS 1371—Toilet seats of moulded plastics.</td>
</tr>
<tr>
<td></td>
<td>AS/NZS 1730—Wash basins.</td>
</tr>
<tr>
<td>Stainless Steel Fixtures</td>
<td>Grade 304 stainless steel for general purpose areas Finish to No. 4 grain finish</td>
</tr>
<tr>
<td>Faucets, Cocks and Outlets</td>
<td>To AS 1718, dezincification resistant copper alloy, pressure tested to 2.0 MPa chrome plated on brass finish with vandal-proof or anti-tempering devices</td>
</tr>
<tr>
<td>Water Conservation Measures</td>
<td>In accordance with the Guidelines for Provision of Water Appliances and Plumbing issued by the Water Technology Committee of Australia Water Resources Council 1993 Laminar flow regulators to water fixture outlets as scheduled below:</td>
</tr>
<tr>
<td></td>
<td>Hand washing basins—4 L/min combined total flow.</td>
</tr>
<tr>
<td></td>
<td>Sinks—6 L/min combined total flow.</td>
</tr>
<tr>
<td></td>
<td>Showers—7 L/min combined total flow.</td>
</tr>
<tr>
<td></td>
<td>Lab taps - 6 L/min combined total flow</td>
</tr>
<tr>
<td></td>
<td>Hose taps - 6 L/min combined total flow</td>
</tr>
<tr>
<td></td>
<td>Urinals (wall hung) – sensor flush 0.8L/flush</td>
</tr>
<tr>
<td></td>
<td>Urinals (slab/floor) – programmable automated flush mechanism to flush 2 to 4 times daily</td>
</tr>
<tr>
<td></td>
<td>Water closets – 4.5L full flush/3.0L half flush</td>
</tr>
<tr>
<td>Hot Water Temperature Control</td>
<td>Discharge temperature not to exceed the requirements set down in AS/NZS 3500.4—Heated water services.</td>
</tr>
<tr>
<td></td>
<td>Performance requirements. Maximum temperature to fixture used for hygiene purposes not to exceed 45°C. Fixture to disabled facilities not to exceed 42°C.</td>
</tr>
<tr>
<td>Electricity supply—present</td>
<td>415 volts, +4% -6%, 3 phase, 50Hz and otherwise in accordance with ETSA Utilities Service Rules and Conditions of Supply.</td>
</tr>
<tr>
<td>Electricity supply—future</td>
<td>400/230 volts, +10%, -6%, 3 phase, 4 wire, 50 Hz in accordance with ETSA Utilities Service Rules and Conditions of Supply.</td>
</tr>
<tr>
<td></td>
<td>Design and utilities only systems and equipment to be capable of guaranteed rated performance on both present and future supply voltages.</td>
</tr>
<tr>
<td>Voltage drop</td>
<td>Voltage drop at switchboards limited to 2.5% (maximum) of nominal LV supply voltage of 400 volt, 3 phase.</td>
</tr>
</tbody>
</table>
DESIGN AND CONSTRUCTION GUIDELINES

<table>
<thead>
<tr>
<th>Item</th>
<th>Design Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage drop at final</td>
<td>Voltage drop at final distribution points limited to 5% (maximum) of nominal LV supply voltage of 400 volt, 3 phase.</td>
</tr>
<tr>
<td>distribution points</td>
<td></td>
</tr>
<tr>
<td>Gas supply</td>
<td>Natural gas calorific value 39.2 MJ/m³, specific gravity 0.6. Supply pressure at consumer side of meter or pressure reducing valve.</td>
</tr>
<tr>
<td></td>
<td>Maximum pressure 3.0kPa</td>
</tr>
<tr>
<td></td>
<td>Minimum pressure 1.0kPa</td>
</tr>
<tr>
<td>Water supply</td>
<td>Adelaide mains water supplied via the Happy Valley water filtration plant. Distribution pressure from the E&amp;WS mains:</td>
</tr>
<tr>
<td></td>
<td>Nominal supply pressure 490kPa</td>
</tr>
<tr>
<td></td>
<td>Maximum pressure 900kPa</td>
</tr>
<tr>
<td></td>
<td>Minimum pressure 300kPa</td>
</tr>
<tr>
<td>Electromagnetic emission</td>
<td>In accordance with AS/NZS 4251 Part 1—Electromagnetic compatibility—Generic immunity standard—residential, commercial and light industry.</td>
</tr>
<tr>
<td>Electromagnetic immunity</td>
<td>In accordance with AS/NZS 4252 Part 1—Electromagnetic compatibility—Generic immunity standard—residential, commercial and light industry.</td>
</tr>
</tbody>
</table>

Industrial Gases Design Criteria

The design criteria associated with an installation are:

<table>
<thead>
<tr>
<th>Table 5-7 – Industrial Gases Design Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
</tr>
<tr>
<td>Extreme ambient conditions under which all</td>
</tr>
<tr>
<td>plant shall operate</td>
</tr>
<tr>
<td>General</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
5.12.10 Water Supply

General
Raw water (drinking water) for both the domestic and the fire protection services will be supplied via separate valved connections generally within a concrete underground pit supplied as part of the building contract. Provide a pressure and flow test on the authority water main at the nearest fire plug for system design requirements. Make application and pay all fees for new fire connection and metered drinking water supply. Coordinate exact location of connection points with SA Water and UniSA. Pipework after the valved connections shall be pressure tested in accordance with statutory requirements before backfilling and connection to the site distribution system. Each connection shall incorporate backflow prevention devices in accordance with statutory requirements.

Underground Services
Underground pipe work shall be copper tube to AS 1432. Install all pipe work to the requirements of AS 3500 with marker location requirements as set out previously for Electrical Services. Underground pipe work external of buildings shall be polyethylene pressure pipe to AS 4130 joined using electrofusion couplings. Install all pipe work to the requirements of AS 3500 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 water services. All underground metallic pipe work and fittings shall be protected from corrosion by a proprietary petrolatum taping system with petrolatum primer applied to pipe/valve/flange surface, then continuous petrolatum taping material (55% overlap min.) and PVC outer wrap tape (55% overlap min.). A photographic record shall be provided of all underground services after approval and before backfilling.

5.12.11 Gas Supply

General
Natural gas shall be distributed around the site and supplied via a single metered gas connection generally within a ventilated enclosure or on a concrete pad supplied as part of the building contract. Details of gas pressure shall be confirmed with the Technical Reference Group. The building contract shall include provision for:
1. A gas isolation valve
2. A pressure reduction valve with over-pressure protection,
3. An automatic gas shut-off solenoid valve connected to the building fire protection system and
4. Any valves as required by the applicable codes for gas burning appliances and equipment.
The contract shall also allow for the application and payment of all fees for any new metered gas supply. The contract must make allowance for the coordination of the exact location of connection points with the Australian Pipeline Authority and UniSA.

**Gas Isolation Valve**

There is to be a gas isolation valve that shuts off the gas supply to the 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 “GAS ISOLATION VALVE” using an appropriately sized metal plate label (size depending on the circumstance), and using white letters on pale green (Raffia X31 for Natural Gas) background as per: AS1345 – Identification of the contents of pipes, conduits and ducts, AS/NZS 5601.1.2010 – Gas Supply, AS 2700 - Colour Standards for general purposes

The label is to be affixed in a position that is easily seen for emergency access.

**Emergency Gas Shut-off Solenoid Valve**

Provide an emergency gas shut-off valve within the building. 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 mains 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 gas supply in an emergency.

Equip the shut off valve with an auxiliary contact and interlock it with the operation of all gas burning appliances to shut them down in the event of closure and preventing them from starting until the shut off valve is opened.

Provide a warning notice on each gas burning appliance advising of the location and procedure to reset the shut-off valve.

Provide an audible and visual alarm on each plant switchboard serving a gas burning appliance to indicate shut-off valve closure.

Allow for additional zone shut off solenoid valves to UniSA requirements.

**Underground Services**

All underground pipe work shall be fully welded steel construction to AS1074 and protected from corrosion by a proprietary sheathing compatible with the surrounding environment.

Underground pipe work external of buildings shall be polyethylene pressure pipe to AS4130 joined using electrofusion couplings. Install all pipe work to the requirements of AS5601 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.

All underground metallic pipe work and fittings shall be protected from corrosion by a proprietary petrolatum taping system with petrolatum primer applied to pipe/valve/flange surface, then continuous petrolatum taping material (55% overlap min.) and PVC outer
wrap tape (55% overlap min.). A photographic record shall be provided of all underground services after approval and before backfilling.

5.12.12 Sewer Drainage

General

The site sewer system shall be connected to authority sewer via a single connection in an underground concrete pit supplied as part of the building contract. Pipe work shall be pressure tested in accordance with statutory requirements before backfilling and connection to the site distribution system. All branch sanitary drainage lines shall gravitate to sewer connection via site sewer systems at required falls. Provide inspection openings as required to comply with AS 3500.

Underground Services

Underground sanitary pipe work shall be PVC-U DWV class complying with statutory requirements except where ground conditions require the use of cast iron. Grease arresters shall be provided as part of the building contract if required by statutory regulations. All underground pipe work shall comply with the marker and location requirements as set out previously for Electrical Services. A photographic record shall be provided of all underground services after approval and before backfilling.

Sanitary Plumbing

All sanitary plumbing shall comply with statutory requirements and where materials are prohibited from discharge into SA Water sewers a blind holding tank shall be provided as part of the building contract.

5.12.13 Stormwater

General

The site stormwater system shall be connected to council stormwater system as required via an underground concrete pit supplied as part of the building contract. Pipe work shall be pressure tested in accordance with statutory requirements before backfilling and connection to the site distribution system. All branch sanitary drainage lines shall gravitate to sewer connection via site sewer systems at required falls. Provide inspection openings as required to comply with AS 3500.

Underground Services

Underground stormwater pipe work shall be FRC Class 4 or reinforced concrete complying with. Gross pollutant traps shall be provided as part of the building contract if required by statutory regulations. All underground pipe work shall comply with the marker and location requirements as set out previously for Electrical Services. A photographic record shall be provided of all underground services after approval and before backfilling.
Retention
Provide stormwater retention system to comply with statutory requirements shall be provided as part of the building contract.

5.12.14 Hydraulic Services

General
All sanitary plumbing within the building shall comply with AS 3500 and the SA Water requirements. UniSA shall approve fixture selection prior to documents being issued for tender.

Identification
All items of equipment shall be identified with screw Romark engraved labels. All pipes shall be identified in accordance with AS 1345 and further identified by the name of the particular service and flow direction.

Sanitary Fittings and Fixtures
Toilet suite should be Caroma Caravelle or similar exposed ‘Smart Flush’ cistern suite. Access toilets should use Caroma Trident Sovereign Care exposed ‘Smart Flush’ cistern suite or similar (with Caroma Colani seat or similar) toilet suites with Caroma Care Push Button flush mechanism.
Standard hand basins shall be Caroma Integra or similar wall hung basin. Vanity basins shall be Caroma Concorde 500 or similar.
Access toilets shall be Caroma Care Integra or Caroma Care Concorde 500 or similar hand basin. Wastes for access basins shall be built into wall.

Hot Water
Hot water for laboratories should be centralised using a number of mains pressure HWS in parallel with insulated flow and return lines incorporating a circulating pump plus standby pump. The circulator pump set shall be time controlled to comply with BCA requirements. The hot water service to laboratories shall be separate from all other hot water requirements to the remainder of the building. The water supply to the hot water systems servicing the laboratories shall come from either a break storage tank or downstream of a backflow protection valve assembly to suit hazard rating of the laboratory.
Where commercial kitchens or similar are provided throughout a building, a centralised system similar to laboratories shall be incorporated.
Sufficient hot water storage shall be provided to allow meet the demand of hot water for four (4) hours when heating elements are shed by the BMS for energy management purposes. Provide AUTO/OFF/MANUAL controls at the hydraulics switchboard for all electric hot water systems and hot water circulating pumps. Hot water lines should not be directly encased within walls. All hot water pipes shall be thermally insulated with approved elastomeric preformed pipe insulation (not fibreglass or mineral fibre) prior to installation within wall.
Hot Water Systems

Prime consideration should be given to the installation of gas boosted solar hot water units and then electrically boosted solar hot water units. Where solar systems are not practical either because roof area is insufficient or where vandalism is a concern, heat pump hot water system may be considered as an alternative. Proposed hot water systems and reticulation must be confirmed with the Technical Reference Group at an early stage. In all cases, the Consultant Team should check that the flows and temperatures available are suitable to the application. Hot water may be provided by single or multiple electric mains pressure hot water units similar to Rheem or Edwards stainless steel tank units with 3.6 kW elements. Allow for sufficient space around the unit for removal of elements and above the unit for the withdrawal of anodes. Gas fired hot water units shall be similar to Rheem or Rinnai mains pressure electronically fired continuous flow (instantaneous) units in single or multiple installations. Hot water to single isolated fixture may be provided by the use of a local quick recovery unit such as Zip or Stiebel Eltron under sink mounted units. Pressure relief drains from hot water units shall discharge to gully or tundish. Over stainless steel safe trays under all units at sufficient height to face the overflow pipe to a drainage connection point. Storage units shall be mounted within the safe tray and the tray drained in accordance with AS 3500.4.

Laboratory Gases

Gases shall be supplied from bottles located within a lockable ventilated storage space located external to the building which is easily accessible by the service road. Cylinders shall be manifolded with non return valves in such a way that any cylinder can be removed and still allow the effective operation of the pressure manifold. Pipe work and valves shall be of a material or type appropriate to the particular gas. Locate storage cylinders neatly in storage area in accordance with regulatory authorities and AS 4289 and AS 4332. Provide galvanised storage restraints fixed to structure to adequately restrain bottles and which can easily be removed to replace empty cylinders. Provide all necessary gas identification signs, safety procedures and Operations instruction in weatherproof frames fixed to gas cylinder enclosure. Provide isolation valve or emergency push buttons in each work area to isolate the industrial gas system to comply with UniSA and authority requirements.

Compressed Air

Where possible, compressed air shall be supplied from duplicate air compressors within the building and interconnected with the system in adjacent buildings to provide back-up. Compressors shall be oil-free of approved manufacture. Compressors shall be mounted together with their motor on an integral steel base mounted on an inertia base and shall be effectively isolated from the structure. Tank mounted compressors are also acceptable. The compressor shall be effectively silenced. Air cleaners shall be substantially mounted. Unless otherwise called for, compressed air shall be reticulated at 700 kPa and regulated at each laboratory. Provide isolation valve or emergency push buttons in each work area to isolate the compressed air system to comply with UniSA and authority requirements.
Vacuum

Where possible vacuum shall be supplied by duplicate vacuum pumps within the building. Vacuum pumps shall be of approved manufacture, capable of passing fluids from the system without damage to the pump. Vacuum pumps shall be mounted together with their motor on an integral galvanised steel base and shall be effectively isolated from the structure. Water seals with safety interlocks shall be provided to each pump. Piping to the vacuum pump water seals shall be as recommended by the pump manufacturer.

A vacuum receiver tank shall be provided to limit the number of starts per hour of the pump(s). The tank shall be provided with all necessary gauges, safety valves, pressure stats for automatic operation. Bacterial filters shall be fitted where required by the Australian Standards or other applicable regulations. All control systems shall be checked and commissioned by the manufacturer or its authorised representative.

Provide isolation valve or emergency push buttons in each work area to isolate the vacuum system to comply with UniSA and authority requirements.

5.12.15 Fire Protection Services Design Criteria

General Overview

This Specification sets out the requirements for the design, installation and commissioning of fire detection and alarm systems comprising components complying with the requirements of the AS1670.1 and the appropriate product Standards. This specification also looks at compliance with Fire Alarm Conditions of Connection as stated by the SAMFS, engineered solutions and commissioning and handover documentation.

All fire detection and alarm systems shall comply with the requirements of AS1670.1 (current version at time of DA approval) and with Section 2 and Section 3, with the additional requirements of Section 4, Section 5, or Section 6 according to the actuating device type, and the commissioning requirements of Section 7 of this document.

Where a fire detection and alarm system is ancillary to an automatic fire suppression system, the detection and alarm system shall comply with the appropriate requirements of this Standard.

This Standard requires that detection be provided throughout all areas of the building however, where systems are installed to solely meet the requirements of the BCA, detectors may only be required in certain nominated areas.

All installations, preventative maintenance and reactive service of any element of fire detection systems employed by UniSA are to be in line with appropriate legislation, Australian Standards, the BCA and in accordance with the technical and performance criteria set out in this specification.

All works are to be inclusive of the supply of all equipment, hardware, software, cabling and ancillary services. All required programming and software including data transfer dongles and cables are to be considered the intellectual and physical property of UniSA.
On completion of all works a series of commission documents, maintenance manuals, plans and drawings will be required to be supplied to the UniSA Facilities Management Unit irrespective of the requirements of the Builder or Consulting Engineer. The nominated fire contractor is to familiarise themselves with all matters related to specified works and to account for such in their tendered price. It is the responsibility of the nominated fire contractor to obtain clarification of all matters in which doubt exists as to the exact intent of this document or in which a conflict appears to have arisen. Such information must be obtained before the closing and lodging of tenders. The response shall clearly detail all pricing for components, cabling, installation, engineering, training, commissioning, setting to work, and comprehensive warranty for the period remaining for the current Maintenance Contract.

Product and Supply

It is a requirement of UniSA to standardise the products used in relation to the installation and replacement of fire systems. To this end all fire detection shall comply with the following:

The Fire Indicating Panel or CIE must:
- Carry the appropriate Australian Standards
- Carry the applicable SSL certification
- Meet the requirements of AS1670.1
- Comply with the requirements of the SAMFS conditions of connection document.
- Be of the latest technology at the time of installation
- Have the capability to have software program upgrades installed
- Carry a manufacturers warranty of no less than 1 years
- Have the support of manufactured spare parts for a minimum of 10 years after installation
- All field devices shall be compatible with the technology and functionality of installed FIP
- Not be a proprietary product

It is UniSA recommendations that all fire indicator panels installed within our campuses or infrastructure buildings shall be of an AMPAC FireFinder brand or equal equivalent.

Supply

The supply of products and services shall be inline with the project’s timeframes and is the responsibility of the installing contractor to ensure all products, material and labour are procured in such a manner as to not delay or impede the progression of works or the completion date. Any such delays may result in liquidator damages being imposed by UniSA on the installing contractor.

Warranty

All products supplied by the contractor shall carry a minimum 12 months manufactures warranty against faulty parts. All warranty claims shall include parts and labour and will be at no additional cost to UniSA. Installation warranties shall carry an indefinite liability against latent deficiencies in the system design, installations and poor workmanship. All warranty claims shall include parts and labour and will be at no additional cost to UniSA.
5.12.16 Fire Detection Services

If an automatic sprinkler system is not required, thermal and smoke detectors shall be installed throughout all buildings as appropriate to space utilisation in accordance with AS1670. All cabling, field devices, equipment interface shall also comply with AS1670. Where a fire detection and alarm system is ancillary to an automatic fire suppression system, the detection and alarm system shall comply with the appropriate requirements of AS1670.

This Standard requires that detection be provided throughout all areas of the building, however, where systems are installed to solely meet the requirements of the BCA, detectors may only be required in certain nominated areas.

Fire Detection System Design and Component Requirements

System components shall be selected and located in order to achieve stable and reliable performance. Equipment shall be suitable for the environment in which it is to be located. If environmental conditions such as high temperature, dampness, dust, corrosion, vibration, shock, flammable atmosphere or explosive atmospheres may be experienced, the equipment shall be of a type complying with the appropriate Standard.

UniSA, for reasons of system component consistency, performance and maintenance has determined the following:
The following components or equal equivalent will be utilised in all new installations and system upgrades:

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Indicator Panel</td>
<td>AMPAC FIREFINDER</td>
</tr>
<tr>
<td>EWIS Panel</td>
<td>AMPAC EV SERIES</td>
</tr>
<tr>
<td>PE smoke detectors</td>
<td>AMPAC XP95</td>
</tr>
<tr>
<td>Ionisation smoke detectors</td>
<td>AMPAC XP95</td>
</tr>
<tr>
<td>Thermal detectors</td>
<td>AMPAC XP95</td>
</tr>
<tr>
<td>Manual call points</td>
<td>AMPAC XP95</td>
</tr>
<tr>
<td>Sounder bases</td>
<td>AMPAC XP95</td>
</tr>
<tr>
<td>Strobes</td>
<td>AMPAC XP95</td>
</tr>
</tbody>
</table>

All internal hardware shall be Ampac brand or equal equivalent. No third party hardware is to be installed in any part of the system. System configuration and programming shall be in accordance with the manufacturer’s ‘Installation Commissioning & Operations’ Manual.

Expansion and Capacity

The fire indicator panel shall be supplied to accommodate the ‘As Built’ design load + 30% to support future expansion
The evacuation panel shall be supplied to accommodate the ‘As Built’ design load + 30% to support future expansion
Battery size shall be calculated in accordance with the formulae contained in Section 23 of the 'Ampac FireFinder Installation Commissioning & Operation' Manual and verified against the requirements of AS1851.8.

Ancillary Isolations

It is a requirement with every new fire panel installation that, where needed, allowances shall be made for individual key switch isolation facilities to be provided for ancillary functions such as, but not inclusive of;
- A/C shutdown
- Door releases
- Gas supply
- Plant shutdown
- Gas Suppression

Programming

As it is the recommendation of UniSA that the AMPAC FireFinder brand of fire indicator panels be used with all new and replacement installations it is also UniSA’s recommendation that the AMPAC config Manager be used to program each panel. The logic behind each device and associated functionality shall meet with the fundamentals of this software. All installing contractors shall undertake the appropriate config program training provide by AMPAC.

As part of the commissioning process it is expected that all logic and functionality 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 config program, including key output functionality shall be signed off by the installing contractor upon practical completion as having met the requirements of the tender specification.

Brigade Connection

Building alarms shall be grouped and relayed to the SAMFS utilising an Alarm Signaling Equipment, (ASE) incorporating both a Telstra PSDN land line and a wireless connection. A primary ASE connection shall consist of a Telstra PSDN phone line which can be connected to the SAMFS via the building’s existing MDF and through the campus phone systems. The existing PSDN and master/slave ASE capacity of a campus should be fully utilised prior to supply and connection of any additional PSDN lines or master ASE units.

Where a new salve ASE unit is required to an existing master ASE, the FIP installer is to obtain an internal phone line connection from UniSA’s ISTS Help Desk via the Contract Supervisor and clearly label and document the line and/or MDF details within both the FIP panel and the Operation & Maintenance Manual. Where a new master ASE unit is required, the FIP installer is to obtain a Telstra PSDN line from UniSA’s ISTS Help Desk via the Contract Supervisor and clearly label and document the line number in within both the FIP panel and the Operation & Maintenance Manual.
Occupant Warning

Warning sirens shall be installed in corridors and specific areas where required to ensure that the signal is audible to all occupants of the building. Occupant warning shall be installed as per the BCA and clause 3.22 of AS1670.1

Occupant warning shall be provided to alert all building occupants to a fire alarm situation.

The warning system shall be one of the following:
(a) A sound system for emergency purposes in accordance with AS 1670.4, initiated by the fire detection system. The fire alarm system shall monitor the sound system for fault signals required by AS 1670.4.
(b) Electronic sounders, or amplified sound systems producing the evacuation signal (with or without verbal message). The evacuation signal shall operate simultaneously throughout the building.

Early Warning & Intercommunication System (EWIS)

Where an integrated Public Address and EWIS is installed within a multi storey building, its main function is to broadcast a series of warning tones throughout the building in the event of a fire alarm or other emergency, thereby enabling the orderly evacuation of building occupants. To maximise the supervision and effectiveness of the warning system in an emergency situation, a degree of evacuation consistency needs to be maintained between existing buildings and campuses.

Unless mandated by the BCA or other legislative authorities, the cascade programming of the EWIS shall be omitted. Evacuation shall consist of an alert tone for 0 (zero) minutes throughout the building followed by a complete building evacuation tone with no individual floor cascading.

The evacuation signal shall trigger a continuous message wording in a female voice: “Attention, Attention, an emergency exists in this area, please proceed to the nearest exit and evacuate in an orderly manner”. Followed by 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 Clause 4.3.4. of AS 1670.4. Sound levels must be >65dB in each room with doors closed. If necessary, a speaker is to be installed in each room to satisfy this need. Installation of speakers in corridors only may not be sufficient to satisfy this clause.

A smoke control system shall be installed in accordance with BCA. Pressurisation systems utilising air relief openings are preferred to mechanical extraction systems.

Identification of detectors

Type, circuit number and consecutive device number must identify each installed detector. Manual call points must also be marked with circuit number and consecutive device number e.g. T10-3, P8-4, I31-2, C22-6.
DESIGN AND CONSTRUCTION GUIDELINES

The type of detector information must be permanently inscribed on the detector head as noted below:
T thermal detector, fixed or rate of rise; or P photoelectric smoke detector; or ionisation smoke detector; or
C combustion detector. (CO)

Instructions to be installed at the F.I.P.

Due to the variety in types of FIP’s and differing modes of operation, concise written instructions must be provided which precisely detail the method of panel operation to attending firefighters. Such notices must be individually approved by MFS for each type of panel manufactured and be displayed inside each set of required block plans next to the legend. An example of such a notice is given below:

<table>
<thead>
<tr>
<th>Panel Operation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Press ‘Acknowledge’ then ‘Next’ to view all circuits in alarm.</td>
<td></td>
</tr>
<tr>
<td>After investigation, press the red reset pad. This resets the whole system, including air-conditioning.</td>
<td></td>
</tr>
<tr>
<td>If the system will not reset, press the white isolate pad, which will only isolate the faulty circuit</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: The MFS Fire Alarms Officer will provide assistance when determining the operating sequence of each FIP and will check the necessary instruction sheets in the block plan folders.

5.12.17 Fire Installation Retrofitting and Upgrades

Alterations to existing installations shall 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, shall be compatible, only used within equipment listing limitations and shall satisfactorily perform the required functions.

Consideration shall be given to overloading existing circuits with detectors or ancillary devices particularly with conventional style Fire Indicating Panels. Alternatives must be sort 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.

Alternatives 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 BCA or AS1670.

It is imperative that all circuit, detector of device modifications are recorded on both copies of the building specific fire detection block plans.

Temporary Changes to Fire Detectors

The Consultant Team shall 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 shall include the requirement to internally clean of all detectors within the refurbishment area and adjacent construction access areas which may have been affected by dust migration. The fire detector block plans in the Fire Panel must be updated as required to show any changes to detector layouts, including temporary alterations, in order to keep block plans current at all times. All detectors within the site and adjacent areas shall be cleaned by a fire protection subcontractor on completion of the works.
It is recommended smoke detector replacement and reinstatement or cleaning be performed by the existing UniSA Fire Maintenance contractor. All associated costs shall be incorporated within the project scope of works. Failure to comply with this requirement may result in a false alarm calling out the SAMFS and the fire protection subcontractor or UniSA Fire Maintenance contractor, the cost of which will be invoiced to the Contractor.

FIP Replacements

All FIP replacements shall be based on the same criteria as a new installation ensuring compatibility with all field devices and maintains all existing functionality. The additional capacity of the new panel must comply with clause 1.3.4
It is also recommended that replacement batteries be included with every new installation and a battery capacity test be performed prior to completion to ensure that the correct size of the batteries are supplied and power supply is capable of charging the batteries correctly. Every panel changeover must include an Operation and Maintenance Manual as outlined in clause 1.6.1
Updating detection block plans or producing Précis of Operation is not necessary for the replacements of fire panels unless requested by UniSA to do so and as such it is acknowledge that this will be at an additional cost.

5.12.18 Engineered Fire Solutions

**Extract From SAMFS Guidelines**

*BUILT ENVIRONS SECTION GUIDELINE 05: FIRE ENGINEERING & ALTERNATIVE SOLUTIONS*

1. General

This policy addresses some of the basic issues associated with a “fire engineered” or “alternative” solution as opposed to the deemed to satisfy provisions contained in the Building Code of Australia (BCA). In formulating this document, recognition has been given to the recommendations and requirements contained within the Building Code of Australia (BCA). the BCA Commentary, The Fire Safety Engineering Guidelines (FSEG), the Institute of Engineers Australia; Society of Fire Safety and South Australian Legislation.
2. Fire Safety Engineering Design Brief

It is essential that early dialog take place between the prospective developer, designers, relevant authority and this Department before a submission is made to the MFS as required under Regulation 28 of the SA Regulations under the Development Act 1993. A deemed-to-satisfy design should be identified as a benchmark for the proposed building/application. Where more than one building classification applies, the benchmark that provides the highest level of safety to the community may apply. The reasons for and extent of proposed variations to the benchmark should be listed in a preliminary Fire Safety Engineering Report, which should be tabled at a preliminary FSEDB meeting, attended by the appropriate fire brigade, relevant authority, developer, fire engineer, and other designers.

The intent of this meeting should be to outline the proposed building use, method and materials of construction and relationship to adjoining properties. Details to be discussed should include any manufacturing or other processes which occur in the building, fire hazards, fire load ignition potential, proposed fire safety systems and, availability of fire brigade intervention. Agreement on such issues as design fires, occupant exit speeds or fire brigade intervention should not take place at the preliminary meeting, these issues should be discussed at a subsequent meeting after all parties have had sufficient time to digest the information provided.

Compliance

All engineered solutions shall be documented in totality including, but not inclusive of, solution criteria and functionality, system schematics, performance and maintenance requirements. This information shall be included in the handover documents and shall form part of the operation and maintenance manuals.

5.12.19 Documentation of Fire Systems

Operating & Maintenance Manuals

The nominated fire contractor shall provide to the university’s delegated fire services officer such comprehensive documentation as to enable effective operation and routine maintenance of the entire Fire Detection System. This shall include at least the following:

- Operating handbooks
- Operator instruction manuals
- Complete hardware description and installation records.
- Maintenance Logbook
- Details of any engineered solutions
- Detection block plans
- Commissioning documentation
- Programming verification
- Battery capacity details and installation load
- SAMFS sign off
- ESP Form 1
- ESP Form 2
- ESP Form 3
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.

Three (3) printed copies and one (1) electronic copy of the Operating and Maintenance Manuals, including three (3) full sets and one (1) electronic copy of the As-Built Drawings, shall be supplied prior to practical completion in accordance with the Operating & Maintenance Manual Specification.

The manuals shall include a full description of all installations and the functioning of the various elements involved and instruction to cover every action necessary for the efficient operation and maintenance of the installation.

**As-Built Drawings**

In addition to the drawings provided with the Operating & Maintenance Manuals, supply two (2) printed copies and one (1) electronic copy of as-built drawings to the Campus Facilities Administrator prior to practical completion as set out in the Operating & Maintenance Manual Specification.

Practical Completion shall not be granted until such drawings are received, are up to date and accurately reflect all field changes to the installation and which are a true and accurate representation of the actual installation.

The drawings shall include the following:
- Schematic wiring diagrams with correct circuit and termination identification.
- Final equipment, speaker and detection layouts.

**Fire Alarm Block Plans**

Generally the detection block plans shall use all current symbols and circuit as AS1670. At the time of inspection/connection, four sets of block plans must be handed to the inspecting officer; one set for retention at MFS HQ, two sets to be stored within the F.I.P. and one set for the nearest attending fire station.

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, unless otherwise approved;
- Be bound into a booklet with the sheets protected from damage by a clear plastic envelope;
- Show access paths to any concealed detectors e.g. access panels and removable tiles;
- The booklet front cover must be clearly labelled in 10mm uppercase lettering: FIRE ALARM PLANS - DO NOT REMOVE - FOR FIRE SERVICE USE ONLY;
- The plans must be numbered, one per floor level which show:
  - the building outline; and
  - any internal full height walls/partitions; and
  - means of access to each room in the building; and
  - the location of each detector/ manual call point, audio and or visual device (using AS 1670 symbols); and
  - the location of each Warden Intercom Phone, Speaker and Master Evacuation Control Panel (using current S.A.A. symbols);
(vi) any additional information necessary so that every installed detector may be accessed by the attending firefighters;
(vii) the north orientation;

(f) Include a Legend at the front of the set of plans, which must:
   (i) list each separate alarm group and identify the floor number and block plan number where each listed group appears. IMPORTANT: This list is to read the same as the digital display and the legend on the FIP; and
   (ii) include a key of the symbols at the front of the set of plans or alternatively on each plan; and
   (iii) where relevant, a master site plan and/or legend;

(g) Have areas covered by each detector group coloured, and use the same colour for identification in the legend at the front of the log book; and

(h) Be maintained in a legible condition at all times which must not be altered unless an application and approval is sought in accordance.

Where an existing fire detection and alarm system is to be upgraded:
Where the upgrade involves more than 50% of the building, then the whole building must have detector bases and detector identification upgraded in accordance with the current standard and this Schedule.

5.12.20 Fire Detection Block Plan Index - Sample

The SAMFS requires a summary page at the front of the Fire Alarm Plans Folder which references the zone number, location and corresponding block plan page number. Areas covered by each detector group are to be coloured, and the same colour should be used for identification in the legend at the front of the log book.

<table>
<thead>
<tr>
<th>ZONE</th>
<th>TYPE</th>
<th>DESCRIPTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SMOKE</td>
<td>PARADENTAL GND STAIRS/TOILETS</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>THERMAL</td>
<td>PARADENTAL GROUND SOUTH</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>SMOKE</td>
<td>PARADENTAL GROUND CENTRAL</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>SMOKE, THERMAL</td>
<td>PARADENTAL GROUND NORTH</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>SMOKE, MCP</td>
<td>PARADENTAL 1ST STAIRS/TOILETS</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>SMOKE, MCP</td>
<td>PARADENTAL FIRST FLR NORTH</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>SMOKE</td>
<td>PARADENTAL FIRST FLR SOUTH</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>THERMAL</td>
<td>GROUND PLANT ROOM</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>THERMAL</td>
<td>PARADENTAL 1ST FLR PLANT RM</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>THERMAL</td>
<td>PARADENTAL ROOF PLANT ROOM</td>
<td>3</td>
</tr>
</tbody>
</table>

A detailed list of the alarm zones, device addresses, device #, type and location for addressable systems only should be inserted at the back of the Fire Alarm Plans Folder. This should be available for service providers when performing preventative and reactive
maintenance tasks. Areas covered by each detector group should be coloured and the same colour used for identification in the legend.

<table>
<thead>
<tr>
<th>Zone No.</th>
<th>Device No.</th>
<th>Type</th>
<th>Location Description</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1001</td>
<td>Smoke</td>
<td>GND MALE TOILET AIR LOCK</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1061</td>
<td>Smoke</td>
<td>G30 CLINICAL AREA IN CEILING</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1084</td>
<td>Smoke</td>
<td>G18 FOYER</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>1092</td>
<td>Smoke</td>
<td>G11 STAFF OFFICES IN CEILING</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>1087</td>
<td>MCP</td>
<td>1ST FLR STAIR MCP</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>2001</td>
<td>Smoke</td>
<td>1ST CLASSROOM 9</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>2025</td>
<td>Smoke</td>
<td>1ST LAB OFFICE IN CEILING</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>2087</td>
<td>Smoke</td>
<td>Gnd FLR STAIR MCP</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>1084</td>
<td>Thermal</td>
<td>1ST FLR PLANT RM</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>1001</td>
<td>Thermal</td>
<td>ROOF PLANT ROOM</td>
<td>3</td>
</tr>
</tbody>
</table>
DESIGN AND CONSTRUCTION GUIDELINES

Fire Detection Block – Samples
Fire Alarm Symbols

FIRE ALARM SYMBOLS
(Normative)

- ▲* Heat detector (exposed or ceiling mounted)
- ▲* Heat detector in concealed space
- ▲* Heat detector within air duct
- ▲ Line detector
- ＄* Smoke detector (exposed or surface mounted)
- ＄* Smoke detector in concealed space
- ＄* Smoke detector within air duct
- ＄ Smoke detector with sampling device
- ＄ Aspirated smoke detector system
- ＄ Optical beam type smoke detector (transmitter)
- ＄ Optical beam type smoke detector (receiver)
- ● Heat alarm
- ● Smoke alarm
- ▲ Electromagnetic holder
- ■ Remote visual indicator
- ▲ Flame detector
- ▲ Gas fire detector
- ▲ End-of-line device
- ▲* Multi-sensor detector
- ＄ Type of smoke detector, e.g., I= ionization, P= Photoelectric
- ▲ Substitute loop and device number as applicable
- ▲ Type of flame detector, e.g., IR= infra-red, UV= Ultraviolet
- ▲ Type of gas detector, e.g., CO

* Heat detector type (e.g. TA, TB etc. for AS 1603.1 detectors or A1, B, etc. for AS 7240.5 detectors.)

† Type of smoke detector, e.g., I= ionization, P= Photoelectric

End-of-line device
Précis of Operation

A précis of Operation will be created for every new development and will follow the guidelines of the SAMFS policy 38. The following is an extract from SAMFS Policy 38.

THE PREPARATION OF A BUILDING FIRE SYSTEM PRÉCIS

1.1 General
This document has been produced as a design aid for the formulation of a required fire précis document. Wherever possible the philosophy behind the requirement has been included for further information. One copy of the précis will be retained in S.A.M.F.S. control room and at least one further copy must be retained in the building fire control room or F.I.P.

1.2 What a Précis Is Used For
Whilst it is the responsibility of all fire officers to be familiar with the buildings on their fire ground, it is impossible for them to be intimate with the detailed fire safety features of every building in their district. Furthermore staff transfers from district to district may result in "newcomers" attending a fire within a building, which is unfamiliar to them.

If a fire escalates, more and more personnel and equipment attend the fire scene and the responsibility of control is placed upon higher-ranking officers until eventually in the event of a large fire, the Chief Officer may take control of the incident. It must be appreciated the Chief Officer cannot be intimate with every major building in the Metropolitan Fire Service gazetted area.

Officers in charge of an incident therefore need precise, detailed, quickly understood basic information about the building and its fire safety facilities.

Provision of a separate ESP manual consolidating all documentation and drawings associated with life and fire safety detailed as follows:


(a) BCA assessment statement with particular reference to all fire and lift safety requirements, including:
   - Classification
   - Structure
   - Fire Resistance & Compartmentation
   - Access and egress
   - Services & Equipment

(b) Copy of ESP Form 1

(c) Copy of ESP Form 2

(d) Building Occupancy Certificate
(d) Where a fire hydrant or sprinkler system is installed, a current certificate of flow test.

(e) Where a fire alarm system is connected to the Metropolitan Fire Brigade, copies of all relevant applications and certificate

(f) Where fire extinguishers are installed, provide comprehensive details including all design analysis and calculations as per the requirements of the BCA to identify selection, type and location of all installed portable fire protection equipment.

(g) Précis of operation for all fire detection and protection systems


(a) 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.

(b) Layout and detail drawings of identifying the full extent and design of all relevant fire safety measures and systems, including:

- compartmentation, fire wall/separation and fire/smoke doors and/or windows
- means of egress, detailing paths of travel
- signs, including lifts and all signage associate with egress paths, etc
- access for fire appliances
- emergency Lifts
- emergency & 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

(c) Details of the work to be undertaken (which may be in the form of a specification) stipulating any Australian Standard or other Code to which the work must comply.

**5.12.21 System Commissioning & Acceptance Testing**

The nominated fire contractor shall be responsible for all system commissioning and acceptance tests 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 Campus Facilities Administrator.
All system commissioning shall be carefully pre-planned and scheduled. System commissioning information shall be submitted to the Campus Facilities Administrator for approval not less than two (2) weeks before commencement of system commissioning. UniSA may elect contractor’s staff in undertaking or witnessing the approved system commissioning and any additional system commissioning deemed necessary by the Campus Facilities Administrator.
All system commissioning shall be scheduled to be completed one (1) week prior to practical completion and will performed in conjunction with any other interfacing installation contractor and shall be witness and verified by the SAMFS.
Certificate Of Approval
(a) A certificate of approval, in accordance with clause 1 of this Schedule, must be obtained from MFS prior to the execution of any work on site.
(b) A successful application will be issued with a ‘MFS, Fire Safety Department, Fire Alarm Detection System Connection / Addition / Alteration Approval’ certificate.
(c) In all further correspondence from the Contractor to MFS, the approval registered form number, which appears in the top right hand corner of the form, must be quoted.

5.12.22 System Commissioning

All system commissioning procedures, checking and adjustments shall be carried out to demonstrate to the satisfaction of the Campus Facilities Administrator that the system as installed complies with the specification.
System commissioning shall be by exhaustive testing on a “point by point” basis for each system function. Each point test may be witnessed by the Campus Facilities Administrator (or nominee) and checked off on a commissioning sheet.
The commissioning process shall confirm correct activation and operation of all detection circuits, ancillary devices the FIP and all interfaces.
Should any test fail, cause of failure shall be determined and corrected and the test shall be repeated.
**Commissioning Test Report**

This Fire Alarm Control Panel is installed at:

<table>
<thead>
<tr>
<th>Company Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Street</td>
<td></td>
</tr>
<tr>
<td>Suburb</td>
<td></td>
</tr>
<tr>
<td>State / Country</td>
<td></td>
</tr>
<tr>
<td>Postcode</td>
<td></td>
</tr>
</tbody>
</table>

**Owner or Owner’s Authorised Representative**

<table>
<thead>
<tr>
<th>Company Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Street</td>
<td></td>
</tr>
<tr>
<td>Suburb</td>
<td></td>
</tr>
<tr>
<td>State / Country</td>
<td></td>
</tr>
<tr>
<td>Postcode</td>
<td></td>
</tr>
</tbody>
</table>

Type of Installation:  
- NEW
- MODIFIED
- ADDITION
- UPGRADE  (Circle)

Date of commissioning tests

**Name and address of commissioning company:**  (in ‘BLOCK LETTERS’)

<table>
<thead>
<tr>
<th>Company Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Street</td>
<td></td>
</tr>
<tr>
<td>Suburb</td>
<td></td>
</tr>
<tr>
<td>State / Country</td>
<td></td>
</tr>
<tr>
<td>Postcode</td>
<td></td>
</tr>
</tbody>
</table>

Commissioning Representative: Name (Print)

Signature

**PROJECT NAME:**

<table>
<thead>
<tr>
<th>Type of System (describe)</th>
<th>NUMBER:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Code that system was designed to comply with:</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Switch Type</td>
<td>Qty</td>
</tr>
<tr>
<td>Flow Switch Solenoid Type</td>
<td>Qty</td>
</tr>
<tr>
<td>Pressure Switch Type</td>
<td>Qty</td>
</tr>
<tr>
<td>Thermal Detector Type</td>
<td>Qty</td>
</tr>
<tr>
<td>Smoke Detector Type</td>
<td>Qty</td>
</tr>
<tr>
<td>MCP Type</td>
<td>Qty</td>
</tr>
<tr>
<td>Magnetic Door Holder Type</td>
<td>Qty</td>
</tr>
<tr>
<td>Valve Monitor Type</td>
<td>Qty</td>
</tr>
<tr>
<td>Main Panel Type</td>
<td>Qty</td>
</tr>
<tr>
<td>Main Panel(s) Location</td>
<td>Qty</td>
</tr>
<tr>
<td>Drawing Nos</td>
<td>Qty</td>
</tr>
<tr>
<td>Sub-panel(s) Type</td>
<td>Qty</td>
</tr>
</tbody>
</table>
### DESIGN AND CONSTRUCTION GUIDELINES

**Sub-panel(s) Location**
- Indicator Mimic Panel Type
- Qty
- Indicator/Mimic Panel by:
- Wiring by
- Indicator Panel Location

<table>
<thead>
<tr>
<th>Evac Sign Type</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bell Type</td>
<td>Qty</td>
</tr>
<tr>
<td>Break Glass Alarm Type</td>
<td>Qty</td>
</tr>
<tr>
<td>Lift Car Detector Type</td>
<td>Qty</td>
</tr>
</tbody>
</table>

**Are there any areas of the building that have not been protected that would require protection under........**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Procedure**

The following tests are the minimum that shall be performed when commissioning a system using the Fire Alarm Control Panel. Supplements to these tests may be added by way of attachments or notation (using waterproof ink) to this documentation. If supplements or tests are added reference to them shall be made at an appropriate point on this document.

This Commissioning Record is to be completed in conjunction with the –
- operator’s manual;
- installer’s statement(s);
- ‘as-installed’ drawings; and
- detector test records,

The Record provides a complete description of the installed system and its tested performance at the time of being commissioned.

### System Information

<table>
<thead>
<tr>
<th>Ensure that all detectors used in the system:</th>
<th>Yes</th>
<th>No</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are listed in the operator’s manual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are compatible with the installed AZF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do not exceed the permitted number of detectors on each circuit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed in an environment for which they are suitable</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Check that the primary power source for the system has been provided in accordance with AS3000, and that the isolating switch disconnects the active conductors.

Check that the detector and the FIP locations are in accordance with the
appropriate clauses of Standard, AS 1670

<table>
<thead>
<tr>
<th>Alarm zone circuit:</th>
<th>Yes</th>
<th>No</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure each alarm zone circuit voltage, and ensure each is within the equipment manufacturer’s specifications.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation resistance of all installation wiring measured in accordance with AS 3000 or similar approved method and record the worst case result in the logbook.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open circuit and short circuit the end of line device on each alarm zone circuit or conduct other appropriate tests to ensure that fault and alarm conditions are operating correctly on all alarm zone facilities on other sections of the control and indicating equipment.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FIP test to be carried out as follows:</th>
<th>Yes</th>
<th>No</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate each alarm test, fault test, isolate and reset facility provided for each alarm zone facility to determine correct operation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operate the primary power source switch on and off at least five times to check the system will not cause a false alarm from primary power source interruptions.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Detector testing to be carried out as follows:</th>
<th>Yes</th>
<th>No</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test each installed detector or sampling point with an approved in-situ tester, and ensure that each detector has operated in the correct range, and the alarm has indicated on the control and indicating equipment and, if applicable, at the detector tested.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confirm that response of the system does not exceed 6 s from the time the detector operates until the master alarm facility registers the alarm (while in normal mode) on each zone, or 32 s when AVF is fitted.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Record tests on detector test record as requires by AS 1851.8 and attach to the report.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Check the operation of each manual call point and all other actuating devices. | Yes | No | NA |
| For flame detectors, perform the following: | Yes | No | NA |
| Check that the number and type of detectors provide adequate protection of that area. |     |    |    |
| Check that there are no ‘blind’ spots in areas protected. |     |    |    |
| Check that detectors are rigidly fixed. |     |    |    |
| Check that detectors are properly connected to compatible control and |     |    |    |
indicating equipment.

Check that detector lenses are clean and adequately protected from dust and extraneous radiation sources where these are present.

Test the detection response to a flame source or simulated flame.

<table>
<thead>
<tr>
<th>For smoke detection sampling systems, perform the following:</th>
<th>Yes</th>
<th>No</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure the response time of all sampling points using smoke placed at each sampling point.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check the back-up power supply capacity.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check the operation of alarm settings and indicators.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check operation of remote indication of alarm and fault signals.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check the operation of airflow failure indicators.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check the operation of the system (signal) failure indicators.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check the isolate/reset functions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check the fault and alarm test facilities.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test each ancillary function by operating the alarm zone facility(ies), associated with the ancillary function.

<table>
<thead>
<tr>
<th>Alarm signaling:</th>
<th>Yes</th>
<th>No</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check that the master alarm facility is able to receive the alarm signal by operating each alarm zone facility.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check that the master alarm facility initiates an alarm to the fire control station equipment.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Battery Supply:</th>
<th>Yes</th>
<th>No</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check that both the primary and secondary power sources are of a suitable type and capacity complying with Clause 8.2.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perform a float voltage check according to the battery manufacturer’s recommendation to ensure that the charger type and setting is correct.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of battery installed</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Size of batteries installed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date and month of battery manufacture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charger type installed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charger capacity in</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>NA</th>
</tr>
</thead>
</table>
Check that all alarm zone facilities have been correctly labeled and that the alarm zone is immediately apparent from the labeling.

Check the ‘as-installed’ drawings are marked up, including date, circuit or zone altered, company name, contact phone number, are consistent with the installation and the operator’s manual is relevant to the installation. and forward marked up ‘as-installed’ drawings to the relevant UniSA Project Manager.

Ensure the results of these tests are recorded in the system logbook.
CERTIFICATE

PROJECT NAME: ___________________ NUMBER: ___________________

I/We hereby certify that the installation has been thoroughly tested from each activating device and that a test of the transmission of the alarm signal to the fire control station has been satisfactorily carried out. I/We further certify that the whole system and all appliances in connection therewith are installed entirely in accordance with the current requirement of AS 1670.

Dated: ____________________________
Signature: ______________________________________________________________
Name: ______________________________________________________________
Installing Company: _______________________________________________________
Battery Capacity Calculation: ______________________________________________

INTRODUCTION

The standby power source capacity, or battery capacity, determines how long the system will continue to operate in the event of the loss of the primary power source. It therefore becomes necessary to calculate the battery and hence power supply / battery charger capacity required for each installation.

The following calculator has been designed to determine the required capacity to meet the required standards. Should an existing panel be expanded the required battery and power supply capacity should be recalculated to ensure the panel continues to operate within the required standards.

Battery Capacity

The capacity of the battery, at the time of commissioning, shall be such that in the event of failure of the primary power source the batteries shall be capable of maintaining the system in normal working (quiescent) condition for at least 72 h, after which sufficient capacity shall remain to operate the two worst case alarm zones and associated ancillary control functions for 30 min unless the power supply failure signal is externally monitored, the requirement for quiescent condition may then be reduced to 24h.

When calculating battery capacity, allowance shall be made for the expected loss of capacity over the useful life of the battery. A new battery shall be at least 125% of the calculated capacity requirements, based on a loss of 20% of its capacity over the useful life of the battery.

The battery capacity shall be determined during the final commissioning process by using the following calculation:
(a) Determine the quiescent load current IQ.
(b) Determine the alarm current IA.
(c) Determine the capacity de-rating factor Fc of the battery when discharged at the alarm load rate taking into account the minimum operating voltage of the connected CIE using the battery manufacturer’s data. Where more than one CIE is connected to the battery, use the highest minimum of any of the CIEs. A value of 2 for FC is deemed to satisfy these requirements.
(d) The 20h discharge battery capacity C20 at 15°C to 30°C shall be determined as follows:

$$C_{20} = 1.25[(IQ \times TQ) + FC (IA \times TA)]$$

Where:

- $C_{20}$ = battery capacity in Ah at 20 h discharge rate
- $IQ$ = total quiescent current
- $TQ$ = quiescent standby power source time, (normally 24 h)
- $FC$ = capacity de-rating factor
- $IA$ = total current in alarm state
- $TA$ = alarm load standby power source time (normally 0.5 h)

1.25 = compensation factor for expected battery deterioration

Power Source Calculations For Externally Monitored Installations:

$$Q_{24h} \times 24h = \text{Total Draw} = \left[ A \times .5h \right] \times 2 \times 1.25 = \text{A/h.}$$

Power Source Calculations For Non Monitored Installations:

$$Q_{72h} \times 72h = \text{Total Draw} = \left[ A \times .5h \right] \times 2 \times 1.25 = \text{A/h.}$$

Where the load may vary, the worst case average over required period shall be used.

Power Supply Requirement

Select the greater of 1 or 2

1. $la + \text{non-battery backed ancillary alarm loads}$
2. $lq + \text{non-battery backed quiescent loads}$

If the power supply is used as the charger the current rating of the supply shall be $[(1 or 2) + \text{battery charger current}].$

POWER SUPPLY RATING

The minimum Power Supply Rating (4) is obtained by calculating the manufacturers recommended battery charge current (1) then adding the quiescent current of the entire system (2) and the alarm current (3).

1. Battery Capacity (AH) (determined from Calculator) = Amps
   $$24 \times 0.8$$
2. Add Quiescent Current of the System (lq) = Amps
3. Add the extra current that is drawn when in alarm (la) = Amps
4. Minimum Current Rating of Power Supply is = Amps

5.12.23 Miscellaneous Items

Training

The contractor shall 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 Operating & Maintenance Manual Specification.

Responsibility for provision of all instruction and full support resources, including course outlines, training materials and instruction notes shall 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 fire contractor is to allow a period of two (2) hours to complete the necessary training. If additional training time is required by the Campus Facilities Administrator, direct negotiation on costs are to be between the nominated security contractor and the Campus Facilities Administrator.
System Abbreviations

ACF: ANCILLARY CONTROL FACILITY
ACKD: ACKNOWLEDGED
AHU: AIR HANDLING UNIT
ALM: ALARM
AVF: ALARM VERIFICATION FACILITY
AZF: ALARM ZONE FACILITY
AZC: ALARM ZONE CIRCUIT
C: RELAY COMMON CONTACT (WIPER)
CIC: CONTROLLER INTERFACE CARD
CN: CONNECTOR
CPU: COMMON PROCESSOR UNIT
DGP: DATA GATHERING POINT
EARTH: BUILDING EARTH
EOL: END OF LINE
FDS: FIRE DETECTION SYSTEM
FACP: FIRE ALARM CONTROL PANEL
FLT: FAULT
GND: GROUND (0 VOLTS) NOT EARTH
I/O: INPUT/OUTPUT
LCD: LIQUID CRYSTAL DISPLAY
MAF: MASTER ALARM FACILITY
MCP: MANUAL CALL POINT
MOV: METAL OXIDE VARISTOR (TRANSIENT PROTECTION)
NIC: NETWORK INTERFACE CARD
N/C: NORMALLY CLOSED RELAY CONTACTS
N/O: NORMALLY OPEN RELAY CONTACTS
N/W: NETWORK
PCB: PRINTED CIRCUIT BOARDS
P/S: POWER SUPPLY
PSM: POWER SUPPLY MODULE
REM: REMOTE
SPOT: SINGLE PERSON OPERATING TEST
TB: TERMINAL BLOCK
VDC: DIRECT CURRENT VOLTS

System Terminology

Addressable system - a fire alarm and detection system that contains addressable alarm zone facilities or addressable control devices.

Alarm Verification Facility (AVF) - that part of the FACP, which provides an automatic resetting function for spurious alarm signals so that they will not inadvertently initiate Master Alarm Facility (MAF), or ACF functions. Using ConfigManager prior to downloading to the FireFinder™ sets this option
Alarm zone - the specific portion of a building or complex identified by a particular alarm zone facility.

Alarm Zone Circuit (AZC) - the link or path that carries signals from an actuating device(s) to an alarm zone facility(s).

Alarm Zone Facility (AZF) - that part of the control and indicating equipment that registers and indicates signals (alarm and fault) received from its alarm zone circuit. It also transmits appropriate signals to other control and indicating facilities.

Alert signal - an audible signal, or combination of audible and visible signals, from the occupant warning system to alert wardens and other nominated personnel as necessary to commence prescribed actions.

Ancillary Control Facility (ACF) - that portion of the control and indicating equipment that on receipt of a signal initiated predetermined actions in external ancillary devices.

Ancillary equipment - remote equipment connected to FACP.

Ancillary relay - relay within FACP to operate ancillary equipment.

Ancillary output - output for driving ancillary equipment.

Approved and approval - approved by, or the approval of, the Regulatory Authority concerned.

Card-detect link - a link on a module connector to indicate the disconnection of the module.

Conventional System - is a fire detection system using a dedicated circuit for each alarm zone.

Distributed system - a fire alarm and detection system where sections of the control and indicating equipment are remotely located from the FACP or where sub-indicator panel(s) communicate with a main FACP.

Field connections - are connections made to FACP or ancillary equipment during installation.

Fire alarm system - an arrangement of components and apparatus for giving an audible, visible, or other perceptible alarm of fire, and which may also initiate other action.

Fire detection system - an arrangement of detectors and control and indicating equipment employed for automatically detecting fire and initiating other action as arranged.

Fire Alarm Control Panel (FACP) - a panel on which is mounted an indicator or indicators together with associated equipment for the fire alarm or sprinkler system.

Fire resisting - an element of construction, component or structure which, by requirement of the Regulatory Authority, has a specified fire resistance.

Indicating equipment - the part of a fire detection and or alarm system, which provides indication of any
warning signals (alarm and fault), received by the control equipment.

**Interface** - The interconnection between equipment that permits the transfer of data.

**Main equipment** - equipment essential to the operation of the system including, control equipment, amplification equipment and power supply modules.

**Master Alarm Facility (MAF)** - that part of the equipment which receives alarm and fault signals from any alarm zone facility and initiates the common signal (alarm and/or fault) for transmission to the fire control station. Bells and other ancillary functions may be initiated from this facility.

**Power Supply** - that portion of the FACP which supplies all voltages necessary for its operation.

**Regulatory Authority** - an authority administering Acts of Parliament or Regulations under such Acts.

### 5.12.24 Fire Water Supply

**General**

The primary fire protection services comprises of a dedicated site fire reticulation ring main servicing the site which is fed from various SA Water connection points located on the site. Water supply to serve any proposed new fire services systems shall be connected to and supplied via a new valved connection at the main and installed within a concrete underground valve pit and cast iron lid which will be incorporated as part of the building contract.

Fire service pipe work from this valved connection shall be pressure tested in accordance with statutory requirements before any backfilling of the trench is to occur and connection to the new site distribution system.

**Underground Services**

Underground fire service pipe work shall consist of either Ductile Iron Cement Lined (DICL) pipe work complete with DICL fittings (flanged fittings only wrapped in Denso complete with overwrap) all protected with green sleeve sheathing, or alternatively Blue Brute UPVC piping complete with DICL fittings (fittings only wrapped in Denso complete with overwrap and protected with green sleeve sheathing)

Fire service pipe work located below building footings shall consist of copper type A complying with AS1432 and AS2419.1. Wrap all pipe work with Denso complete with overwrap and protected with green sleeve sheathing.

Install all fire service pipe work in accordance with the requirements as detailed in AS3500 and provide identification marker tape within the trench to identify the type and location of the underground service

**Fire hydrant system**

**External fire hydrant system**
An external fire hydrant system shall be designed and installed to suit the proposed new on site building works. Install all external fire hydrants in strategic locations around the building and in reasonable proximity to the buildings (in accordance with the BCA) to provide a sufficient form of on site fire fighting facility for use by the authorities. The new fire hydrant system shall be connected directly to the sites dedicated fire protection services water supply main which will supply water to the fire hydrant standpipe delivering water through a 100mm diameter double-headed fire hydrant standpipe.

Internal fire hydrant system
An internal fire hydrant system shall be designed and installed to suit the proposed new on site building works. Install all internal fire hydrants within a fire rated stair within the building (in accordance with the BCA) to provide a sufficient form of on site fire fighting facility for use by the authorities. The new fire hydrant system shall be connected directly to the sites dedicated fire protection services water supply main which will supply water to the fire hydrant riser delivering water through a 65mm diameter hydrant outlet located on the riser.

The system shall be designed such that two hydrants shall operate simultaneously delivering 10 L/s at 350 kPa and 10 L/s at 700 measured at the two most hydraulically disadvantaged fire hydrant outlets.


Fire hose reel system
An internal fire hose reel system shall be designed to provide a form of fire fighting for use by building occupants only.

The fire hose reel system shall be connected directly to the proposed fire service reticulation mains which shall proceed to serve 36m x 19mm type fire hose reels located within four metres of a required exit.

Each fire hose reel shall be fitted with its own backflow prevention device and designed such that the unit delivers 0.45 L/s at a running pressure of not less than 210 kPa.


Fire hose reels are to be recessed off a main circulation space but they are not required to be in a specific cupboard.

Portable fire extinguishers
Portable fire extinguishers and fire blankets complete with signage shall be installed to serve each particular building to provide a form of fire fighting for use by building occupants only.

Fire extinguishers shall generally consist of 9L Water 2A, 3.5 kg Carbon Dioxide 5B: (E), 2.5kg Dry Chemical Powder 2A:30B (E), 9L Foam 3A: 20B and fire blankets 1.8 m x 1.8 m in size all of which shall be selected to suit each independent risk.

The type of fire extinguisher and location of the extinguisher and fire blanket shall be installed in compliance with AS2444—2001—Code for portable fire extinguishers and fire blankets and the Building Code of Australia.
Automatic fire sprinkler system

An automatic fire sprinkler system of the wet type shall be installed to serve the proposed new on-site building. The system shall consist of an incoming water supply connection direct from the dedicated fire service water supply main which shall proceed to connect to a set of sprinkler control valves located within the sprinkler control valve room serving the building. The sprinkler control valve arrangement shall consist of all ancillary equipment such as jacking pump, pressure switch arrangements, annubar testing facility, water storage holding tank for testing purposes with the building's wet system being directly interfaced to the building's sub-fire indicator panel to indicate system operation and provide alarm indication. Sprinkler pipe work from the valve set shall reticulate throughout the entire building serving, semi-recessed type fire sprinklers at ceiling level and concealed space type fire sprinklers located within the ceiling or roof space of the building. The automatic fire sprinkler system shall be designed in accordance with the relative building hazard classification as detailed in AS2118.1 and all piping systems and fire sprinkler head selection shall designed utilising a certified computer hydraulic package. The system shall be designed in accordance with AS2118—1999—Code for automatic fire sprinkler system, AS2941: 2002—Code for fixed fire protection installations—Pump set systems and the Building Code of Australia.

Automatic fire detection system

An automatic fire detection system shall be installed to serve the proposed new on-site building. The automatic fire detection system shall predominantly consist of smoke detectors, thermal detectors installed throughout with manual break glass alarms installed in all paths of egress with all electrical installations configured as an addressable type system. A single addressable type sub-fire indicator panel shall be installed within the main entry to the building. A combined strobe/sounder light shall be fitted externally to the building in a prominent position to indicate the exact location of the sub-fire indicator panel to the local authorities upon arrival to the building. The sub-fire indicator panel shall be directly interfaced with the site's main site fire indicator panel. The automatic fire detection system shall be configured such that upon activation of a smoke detector, thermal detector or manual break glass alarm a signal shall be transmitted to the sub-fire indicator panel located within the building which in turn shall issue an alarm signal at the main site fire indicator panel to alert the local authorities of an on-site emergency. The automatic fire detection system shall also control the mechanical air handling plant in the event of a fire alarm such that all air handling plant shall shutdown upon the receipt of a fire alarm signal at the panel. The system shall be designed in accordance with AS1670.1—2004—Code for fire detection, warning, control and intercom systems—system design, installation and commissioning, AS1668—2005—Code for the use of ventilation and air conditioning in buildings and the Building Code of Australia.
Alert sirens shall be installed in corridors and specific areas where required (refer to the Sound system and intercom system for emergency purposes section) to ensure that the signal is audible to all building occupants during an emergency.

Building fit-out works
In the event of building fit-out works, the consultant team shall 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 building supervisor to temporarily replace any smoke detectors with thermal detectors.

When smoke detectors are isolated only, the project scope of works shall include the requirement to internally clean of all detectors within the refurbishment area and adjacent construction access areas which may have been affected by dust migration.

The fire detector block plans in the Fire Panel must be updated as required to show any changes to detector layouts, including temporary alterations, in order to keep block plans current at all times. All detectors within the site and adjacent areas shall be cleaned by the fire protection services subcontractor on completion of the works.

It is recommended that smoke detector replacement and reinstatement or cleaning be performed by the existing UniSA fire protection services maintenance contractor and that all associated costs shall be incorporated within the project scope of works.

Failure to comply with this requirement may result in a false alarm calling out the SAFS, fire protection services subcontractor or the UniSA fire protection services maintenance contractor, the cost of which will be invoiced direct to the contractor.

**Sound System and Intercom System for Emergency Purposes**

An Emergency Warning System and Emergency Intercom System shall be installed to serve the proposed new on-site building. The Control Panel is to be located adjacent to or as part of the Fire Indicator Panel. The system shall be interconnected to the FIP 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 Emergency Warning System shall predominantly 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 EWS will also have a Public Address facility located at the panel 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 shall also be adaptable to the EWS should they be required.

The Emergency Intercom System shall be incorporated as part of the EWS panel 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.

The system shall be designed in accordance with AS1670.4—2004—Code for fire detection, warning, control and intercom systems—system design, installation and
commissioning Part 4: Sound systems and intercom systems for emergency purposes. Sound systems must comply with Clause 4.3.4. of AS 1670.4. Sound levels must be >65dB in each room with doors closed. If necessary, a speaker is to be installed in each room to satisfy this need. Installation of speakers in corridors only may not be sufficient to satisfy this clause.

**Building fit-out works**

In the event of building fit-out works, the consultant team shall identify temporary changes to the EWS 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 EWS zone amplifier or should this be unavoidable replacement with a larger amplifier that is compatible with the CIE shall be sourced.

**Smoke Control**

A smoke control system shall be installed in accordance with Building Code of Australia and relative Australian Standards.
5.13 Building Management System Specification

5.13.1 Introduction

This specification identifies UniSA’s minimum requirements for the building management system (BMS) to ensure that it will be fully compatible with the existing Invensys Building Management System.

All new installations shall be provided with full BMS control. Alternative controls shall not be used. There shall be close collaboration and coordination between the Consultant Team and the Technical Reference Group to ensure compliance with these guidelines on a project specific basis.

Nominated BMS Contractor

All new works in relation to this Building Management System Specification must be carried out by UniSA’s Nominated BMS Contractor—Air Con Serve.

5.13.2 Building Management System

System Networks

The existing BMS comprises of numerous Invensys Universal Network Controllers (UNC) 500 Series which communicate over UniSA’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:

- an original Robert Shaw Digital Management System (DMS) together with integrated Microsmart control systems which communicate over various dedicated data trunks
- new Daikin BACnet control systems
- RS485 (Modbus) data trunks
- Ion controller networks.

These different types of control systems are located throughout the various UniSA campuses and each has their own individual sub-networks and communication protocols.

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.

Automatic Controls
UniSA’s buildings are monitored by a Niagara/Invensys centrally located server. Refer to Building Management System for clarification.

The automatic control system for each building shall be a stand alone system, interfaced with the Niagara server to allow remote monitoring and operation of 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 shall be controlled to automatically start up and stop to provide design conditions during normal working hours. Each air conditioner control system shall have the ability to set different working hours from other air conditioners. All air conditioning systems shall be interlocked with any outside air/extract systems as appropriate.

All air conditioners used for teaching spaces and selected air conditioners as nominated by the Technical Reference Group shall 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 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 controls to individual rooms are to provided via a Clipsal C2000 or SC2000 series switch plate which is made up of the following components:

- flush surround and two gang grid
- switch mechanism 250 V 10 A Bell press 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 shorted) in the field by building works between the BMS controller and the push button control
- flush surround to be engraved with “AIR CONDITIONING” above the switch mechanism.

All automatic controls shall fail safe with control and operation of all plant being independent of the normal control system for fire mode operation. All controls shall 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 readily accessible locations shall not be permitted.

Provide a double data point, connected to UniSA’s Building Services VLAN adjacent to each BMS Universal Network Controller (UNC)/BACnet Controller, Nexus server and
ELR. Coordinate with UniSA ISTS via the Contract Supervisor for allocation of static IP addresses.

**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 points 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 hand control to stop and start indoor units in conjunction with A/Hrs push button and time schedule. (i.e. If time schedule is commanded on, unit still requires a start from remote control prior to starting unless specifically requested).

Supply a new Invensys UNC 500 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 approved by the Technical Reference Group prior to installation.

### 5.13.3 Metering

**General**

To assist in the efficient operation, monitoring and management of services, meters shall be installed on all incoming site services and such services within all buildings. Use pulse meters for displaying gas and water data only. Pulse rates of connected meters are to be supplied in writing to BMS contractor.

**Responsibilities**

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 only.

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.

**Water Meters**

The new incoming water to supply a campus or site shall have a water meter supplied by SA Water and fitted with a pulsed output for input into the BMS and energy management programs. Each building and each floor within a building shall also have a supply
authority accuracy water meter interfacing with the BMS and energy management programs.
Water supplied to a cafeteria or cafe kitchen facility or other tenancy shall have a separately metered and monitored service. The meter shall interface with an energy management program.

**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 program. Each building and each floor within a building shall also have a supply authority accuracy gas meter interfacing with the BMS and energy management program.
Gas supplied to a cafeteria or cafe kitchen facility or other tenancy shall have a separately metered and monitored service. The meter shall interface with an energy management program.

**Electrical Meters**

The new incoming electricity to supply a campus or site shall have a electricity meter with a 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 a supply authority accuracy electricity meter interfacing with the BMS and energy management programs.
Power supplied to a cafeteria or cafe 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 interfaced with the Niagara server for data logging and load shedding purposes shall be provided in all switchboards, including:

- main building switchboard (MSB)
- floor/level main distribution boards (MDB)
- Transport Services switchboard (TSSB)
- Mechanical Services switchboard (MSSB).

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 RS 485 output may be used. If alternative brand existing meters are already connected to a specific UNC, the same type of meter may be installed to ensure data integrity of the Modbus data trunk.

### 5.13.4 Interactive Energy Management System

**Programming**
The energy management system as well as monitoring the campus and building energy usage 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. This demand limiting is to have set time limits, and preset set point offsets to ensure reasonable comfort levels are maintained.

Programming is to 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 Stop/Start 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.

Graphic Pages

Commence graphics with 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. 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.

Meter Graphic Pages

Meter graphic pages are to display:

all sub meters connected downstream
phase to phase voltage or phase to neutral voltage
amperage of each phase
tc 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 monthly 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).

**Mechanical Graphic Pages**

Mechanical graphic pages are to display:

- all temperature sensors connected
- status of all fans, pumps and compressors
- 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.

**Electrical Graphic Pages**

Electrical graphic pages are to display:

**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 are to display:

- show lighting areas served by each time schedule, colour code separately to limit confusion and label accordingly.
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.

System Network

Each DMS panel is connected via a local DMS sub-LAN to its own individual controllers. A maximum of 64 controllers can be connected to a DMS panel.

Each campus has a series of DMS Panels connected to each other via a second sub-LAN:

Underdale (FLC)—1 off DMS
Magill—3 off DMS and 3 off UNC
Mawson Lakes—7 off DMS and 6 off UNC
Whyalla—1 off DMS and 1 off UNC
City West—1 off DMS and 1 off UNC
City East

City East (Reid).

All DMS Panels located at Underdale, Magill, City West, Mawson Lakes and Whyalla have a separate BMS network, which is routed through hubs located on each campus. These hubs then interconnect the campuses via individual ISDN modems and lines to Mawson Lakes Power House as detailed:

ISDN modem and line from Underdale (FLC) to Mawson Lakes
ISDN modem and line from Magill to Mawson Lakes
ISDN modem and line from Whyalla to Mawson Lakes
ISDN modem and line from City West to Mawson Lakes.

Due to the age of DMS controller panels at City East, this campus has not been connected to the DMS network interlinking all the other campuses.

A new interactive energy management system (IEMS) has recently been installed. This new system 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. UniSA has utilised a sub-net with a separate IP range from their existing ISTS computer WAN for this data transfer to occur. The UNC’s are the 500 series which are self booting EPROM type based on the Windows NT/XP platform. There are no hard disks, or graphical user interface in these 500 series
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 supervising 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 UniSA’s Exchange email system.

Work Place Pro Software

As previously mentioned, the UNC’s do not have any graphical user interface (GUI) onboard. 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. This software has three main functions in one package.

- it is a tool for generating graphic pages
- it is a programming tool for UNC’s
- it also acts as an interface to Internet Explorer.

This means, graphic pages can be created, points from UniSA’s existing DMS systems, Lon controllers, BACnet systems, and Modbus protocol devices can all be linked together, and then viewed from any UniSA web browser connected to UniSA’s intranet.

Web browser access is password protected.

Additional logic may be programmed in whilst linking points, allowing for

- specific control to suit individual equipment requirements
- time schedules can be created, and afterwards, manipulated via the web browsing feature
- equipment can be stopped and started, set points adjusted etc. all via the web browsing function.

Logging Function

Each UNC has the capability of logging data from any of the connected points. These logs are text based only and stored in an internal buffer within the UNC. At nominated frequencies, the data is then transferred to the workstation, where it is permanently archived in an SQL data base.

Once archived, specifically tailored graphs of the data can be created and viewed via the web browsing function.

Data can be captured and exported to Excel spread sheets as required. These spread sheets can be created so as to update with the most recent data automatically each time they are opened.

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.
The data logged assists in pin-pointing where and when high electrical demands occur. Where ever possible, loads have been re-scheduled/or limited in an effort to reduce the peak consumption level. Where possible the metering has been kept site specific.

Mawson Lakes have Schneider meters installed
City East, Whyalla, and City West have EDMI meters installed
Magill have EDMI and Circutor meters installed.
The Schneider and Circutor meters installed operate in tandem with the revenue meters at Magill and at Mawson Lakes.
All the meters Operations in tandem with revenue meters are reset at pre-defined times in accordance with Maximum Demand tariff conditions.
The energy provider reset their meters as they are read each month. Unfortunately the reading times vary and this creates discrepancies between our data logged and the actual energy consumption UniSA is billed for. The readings however are usually within 1%.

**Meter Types**

**EDMI**
There are two types of EDMI meters installed – dual output and single output meters. The dual output meters were installed by ETSA Utilities. These meters are the actual revenue meters and send data to the energy supplier and to the IEMS system. These meters are only monitored by the IEMS system. The monthly resetting is carried out by the energy provider. Consumption and demand data logged from these meters should match the data on the electrical invoices.
The single output meters only send data to the IEMS system.

**Schneider meters**
There are two different models of Schneider meters installed, PM500 and PM650 meters. These are all single output meters and only send data to the IEMS system.

**Circutor meters**
These meters are also single output meters and only send data to the IEMS system.

**Electronic Demand Limiting**
As previously mentioned, the IEMS system monitors Instantaneous demand. This data is fed back into the DMS system, where pre-defined maximum demand limits and periods are programmed in.
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 setpoint on Mawson Lakes Chillers limits power consumption by locking out second stage compressors at City West, to reduce the connected electrical load. This demand limiting has set time limits, and preset set point offsets to ensure reasonable comfort levels are maintained. Future projects also include limiting of lift carriages in dual lift buildings as a back up

5.14 Telecommunication infrastructure specification

This document does not replace the requirements of the Australian Communications & Media Authority (ACMA). Where this document conflicts with any aspect of mandatory requirements of the ACMA, the ACMA requirements take precedence.

5.14.1 General

Scope

This document is a generic description of the minimum standards and guidelines for all University of South Australia (UniSA) Telecommunication Infrastructure projects. The standard is not project specific, but is provided by UniSA to inform consultants and installers as to the minimum requirements for design, installation, documentation, and quality control as required by UniSA Information Strategy & Technology Services (ISTS). ISTS is responsible for telecommunications infrastructure projects and maintenance within UniSA. ISTS reserves the right to carry out (or to appoint a third party organisation to carry out) random quality inspections before, during and/or after installation of any telecommunication infrastructure for UniSA. The cost of these inspections will be borne by ISTS.

This document is ‘Commercial in Confidence’ and remains the property of UniSA. It shall not be modified, reproduced or distributed by third parties for any purpose or project external to UniSA.

UniSA reserves the right to provide updated versions of this document on a project by project basis. Modification, reproduction or distribution of this document may be undertaken by third parties that are required to include this information or parts thereof within project specifications written for UniSA.

Background

This standard represents UniSA’s standard voice and data requirements. It is a generic document, capturing broad voice and data installation requirements. Project and location
specific requirements shall be confirmed with the UniSA Project Manager and the Technical Reference Group.

**Applicable Standards**

The design and installation shall as a minimum comply with the most current version of the applicable Australian Standards, including the following Standards:

- AS/CA S008 – Requirements for Authorised Cabling Products.
- AS/NZS 3000 – Electrical installations.
- AS/NZS IEC 61935.2 – Testing of balanced communication cabling in accordance with ISO/IEC 11801 Part 2: Patch cords and work area cords.
- AS/NZS 2967 - Optical fibre communication cabling systems safety.

The hierarchy of requirements in relation to regulations and standards are as follows:

- Mandatory regulations.
- OH&S Safety Standards.
- Project specifications.
- Telecommunications Infrastructure Standard.
- Nominated Australian Standards for performance and design.

### 5.14.2 Global Requirements

**Warranty & Certification Requirements**

All new cabling installations shall be covered by a Manufacturer certification and warranty program that includes parts and labour within the agreement.

**Acceptance Requirements**

**Documentation**

No project shall be deemed complete until such time as all project documentation, e.g. as-built drawings and test reports, has been received and accepted by ISTS. As-built
documentation is fundamental to ISTS’s ongoing role of administering and maintaining the UniSA telecommunications infrastructure.

As-built documentation shall include the following:

- Plans showing the location of all distributors, backbone pathways, backbone cables, telecommunication outlets and associated identifiers.
- Signed ACMA TCA1 form for the associated work.
- Vendor warranty documents.
- All fibre and unshielded twisted pair (UTP) test results including backbone and outlet cabling.
- A ‘Statement of Compliance’ from an ISTS-approved NATA inspection body for all associated test results for:
  - All projects over 200 outlets.
  - All large projects (consult with ISTS for definition of “large”) containing optical fibre cabling.

Note: ISTS approved NATA inspection body is VTI Services Pty Ltd.

VTI Services Pty Ltd contact details:
Murray Teale
Telephone: 02 9824 2412
E-mail: mteale@vti.net.au

5.14.3 General Requirements

Clean and safe work practices are required within all UniSA facilities at all times.

Cable Reticulation Inspection & Report

Telecommunications consultants shall perform cable reticulation inspections at regular intervals throughout a project and provide a report to the UniSA Project Manager. The inspection shall be against mandatory standards, requirements specified within this document, industry-recognised installation practices and specified project requirements.

Pathways and Spaces

All concealed communication cabling reticulation through ceiling spaces shall be supported by a purpose-built pathway. All designs shall provide a contiguous and independent support route between the telecommunications systems, distributors and telecommunication outlets through all internal and external building spaces.

All exposed (surface) cabling shall be supported and enclosed in duct or conduit for all of the exposed route length. Where communication cabling is installed in a public area it shall be protected from accidental or malicious damage.
Labelling Convention

Labelling of the communication cabling system shall strictly adhere to UniSA requirements.

Patch & Fly Leads

LAN patch and fly leads shall match or exceed the performance level of the cable systems installed.

LAN patch and fly leads shall be, as a minimum, blue Category 6 RJ45 to RJ45 patch leads. Voice patch shall be constructed using yellow Category 5 RJ45 to RJ45 patch leads. VOIP telephone leads shall be yellow Category 5 RJ45 to RJ45 patch leads. Telephone fly leads shall be RJ45 to RJ11 patch leads. RJ45 to RJ11 cords shall be used for all telephone equipment incorporating RJ11 connections.

Note 1: RJ11 telephone leads inserted into RJ45 telecommunication outlets affect some vendor warranties.

Note 2: RJ11 are sometimes incorrectly identified as RJ12.

All Category 6A patch cords and fly leads used shall meet or exceed the requirements of Category 6A when tested in accordance with IEC 61935.2.

All Category 6 patch cords and fly leads used shall meet or exceed the requirements of Category 6 when tested in accordance with AS/NZS IEC 61935.2. All Category 5 patch cords and fly leads used shall meet or exceed the requirements of Category 5 when tested in accordance to AS/NZS IEC 61935.2.

Testing

All new cabling installations shall be 100% tested to the minimum requirements of this standard.

All fibre optic cabling shall pass the compliance/conformance requirements specified for permanent links within AS/NZS 3080 Annex B utilising AS/NZS ISO/IEC 14763-3 test and reporting methodologies.

Unless stipulated within the project specifications, ORL testing does not form part of UniSA requirements.

Where ORL is required, OTDR testing shall be carried out utilising a launch and a tail cable and the ORL shall be determined by the assessment of OTDR traces. ORL Pass/Fail requirements will be assessed against "components only" values specified within AS/NZS 3080.

All terminated fibre optic cores shall be tested in two directions and at two appropriate wavelengths.

All fibre cables that are longer than 100 metres or run underground shall additionally be tested with an OTDR in one direction and at two wavelengths. OTDR test configuration
shall include a launch and a tail cable of sufficient length to enable the loss of the first and last connector to be determined.

All 4-pair UTP cabling shall pass the compliance/conformance requirements specified for permanent links within AS/NZS 3080 Annex B utilising an AS/NZAS 61935-1 tester with a compliance level equal to or exceeding that specified for the desired performance level.

For Class Ea installations or above, alien crosstalk shall be tested as specified sample sizes specified with the UniSA project specification or defined in Annex B of AS/NZS 3080 unless one of the following conditions is met:

1. A Statement of Conformity in writing from the cabling vendor that alien crosstalk to AS/NZS 3080 requirements are met by design. The Statement of Conformity must clearly state any conditions that are applicable and should, as a minimum, stipulate minimum and maximum cable runs.
2. The alien crosstalk requirements do not form part of reference or installation requirements of AS/NZS 3080 Annex B.
3. Alien crosstalk is specifically stated as not being required within the UniSA specification.

5.14.4 Design Requirements

General Requirements

All project specifications that are drafted by internal or external telecommunications consultants for UniSA shall evoke the latest:

- Applicable Mandatory Standards.
- Requirements specified within this document or its replacement.
- Applicable Standards specified in Section 1.4.

Design Consideration

Design shall reflect the consideration of the following issues:

- Type, nature and proposed usage of the buildings.
- Geographical location of the project and buildings.
- Physical size of the project and buildings.
- Length of lease/rental agreement for 3rd party owned buildings.
- Number of users.
- Future expansion plans.
- Existing telecommunication infrastructure.
- Current and future telecommunication and LAN systems that will utilise the structured cabling system (SCS).
- Placement of data points for the provision of Wireless Access Units
- Hazardous situations that could affect safety and performance.
- Environmental issues that may need special consideration.
- Access to the building for the installation team.
- Security of telecommunication systems.
\begin{itemize}
\item Redundancy of the SCS.
\item Mission critical nature of the information being carried.
\item Potential problems associated with electromagnetic interference (EMI) and electromagnetic compatibility (EMC), i.e. located near power substations, radar facilities, etc.
\item Ongoing support of the installation.
\item Access and keying that is consistent with all other ISTS campus communications areas.
\end{itemize}

Where potential EMI/EMC issues have been identified, consideration shall be given to:

\begin{itemize}
\item Use of fibre optic cabling.
\item Use of shielded cabling.
\item Use of earthed metal duct or conduit.
\item Providing greater distances between telecommunication cabling and the EMI/EMC source.
\end{itemize}

\section{ISTS Design Requirements}

\subsection{UTP Cabling}

All 4-pair UTP, data and voice communication cabling and connectivity products shall be a minimum of Category 6 and the associated permanent links shall meet the requirements of a Class E permanent link as specified in AS/NZS 3080. The installed permanent link shall meet or exceed the requirements of a Class E permanent link as defined by AS/NZS 3080 when tested with a Level III tester or greater as defined by AS/NZS IEC 61935.1.

All UTP cables shall be wired in a T568A wiring sequence. All 4-pair UTP backbone cables shall be terminated on a separate patch panel from horizontal UTP patch cables. Termination of tele-communication outlet cabling at a distributor shall be on eight pin modular outlet patch panels.

Horizontal wiring to telecommunication outlets shall be:

\begin{itemize}
\item Category 6, 100 ohm UTP.
\item Cable approved by the system vendor and consistent throughout the entire installation.
\item Installed by an SCS contractor utilising a vendor(s) that has a designed and matched Class E solution for the complete channel, including the outlet, patch panel and horizontal cable plus LAN patch and fly leads.
\end{itemize}

All telecommunication outlet locations shall be serviced by a double telecommunication outlet unless agreed to by ISTS. All telecommunication outlets shall be installed utilising white unshuttered face plates. The face plates shall match the manufacturer of the existing power outlets.

The Contractor shall not disconnect legacy active communication cabling without authorisation from the UniSA Project Manager or ISTS. All redundant/replaced cabling and associated products shall be removed as part of any project.
5.14.6 Fibre Cabling

All new fibre optic (FO) backbone cables shall be OS2 single mode fibre with optical attenuation of less than 0.4 dB per Kilometre unless otherwise specified. Multimode FO backbone cables that have a proposed route length of 300 metres or less shall be of 50/125 um OM4 Multimode type cable.

FO cores shall be terminated using SC connectors. All single mode terminations shall be terminated by fusion splicing. Multi-mode terminations shall also be by means of fusion splicing. SC and ST connectors shall be of a type that utilises ceramic ferules. SC connectors shall be used on all new sites and major refurbishments. ST connectors may be used when adding to existing (legacy) fibre plant. Adapters used for all Single Mode installations shall be blue in colour.

LC connectors shall be used in UniSA Data Centre’s for OM4 and OS2; use outside the Data Centres will require ISTS approval. When LC connectors are used in UniSA Data Centre’s, the point to point channel shall be in a cross over configuration “TX to RX and RX to TX”. All LC patch leads for Data Centres shall also be cross over cables.

If LC connectors are approved by ISTS for use outside of Data Centre’s, consultation in relation to the use of a crossover or a straight through configuration will be required.

Fibre patch panels shall be telescopic 24 port patch panel units with integral cable support and fibre core management.

Loose tube fibre cables shall be terminated with a break-out kit approved by the manufacturer. All fibre cores shall be encased in a protective tube for the complete length from the break-out kit into the fibre connector.

All fibre cores unless specified shall be terminated at each end and presented within fibre optic enclosures on fibre optic couplers.

Voice & Low Speed Backbone Cabling

UniSA utilises indoor and outdoor voice grade, multi-pair cables within its campuses. Pair termination sequencing shall be compliant with an Australian Standard colour coding recommendation for terminating multi-pair cables.

New installations must be designed to terminate voice services from existing campus distributor (main distribution frames), building distributor (intermediate distribution frames) and test point frames into the new communication cabinets to allow all telecommunication outlets to have access to voice services.

Voice and low speed data backbone cables shall be terminated on a 24 port, Category 5 patch panel at a distributor, or purpose made 50 point voice RJ45 patch panels, one pair shall be terminated per RJ45 port (Pins 4 and 5).

Voice and low speed data backbone cables terminating on traditional voice distributors shall be terminated on Krone LSA, 10 pair disconnect modules or equivalent. In accordance with mandatory standards, cable records for this frame shall be updated and maintained for the cabling work undertaken. If no record book is available, the Contractor shall provide one detailing their work.
Clarification should be sought from ISTS in relation to any Voice Cabling previously installed beyond late 2009. Future requirements for voice cabling may be reduced due to the low demand for analogue phones in public areas, e.g. security phones and lift phones.

**Alternative Structured Cabling Systems**

ISTS may consider higher performing Structured Cabling Systems on a project by project basis. ISTS assessment will be based on a cost benefit analysis and will address criteria such as value for money, performance, standards compliance, operational impact, compatibility with existing infrastructure and need.

To be considered by ISTS the structured cabling system must utilise components and cables that meet or exceed published Australian Standards, plus:

- Have Link and Channel performance that meets or exceeds published Australian Standards.
- Be capable of being tested against a published Australian Standard. This would include specific Australian Standards for the test equipment.

ISTS will not consider any cabling system that is not supported by published standards. Where no published testing/tester standard is available, draft standards do not meet this requirement.

**Wireless Coverage**

The adoption of new standards and a greater dependence on the provision of wireless services necessitates full consideration in relation to wireless placement, density, type and location in new and refurbished areas.

Currently there are three types of supported units, a ceiling mount, a wall mount and a large industrial unit for outside use, the ceiling mount is the most common. Placement, type and density will require input from ISTS during the design stage. The data requirements for each wireless access point will be a standard double data, there will be no requirement for power (GPO) unless specifically specified by ISTS.

**5.14.7 Pathways & Spaces**

Cable trays, baskets, conduits and/or ducts shall be dedicated to the purpose of SCS cabling and not be shared with any hazardous services. All pathways and spaces shall be designed to allow for a minimum of 30% expansion. All cables installed underground shall be ACMA approved for underground use.

Speaker cabling is deemed to be a hazardous service.

**5.14.8 Telecommunications Closets**

Telecommunications closets (including telecommunications rooms) housing active and passive telecommunications equipment shall meet the following minimum requirements.
General
All telecommunications closets shall be located centrally to the area they are to serve. They shall be entered via a public thoroughfare and not be restricted by access through an occupied area. There shall be adequate telecommunications closets so that no cabling feeding a workstation exceeds 90 metres in length.

Adequate space and clearances shall be allowed for in the CD/BD communications room for ISDN and other carrier or carriage service provider services requiring access to interface hardware.

There may need to be a wall area/space allocated for Cardax controllers. These will have a Socket Outlet (GPO) and double data point requirement.

Telecommunications Closets Spatial Requirements
The preferred length to width ratio for telecommunications closets is 3 to 4. All telecommunications closets shall allow for 100% expansion. See Communications Rack specifications. Closets must have sufficient floor and door space for access and would generally accommodate two racks. Scaling the space allocated should only be done in consultation with ISTS Network Services personnel.

Heat Dispersion
Telecommunications closets shall have adequate ventilation to allow for the dispersion of heat from equipment that is likely to be housed within it for the life of the installation. To comply with this clause, the temperature of the room shall not exceed 28 degrees Celsius under any circumstances.

Where ventilation alone will not disperse adequate heat, one or more of the following shall be provided:

- Fans and filters installed in-room to improve airflow. The fans shall be such as to provide positive pressure within the telecommunications room.
- Connection to existing air conditioning to be installed.
- Dedicated air-conditioning unit supplied and installed.
- Communications rack fitted with stand alone air conditioning unit.

We suggest ventilation and cooling requirements be discussed with the engineering section of the UniSA's Facilities Management Unit as there are some concerns in relation to energy efficiency across such a large number of University Communications rooms.

Clearance
Telecommunications closets shall be laid out in such a way to allow the installation, maintenance and removal of all active and passive equipment during the life of the installation, and additionally shall have adequate clearances as detailed below.

- All communications/data racks shall have a minimum of 800mm clearance front and back.
- All communications/data racks and active equipment shall have adequate clearance so all doors are capable of opening past 90 degrees.
All wall frames shall have a minimum of 800mm clearance in front of modules.

Security
Telecommunications closets shall have locks fitted on all access doors, and additionally all other doors or Cardax control, shall have top and bottom vertical bolts connecting to the doorframe or the floor. Locks shall be keyed into the same ISTS grouping for the campus.

Contaminants and Static Control
Telecommunications closet walls, ceiling and floors shall be sealed to control air contaminants. Unless specified, all floors shall have anti-static linoleum fitted. Telecommunications closets shall not be open to ceilings or other voids.

Power and Lighting
All communications cabinets housing or intending to house active equipment shall have a dedicated 240v circuit with a 15 amp captive outlet along with a double Socket Outlet. There shall additionally be three double Socket Outlets for every 5m² or part thereof, equally spaced around the telecommunications closets for test and other equipment.

Each telecommunications closet shall have adequate lightning to enable work to be carried out on any passive or active equipment in the closest. The lighting for the telecommunication room or closet shall be controlled by a separate switch.

Labelling
The door of each telecommunication closest shall be labelled with the words “Telecommunications” and additionally contain the Block, Level and Distributor Number.

5.14.9 Communication Cabinets
All cables shall access the cabinet through the cabinet plinth or roof via a suitable sized PVC duct or cable tray/ladder. If a cable tray/ladder is used then the exposed component of the communication cabling shall be enclosed within a steel (top hat) section.

Where additional racks are installed in an existing distributor or telecommunication closet, racks shall be of the same type to effectively facilitate baying of cabinets. There shall be sufficient access around the cabinet to open the front and rear doors, and remove one of the side covers without impedance.

Communication cabinets shall have, as a minimum, the following configuration:

- Keyed metal ventilated front door.
- Keyed metal rear door, ventilated if used.
- Vertical cable management – front only.
**ISTS Preferred Standard Rack Configuration**

This information can form the basis for a 1 or 2 rack configuration with or without doors. Panduit Net Access switching & patch cabinets are required.

<table>
<thead>
<tr>
<th>CN1CN</th>
<th>Network Cabinet <strong>With Doors and Side Panels</strong>, 45 RU, Cage Nut Rails</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN2CN</td>
<td>Network Cabinet <strong>With Doors</strong>, 45 RU, Cage Nut Rails</td>
</tr>
<tr>
<td>CN3CN</td>
<td>Network Cabinet <strong>Frame Only</strong>, 45 RU, Cage Nut Rails</td>
</tr>
</tbody>
</table>

If you elect to purchase doors and sides separately, the part numbers are:

<table>
<thead>
<tr>
<th>CNDDE</th>
<th>Dual Hinge Door, Enhanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNDS</td>
<td>Cabinet Split Door Perforated</td>
</tr>
<tr>
<td>CNPS</td>
<td>Cabinet Side Panel Solid</td>
</tr>
</tbody>
</table>

If you require a vertical power strip you will need a mounting bracket kit.

<table>
<thead>
<tr>
<th>CVPDUB</th>
<th>Cabinet PDU Bracket Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPSV2016C13NCN</td>
<td>Vertical power strip, 20 x IEC C13</td>
</tr>
</tbody>
</table>

The following is an example of a rack configuration without doors; this should be used in a secure location.

- **2 x PANCNPS** 6130783478 NET-ACCESS CAB.SIDE PANELS (for one or two joined racks)
- **1 or multiple PANCN3CN-BU** 6131164787 CABINET 32”W x 41”D x 84”H OPEN FRAME

**ISTS Preferred Communication Rack Layout**

ISTS standard single rack layout is as follows, from highest cabling position to lowest:

- Fibre optic cabling.
- Expansion allowance for fibre optic cabling.
- Active equipment.
- Expansion allowance for active equipment.
- Telecommunication outlets – data. A*1 to A*128 or above.
- Expansion allowance for telecommunication outlets – data.
- Telecommunication outlets – data. B*1 to B*128 or above.
- Voice patch panels.
- Expansion allowance for voice services and patch cord minders.
5.14.10 Patch Cord Management

Minimal horizontal patch cord management is required. ISTS preferred patching method is for patching from active devices and passive panels to be evenly done across the face of the devices and to side cable management with fingers. Velcro can be used to help bundle patch leads. See example below.

Example using Panduit Rack
5.14.11 Preferred Manufacturer Solutions

All ISTS structured communication systems shall be on the ISTS Preferred Manufacturers/Suppliers List. The addition or removal of contracting organisations from the ISTS Preferred Manufacturers/Suppliers List is at the sole discretion of ISTS.

Standardisation in relation to manufacturer solutions is important to the University, but we also understand that some products may better suit a particular environment or application. All the products in the list below are acceptable, but are in order of preference.

ISTS Preferred Manufacturers List is as follows:

1. Krone
2. Panduit
3. Molex
4. AMP
5. Clipsal

On existing floor and associated distributors, the same manufacturer’s products shall be used if the manufacturer appears on the ISTS Preferred Manufacturers/Suppliers List. Warranties shall be a minimum of 15 years.

It is the responsibility of the preferred manufacturers/suppliers to carry out adequate inspections during the installation to ensure the certification and warranties can be issued at the end of the installation.

5.14.12 Contractor Requirements

General

The Contractor shall ensure that their onsite staff and subcontractors are fully conversant with the current version of relevant documents including mandatory, ISTS and performance standards, as well as this document and associated project specifications. Contractors shall ensure that their onsite staff and subcontractors are familiar with the UniSA OHS&IM Policies (available from the UniSA website) and the UniSA Preliminaries document (available from UniSA Property or ISTS).

No variations will be entered into for not having a full understanding of requirements of this document, mandatory standards, performance standards, and project specification.

The Contractor shall carry out installation, testing and commissioning and obtain an approved vendor warranty for any installation undertaken, and shall be directly responsible for any faults and other identified issues during the defects liability period of any project or installation work.

All installation works shall be directly supervised at all times by personnel holding a current ACMA Open Cabler registration. A current ACMA Open Cabler registration shall be held by 50% of personnel carrying out cable reticulations. All personnel terminating cables shall hold a current ACMA Open Cabler registration.

ISTS reserves the right to check without notice the registration documentation of Contractor’s staff and subcontractors on site.

5.14.13 ISTS Preferred Contractors List

Only Contractors that appear on the ISTS Preferred Contractors List shall undertake work on UniSA sites. Contractors not appearing on the ISTS Preferred Contractors List may contact ISTS to request inclusion on an individual project basis. The addition or removal of Contractors from the ISTS Preferred Contractors List is at the sole discretion of ISTS.
**5.14.14 Preferred Contractors Pre-requisite**

In consideration of existing and new installation contractors for the ISTS Preferred Contractors List, the contractors will be assessed in part on experience, demonstrable systems including OHS&IM, number of ACMA approved cablers, vendor-trained staff and previous performance. It is regarded as an essential criterion that preferred contractors are specialist communications cabling contractors.

The following table gives installation contractors some indication of required minimum attributes of ISTS communications cabling contractors:

<table>
<thead>
<tr>
<th>ATTRIBUTES</th>
<th>ACHIEVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proven track record of communications cabling installation.</td>
<td></td>
</tr>
<tr>
<td>Demonstrated understanding of ISTS requirements contained within this document.</td>
<td></td>
</tr>
<tr>
<td>Have appropriate UTP test equipment.</td>
<td></td>
</tr>
<tr>
<td>Have appropriate fibre test equipment if fibre work is to be undertaken.</td>
<td></td>
</tr>
<tr>
<td>Shall be suitably trained as Vendor partners and able to perform works to obtain desired ISTS warranty requirements for the sites.</td>
<td></td>
</tr>
<tr>
<td>Shall have demonstrated an effective and documented OH&amp;S policy.</td>
<td></td>
</tr>
<tr>
<td>Shall have at least $10 million public liability insurance.</td>
<td></td>
</tr>
<tr>
<td>Have adequate trained staff and project managers to carry out the work.</td>
<td></td>
</tr>
<tr>
<td>Shall have adequate on-site ACMA licensed or registered staff.</td>
<td></td>
</tr>
</tbody>
</table>

**5.14.15 Installation Requirements**

**General**

The Contractor shall visit site prior to pricing to become familiar with the access, site conditions, and the existing installations. Ignorance of the existing conditions or installation will not be accepted as justification for claims for variations.
The location of equipment shown on the drawings is indicative only, except where dimensions determining locations are shown. Dimensions shall be checked on site. No claims for variations will be allowed for errors due to scaling of drawings.

The Contractor shall determine the final location on site, coordinating this location with all other services located in the area and having regard to any other restrictions on locations. All equipment installed shall be neatly and accurately aligned. Mounting heights of telecommunication outlets shall match adjacent power outlets unless advised otherwise. All products supplied and installed by the Contractor shall be new and undamaged.

5.14.16 Pathways & Spaces

All above ground pathways are to be installed at a suitable height and location to prevent accidental or malicious damage and unwanted access. All pathways and spaces shall be built to last for the proposed useful life of the building.

Existing pathways and spaces may be used as long as the installed components satisfy the minimum requirements of this standard and they have enough spare capacity to accommodate all new and proposed SCS.

Special consideration shall be given to segregation and separation from hazardous services when designing pathways and spaces, and to EMC/EMI for pathways and spaces that are in close proximity and/or parallel to electrical equipment and/or cabling with low and high voltages (be aware that “high voltage” applies to 1000V and above) for extended lengths.

Telecommunication outlet cabling shall be star wired from the designated communications room. No 4-pair UTP cable shall exceed 90 metres nor be less than 15 metres in length.

Cable/tray baskets shall be considered for major cabling routes from which catenary systems can branch from. Ceiling hangers shall not be used for fastening SCS. SCS shall not be fastened to the surfaces of other services such as pipes or air-conditioning struts. At no point shall the cabling rest on the topside of the false ceiling or light fittings or any other services.

5.14.17 Ceiling Spaces

Consideration shall be given when designing and installing pathways and spaces through ceiling spaces to the following:

- Pathways shall be as unobtrusive as possible.
- All cabling shall be reticulated and hidden from view in ceiling spaces where possible.
- Plaster or solid ceiling space may only be utilised where the ceiling space has sufficient space for installers to safely enter, reticulate and fasten cabling with adequate provision of maintenance access hatches or removable roof tiles.
- SCS cabling may be fastened to major building structures within a ceiling space as long as it cannot be damaged by installers moving through spaces and upon structures in the future.
- Ceiling spaces that have no current or future access for cabling once built shall not be used unless conduits and draw through boxes with draw wires are installed to access the SCS cabling and conduit system.
- SCS cabling may be fastened to major building structures within a ceiling space as long as the additional weight of cabling does not exceed the load bearing capacity of the building structure.
- SCS cabling shall not be laid directly on top of ceiling surface.
- Temperature within ceiling space does not exceed recommended maximum operating temperature of SCS cabling.
- Where the temperature within the ceiling space is likely to exceed 40°C, the maximum length of the cable run should not exceed that stipulated within AS/NZS 3080.

5.14.18 Wall Cavities

Consideration shall be given when designing and installing pathways and spaces through wall cavities to the following:

- Pathways shall be as unobtrusive as possible.
- All cabling shall be reticulated and hidden from view in wall cavities where possible.
- All cabling that is installed in external wall cavities shall be installed in conduit.
- All cabling that is installed in internal wall cavities shall be installed in conduit where it shall run close to electrical cables.
- Conduits used to drop cables in wall cavities shall be fastened before the point of entry into the wall.
- Cable entry into a wall cavity shall be directly above or below the physical location of the telecommunication outlet.
- Cable entry holes into the wall cavity shall be of an appropriate size to allow for the minimum bending radius of the cable and for additional cables.

5.14.19 Risers

Consideration shall be given when designing and installing pathways and spaces through risers in buildings to the following:

- Risers shall be established where SCS cables traverse from one building level to adjacent levels.
- Risers shall be secured from unauthorised entry and accessed only by using a tool or key.
- If a riser is established in a trafficable area it shall be fully enclosed from floor to ceiling.
- Risers shall not share the same space with hazardous services.
▪ Risers shall be appropriately sized for expansion of the SCS.
▪ Risers shall be appropriately sized for installers to easily carry out additions, moves and changes to the SCS.
▪ Risers shall have cable trays/baskets installed from the top to the bottom of the vertical plane of the wall to facilitate SCS cable reticulation and fastening.
▪ Risers shall have appropriately sized penetrations through the floor and ceiling where cables are required to traverse between levels.
▪ Firestopping within the riser shall be restored where any penetration has occurred.

5.14.20 Workstation Furniture

Consideration shall be given when designing and installing pathways and spaces through workstation furniture to the following:

▪ Enough space shall be allowed within workstation furniture for cable reticulation and to terminate telecommunications outlets in compliance with the minimum bending radius of the cable.
▪ Where the workstation furniture has no purpose-built pathway, then two compartment PVC or metallic ducts shall be installed to the surface.
▪ Separation from communication cabling from electrical and other hazardous services shall be maintained at all times.

5.14.21 Service Poles

Consideration shall be given when designing and installing pathways and spaces through service poles to the following:

▪ Service poles shall be purpose built for the reticulation and termination of SCS cabling.
▪ Service poles shall be attached to and perpendicular to the floor.
▪ Cables entering and exiting service poles shall meet minimum segregation requirements.

5.14.22 Catenary Systems

Catenary systems shall be used to support all cables contained in ceiling spaces not supported by trays, baskets, conduits, ducts or ISTS approved fixings. Catenary support systems shall:

▪ Utilise turnbuckles and steel eyelets and shall be used to tighten the catenaries.
▪ Not support more than 2 x 24 or 4 x 12 4-pairUTP cable bundles.
▪ Be constructed of steel wire rope.
Be suitably anchored at both ends by means of fastening hardware to permanent building structures that has the capability of bearing the proposed weight of the SCS cabling.

Be anchored at a maximum of 5.0 metre spans along its route length at regular intervals by means of fixing hardware to permanent building structures that has the capability of bearing the proposed weight of the SCS cabling.

Catenary systems shall not be used to reticulate SCS vertically.

5.14.23 Cable Trays & Baskets

Cable trays and baskets shall be used in the following situations:

- Reticulation and support of cables in riser locations.
- Reticulation and support of major/common pathways of large amounts of horizontal cabling.

Cable trays and baskets should be used to create SCS pathways in the following situations:

- New or renovated building projects where a large number of cables are specified or proposed in the future.
- Reticulation and support of cables in TC and distributor locations.
- Reticulation and support of backbone cables.

Consideration should be given when designing and installing cable tray and basket reticulation systems to the following:

- Cable trays/baskets should not be installed where their positioning will be unduly detrimental to UniSA’s normal operations.
- Cable trays/baskets should be designed to accommodate expansion of the SCS.
- Cable trays/baskets should be designed to bear the weight of the proposed SCS, as defined by the manufacturer.

When installing cable tray and basket systems, they shall meet the following:

- Manufacturer’s recommendations for support and fastening.
- Be supported at intervals defined by the manufacturer’s recommendations.
- Be fixed to solid and permanent building structures that have the capability to bear the combined weight of the proposed SCS cabling and cable tray/basket systems.
- Utilise cable tray/basket manufacturer bends, tees, crossovers and reducers or by means approved by the manufacturer.
- Supporting backbone and or fibre cables shall have visible, legible and durable SCS identification labels fastened at intervals not exceeding 10 metres along the route length. The label shall contain wording that reflects the service run on the cable tray or basket.
Where installed adjacent to or on the surface of a wall or floor, there shall be a minimum distance between the surfaces to allow for fastening of the SCS cables to the cable tray/basket.

Be installed so that there is enough vertical clearance from the highest point of the cable tray/basket surface to allow easy access for installers to reticulate and work upon the SCS cabling.

Contain no fastening hardware or other sharp objects protruding through the SCS cable bearing surface of the cable tray/basket.

Be adequately bushed to protect cables at entry or exit from trays.

5.14.24 Conduits & Ducts

Conduits and ducts shall be used in the following situations:

- To provide adequate mechanical protection to SCS cabling from the external environment of buildings such as ultra-violet light (Sun), temperature, moisture, accidental and malicious damage.
- In the ceiling space of a building where there is limited access to install and maintain the SCS.
- In a visible location within a building, on the surface of walls where there is no access through wall cavity.
- In a visible location within a building where the number of SCS cables does not warrant the expense of cable trays/baskets.

Conduit and duct systems shall:

- If metallic, be connected to the protective earth system of the building.
- Have a draw cord left in the conduit if possible.
- Maintain mechanical continuity through all joints and bends of conduits/ducts.
- Not be the same colour or labelled as that used by a hazardous service.
- Be manufactured and installed to comply with the physical and colour requirements referred to in Mandatory Standards.

Consideration shall be given when designing and installing pathways and spaces using conduits and ducts to the following:

- Conduits/ducts should be sized to allow for expansion of the SCS.
- All sharp edges shall be removed from the internal and external surfaces of conduits/ducts.
- On extended route lengths, conduits/ducts should have pits or draw through boxes installed at regular intervals to comply with maximum cable pulling tensions during the reticulation of cables.
- Have conduits/ducts draw through boxes and shall be appropriately sized to allow for the minimum bending radius of the cables.
- If installed externally or underground, conduits/ducts shall be continuous and waterproof with all joints glued to retard the ingress of moisture.
- Conduits/ducts shall be fastened to surfaces at regular intervals using hardware that is designed to bear the required load.
- On long runs, conduits/ducts shall have expansion joints installed at regular intervals to allow for changes in the external environment such as ultra-violet and temperature.
- Where installed in an environment that is open to accidental or malicious damage, conduits/ducts shall be protected by means of conduits that are of metallic construction or PVC that is also covered with a metallic shroud for the complete length of the area of risk.
- Use appropriate support and fastening hardware and distances between supports that are capable of bearing the combined weight of SCS cabling and conduits/ducts.
- Where spare-unused underground conduits are installed they shall turn up to above ground surface or within pits and shall be capped to stop the ingress of moisture.
- Conduits/ducts shall be buried to a depth that complies with the mandatory requirements.
- Have SCS identification location tape installed above all underground SCS conduits.
- Have ground location markers that identify SCS installed at regular intervals above the location of the conduits/ducts route and shall be visible at ground surface level.
- Conduits/ducts shall have at all changes of direction in conduits/ducts factory manufactured bends, elbows, tees or pit.

5.14.25 Access Pits

Access pits shall be shall be used in the following situations:

- At each change of direction of underground conduits, factory manufactured bends may be used where the underground conduit turns up through the ground surface.
- Long runs of underground conduits shall have access pits installed at regular intervals to comply with maximum cable pulling tensions.

When installed, access pits shall:

- Be sized appropriately to allow for the SCS cable minimum bending radius.
- Have access pit lids or covers labelled to identify the access pit contains SCS.
- Be constructed and installed to bear the worst case traffic load conditions inherent with its environment.
- Be installed in such a way to allow collected water to dissipate into surrounding areas.
- Have no conduits access to pits at the bottom.
5.14.26 Penetrations

Where penetrations are proposed, the penetration shall:

- Be brought to the attention of UniSA Property or pre-approved by a consulting engineer.
- Have spare capacity for future expansion of the SCS.
- For masonry floors, ceilings and walls - be sleeved with PVC conduit that extends past the edge of the masonry on each side except if cable trays/baskets reticulate through the penetration in a continuous length and provide adequate protection from sharp and abrasive surfaces.
- For plastic, plasterboard and metallic objects - be fitted with appropriate bushing to provide adequate protection from sharp and abrasive surfaces.
- For fire rated building structures - be fire sealed to a level that matches the designed Fire Rating of the building structure and additionally shall meet any independent fire sealing assessment requirement of the Building Code of Australia, fire regulation or any other statutory body.

Where penetrations are made through building structures that are exposed to the entry of moisture and gas, the penetration shall be sealed from the ingress of water and gas.

5.14.27 Cabling Installation

The SCS and electrical cable shall be separated by a minimum distance as specified in the 'Mandatory Requirements' (i.e. AS/ACIF S009). All SCS cables shall be labelled at each end.

Where SCS cables reticulate horizontally on cable trays, ducts or catenary wire they shall be fastened at regular intervals with cable ties or Velcro.

Cable ties, if utilised, shall be loosely tied as not to deform the outer sheath of any cables being attached.

Where SCS cables are reticulated vertically through different levels of a building the cable shall be lowered rather than raised during installation.

SCS cables shall be installed to meet manufacturer’s requirements. SCS cables shall be reticulated by using constant and controlled force that does not exceed manufacturer’s recommended maximum pulling tension. Installers shall ensure that when reticulating cables during installation that the bending radius and pulling tension specified by the cable manufacturers is not exceeded.

Installers shall ensure to protect the SCS cable against external sheath damage from sharp and abrasive edges during installation. Installers shall ensure that kinking, twisting or otherwise damaging the cable sheath and crushing of cables does not occur during reticulation of the cabling. Installers shall leave some spare capacity at each end of the cable route to allow for future moves and changes or restoration of accidental or malicious damage.
DESIGN AND CONSTRUCTION GUIDELINES

Installers shall ensure that the SCS cabling is always protected from the following environmental factors during the reticulation phase:

- SCS cables shall not be left unattended across the floor surface where any form of personnel or vehicular traffic may come into contact with it.
- SCS cables shall not be left in wet situations.
- Where SCS cables are bundled and hanging in position above the final termination location for any period of time, care shall be taken to ensure that the minimum bending radius and pulling tension specified for the cable is not exceeded.
- All fibre, UTP and voice grade cable that is run underground shall meet the requirements of AS/CA S008 for underground cables. Please Note: not all indoor/outdoor cables meet this requirement.

5.14.28 Communications Cabinet Cabling

Cables emanating from the cabinets shall be neatly loomed in the cabinet, on a minimum 150mm tray (sized appropriately to accommodate horizontal cables) to the ceiling access (or floor access). Cables within the cabinets shall be loomed in such a way as not to obstruct the mounting equipment in the cabinets. The cable reticulation path within the cabinet shall be chosen such that any future cables may be installed easily without disturbing active equipment.

5.14.29 Communication Cabinet Earth

All cabinets shall be earthed to the communication earth terminal (CET) or protective earth (PE) system in accordance with AS/ACIF S009. All necessary cable and termination devices shall be supplied and installed to provide a fixed and permanent low impedance earth to each cabinet. UniSA does not deem the earth created by installing a cabinet power rail connected to a Socket Outlet as sufficient.

The communication cabinet earth cable sheath shall be green and yellow. The earth cable size shall be sized to ensure maximum impedance of 1 ohm. The table on the following page has been provided as a guide only, and it is the installation contractor’s responsibility that the one ohm requirement is met.

<table>
<thead>
<tr>
<th>Cable Size</th>
<th>Nominal Cable Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 mm</td>
<td>135 metres</td>
</tr>
<tr>
<td>4.0 mm</td>
<td>275 metres</td>
</tr>
<tr>
<td>6.0 mm</td>
<td>324 metres</td>
</tr>
<tr>
<td>16.0 mm</td>
<td>869 metres</td>
</tr>
<tr>
<td>35.0 mm</td>
<td>1908 metres</td>
</tr>
</tbody>
</table>
Note 1: A Licensed Electrical Contractor or an A Class Electrical Worker shall carry out the termination of the earth cable from the CET into the electrical distribution board. The CET shall be installed externally to the confines of the electrical distribution board.

Installations and termination of the earth system from the communication cabinet to the CET may be performed by registered communications cablers who do not hold an electrical licence. The CET shall be labelled ‘Communication Earth Terminal’ using 6mm black letters on white trifoliate material.

5.14.30 Labelling

Communication Cabinets

The door to the cabinet location shall have an engraved label 200mm x 50mm. The labels shall be self-adhesive multi-layered laminated and engraved with 10mm upper case black lettering on a white background (eg. P-2-Central). The labels shall be located on the front and rear of each rack, near the top. The labelling convention shall indicate distributor and cabinet number.

Fibre Optic Patch Panels

Labelling conventions for optical fibre cables shall have the format ‘From / To / Cable Size / Class’ where:

- From is the local cabinet identifier.
- To is the remote cabinet identifier.
- Cable Size is the number of backbone cores (numbered in ascending order from left to right above or below each fibre coupler).
- Class is the grade of fibre either 62.5µm or 50µm for existing fibres, or 50µm OM3 or OS1 for new installations.

For example:

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Cable Size</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-2-Central</td>
<td>JB-1-East</td>
<td>12 core</td>
<td>50µm OM3</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
DESIGN AND CONSTRUCTION GUIDELINES

The fibre patch panels can utilise the manufacturer supplied label if it complies with the above. If not then clearly labelled using P-Touch or Brother type self adhesive labels with 4mm upper case black lettering on a white background.

Class E Backbone Patch Panels

Labelling conventions for UTP backbone cables shall have the format ‘From / To / Category / Class’ where:

- **From** is the local cabinet identifier.
- **To** is the remote cabinet identifier.
- **Category** is the performance level of the backbone cables (numbered in ascending order from left to right above or below each RJ45 Jack).
- **Class** is the grade of 4 pair UTP

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Category</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-2-Central</td>
<td>JB-1-East</td>
<td>6</td>
<td>E</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

The UTP backbone patch panels can utilise the manufacturer supplied label if it complies with the above. If not then clearly labelled using P-Touch or Brother type self adhesive labels with 4mm upper case black lettering on a white background.

Voice Patch Panels

Labelling conventions for voice backbone cables shall have the ‘From / To / Size / Cable Type’ format where:

- **From** is the local cabinet identifier.
- **To** is the cabinet/CD frame identifier.
- **Size** is the number of backbone pairs (numbered in ascending order from left to right above or below each outlet).
- **Cable Type** is the grade of multi-pair pair UTP.

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Size</th>
<th>Cable Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-2-Central</td>
<td>JB-1-East</td>
<td>24 Pair</td>
<td>Voice</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>6</td>
<td>7</td>
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<td></td>
<td>23</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

The voice backbone patch panels can utilise the manufacturer-supplied label if it complies with the above requirements. Otherwise, clearly label using P-Touch or Brother type self adhesive labels with 4mm upper case black lettering on a white background.
Horizontal Patch Panels

Telecommunications outlets and associated patch panels shall be labelled as follows:

- Category 5 – 2000 outlets shall be prefixed with A or B.
- Category 5 – 2003 outlets shall be prefixed with AA or BB.
- Category 6 – 2003 outlets shall be prefixed with A* or B*.

Typically patch panels and outlets that contain an “A” are used for data and “B” are used for voice.

Example – A*24 would typically indicate a Category 6/Class E data outlet while B*24 would be its matching Category 6/Class E data outlet which is usually used for voice.

Telecommunication Outlets

Each dual outlet shall be labelled designating the source cabinet (e.g. P-2-Central). The apertures on each face plate shall be labelled “A*” (left) and “B*” (right) and designate the number of the source patch panel port (i.e. A*-1 B*-1). Both “A*” “B*” outlet shall always have the same number.

The telecommunication outlets shall be clearly labelled using P-Touch or Brother type self adhesive labels with 4mm upper case black lettering on a white background unless otherwise specified.

Testing

*Progressive testing in the initial phases of the installation is highly recommended to ensure all practices and procedures (e.g. pair terminations) are correct before the job is too far advanced.*

Final testing shall not proceed until all termination hardware and cabling has been terminated and mounted in the final position with all labelling and documentation completed so that the test results accurately reflect the actual installed cables and connectors.

The test results for all cables, connectors and outlets shall be fully documented and tabulated, identifying each cable and each outlet by its label. All test results shall be
5.14.31 Fibre Optic Testing

Fibre optic testing shall meet or exceed compliance requirements for fibre optic cabling systems as specified in AS/NZS 3080 and test methodologies with AS/NZS ISO/IEC 14763.3.

**Optical Attenuation**

Fibre optic cable testing for Optical Attenuation shall be carried out with a power meter and light source on all fibre cores. Optical loss shall be measured at 850 nm and 1300 nm for multi-mode (OM3) and 1310 nm and 1550 nm for single mode (OS1) cables in two directions. Each fibre core shall be tested and tabulated from both ends of each fibre link, i.e. A to B then from B to A.

A hard copy summary of the power meter and light source test results is required on an ISTS standard fibre reporting sheet and additionally, where available, a database version shall be included in the project documentation.

Referencing of the power meter and light source shall be carried out using a one or three patch cord method. All test cords (jumpers) shall utilise reference connectors. Method used for zeroing shall be included with the test documentation.

Light budget shall be calculated for all fibre permanent links and test results shall be assessed against the calculated light budget.

Where the tested optical attenuation exceeds the test value, the installation contractor will rectify the issue and retest the affected cores.

Averaging of power meter and light source test results is unacceptable.

Launch conditions of the light source and associated test cord shall meet the specified requirements of AS/NZS ISO/IEC 14763.3.

**Length**

The length of the cable under test shall be provided and can be obtained by calculation from sheath markings or from test equipment.

**Propagation delay**

Propagation delay shall be provided for each fibre cable and can be obtained using a calculation from length or from test equipment.

**Continuity and maintenance of polarity**

Continuity and maintenance of polarity does not need to be tested if optical attenuation has been obtained by power meter and light source.
OTDR

OTDR testing shall only be used to support light source and power meter testing used for compliance. OTDR results may be included in a project specification:

- For underground installations to provide a graphical representation of the cable route and identify installation issues.
- Obtain accurate length measurement.
- Where the fibre cable transverses through public areas.
- OTDR testing for installed cables shall utilise a launch and a tail cord.

5.14.32 4-Pair UTP Backbone & Horizontal Testing

All telecommunication outlets and 4-pair UTP backbone cables shall be tested. They shall meet or exceed compliance/conformance test requirements of AS/NZS 3080 or ISO/IEC 11801 or their replacement.

All outlets and 4-pair UTP backbone cables shall be tested against permanent link requirements. The tester shall be a UniSA approved tester which is detailed below:

- Fluke DTX 1200 and 1800.
- Approved ISTS tester.
- Correct adaptor shall be used for all tests.
- Correct performance level adaptor shall be used for all tests.
- Only results displaying Pass or Pass* (conditional/marginal passes) shall be accepted.

Tests carried out shall be to the latest standards. All test results shall be provided in the most detailed format using the cable test report management software inherent to the test instrument vendor in the electronic database format.

All telecommunication outlet test result identifiers (label) shall, as a minimum, detail the distributor that it was fed from along with the outlet number. All backbone cable test results shall, as a minimum, identify the distributors that are links and the number of the cable.

Testing shall be undertaken with the main unit at the equipment rack end with the remote unit at the outlet end. The Contractor shall replace and retest any termination or cable that is faulty at no additional cost. Any cable not meeting the aforementioned transmission standards shall be replaced at the expense of the Contractor.

5.14.33 PROJECT Documentation

Prior to the date of Practical Completion, provide two copies of project documentation, written in clear, concise English, containing a title page listing the Contractor and suppliers names, addresses and telephone numbers, a table of contents and the following data:
5.15 Audio Visual Equipment

5.15.1 Introduction

UniSA has established audio visual equipment standards for its general teaching and meeting facilities. The aim is to provide the users with a consistent operational format as they move between venues. By providing user friendly and reliable facilities, we will promote the use of appropriate technologies for educational delivery. It is not only important for the facility to work well but it must also project a professional and high quality image to both staff and students in keeping with UniSA's desire to be a leader in education.

The standards reflect the range of equipment encountered in all general teaching and meeting facilities at UniSA, from tutorial/seminar rooms to large lecture theatres.

Please note that the following standards relate to general teaching and meeting facilities only (i.e. that which is available for booking by all schools through Syllabus Plus).

5.15.2 Environmental

UniSA is a responsible organisation and as such is committed to the long term sustainability of renewable energy and usage of resources. Consideration must be demonstrated in the form of recycling, reusing & management of energy consumed within the audio visual systems.
Installation processes must incorporate a management plan for the minimisation of the impact on the environment.

The Control systems must ensure that power is removed to devices when not in use and where lighting control is automated it shall sense when people are present and control the lighting levels accordingly.

5.15.3 Room Classification

Centrally time tabled/booked teaching & meeting spaces have an AV classification from AV0 to AV06 depending on the level of facilities present in the room. The description of the classifications is as follows:

- AV0 - No equipment provided
- AV01 - Dual Lamp Overhead Projector, screen and Whiteboard
- AV02 - LCD Data Projector, VCR/DVD, Large screen and Whiteboard
- AV03 - Dual Lamp Overhead Projector, VCR/DVD, LCD Data Projector, AV-PC (configuration by ISTS) Large screen
- AV04 - Dual Lamp Overhead Projector, VCR/DVD, AV-PC (configuration by ISTS), LCD Data Projector on a large screen control of all devices on Lectern
- AV05 - Dual Lamp Overhead Projector, VCR/DVD, XGA Document Camera, AV-PC (configuration by ISTS), LCD Data Projector on a large screen control of all devices on Lectern
- AV06 - Specialist facility such as Video Conferencing, Access Grid or TV Studio

+ - The addition of a “+” to AV03 to AV05 indicates a specialist feature or facility is in place in addition to the base classification (e.g., ceiling mounted microphones for recording or normalised patch field for recording and control)

5.15.4 Equipment Racks

- preferred manufacturers Rack Technologies or Hallam
- shall have adequate ventilation and where the heat load within the racks may affect other components within the rack additional cooling shall be employed to dissipate such heat
- front rails shall be configured so as to not permit protrusion of installed components past the front fascia of the rack
- shall be of adequate depth so as to not permit protrusion of installed components past the rear of the rack
- shall be of a type in accordance with the required security level
- shall have an additional capacity within the rack to permit further expansion
- shall be of solid construction manufactured free from plastic components
- shall have a front door with a choice of Perspex or Solid doors dependent on the security level required.

Hardware
- shall be installed within the rack utilising cage nuts and bolts
- shall ensure that all fixings are utilised and in accordance with the manufacturers specifications
- shall be installed in such a manner so as to ensure stability of the rack
- heavy components shall be located at the base of the rack up to a maximum of 30% of the rack height
- shall be installed so as to permit free and easy removal of the components for service
- shall have adequate power reticulation with current protection

**Wiring Systems**
- shall be installed within the rack utilising cable ties and shall be protected from mechanical damage
- shall ensure that all electrical plug & socket terminations are undertaken by licensed & qualified electricians
- shall ensure that all data plug & socket terminations are undertaken by licensed, registered & qualified data cablers
- shall ensure that all analogue plug & socket terminations are undertaken by qualified electronic technicians
- shall ensure that power to all components is RCD Protected
- shall ensure that excess cable is cut off and suitably re-terminated
- shall ensure that the rack has adequate tails to permit its’ removal from its’ position in order to carry out servicing
- shall ensure that power packs are suitably restrained and are free from hazards
- shall ensure that cabling is machine print labelled <Source, Type, Destination > and shall be self laminated

5.15.5 **Video Systems**

**Projector Mount**
- preferred manufacturer Ultralift
- projector mount shall be professionally engineered and capable of withstanding a load of projector weight + 100Kg
- shall incorporate a security housing to prohibit the unauthorised removal of the unit but enable access to lamp housing and filters without the necessity to remove such item
- shall be fixed to structural elements and free from the ceiling components and in accordance with the manufacturers specification
- shall have adequate clean air space at a nominal temperature to ensure that ventilation and cooling of the projector and its’ components is not in any way inhibited and shall be within the manufacturers specification
- shall not be installed within 500mm of any Air Conditioning outlet
- shall be installed centre & perpendicular between the centre lens of the projector and the screen image
- shall be mounted in such manner that the projector is in a horizontal state
- the mount shall be load tested once installed

**Projector**
- preferred manufacturers NEC or Sony
shall be of LCD construction
• minimum brightness of 3500 ANSI Lumens
• minimum lamp life 2000 hours or 3000 eco mode
• contrast Ratio of 600:1
• native resolution XGA (1024 x 768), support resolutions of up to 1600 x 1200
• support for up to 3 x inputs capable of VGA, SVGA, XGA, SXGA, SXGA+, UXGA, HDCP
• support for up to 3 x inputs capable of 625/25 1080i, 720p, 576p, 576i, 480p, 480i
• rs232 control with supported protocol
• friendliness, reliability and product backup will be prerequisites for device selection
• shall be installed in accordance with manufacturer instructions
• and preference will be given to those who are endorsed by the manufacturer
• shall not be installed within 500mm of any Air Conditioning outlet
• shall be mounted centre & perpendicular between the centre lens of the projector and the screen image with no horizontal keystone error *keystone correction is not permitted
• shall be mounted in such manner that the image is in a natural state and no vertical keystone adjustment is required. *keystone correction is not permitted
• power to the unit must be from a GPO derived from a dedicated power circuit and not from lighting circuits nor switched in either the Active and / or Neutral conductors
• shall be aligned using a calibrated Video Test Generator
• shall be free of abnormalities
• shall be free of colour skew
• shall be free of pre & post image ghosting
• shall have correct colour order

Projection Screen
• preferred manufacturers are Screen Technics or LP Morgan
• shall be of metal construction inclusive of mounting brackets (plastic mounts are prohibited)
• shall be set out from the wall by an additional 45mm to facilitate whiteboards
• where motorised shall be controlled via Infra Red and the sensor mounted externally

Display Mount
• preferred manufacturer Screen Technics
• mount shall be professionally engineered and capable of withstanding a load of display weight + 50Kg
• shall incorporate a security mechanism to prohibit the unauthorised removal of the unit but enable access to connections & filters without the necessity to remove such item
• shall be fixed to structural elements and in accordance with the manufacturers specification
• shall have adequate clean air space at a nominal temperature to ensure that ventilation and cooling of the display and its’ components is not in any way inhibited and shall be within the manufacturers specification
• shall be mounted in such manner that the display is in a horizontal state for Landscape or vertical state for Portrait
the mount shall be load tested once installed

Display Panels
- preferred manufacturers are Sony or NEC
- shall be of Commercial Grade LCD construction
- minimum brightness of 450 cd/m2
- contrast Ratio of 1000:1
- native resolution 1920 x 1080 @ 60 Hz
- support for up to 3 x inputs capable of VGA, SVGA, XGA, SXGA, SXGA+, UXGA, HDCP
- support for up to 3 x inputs capable of 625/25 1080i, 720p, 576p, 576i, 480p, 480i
- viewing angle of 178 deg Horizontal x 178 deg Vertical
- rs232 control with supported protocol
- friendliness, reliability and product backup will be prerequisites for device selection
- shall be installed in accordance with manufacturer instructions
- preference will be given to those who are endorsed by the manufacturer
- power to the unit must be from a GPO derived from a dedicated power circuit and not from lighting circuits nor switched in either the Active and / or Neutral conductors
- shall be aligned using a calibrated Video Test Generator
- shall be free of abnormalities
- shall be free of colour skew
- shall be free of pre & post image ghosting
- shall have correct colour order

Video Distribution
- preferred manufacturer is Extron
- shall ensure that it has sufficient capacity for the required number of display devices
- shall have a bandwidth of not less than 350MHZ @ -3db fully loaded
- shall exhibit a flat response between 0 – 130MHZ with no more than +3db / -1db
- shall ensure that signals received from the output device are not diminished
- shall employ interfaces where required, to ensure that Video & Sync levels are restored and maintained throughout the signal reticulation process

Video Switching
- preferred manufacturers are Extron or Autopatch
- shall ensure that it has sufficient capacity and able to natively switch playback device outputs to the relevant display device inputs with a minimum of 2 spare inputs for future technology / expansion
- I + 2 = # of Inputs (where I = XGA or Composite or S-Video)
- + 2 = # of Outputs (where O = XGA or Composite or S-Video)
- shall have a bandwidth of not less than 350MHZ @ -3db fully loaded
- shall exhibit a flat response between 0 – 130MHZ with no more than +3db / -1db
- shall have additional capacity to ensure further expansion
- shall incorporate audio switching
- RS232 control with supported protocol
- shall ensure that signals received from the output device are not diminished
shall employ interfaces where required to ensure that Video & Sync levels are restored and maintained throughout the signal reticulation process

**Document Camera**
- preferred manufacturers are Elmo or Wolfvision
- shall incorporate a 850,000 pixels Progressive Scan CCD
- shall have 36x magnification with auto-focus
- shall have discrete user control via Infra-Red particularly between VCR & DVD operation
- shall have Composite and S-Video output
- shall have common audio output

**Video Playback Device**
- preferred manufacturer is NEC or Sony
- shall incorporate a DVD Player supporting all common formats
- shall have XGA output

**Video System Wiring**
- Computer signals -
  - preferred supplier is Extron
  - shall be minimum 5 x 75ohm, be individually & overall shielded
  - shall be individually sheathed & colour coded with an overall sheath
  - shall have a nominal attenuation of less than -20.6db/100m @ 135MHZ
  - shall have a maximum installed length of 50m
  - shall be installed in accordance with

**Composite only signals -**
- preferred manufacturer Belden
- shall be RG6 Quad shielded

### 5.15.6 Audio Systems

**Microphones**
- preferred manufacturer Beyerdynamic or AKG
- shall be electret condenser Hyper-Cardiod Pickup
- shall have a nominal pickup pattern of 95 degrees
- shall have a frequency range of not less than 20Hz to 18kHz
- shall incorporate a selectable bass frequency roll off @ 200hz
- shall have shock mount for low frequency noise suppression
- shall be terminate with a 3 pin XLR

**Audio Mixer / Signal Processing**
- preferred manufacturer AMIS or Biamp
- shall ensure that it has sufficient capacity and able to adjust playback device output levels to the amplification inputs with a minimum of 2 spare inputs for future technology / expansion
  - \[ I + 2 = \# \text{ of Inputs (where I = Balanced or Unbalanced)} \]
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- $O + 2 = \#$ of Outputs (where $O = \text{Balanced or Unbalanced}$)
  - shall have a bandwidth of not less than 20Hz to 20kHz
  - shall exhibit a flat response
  - shall incorporate Phantom Power to all Balanced inputs
  - in the case of processors shall have RS232 control port with supported protocol
  - shall be 19” rack mountable

**Speakers**
- preferred manufacturer AMIS or Turbosound or EAW
- shall ensure that it has sufficient coverage and has adjustable taps for 100V
- shall have a frequency range of not less than 20Hz to 20kHz
- shall have a mount capable of supporting the speaker
- mount shall be capable of focussing the speaker to the desired area and locked off
- where net weight exceeds 3kg shall have an additional independent safety cable attached

**Audio Amplification**
- preferred manufacturer AMIS or Lab Gruppen
- shall ensure that it has sufficient capacity under full load
- calculated watts * 1.2 (20% overhead)
- shall have a bandwidth of not less than 20Hz to 20kHz
- shall exhibit a flat response
- shall exhibit less than .1% harmonic distortion
- shall have a visual indication of power status
- shall have a signal to noise ratio of > 90dB
- shall be 19” rack mountable

**Audio System Wiring**
The selection of cabling are subject to the following;
- **Balanced signals** -
  - shall be 2 x 110ohm, individually and overall shielded
- **Unbalanced signals** -
  - shall be 110ohm, overall shielded
- **Speaker** -
  - shall be 2 x 0.75mm, double insulated

### 5.15.7 Control Systems

**Central Controller**
- Nominated manufacturer AMX
- shall ensure that it has sufficient capacity and able to control devices with a minimum of 2 spare inputs for future technology / expansion
  - $P + 2 = \#$ of Inputs (where $P = \text{RS232/422/485 or IR or Relay or I/O}$)
- shall be standards based protocols
- shall support Ping, Telnet, TCP/IP, DHCP, ICSP, ICMP, HTTP, FTP protocols
- the system shall control devices by the following methods;
  - RS232
    - Switchers
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- Projectors
- LCD Displays
- Matrix Switchers
- Lighting Control Systems
- Video Conferencing Systems

- Infra Red
  - VCR
  - DVD
  - Motorised Screens
- Relay
  - Blinds
  - Power Control

**User Interface**
- Nominated manufacturer AMX
- shall be cabled using standards based protocols such as RS485 or TCP/IP
- shall be capable of alteration to suit further expansion of system devices
- shall be reprogrammable and re-addressable to permit additional interfaces

**System Programming**
The system shall be commensurate with AMX programming standards and in a manner that is legible for another programmer to reasonably comprehend. The User Interface shall be designed to provide an intuitive, easy to read and simple format permitting the majority of users to utilise the system with very little training or explanation.

Upon completion the programmer shall provide both a Hard & Soft copy of the Source Code within the documentation set for backup purposes only and not for release to other vendors.

Modular Code sets are only permitted where the equipment manufacturer does not release the protocol and a Module is available and supported by AMX Australia or AMX Corporation with supportive documentation.

**Control System Wiring**
- preferred manufacturer Belden
- shall be 2 x 2 x 110 ohm (Red / Black +/-12v Green/White AXP/AXM ), overall shielded with drain wire
- shall be terminated in accordance with standards and manufacturers instructions

**5.15.8 Systems Documentation**

Unless directed otherwise specified the system design and specification shall be undertaken in direct consultation with the client with information disclosed back to the project management team via the agreed Project Information Channel.

Documentation shall be drafted for review and approval and sign off by the client prior to Construction. Drawings, Documentation and all Information obtained as a result of this
process shall remain In-Confidence and shall not be released without written consent from the client.

Documentation & Drawings must be in *.PDF / *.DWG format and shall be editable, a copy in Soft Copy & Hard Copy shall be presented upon completion of the project. Documentation shall reflect Input / Output patching to matrices & audio mixers in a spreadsheet format and be cross compatible with the CAD drawing.

### 5.15.9 Systems Installation

#### Commencement

The AV Contractor shall furnish the Head Contractor a works schedule / programme showing personnel & time required to carry out tasks, the Head Contractor shall ensure that the AV Contractor has the time specified to carry out the works without disruption and or hindrance by other trades. No projector, display device or AV components shall be brought to site with the exception of AV cabling systems, empty AV Racks, projector or display mounts, until a clean, dust free environment is provided.

The Head Contractor shall ensure that there is adequate security once equipment is installed prior to handover to the client.

### 5.15.10 Nominated AV Contractor

The University Project Management Team shall determine the most suitable Audio Visual contractor to undertake the supply & integration of the project through to its' completion.

The AV System programmer shall be endorsed by the manufacturer and shall provide a full copy of the Source Code to the client upon completion for back up purposes only. It may be released to other vendors at the University’s discretion if service and support arrangements change.

#### Cabling Installation

The contractor may elect to use a separate subcontractor other than the nominated AV Subcontractor to supply & install electrical & / or data cabling provided that they meet and or exceed the requirements for the provision of these services to the AV systems.

Any deviation from the specified standards as set by the documented specification shall be approved by the client and / or the consultant team prior to supply and installation of the proposed alternate and shall meet or exceed the specification.

The cabling shall be installed with adherence to good cabling management practices including but not limited to

- Adequate bend radii
- Separation from hazardous / harmful environments
- separation in accordance with AS3000:2000, AS3084 and TS009
- adequate mechanical support ensuring cabling is not placing load on ceiling systems
5.15.11 Equipment Installation Practices

The nominated AV Subcontractor is responsible for the supply of AV equipment installation services and shall employ appropriate practices including but not limited to:

- Provision of suitable waste management procedures
- Ensure that all areas are kept clean and that empty boxes are removed daily
- Provision of Occupational Health Safety and Welfare Policies and Procedures
- Provision of Safe Work Method Statements
- Provision of qualifications and licences where required
- Ensure that all staff employed understand and commit to the project
- Maintain separation of signal cabling from mains cabling
- Undertake all height work as a priority
- Ensure that equipment is kept clean and that hand marks and finger prints are removed
- Ensure that staff are suitably licensed, registered and qualified for the works undertaken
- Ensure that tools are in a safe condition, are free from defects and suitable for the purpose intended

5.15.12 Audio Visual Cabling

Audio Visual Cabling shall be typically run between the following locations:

- Equipment Rack & Projector
- Equipment Rack & Screen
- Equipment Rack & Display
- Equipment Rack & Slide Projector
- Equipment Rack & Speaker(s)
- Floor boxes
  - shall be Esco SSOB1 and contain a 32mm communications conduit and not shared with any other service, (i.e. there would normally be 3 x 32mm conduits) changes in direction shall be via sweeps not elbows and corrugated conduit is not permitted at any stage during its’ length.

  - Ceiling spaces
    - minor cable pathways shall incorporate catenary cabling where the cable weight can be reasonably be supported by this method with sag of no more than 300mm
    - major cable pathways shall incorporate cable ladder

5.15.13 Audio Visual Commissioning, Training & Review

- Systems shall be technically demonstrated to be operationally correct and free of any anomalies
- Systems shall be tested utilising impedance meters, audio & video test generators, oscilloscopes, and lux meters
- results shall be recorded and included within the system documentation package
Training shall be provided at 2 levels
  o Technical User Group
    ➢ System Layout
    ➢ Fault Finding
  o End User Group
    ➢ System Capability
    ➢ System Operation

A system review shall take place 3 months after completion to enable user feedback to be implemented upon management review & acceptance.

5.15.14 Power & Data

Power and data will be installed by the project electrical subcontractor unless otherwise advised. As a design minimum there shall be:

- 3 x Double GPO located in each rack
- 1 x Double GPO located above each AV03 rack or on top of Lectern
- 1 x Double GPO located at each display device
- 2 x Double Data located in each rack
- 1 x Double Data located above each AV03 rack or on top of Lectern
- 1 x Double Data located at each display device

Where Floor boxes are required they:
  o shall be Esco SS081 and have 3 x 32mm conduits for services. Changes in direction shall be via sweeps not elbows and corrugated conduit is not permitted at any stage during its’ length.

5.15.15 Security

In all AV02 –AV06 installations there will be local alarming of system via monitoring of open circuit inputs on the AMX system. A Blue Strobe and Piezo screamer will be installed with each system by the AV contractor. A dry contact will also be provided for connection to the UniSA Cardax System in coordination with the University’s’ nominated Security provider.

The AV contractor will also coordinate with the University’s’ nominated Security provider for the installation of reed switches to all Display devices in line with the UniSA Security Design and Construction Guidelines.

5.15.16 Detailed System Specification

**AV01 Audio Visual Level 1**

Overhead Projector 3M 1720 250w dual lamp OHP, triplet lens
Projection Screen, Screen Technics Pull Down screen mounted to wall or ceiling
Overhead Projector Trolley Admerch TS128 with 75mm wheels
Installation Standard
Installation must be carried out by qualified personnel competent in projection installations and having the necessary testing resources.
OHP trolley to be adjusted so the top of the OHP is flush with the top of the trolley.
A 20mm saddle is to be placed over the power cable immediately adjacent to its exit point from the projector and secured to the adjustable shelf.
System must be commissioned in the presence of the Campus Facilities Manager or person authorised as such & any maintenance issues addressed at this stage
Non adherence in any of the above may result in the non acceptance of system and corrective procedures must be documented

AV02 (Audio Visual Level 2)
LCD Data Projector 3500 ANSI Lumens, Native XGA (1024 x 768)
Audio & Video switcher & volume controller
XGA Distribution amplifier
LCD Projector Security Housing Bracket
Projection Screen Pull Down screen mounted to wall or ceiling
2 x speakers nominally 10 watt program power
1 x monaural mixer amplifier
Provision for AV-PC (Supplied & configuration by ISTS)
AMX NI2100 Central Controller
- RS232 - Projector
- RS232 - Switcher/Audio Control
- IR - VCR/DVD
- Relay - Amplifier Power Control
- AV-PC (selects computer supplied by ISTS in rack)
- Laptop (selects laptop input on wall – where more than 1 input toggles through lights up on 1)
- VCR (selects VCR mode on VCR/DVD)
- DVD (selects VCR mode on VCR/DVD, doubles as Menu key when already selected)

- Up (DVD cursor key up / Volume Up)
- Down (DVD cursor key Down / Volume Down)
- Left (DVD cursor key Left)
- Right (DVD cursor key Right)
- Play/Pause/Enter
- Stop
- FFwd
- Rew

Installation Standard
Installation must be carried out by qualified personnel competent in projection installations and having the necessary testing resources.
Laptop cabling shall be terminated on Clipsal 2000 series plate and be engraved “Laptop Video”
Permanent PC cabling shall be supplied with the ability to connect a local monitor
Controller must provide web based feedback such as audio level, selected device and lamp hours

Speakers shall be mounted either side of screen VCR/DVD, AV switcher / volume controller, Central Controller & amplifier must reside in rack and secured to wall

System must be commissioned in the presence of the Campus Facilities Manager or person authorised as such & any maintenance issues addressed at this stage

Non adherence in any of the above may result in the non acceptance of system and corrective procedures must be documented

**AV03 (Audio Visual Level 3)**

Overhead Projector 3M 1720 250w dual lamp OHP, triplet lens

Overhead Projector Trolley Admerch TS128 with 75mm wheels

LCD Data Projector 3500 ANSI Lumens, Native XGA (1024 x 768)

Audio & Video switcher & volume controller

XGA Distribution amplifier

LCD Projector Security Housing Bracket

Projection Screen Pull Down screen mounted to wall or ceiling

2 x speakers nominally 10 watt program power

1 x monaural mixer amplifier

**AV-PC (Supplied & configuration by ISTS)**

AMX NI2100 Central Controller

- RS232 - Projector
- RS232 - Switcher/Audio Control
- IR - VCR/DVD
- Relay - Amplifier Power Control
- AVP-WP12 Heavy Duty Wall Controller
- AV-PC (selects computer supplied by ISTS in rack)
- Laptop (selects laptop input on wall – where more than 1 input toggles through lights up on 1)
- VCR (selects VCR mode on VCR/DVD)
- DVD (selects VCR mode on VCR/DVD, doubles as Menu key when already selected)

- Up (DVD cursor key up / Volume Up)
- Down (DVD cursor key Down / Volume Down)
- Left (DVD cursor key Left)
- Right (DVD cursor key Right)
- Play/Pause/Enter
- Stop
- FFwd
- Rew

**Installation Standard**

Installation must be carried out by qualified personnel competent in projection installations and having the necessary testing resources

Laptop cabling shall be terminated on Clipsal 2000 series plate and be engraved “Laptop Video”

Permanent PC cabling shall be supplied with the ability to connect a local monitor

Controller must provide web based feedback such as audio level, selected device and lamp hours
Speakers shall be mounted either side of screen VCR/DVD, AV switcher / volume controller, Central Controller & amplifier must reside in rack and secured to wall OHP trolley to be adjusted so the top of the OHP is flush with the top of the trolley. A 20mm saddle is to be placed over the power cable immediately adjacent to its exit point from the projector and secured to the adjustable shelf. System must be commissioned in the presence of the Campus Facilities Manager or person authorised as such & any maintenance issues addressed at this stage. Non adherence in any of the above may result in the non acceptance of system and corrective procedures must be documented.

**AV04 (Audio Visual Level 4)**

12RU Equipment Rack
Overhead Projector 3M 1720 250w dual lamp OHP, triplet lens
Overhead Projector Trolley Admerch TS128 with 75mm wheels
LCD Data Projector 3500 ANSI Lumens, Native XGA (1024 x 768)
Audio & Video switcher & volume controller
XGA Distribution amplifier
LCD Projector Security Housing Bracket
Projection Screen Motorised screen mounted to wall or ceiling
Lecturn Microphone
UHF Radio Microphone Lapel Frequency Agile
2 x 200 watt speakers
1 x 200w x 2 amplifier
Hearing Loop
AV-PC (Supplied & configuration by ISTS)
AMX 10” Colour Graphical User Panel
AMX NI3100 Central Controller
- RS232 - Projector
- RS232 - Switcher/Audio Control
- RS232 – C-Bus PC Interface
- IR - VCR/DVD
- IR - Screen
- Relay - Amplifier Power Control
C-Bus PC Interface
C-Bus Relay Fluorescent Lighting Control # of ccts rounded up to 12 channels
C-Bus Dimmers # of ccts rounded up to 8 channels

**Installation Standard**

Installation must be carried out by qualified personnel competent in projection installations and having the necessary testing resources
Laptop cabling shall be terminated on Clipsal 2000 series plate and be engraved “Laptop Video”
Permanent PC cabling shall be supplied with the ability to connect a local monitor OHP trolley to be adjusted so the top of the OHP is flush with the top of the trolley. A 20mm saddle is to be placed over the power cable immediately adjacent to its exit point from the projector and secured to the adjustable shelf. System must be commissioned in the presence of the Campus Facilities Manager or
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person authorised as such & any maintenance issues addressed at this stage
Non adherence in any of the above may result in the non acceptance of system and
corrective procedures
must be documented

AV05 (Audio Visual Level 5)
12RU Equipment Rack
LCD Data Projector 3500 ANSI Lumens, Native XGA (1024 x 768)
Audio & Video 3 output matrix & volume controller
XGA Distribution amplifier
XGA Document Camera
AV-PC (Supplied & configuration by ISTS)
Provision for Lecture recoding system Capture Device
LCD Projector Security Housing Bracket
Projection Screen Motorised screen mounted to wall or ceiling
Lecturn Microphone
UHF Radio Microphone Lapel Frequency Agile
UHF Radio Microphone Handheld Frequency Agile
4 x 200 watt speakers
1 x 200w x 4 amplifier
Hearing Loop
AMX 12" Colour Graphical User Panel with PC Video
AMX NI3100 Central Controller
  RS232 - Projector
  RS232 - Switcher/Audio Control
  RS232 – C-Bus PC Interface
  IR - VCR/DVD
  IR - Screen
  Relay - Amplifier Power Control
C-Bus PC Interface
C-Bus Relay Fluorescent Lighting Control # of ccts rounded up to 12 channels
C-Bus Dimmers # of ccts rounded up to 8 channels

Installation Standard
Installation must be carried out by qualified personnel competent in projection
installations and having the necessary testing resources
Laptop cabling shall be terminated on Clipsal 2000 series plate and be engraved “Laptop
Video”
Permanent PC cabling shall be supplied with the ability to connect a local monitor
System must be commissioned in the presence of the Campus Facilities Manager or
person authorised as such & any maintenance issues addressed at this stage
Non adherence in any of the above may result in the non acceptance of system and
corrective procedures must be documented

Access Grid Room (AGR)
1 x 40" Commercial grade LCD panel w/RS232
1 x lockable Heavy Duty LCD Display mount
**Installation Standard**

Installation must be carried out by qualified personnel competent in projection installations and having the necessary testing resources.

Projection images shall be aligned for seamless edge between images suitable for edge blending.

Laptop cabling shall be terminated on Clipsal 2000 series plate and be engraved “Laptop Video”.

Permanent PC cabling shall be supplied with the ability to connect a local monitor.

System must be commissioned in the presence of the Campus Facilities Manager or person authorised as such & any maintenance issues addressed at this stage.
Non adherence in any of the above may result in the non acceptance of system and corrective procedures must be documented

5.15.17 Digital Signage

**Back Ground**
The University has undertaken a comprehensive and exhaustive investigation into a Digital Signage Solution. The solution selected for Uniwide deployment is NEC Panel Director. The final determination was for the NEC Panel Director solution based on the commitment and cost effectiveness of the Main Server system and Digital Signage Players. Consideration was also given to security of the system to prevent system outages and viral attacks from external influences.

**Current Requirements**

**Display Selection**
This needs to be in consultation with the specific requirements for each area notwithstanding they must
- be of commercial grade for all areas
- shall have an RS232 port for control of the panel via the Panel Director Digital Signage Player
- shall communicate natively with the Digital Signage Player
- shall incorporate VESA mounts
- shall be native 1920 x 1080 resolution
- shall be supported by NEC

**Hardware Installation**
This needs to be in consultation with the Universities Design & Construction Guidelines but specifically
- mounts shall be affixed to the building structure
- Where no structure is available in the immediate vicinity adequate spans shall be employed which shall be affixed to the building structure
- mounts shall be capable of supporting the load + 100Kg
- mounts shall be lockable
- mounts shall be of heavy duty construction
- fixings shall be of the Hilti, Ramset or Unistrut type
- plastic anchors must not be used

**Cabling Installation**
This needs to be in consultation with the Universities Design & Construction Guidelines but specifically
- 2 x Power Outlets are required and shall be installed as per AS3000:2007
- 2 x Data Outlet shall be as per Cabling Provider Rules 2000

**Configuration**
- The units will need to be approved and Blue Plates obtained from ISTS prior to deployment
The units require installation and configuration of the Panel Director software onto the Digital Signage Player and configuration to the display. Units will require Registration with the Panel Director CenterSystem and subsequent Management to the respective Display Panel Authentications.

Required NEC Components

**Content Playback (1 Required)**

Digital Signage Players | Stand Alone Model: DSP6188 | Rack Mount Model: DSP6190RU
                        | (Special use facilities only)

**Content Display (1 Required)**

Commercial Panel | 40” Display Model: M40 + SP40 | 46” Display Model: M46 + SP46

**Security**

Each LCD panel installed should be connected to the Cardax system for monitoring. Where possible this should be done via the structured cabling or if not then directly. The contractor will also coordinate with the University’s nominated Security provider for the installation of reed switches to all devices in line with the UniSA Security Design and Construction Guidelines.

5.16 Security Alarm, Access Control and CCTV Specification

UniSA has established the following Security Alarm, Access Control and CCTV Specification (Version 1—01/01/07). Updates to this specification will be available on the Facilities Management Unit website.

5.16.1 System Abbreviations and Terminology

<table>
<thead>
<tr>
<th>Hardware Components Abbreviations</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAS</td>
<td>Intruder Alarm System</td>
</tr>
<tr>
<td>IFC’s</td>
<td>Intelligent Field Controllers</td>
</tr>
<tr>
<td>LED</td>
<td>Light Emitting Diode</td>
</tr>
<tr>
<td>LCD</td>
<td>Liquid Crystal Display</td>
</tr>
<tr>
<td>Comms</td>
<td>Communications</td>
</tr>
<tr>
<td>PSTN</td>
<td>Public Switched Telephone Network</td>
</tr>
<tr>
<td>SNA</td>
<td>Systems Network Architecture</td>
</tr>
<tr>
<td>RS485 LAN</td>
<td>Protocol used for LAN Communications</td>
</tr>
<tr>
<td>RS232</td>
<td>Common Interface Standard</td>
</tr>
</tbody>
</table>
Table 5-9 - Alarm Monitoring Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>A separate partition of the system</td>
</tr>
<tr>
<td>Input/Point</td>
<td>EOL supervised alarm device or contact</td>
</tr>
<tr>
<td>Output</td>
<td>Dry contact relay or 50 mA open collector transistor</td>
</tr>
<tr>
<td>Secure</td>
<td>Area is armed</td>
</tr>
<tr>
<td>Access</td>
<td>Area is disarmed</td>
</tr>
<tr>
<td>Alarm</td>
<td>Input has been activated or there is a system alarm</td>
</tr>
<tr>
<td>Unsealed</td>
<td>A condition where an input is activated</td>
</tr>
<tr>
<td>Sealed</td>
<td>A condition where the input is in normal mode</td>
</tr>
<tr>
<td>EOLM</td>
<td>End of Line Module</td>
</tr>
</tbody>
</table>

Table 5-10 - Surveillance Equipment Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCTV</td>
<td>Closed Circuit Television</td>
</tr>
<tr>
<td>IPVS</td>
<td>IP Video System</td>
</tr>
<tr>
<td>NVR</td>
<td>Network Video recorder</td>
</tr>
<tr>
<td>RVS</td>
<td>Remote Viewing Software</td>
</tr>
</tbody>
</table>

5.16.2 General Overview

Introduction
This specification calls for the supply, installation and commissioning of additions to the existing integrated security system at the University of South Australia (UniSA). The existing system consists in the main of a Cardax FT security and access control LAN. CCTV also operates across the UniSA Network and predominately consists of Indigo hardware architecture.

Areas covered by this specification include, but are not limited to, the following aspects:
- Access Control
- Intruder Alarm (including high grade systems interfaces)
- Computer Security Interface
- Alarms Management
- Surveillance Cameras
- Network Video Recorder
- Network Video Low and High Level Interfaces
- Fire System Interface (Low Level).

Nominated Security Contractor
All new works in relation to this Security Alarm, Access Control and CCTV Specification must be carried out by UniSA’s Nominated Security Contractor—Chubb Security.

General
All installations, maintenance and reactive service of any element of security systems employed by UniSA are to be in line with appropriate local and international standards and in accordance with the technical and performance criteria set out in this specification.
All works are to be inclusive of the supply of all equipment, hardware, software, cabling and ancillary services as required to provide the seamless integration of new works to the existing UniSA systems, complete and functional in all respects. The nominated security contractor is to familiarise themselves with all matters related to specified works and to account for such in their tendered price.

It is the responsibility of the nominated security contractor to obtain clarification of all matters in which doubt exists as to the exact intent of this document or in which a conflict appears to have arisen. Such information must be obtained before the closing and lodging of tenders.

The response shall clearly detail all pricing for components, cabling, installation, engineering, training, commissioning, setting to work, and comprehensive warranty for the period remaining for the current Maintenance Contract.

**Functionality Overview**

All new works shall seamlessly integrate into the existing Cardax FT Enterprise Platform currently Operations throughout all UniSA sites.

The system currently provides for the following functionality:

- Provides a means to control access through nominated doors by checking the access privileges stored in field controllers for access control tokens presented at such readers.
- Provides access control in elevators enabling the access of each cardholder to have access to any combination of floors over specified time periods. The interface to the elevator manufacturers’ equipment is by low level interface (relay outputs).
- Monitors the condition of inputs. The system is able to be programmed to apply a variety of conditions to the way in which these inputs are monitored and enunciates the condition of such inputs in accordance with such programming. All system programming is to be conducted in association and under supervision of the Campus Facilities Administrator, UniSA Facilities Management Unit.
- Provides a fully functional intruder alarm system including entry and exit delays. The Intruder Alarm System component is fully integrated with the Access Control aspects of the system. It is possible to secure or access areas from any access control reader associated with an area, or via Remote Arming Terminals or as required from defined central control locations.
- Totally integrates to the existing UniSA WAN Network. A data point adjacent to each field controller is to be supplied by others to achieve the required connectivity. The allocation of suitable IP addresses and routing requirements for field controllers will be supplied by UniSA under current arrangements and procedures with the nominated security contractor. Connection to Intelligent Field Controllers (IFC’s) shall be achieved using Ethernet cabling supporting 10baseT and TCP/IP protocols.
- Reports all events to the operator(s) as configured and produces and maintains a log of all system events, alarms and operator actions. Also provides a means for an operator to extract information relative to the event log and system configuration and produce this information in the form of printed reports, screen displays or ASCII files.
- Provide for 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.
5.16.3 Cardax Access Control

**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.

**Central Control and System Management Software**
The central control and system management software Operations throughout all UniSA sites is the Cardax FT Enterprise 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 Campus Facilities Administrator.

**IFC’s**
The system shall incorporate dedicated Cardax FT 3000 or 5000 Series Intelligent Field Controllers (IFC’s), which communicate with and control the following equipment:
- card access readers
- reader, Input and Output (RIO) panels (5000Series only)
- elevator access equipment
- alarm monitoring Input/Output panels and equipment
- Remote Arming Terminal (Codepad)
- alarm response equipment.

All system enclosures are to be equipped and configured to detect tampering and report low supply voltage conditions. Cardax enclosures include tamper protection for the front (open door) and the back (removed from wall) of the panel. Cardax tamers are optical and mechanical tamper devices are only to be installed on battery / power supply enclosures.

Where a Remote Arming Terminal is specified for a project, the Cardax 3000 Series shall be used.

**Power Supplies and Batteries**
Each IFC shall be equipped with a minimum of two (2) ELV Power Supplies and Back-up Batteries. Each IFC is to be powered by an independent 12 VDC 2.5 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 12 VDC 5 Amp Regulated Power Supply and 12 VDC 24 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 supply 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 nominate the number and location of each IFC within their tender submission to ensure due allowance is made by Electrical Contractors.

**Access Control Readers**

Card Readers to be used throughout UniSA is predominately swipe card technology and can be specified in two configurations, being:
- card plus PIN reader (Cardax SmartSwipe Plus Reader), or
- card only reader (Cardax SmartSwipe Reader).

UniSA is currently in the process of migrating to Mifare Smart Card Proximity reader technology. These readers have the same configuration options to that of the Swipe Card Readers. An added advantage with use of these readers is the accessory option of a vandal resistant enclosure meeting IP66 rating. These should be used for all outdoor applications. The requirement for either Swipe or Proximity readers is detailed in the contract documents.

Readers with integrated PIN pads provide an ‘Entry under Duress’ function. This function is not to be disabled.

**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>
<thead>
<tr>
<th>Card Reader</th>
<th>Reed Switch</th>
<th>Electric Strike</th>
<th>Mag Lock (Double)</th>
<th>Mag Lock (Single)</th>
<th>Auto Door Release Output</th>
<th>Mag Hold Back</th>
<th>Press to Release Button</th>
<th>Emergency Break Glass</th>
<th>AV Indicator Unit</th>
<th>Cable Transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access and Egress Control to Auto Double Leaf Door</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Access Control to Auto Double Leaf Door</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Access and Egress Control to Auto Single Leaf Door</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>
### Access Control to Single Leaf Door

<table>
<thead>
<tr>
<th>Door Type</th>
<th>1</th>
<th>1</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>1</th>
<th>1</th>
<th>-</th>
<th>-</th>
<th>AAD1</th>
</tr>
</thead>
</table>

### Access and Egress Control to Double Leaf Swing Door

<table>
<thead>
<tr>
<th>Door Type</th>
<th>2</th>
<th>2</th>
<th>1</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>1</th>
<th>1</th>
<th>1</th>
<th>AESD2</th>
</tr>
</thead>
</table>

### Access Control to Double Leaf Swing Door (Free handle egress)

| Door Type                                      | 1 | 2 | 1 | - | - | - | - | 1 | 1 | 1 | ASD2 |
|-----------------------------------------------|---|---|---|---|---|---|---|---|---|----|

### Access and Egress Control to Single Leaf Swing Door

<table>
<thead>
<tr>
<th>Door Type</th>
<th>2</th>
<th>1</th>
<th>1</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>1</th>
<th>1</th>
<th>1</th>
<th>AED1</th>
</tr>
</thead>
</table>

### Access Control to Double Leaf Swing Door ML

| Door Type                                      | 1 | 2 | - | 1 | - | - | - | 1 | 1 | 1 | ASD2M |
|-----------------------------------------------|---|---|---|---|---|---|---|---|---|----|

### Access and Egress Control to Single Leaf Swing Door ML

| Door Type                                      | 2 | 1 | - | 1 | - | - | - | 1 | 1 | 1 | AED1M |
|-----------------------------------------------|---|---|---|---|---|---|---|---|---|----|

### Fire Door Double Leaf (Outer)

| Door Type                                      | - | 2 | - | 1 | - | - | - | 1 | 1 | 1 | FD2O |
|-----------------------------------------------|---|---|---|---|---|---|---|---|---|----|

### Fire Door Single Leaf (Outer)

| Door Type                                      | - | 1 | - | - | 1 | - | - | 1 | 1 | 1 | FD1O |
|-----------------------------------------------|---|---|---|---|---|---|---|---|---|----|

### Fire Door Double Leaf (Inner)

| Door Type                                      | - | 2 | - | 1 | - | - | 2 | - | 1 | 1 | FD2I |
|-----------------------------------------------|---|---|---|---|---|---|---|---|---|----|

### Fire Door Single Leaf (Inner)

| Door Type                                      | - | 1 | - | - | 1 | - | 1 | 1 | 1 |   | FD1I |
|-----------------------------------------------|---|---|---|---|---|---|---|---|---|----|

### Notes

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.

The above list is indicative only and there may be variations required for specific doors. Any such variations will be indicated in the contract documents.

All access control doors shall be monitored for both door open/closed and door unlocked/locked using concealed monitor 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 Monitoring Station.

### 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 shall comprise a card reader in each elevator car, reporting to elevator control interface equipment mounted in or near the elevator motor room. Reader type shall be the same as that used on access control doors. The elevator control system shall be capable of controlling access independently in a number of elevator shafts simultaneously. Each elevator reader shall be identified independently at the central control by means of a unique plain language descriptor. Each reader head shall 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 shall be via dry relay contacts. Trailing cables and cable interface between the two controllers are to be the responsibility of the lift contractor. Termination at the security IFC can be via a termination block with each contact clearly identified.

The elevator control system shall provide one relay contact per elevator shaft per level for the system. This relay contact shall be used to interface with the elevator switching control equipment.

An input shall 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 call 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 should indicate the lift call requirements.

**Access Cards and Tokens**

Generally, access token technology shall incorporate a Magnetic Track Swipe. Cards are issued and supplied by UniSA under separate arrangements. Where swipe card readers are specified, no access cards are to be supplied under the project.

Where Mifare proximity card readers are specified in the contract documents, dual token technologies are to be combined into a single Card, Magnetic Track Swipe and contactless Smart Card. The nominated security contractor is to supply the number of Cards specified in the contract documents to the Campus Facilities Administrator.

Cards shall be of standard credit card size, being no larger than CR-80 and shall be direct printable using a dye-sublimation print process or be capable of accepting an adhesive label printed through such a process. All cards shall meet ISO standards. The Smart Card aspect of the Cards shall incorporate Mifare Standard technology. The card number shall not be the card serial number, it must be a number specifically coded onto the card. The magnetic tracks on the supplied Cards are not to be encoded. The encoding of the Card magnetic tracks will be the responsibility of UniSA.

**Electric Strikes**

Electric Strikes (Padde ES2001) are to be provided for nominated doors (refer to contract documents). The supply and installation of electric strikes are the responsibility of the builder. Power cable and supply and strike function are the responsibility of the nominated security contractor.

**Electromagnetic Locks**

Electromagnetic Locks are to be Padde EML10 for double doors and Padde 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 for a single power supply will be dependant on the opening draw of the lock and the capacity of the power supply. There is always to be 10% spare capacity from maximum draw calculations.

**Magnetic Door Hold Back Lock**
Magnetic Door Hold Back 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.

**Press to Release Button**
Door release buttons are to be of PCV Clipsal Switch-plate type (white in colour) with the words ‘Door Release’ engraved with black prominent writing. Mullion size door release buttons are only to be used where it is impracticable to use a standard wall plate size.

**Emergency Break Glass Button**
Emergency break glass buttons are to be manufactured for purpose and be either white or green in colour. All Emergency break glass buttons installed at UniSA facilities are to be double polled, the primary poll for the direct door release and the second poll wired back to the APC and commissioned as an alarm input.

**Audio/Visual Indicator Units**
An Aritech AR638 (or equivalent) Audio/Visual Indicator Unit is to be installed above the head-space of any access controlled door that requires a ‘Door Open Too Long’ local alert. All such devices are to be programmed for a 30sec local alert only (Stage 1 alarm) followed by a monitored alert after a further 30 sec without a door seal (Stage 2 alarm).

### 5.16.4 Alarm Contacts

**Overview**
Predominately, all alarm points are to be connected to Cardax 3000 Series IPC’s on individual input expanders. The inputs and outputs of the Series 3000 IPC should be left allocated only for access control purposes. This may vary in some instances were the facility is small or has a low expectation of security requirements. When in doubt, the Campus Facilities Administrator should be contacted to obtain clarification.

**Movement Detectors**
All movements shall 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.

**Door Contacts**
Each door (including each leaf of a double door) nominated to be provided with electronic access control shall have commercial grade recessed Reed Switches installed. This is to ensure that both ‘Forced Door’ and ‘Door Open Too Long’ functionality is available. These shall be of Sentrol 1078 25 mm recessed types (or equivalent) in most occasions. Any
deviation to the type of detector needs to be approved by the Campus Facilities Administrator.

**IT Workstation Alarm Contacts**

IT workstations in computer pool facilities are connected to a double data outlet, one being for the actual LAN communications and the other for line resistance monitoring for PC 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, separate to the nominated security contractor’s responsibility.

The nominated security contractor’s 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 Cardax Input Expander Modules (requires one (1) Cardax Equipment Enclosures, complete with five (5) Eight Input Expansion Modules) to be located adjacent to the Cardax 3000 Controller.

A Cardax Remote Arming Terminal (RAT) is to be installed within close proximity to the computer pools area to provide local control and display of alarm points (location to be confirmed with Campus Facilities Administrator).

A combined Piezo Screamer/Blue Strobe Light Unit is to be installed within close proximity (just below ceiling height) to provide local alert of a PC Security Alarm (location to be confirmed with Campus Facilities Administrator).

**AV Equipment Alarm Contacts**

Data projectors and AMX controlled Audio Visual Equipment shall be connected via the structured cabling double outlet, one being for the actual LAN communications and the other for line resistance monitoring for AV 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.

An anti-tamper housing is provided to each data projector and alarm outputs are also provided from the AMX control system. A combined Piezo Screamer/Blue Strobe Light Unit is installed within close proximity to provide local alert of an AV Security Alarm (location to be confirmed with Campus Facilities Administrator).

These works are provided by the Communications Contractor/AV Contractor, separate to the nominated security contractor’s responsibility.

The nominated security contractor’s 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 Cardax Input Expander Modules (requires one (1) Cardax Equipment Enclosures, complete
with five (4) Eight Input Expansion Modules) to be located adjacent to the Cardax 3000 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 Campus Facilities Administrator.

A Cardax Remote Arming Terminal (RAT) is to be installed within the Communications room to provide local control and display of alarm points (location to be confirmed with Campus Facilities Administrator).

5.16.5 Closed Circuit Television (CCTV)

**Overview**
The current authorised CCTV system for use in UniSA facilities is the Indigo IP Video System (IPVS).
The system incorporates the following components:

- cameras
- transmitters
- receivers
- network Video Recorders
- control Centre Station (Operators and Administrators)
- IP Network Infrastructure.

**IPVS General Description**
Transmitters are connected to each analogue camera and compress the video using MPEG-4 that is then streamed over the IP network. The video can then be viewed on Receivers, which will display the video on a CCTV Monitor, or on multiple Control Centre Station PC’s. Windows NVR’s and/or Linux NVR’s will record the MPEG-4 video from the Transmitters.
The Control Centre Stations are responsible for visual matrix operation of the IPVS, including live video, PTZ control (where applicable), playback, alarm management, sequences, guard tours and salvos. All Control Centre users will log into a central database, which will be managed by a Control Centre Administrator. The IPVS Administrator assigns user privileges as well as configuring and maintaining the system.

**Cameras**
The preferred camera manufacture for use on UniSA sites is Panasonic. All cameras are to be high resolution colour, capable of operation in low light environments. Cameras are to be of integrated dome type and robust in construction (intruder resistant where possible). Cameras are to have dual outputs (where available), one for connection to the UniSA LAN and the other for local viewing. If local viewing is specified a wall plate is to be provided, complete with a composite video output female adaptor and ELV Power female adaptor. The second video output from the associated camera shall be connected to the composite video female adaptor.

Where local viewing is specified, a six inch LCD hand held colour monitor shall be provided for local viewing of cameras. This is to allow staff members to orientate camera
views (of non PTZ cameras) when display positions are required to change. A 3 meter lead is to be provided to connect the LCD monitor to wall plates adjacent to each camera.

Adjacent to each camera location or in another specified location (referenced drawings should specify) a Rittal enclosure of AE model is to be provided to house the camera power supply and communications equipment. Enclosures are to be of a size appropriate to house all the equipment needed. Enclosures may be located in ceiling cavities, as long as a wall or ceiling plaque is supplied to indicate the location and purpose of the enclosure. These are to be located directly below the enclosure, inside the room, easily identified. Enclosures are to be key lockable with an approved profile lock.

The nominated security contractor is to ensure that the size of the enclosure accounts for the installation of a 240 VAC double outlet and a twin data outlet. While these are to be supplied and installed by others, the available space and access requirements are the responsibility of the nominated security contractor. Each camera is to be powered by an individual din rail mounted power supply. Where possible, cameras should operate at 12 VDC so that back-up battery supplies can be provided. Duration of back-up power is to be not less than 24 hours. If 12 VDC operation is not possible, the use of an inverter or other approved power back-up source is to be supplied by the nominated security contractor to account for the required 24 hour + period. The power supply and back-up source is to be housed in the camera enclosure.

Transmitters
The IPVS shall consist of one Transmitter connected to each analogue camera. The transmitter will take an analogue (composite) video input and compress the video using MPEG-4 and stream it over the IP network. Once on the network, the video can be viewed on a Control Centre station or displayed by an MPEG-4 Receiver or recorded by an NVR.

Each Transmitter will perform VMD at source on the Transmitter host processor. Performing VMD by any other method is not allowed, as it is not scalable or as reliable.

Transmitters are to be housed within the camera enclosure and powered from the camera power supply, or if this is not possible due to differing voltage requirements, a separate power supply and back-up source provided.

In some instances (predominately where a number of cameras are in close proximity to LAN/Communication Rooms) cameras may be cabled to a central location were a Rack Chassis and transmitter cards are to be provided. The chassis holds up to 10 Transmitter cards (hot swappable) and have a single network interface and power supply. Mains power for the chassis is to be from the rack UPS power outlet. If the rack is not equipped with UPS power, the nominated security contractor is to provide a suitable back-up source to account for a 24 hour period in the event of mains failure.

Receivers
Receivers are only required where analogue monitors are specified for the viewing of camera images. Where this is required, the IPVS shall consist of one Receiver connected to each analogue monitor to display video from individual MPEG-4 Transmitters.

NVR’s

NVR’s are to be connected to the IP network and record video from selected Transmitters. Additionally they allow playback to Control Centre stations and Receivers as well as storing and sending Alarms.

NVR’s are to be located in the main Server Room of the Campus to which cameras are supplied. Recording of cameras from other campuses can only be authorised in exceptional circumstances and must be approved by the Campus Facilities Administrator.

Rack space for NVR’s will be provided by UniSA Facilities Management Unit. The nominated security contractor is to liaise direct with the Campus Facilities Administrator for rack space requirements. Network connection is the responsibility of UniSA Information Strategy & Technology Services.

The nominated security contractor is only to provide a 32 channel NVR, when required. This will be in the instance where available channels on an existing Campus NVR are not available, or where a Campus is yet to employ CCTV. Only licences for transmitters applicable to individual projects are to be supplied. Spare/vacant channel licences will only be specified and provided by prior approval of the Campus Facilities Administrator. All NVR’s are to be Windows based.

Control Centre Stations

Control Centre users at one or more stations will operate the IPVS. In total, the IPVS will support up to 9,999 Transmitters, Receivers and NVR’s. It will also support an unlimited number of Control Centre Stations. Each Control Centre user will log into a central database that will assign the relevant configuration and access privileges. This database will be configured and maintained by the IPVS Administrator using Control Centre Receivers.

The Control Centre PC specification will depend on the total bit rate of the live video displayed. In most instances a 32 channel NVR is to be provided but there are instances where lower number channel NVR’s may be specified.

The following table details the recommended processors depending on the number of video streams:

<table>
<thead>
<tr>
<th>Table 5-12 - Recommended Processors for Quantity of Video Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Live Video Streams</strong></td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>32</td>
</tr>
</tbody>
</table>
5.16.6 Conduit and Cabling

All cable and conduit is to be installed to meet with the conditions of this specification and meet all current cabling regulation and standards.

5.16.7 Labelling

All cables and equipment cabinets shall be comprehensively labelled to clearly indicate their function.
Where cables enter or leave trays, racks, troughs or ducts, cables shall 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 shall be used to tie together single cables of the one circuit or system, to further assist maintenance identification.

5.16.8 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.

5.16.9 Documentation

General
The nominated security contractor shall provide to the Campus Facilities Administrator comprehensive documentation to enable effective operation and routine maintenance of the entire IAS, EACS and CCTV systems employed at UniSA.
This shall include at least the following:
- Operations 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.

Operations and Maintenance Manuals
Three (3) printed copies and one (1) electronic copy of the Operations and Maintenance Manuals, including three (3) full sets and one (1) electronic copy of the As-Built Drawings, shall be supplied prior to practical completion in accordance with the Operations and Maintenance Manual Specification.
The manuals shall include a full description of all installations and the functioning of the various elements involved and instruction to cover every action necessary for the efficient operation and maintenance of the installation.

As-Built Drawings
In addition to the drawings provided with the Operations and Maintenance Manuals, supply two (2) printed copies and one (1) electronic copy of as-built drawings to the Campus Facilities Administrator prior to practical completion as set out in the Operations and Maintenance Manual Specification. Practical Completion shall not be granted until such drawings are received, are up to date and accurately reflect all field changes to the installation and which are a true and accurate representation of the actual installation. All buildings equipped with either IAS or EACS components shall be included within this scope (also to include total site schematic). The drawings shall include the following:
- schematic wiring diagrams with correct circuit and termination identification
- final equipment layouts.

5.16.10 System Commissioning & Acceptance Testing

General
The nominated security contractor shall be responsible for all system commissioning and acceptance tests 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 Campus Facilities Administrator. All system commissioning shall be carefully pre-planned and scheduled. System commissioning information shall be submitted to the Campus Facilities Administrator for approval not less than two (2) weeks before commencement of system commissioning. UniSA may elect contractor’s staff in undertaking or witnessing the approved system commissioning and any additional system commissioning deemed necessary by the Campus Facilities Administrator. All system commissioning shall be scheduled to be completed one (1) week prior to practical completion.

System Commissioning
All system commissioning procedures, checking and adjustments shall be carried out to demonstrate to the satisfaction of the Campus Facilities Administrator that the system as installed complies with the specification. System commissioning shall be by exhaustive testing on a “point by point” basis for each system function. Each point test may be witnessed by the Campus Facilities Administrator (or nominee) and checked off on a commissioning sheet, prepared by the nominated security contractor. The commissioning sheet shall include such information as successful operation, response times, resulting computer messages, etc. Each possible system event shall be simulated and tests shall include a “full load” test in which all alarms are simulated at once and simultaneously all card readers are utilised both with authorised and unauthorised cards.
Should any test fail, cause of failure shall be determined and corrected and the test shall be repeated.

5.16.11 Training

The contract shall 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 shall 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 Campus Facilities Administrator, direct negotiation on costs are to be between the nominated security contractor and the Campus Facilities Administrator.

5.17 External Asset Groups

External Asset groups include lighting, roads, paths, drains, power, and gas.

5.17.1 External Lights

Introduction

For the purposes of this guideline, “external lights” are those that are not mounted on buildings as part of the building external light fitting program. They may be pole-mounted street lights along roads, path lights, lighted bollards, or lights in parkland-type environments.

Street Lights

General principles

Light intensity should meet the requirements outlined in AS1681. Street lighting designs are to comply with AS1158.1 for category V and/or P situations and 1158.6 luminaires. Lighting designs are to take into consideration the vehicular and pedestrian traffic situations as exist at the light location, and must reflect the need for safe/comfortable access, management of illegal acts and light spill/glare control.

Street-light lamp heads are to be easily maintainable (preferably with quick-release clips for easy access/removal), demonstrate robustness and a relatively long useful life (e.g.
constructed of die-cast aluminium, with stainless steel access brackets or clamps, long-life waterproof gaskets) and be vandal resistant (e.g. fitted with acrylic visors).

**Environmental control**

Street-light lamps are to be environmentally sustainable, both in terms of energy consumption and light spill.

Luminaires should be of the compact fluorescent type, and lamp heads should have non-roadside reflectors.

Solar powered lamps should be considered where appropriate.

**Standardised approach**

Where possible the street lights should be consistent across each campus. This should be reflected in the pole-type, the lamp-type and the luminaire.

**Controls**

Unless otherwise specified, lamps are to be controlled by means of a photoelectric switch, this to be mounted inside of the lamp head.

Provision should be made in the lamp for energy reduction such as reducing light intensity when there is no vehicle or pedestrian activity).

**Pole manufacture**

Street light poles are to be manufactured from hot dipped galvanised steel, and may also be coated with thermoplastic or thermoset polymer dry powder coating (colour to be specified), depending on the surrounding poles, and the circumstances of the specific installation.

**Pole Height**

Pole heights should be consistent with other lamps in the vicinity, and are to be designed specific to the site requirements.

**Path Lights**

**Lighted Bollards**

**Parkland Lights**
5.17.2 Roads

TBA

5.17.3 Paths

TBA

5.17.4 Drains