Design Standards

2024 Version

Artwork 'Luwaytini' by Mark Cleaver, Palawa

RMIT University acknowledges the people of the Woi wurrung and Boon wurrung language groups of the eastern Kulin Nation on whose unceded lands we conduct the business of the University. RMIT University respectfully acknowledges their Ancestors and Elders, past and present. RMIT also acknowledges the Traditional Custodians and their Ancestors of the lands and waters across Australia where we conduct our business.

CONTENTS

1.0 General

1.1 RMIT Gateway Framework (Gateway)

Effective delivery of capital works at RMIT relies on the input of many internal and external stakeholders and sign-off at key project milestones. This process is outlined in the RMIT Gateway Framework.

Gateway ensures that appropriate consultation and sign-off occurs at key decision points and provides transparency and accountability.

Gateway comprises five gates namely:

- Gate 1 – Strategic Assessment
- Gate 2 – Briefing
- Gate 3 – Feasibility / Concept Design and Business Case / Schematic Design
- Gate 4 – Design Development / Contract Documentation / Procurement and Construction
- Gate 5 – Defects Liability Period

It is the responsibility of the consultant team to ensure that the appropriate engagement has occurred at all stages of the project in accordance with Gateway.

1.2 How to use the RMIT Design Standards

The Design Standards are written to advise RMIT Performance requirements above and beyond existing industry codes and standards.

The Design Standards do not repeat Codes and Standards.

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

Where the word “shall” is used, this indicates that a statement is mandatory.

Where the word “should” is used, this indicates that a statement is a recommendation.

1.3 Scope

This Standard is applicable to all RMIT staff and third-party consultants and contractors engaged in the design, maintenance, refurbishment and construction of university spaces and is applicable at all RMIT’s Australian entities.

1.4 Document Control

References within the Design Standards are also available through this website.

Feedback on the operational effectiveness of the Design Standards is invited from stakeholders and consultants via the Design Standards Governance Group (DSGG).

The DSGG will review any feedback and determine any revisions required to the Design Standards to address feedback from stakeholders and consultants, outcomes of Post Implementation Reviews or other changes in regulations/code.

2.0 Introduction

The Design Standards detail the minimum RMIT design requirements for its new and refurbished built environments.

The purpose of these Design Standards is to:

- Maintain relevance and ensure standards and codes are achieved as a minimum requirement.
    - Essential services compliance.
    - Adherence to Australian Standards.
    - Disability Discrimination Act 1992 (DDA) and Building Code of Australia (BCA).
    - All legislative requirements.
- Deliver designs which reflect the values of the University and society.
    - Ensuring safety, fostering a mindset of respect, selfcare and care for each other.
    - Ensuring a socially inclusive environment that is welcoming for all, is informed by Responsible Practice and reflects RMIT's value of inclusion.
- Ensure Indigenous culture and heritage is acknowledged and respected.
    - Creating opportunities for social and community engagement including sharing facilities with community partners and partners with social enterprises.
    - Acknowledging and protecting Indigenous Cultural and Intellectual Property (ICIP).
- Reflect emerging products and technology.
- Ensure designs promote diversity and inclusion, and support the elimination of unlawful discrimination in line with RMIT's values.
    - Design for dignity by providing equitable, accessible, and adaptable spaces and technology that can be personalised.
    - Cultural safety as an underlying design principle.
- Drive sustainability outcomes through good design.
- Facilitate the design of the range of university spaces to be fit for purpose, inclusive, culturally safe and which deliver excellent experiences and outcomes for RMIT's diverse community (students, staff, partners, and visitors).
- Support the development of designs which are economical and efficient from a whole-of-life and operational perspective.
- Incorporate lessons learned and provide a framework to facilitate continuous improvements.

Consultants shall read and be familiar with the entire Design Standards.

It is not acceptable to RMIT for Consultants to focus only on the sections pertinent to their discipline.

All Consultants are required to demonstrate an understanding of world best practice in pedagogy; be aware of the latest innovations in teaching and learning spaces; commit to cross-disciplinary learnings and innovation and to appreciate the absolute necessity for clear communication and coordination of consulting disciplines.

Active contribution to the ethos and success of the University and appreciation and implementation of these Design Standards will be a primary requirement for Consultants to continue to be accepted by RMIT on Consultancy Panels.

All current volumes of the standards are available on the RMIT Design Standards web page.

2.1 Context

All Stakeholders and Consultants shall be familiar with Section Three – Universal Requirements, which provides context on the organisational and governance arrangements that apply to the design and construction of new facilities and describes the key principles that underpin the requirements of the Design Standards:

- Inclusion and Diversity
- Responsible Practice
- Disability and Discrimination Act
- Sustainability
- Occupational Health and Safety
- Safety in Design
- Management of Construction
- Handover and Commissioning
- Facilities Management
- Hazardous Materials

All Stakeholders and Consultants shall be familiar with Section Four – Planning and Design, which provides context on the innovation focus of RMIT and its cultural approach to the natural and built environment, both past and present:

- Town Planning
- Urban Design Principles
- Architectural Design Principles
- Heritage and Legacy
- Cultural
- Indigenous Cultural and Intellectual Property (ICIP)

2.2 Purpose

The purpose of the Design Standards is to set out RMIT's expectations for the operability serviceability, maintainability, and aesthetic approach of built environments across all RMIT University campuses.

The Design Standards includes RMIT's social and cultural expectations, through urban design and planning, equity, diversity and Responsible Practice, architectural and engineering design requirements, Occupational Health and Safety (OH&S), Access for People with a Disability and Sustainability.

The Design Standards direct consultants to relevant internal RMIT documents which define space allocation and workspace guidelines for staff accommodation.

Any design aspects not specifically addressed by this document shall be identified by the Consultant during the development of the design and shall be brought to the attention of the PCG for resolution.

2.3 Primary Objectives

RMIT promotes innovation in design and actively promotes variety in the appearance of its facilities and buildings:

- RMIT is committed to achieving Carbon Neutrality by 2025. Designs are to be developed to achieve optimal efficiency to the operation of the building and consider the whole-of-life costs associated with the materials, plant and equipment proposed.
- Consideration and respect for differing cultural interpretations.
- Designs are to focus on the social, cultural, economic and sustainability goals of RMIT (include relevant links to our corporate responsibility, sustainability, reconciliation, Responsible Practice, and inclusion commitments).
- Create an ethos of inclusion of all people with diverse capabilities, physical abilities, identities, circumstances and or backgrounds.
- Delivery of teaching and learning outcomes consistent with RMIT objectives and policies.
- Recognise that operating and maintaining facilities shall occur within acceptable financial limits.

- Projects as delivered, to progressively increase efficiency and effectiveness of the design, documentation and delivery process.

The major delivery point for RMIT's activities is in research, teaching and learning spaces.

An absolute focus is to occur on the integration of all services, physical spaces and infrastructure required to deliver the most creative outcomes in these areas.

2.4 Relationship to the Building Code and Australian Standards

The Design Standards do not relieve any person or company commissioned by or contracted to RMIT of their responsibility to comply with the requirements of all relevant Codes, Standards and Guidelines.

If the requirements of the Design Standards appear to require a deviation from the requirements of good architectural practice, the National Construction Code and/or the requirements of the relevant statutory authorities, the consultant shall convey this issue in writing to the Project Control Group (PCG) and seek clarification and direction.

2.5 Demonstrating Compliance with the Design Standards

At the completion of each design stage (Feasibility Study/Concept Design/Schematic Design/Design Development), the consultant team shall complete a Compliance Statement to confirm that the design as developed is compliant with the Design Standards.

Where the design is not able to be or is not proposed to comply with the Design Standards the consultant team shall detail the proposed departure and submit to the Technical User Group (TUG) for review and consideration/approval.

Departures must be identified and raised early with the TUG to avoid the risk of abortive design work.

The Design Standards Requested Departures Spreadsheet shall be completed during each project phase as part of obtaining approval to progress to the next phase.

2.6 Audio Visual and Information Technology Integration

Coordination of disciplines is a critical factor in RMIT's engagement of its Consultants.

Teaching brief requirements shall be coordinated with the User Groups including ICT.

The consultant team is responsible to produce a design which meets the pedagogic requirements of spaces and users.

Attention is drawn to the need for services reticulation to be carefully detailed were required to be built into fixtures and fittings as well as full coordination between all services disciplines.

3.0 Universal Requirements

The following requirements underpin the Design Standards and apply to all design solutions.

3.1 Inclusion, Diversity, Equity and Access

RMIT has a long and proud history of commitments and action to ensure that opportunities to develop and succeed are open to everyone. The Inclusion, Diversity, Equity and Access (IDEA) Framework creates a blueprint for our continued journey towards our goal that RMIT is 'Inclusive by design: Everyone, everywhere, all the time'.

To achieve our strategic aspirations, we need to ensure that everyone is included and enabled to thrive, whoever and wherever they are. A key guiding principle of the IDEA Framework is Universal Design - ensuring that our products, systems and environments are built for the diversity of the community from the outset so they are usable by all people.

The Design Standards aim to reflect these values in RMIT's portfolio of buildings. Consultants are expected to embrace these philosophies and engage to further develop this leadership role being performed by the University.

3.2 Responsible Practice

RMIT was founded in 1887 on the unceded lands of the Boon wurrung and Woi wurrung language groups of the eastern Kulin Nation. As a collective and as individuals, we commit to respectful ways of working and understanding that acknowledge the experiences, history, and knowledge of Aboriginal and Torres Strait Islander peoples. We actively strengthen relationships between Indigenous and non-Indigenous peoples for the benefit of all Australians and the communities in which RMIT operates.

RMIT's Knowledge with Action 2031 strategy is grounded in the understanding that education, research, and engagement work together to achieve our collective strategic goals. This includes the success of Aboriginal and Torres Strait Islander learners, researchers, and professionals and advancing their self-determination as part of a distinctive learning and engagement ecosystem that is underpinned by Responsible Practice.

The transition from Reconciliation to Responsible Practice encourages us, individually and as a collective, to consider the actions that are within our control, and to take the opportunity to diminish behaviours and sentiments that are not useful or helpful; and to amplify the practices that actively strengthen relationships between Indigenous and non-Indigenous peoples for the benefit of all Australians and the communities in which RMIT operates.

The Design Standards form a foundational element of the strategic purpose by ensuring that research, education and engagement spaces and places (physical and virtual) reflect an awareness of their location on Kulin Country, are culturally safe and welcoming, and promote strength in culture, identity and belonging of Aboriginal and Torres Strait Islander peoples.

The Design Standards also reflect RMIT's commitment to protecting the Cultural and Intellectual Property of Aboriginal and Torres Strait Islander peoples.

3.3 Disability and Discrimination

It is essential the objectives of safe, dignified and equitable access are met for all users of the building.

The Disability Discrimination Act 1992 (DDA) is Commonwealth legislation which was enacted in 1993. It aims to eliminate discrimination against people on the grounds of disability.

The Design Standards acknowledge the University's obligations under the DDA and exceeds these obligations wherever possible.

The Design Standards form the basis for access requirements and recommendations over and above the legislated requirements of the Disability (Access to Premises - Buildings) Standard 2010 (DAPS).

RMIT buildings shall be easy to use and allow access for all people regardless of ability.

- Doors and entries to major paths of travel shall be automated.
- Entranceways shall enable disabled persons to enter and exit the building through the same doorways as the remainder of the University population.
- Operation of vertical transport shall be independently operable by all users.

- Accessible bathroom facilities shall be available to all.
- Accessible car-parking spaces shall be available to all.
- All teaching space types to be available in a variety of accessible locations.
- Braille signage and hearing augmentation shall be provided.

References

- Inclusion, Diversity, Equity and Access Framework
- Section Five – Space Requirements
- RMIT Furniture Standards

3.4 Sustainability

RMIT is committed to leadership in sustainability through its research, teaching and learning and operations. The University's built form is a clear opportunity to drive sustainable outcomes and drive progress towards the University's Carbon Neutral 2025 goal and the UN Sustainable Development Goals (SDGs).

A 'sustainable' building is designed, constructed and operates in a way that reduces or eliminates negative impacts and creates positive impacts, on the climate, natural environment, local economy and society.

The University is committed to:

- **Reduce emissions** through passive design, energy efficiency and renewable energy.
- Assess and adapt infrastructure to **reduce climate change vulnerability**.
- Use **environmentally sustainable best-practice** design and technologies in all development and refurbishments.
- Pursue **precinct-based solutions** that minimise resource consumption and greenhouse emissions.
- **Responsible water management**, focusing on high levels of water efficiency in operations, water capture opportunities and water sensitive urban design to minimise the use of potable water sources.
- Be **inclusive** by design and drive **social impact.**
- **Responsible use of resources** in considering the circularity of material flows in the built environment and developing progressive waste management systems.
- Deliver spaces which **encourage sustainable behaviours** including recycling, energy saving and water conservation.
- **Encourage sustainable modes of transport**, by providing safe pedestrian access, public transport connections and high-quality cycling facilities.
- **Respect, preserve and enhance** Indigenous knowledge, heritage, cultural and natural assets.
- Leverage infrastructure upgrades to provide a mechanism for student participation and research **creating living labs**.

The requirements of these Design Standards provide a holistic approach to the design of sustainable buildings, fit-outs and places.

3.4.1 Certification

All new buildings or significant refurbishments (as defined by RMIT business case) are to be certified by the Green Building Council of Australia's Green Star suite of building rating tools and shall aim to achieve a minimum 5-Star Green Star rating. All projects targeting a Green Star rating must prioritise maximising the number of Indoor Environment Quality and Greenhouse Gas Emissions points, and specifically, sustainable materials points for refurbishment projects.

3.4.2 Carbon Neutral 2025

All projects are to consider and document design decisions that directly contribute to the RMIT Carbon Neutral 2025 goal, through the incorporation of emissions reduction initiatives and preference of energy efficiency in systems design and equipment selection.

The RMIT Carbon Management Plan has committed to no longer installing natural gas assets for building use (this excludes learning, teaching and research requirements). Projects that are considering the replacement of any natural gas-based equipment or infrastructure must develop an all-electric solution.

References

- Sustainability Homepage
- RMIT's Sustainability Plans

3.5 Occupational Health and Safety

RMIT University is committed to providing a safe and secure environment for all students, staff and visitors including service personnel.

Our commitment and expectations include:

- Health, safety, and wellbeing methodologies will be followed when designing, delivering and operating fit-for-purpose facilities.
- Commitment to the compliance of applicable OHSE Acts and Regulations, including plant design registration.
- Eliminating and reducing identified OHSE hazards and risks.
- Safety on campus as a highest priority.

Thoughtful design which considers crime prevention can influence safety and security in a positive manner:

- Incorporate logical street access and wayfinding directing visitors to administration, retail and commercial facilities and supervise entries.
- Design and choice of finishes to discourage vandalism and abuse.
- Avoid entrapment spots where people can be concealed or trapped without observation.
- Review existing CCTV and lighting layouts to avoid entrapment and dark corners.
- Provide night lighting/sensors at access points and well placed external PA speakers and CCTV.
- Security lighting to concourses, under crofts and outdoor pavements, exterior doorways, corridors and stairways.
- Incorporate BMS control with external lux sensors to cover after hours usage.
- Compartmentalise facilities for out-of-hours use.
- Provide good supervision of all areas through passive observation such as windows overlooking pedestrian routes.
- Incorporate CCTV and lighting to entrances/exists to toilets including, where relevant, out-of-hours use.
- Consideration to location of amenities so as not to promote loitering or isolate entrances.
- Incorporate safe out-of-hours access to car parks, bicycle parks and other transport hubs
- Secure fences shall be designed and constructed to not impede sight lines.
- Blind corners are to be avoided, and reliance on enclosed corridors is to be minimised. Visual connection between spaces is to be prioritised.
- Safe refuges for people to wait for assistance to evacuate the building are to be provided.
    - e.g. within fire stair or lift lobby. The size of the refuge is to be according to the expected occupancy of the building. Allow a space of minimum 1300x800mm per person.

References

- Crime Prevention Through Environmental Design (CPTED)
- WorkSafe Registration Requirement on Plant & Equipment

3.6 Safety in Design (SiD)

- Consultants are required to demonstrate that Safety in design has been considered when developing the design documentation for the project.
- The project team must facilitate a workshop including key RMIT stakeholders with an interest in OHS outcomes or operations. The workshop must review each element of the design/proposed works and consider how spaces will be used, managed and operated (including equipment considerations) and adjust the design/proposed works accordingly.
- The project team must compile a summary report documenting the workshop review outcomes and submit to RMIT and the PCG for record-keeping purposes.
- If risks are identified that cannot be mitigated to a satisfactory level within the design, those risks must be transferred to maintenance operations at the completion of the project.
- Selected projects may undergo a Hazard and Operability (HazOp) Study instead of a Safety in Design process. RMIT will advise consultants as to when a HazOp is required, with a specialist consultant engaged to lead the HazOp.

References

- WorkSafe – Safe Design

3.7 Commissioning and Handover

Commissioning and Handover shall be in accordance with RMIT Gateway requirements.

Essential Safety Measures (ESM) maintenance will be undertaken by RMIT Facilities & Asset Management commencing from the contractual handover of projects.

3.8 Facilities Management

Provision shall be made in the design for the following:

- All materials shall be selected for their likely availability, low maintenance frequency and cost and colour consistency over a 40-year building period.
- Items shall be sourced for their ease of replacement, short lead-times with a preference for stocked items, and easy spare parts supply.
- Light-coloured flooring shall be avoided and shall have an appropriate slip test rating.
- Light-coloured fixtures and fittings shall be avoided where applicable (internal and external surfaces).
- Buildings shall be designed to include or accommodate a fixed building access system for maintenance and cleaning of the external façade, including sunshades. Designs shall produce clear unobstructed building perimeter access and incorporate mechanisms to control bird roosting.
- Internal and external maintenance of all project components. Attention is drawn to the accessibility of all maintainable assets.
- External and internal window cleaning.
- Consultants shall obtain written approval through the Technical User Group for the building access system for each design.
- A complying fixed roof safety system shall be provided for ongoing roof maintenance, plant access and cleaning.
- Safe access is shall be provided for the maintenance of green walls and green roofs.
- Lift access shall be provided to any roof top plant space.
- Access to any roof-mounted plant from the lift connection shall be a roof walkway and safety system in accordance with Safety by Design requirements for an individual project.

3.9 Hazardous Materials

- RMIT holds baseline data for hazardous materials (hazmat) within buildings (Division 5 Register) and tree protection zones.

- RMIT Property Services (OHS) issues approvals to access data.
- Where applicable to individual projects, information is to be validated/supplemented by the Consultant for communication in Tender documents.
- Where Hazmat is present or identified, the Project Manager is to conduct a Risk Assessment in consultation with the consultant/contractor team and RMIT's HSE Manager – Governance and Systems.
- A Risk Management Plan and recommendation are then to be prepared by the Project Manager and submitted to the Senior Manager Hazardous Materials & Safety for approval. Options to be tested in the workshop may include full removal, partial removal or encapsulation.
- Storage and use of Radioactive Substances.
    - Design considerations for radioactive substances shall be confirmed with the University Radiation Officer and general enquiries to Radiation Coordinator at extension x57192 Health and Safety team and the RMIT Project Manager in association with the end user of the space.
    - Any system capable of emitting ionizing radiation or radioactive materials shall not be used without the specific written permission from the RMIT Health and Safety team.
    - Where highly radioactive sources are to be used, the store shall be included in the base building design.
    - Conduct a HazOp study to identify risks and relevant controls to mitigate operational risks.
- All facilities containing radioactive sources shall be clearly identified.

4.0 Planning and Design

4.1 Town Planning

The Design Standards provide an outline of the planning and heritage requirements in use and development at RMIT University campuses.

Consultants are required to comply with the strategic and statutory planning requirements for each campus as well as the relevant campus Master Plan.

Property Services Group has a standing contract in place with a preferred town planning consultant.

The Architect/Lead Consultant is to confirm through RMIT's nominated town planning consultant all strategic and statutory planning requirements applicable to the specific project and detail these requirements in their design reports.

RMIT has campuses in the following locations:

Australia:

- Melbourne
- Bundoora
- Brunswick
- Hamilton
- Point Cook

Vietnam:

- Ho Chi Minh City
- Hanoi

Spain:

- Barcelona

Projects are required to comply with the relevant Town Planning Regulations in each of these locations.

Heritage overlays and Indigenous significance overlays may apply. Removal of native vegetation may require a Planning Permit even where building works do not.

Overseas campus planning requirements will be determined in each Approved Project Brief.

Maps of the Campuses can be found on the RMIT website.

References

Planning Schemes Victoria

- Melbourne – Melbourne Planning Scheme
- Bundoora - Whittlesea Planning Scheme
- Brunswick - Merri-bek Planning Scheme
- Point Cook - Wyndham Planning Scheme

4.2 Urban Design Principles

- The plurality of Melbourne's people has had a significant impact on thinking about the city and how we live in it.
- RMIT has always fostered a spirit of urban design creativity which is second to none.
- The RMIT story is of great contribution to the urban fabric – wonderful spaces, innovative buildings and continuous crafting of each campus.
- Consultants are required to critically analyse urban context to provide the basis for urban design.
- Design vision shall encompass socio-cultural, economic, environmental, statutory, infrastructural and other key factors necessary for success.

- Engagement with contemporary issues of sustainability and resilience underpins all urban design, together with the achievement of safety and security.

4.3 Architectural Design Principles

- The architecture of RMIT in recent years has been lauded as inventive, skilled and intelligent.
- RMIT encourages the exploration of innovative, aesthetically focussed products in the building fabric, but asks that in doing so the consultant team carefully consider the practical aspects of planning criteria and construction technologies.
- Planning shall focus on Flexibility, Reconfiguration and Expansion. The siting of building elements shall provision for future expansion.
- All relevant forms of construction should be presented to RMIT at an early stage in the design process to ensure that the emerging design reflects materials and systems acceptable to RMIT. The use of untested technologies, which have been in use for less than two years, is discouraged. If used, they shall be rigorously detailed and proved fit for purpose by the Consultant team. Written approval is to be obtained from RMIT Property Services by the Consultant.
- Designs shall incorporate components and materials of a size that suit the intended means of handling during construction and provide realistic tolerances.
- No building services shall be visible on the outside of the building, the placing of protruding building services or equipment is to be avoided or shielded from view.
- Building services design shall accommodate future expansion and/ or reconfiguration up to an increase 10% in occupancy capacity.

4.4 Artworks

- Artwork shall be considered at the Feasibility Stage.
- Consultants at the Feasibility Stage shall review any existing works of art on the site or building for retention, removal or replacement. If being retained, storage and holding of art works shall be arranged with the Project Manager. Should additional art works be proposed consultation should be undertaken with the RMIT Gallery to determine if there are any works in the collection which would be suitable.
- All expensive artworks and artefacts should have adequate CCTV and lighting coverage.
- As part of RMIT's commitment to keeping campuses and buildings city vibrant during construction, site hoardings, signboards and scaffolds shall be considered for high-quality graphics, decoration, activation and art. Such opportunities are to be detailed in the project design reports.

4.5 Heritage and Legacy

- Protect and enhance heritage items, including cultural, architectural and Indigenous heritage.
- A Cultural Heritage Management Plan (CHMP) is required when high-impact activities are planned in an area of cultural heritage sensitivity as defined by the Aboriginal Heritage Regulations 2007.
- If not specified in the Approved Project Brief consultants are required to investigate at project commencement whether a CHMP is necessary.
- Consultants are to be aware of the longer time implications of Standard and Complex CHMP's.
- Consultants shall consider approval processes for Heritage Applications, allowing at least 60 days for a Standard Approval.

References

- Aboriginal Heritage Act 2006 (Vic)
- Code on the Ethics of Co-existence in Conserving Significant Places
- Victorian Heritage Act 2017
- Burra Charter 2013

4.6 Transport Infrastructure

- RMIT is committed to prioritising sustainable transport through the use of public transport, bicycles and pedestrian access.
- Routes shall be designed to suit projected traffic patterns and destinations, and where possible integrated within a network of open space.
- All access ways shall be self-draining either by ‘crowning’ or by cross fall.
- Where appropriate, bicycle paths and parking facilities are to be incorporated into the building design and surrounding landscape.
- Pedestrian access paths are not to be shared with bicycle paths.
- Routes shall be finished in such a way as to provide adequate slip resistance and low maintenance.
- Cycle paths shall be:
    - Provided with separate access to the site from motorists and pedestrians.
    - Self-draining either by ‘crowning’ or by cross fall.

4.6.1 Parking – DDA

Where vehicle parking is necessary as designated by RMIT, designs shall deliver non-discriminatory access.

- Accessible car spaces shall be provided near to access points to the relevant campus.
- Provide separate pedestrian path through car parks. Where this is not possible, provide a marked pedestrian path on the road aisles.
- Angled parking spaces at 90 degrees only or parallel spaces are to be provided.
- Bollards in designated accessible parking shared spaces shall be 1300mm high and provide a 30% luminance contrast with surrounds.
- Where vehicles overhang the path of travel, e.g. footpaths, provide a wheel stop to ensure the width of the path is maintained always. Provide a luminance contrast between the colour of the wheels top and the road surface.
- Provide directional signage to accessible car parking spaces at any carpark entry.
- Vertical signage shall be provided at the front of the space in locations where it will not restrict the use of vehicle hoists.
- Where a drop-off zones adjacent to building entrances is provided, include a 2400x2400mm space for the use of vehicular hoists at the rear of the zone. Kerb ramps between the road and the footpath level shall be provided at the front and the rear of the drop-off zone.
- Seating shall be provided adjacent to drop-off zones with a clear line of sight to the approaching vehicles. Include an area adjacent to the seat for a person who uses a wheelchair. A circulation space of 1540x2070mm shall be provided in front of the seat. Shelter from rain and weather shall be provided.
- Use visual cues such as colour and/or symbols to identify different parking zones and levels.
- Provide accessible car spaces with shade and protection from weather.
- Car park lighting shall be even and consistent including any ticket machines.
- Provide bicycle parking in accessible locations that are secure and easy to use. Consider different types of cycles, including hand cycles and recumbent bikes.
- Provide a covered area for motorised scooter parking with recharge points at 600-1100mm above finished ground level.
- Traffic barriers are required at entrances and exits to car parks. Install push buttons and controls 50+/-25mm behind the face of the kerb to allow easy reach for the driver. Controls should be suitable for people with weak grasp. Buttons are recommended to sit proud of the surrounding surface and be a minimum 25mm in size.

- Where ticket machines are required, provide on a level landing of a maximum 1:40 with manoeuvring space of minimum 1540x2070mm. All operative parts of the machines are to be at 900-1250mm AFGL.

4.6.2 External Paths of Travel – DDA

- Path width to be a minimum 2100mm for main paths; 1500mm for secondary paths and 1200mm for all paths. Curved paths to be minimum 1500mm width.
- Define accessible paths of travel for people with vision or cognitive impairments from the property boundary or adjacent thoroughfares to the building entrances. This may include the use of borders, planter boxes or surfaces with contrasting texture or colour.
- Passing spaces of a minimum 1800mm wide along paths of travel at maximum 20m intervals are to be provided.
- Kerb ramps, including the splayed sides, are to be of a colour that contrasts with the adjoining surface.
- Areas with reduced head height are to be enclosed or provided with another barrier such as rubbish bins, planters or seats.
- A different pavement colour or texture is to be used in areas where seats, bicycle racks, drinking fountains etc are located to identify the area separately from the main paths of travel.
- Seats are to be positioned at least 500mm away from the edge of a pathway to prevent the legs of a seated person becoming a hazard for others. Seating at maximum 60m intervals is to be provided.
- Bike racks are to be positioned out of the path of travel and away from the building line and include allowance for poorly parked bikes.
- External grassed areas to meet the toileting and feeding needs of assistance animals are to be provided.
- Provision of sightlines, lighting and video surveillance which assists in crime prevention are to be considered.
- Timber boards to be laid perpendicular to the path of travel with gaps of no less than 6mm and no greater than 10mm, to prevent wheeled mobility aids, walking sticks, crutches, etc. becoming stuck in the gaps.

4.6.3 Secure Bicycle Parking

- For all new buildings, secure bicycle parking is required to accommodate 5% students (calculated on 75% occupancy EFTSL) and 10% staff.
- The provision of floor-mounted bicycle parking is preferred.
- Access should be from a street-frontage, without passage through the building.
- Secure fencing to be provided with RMIT standard CCTV and swipe-card access controls.
- Facility to be bright and well illuminated, with slip-resistant flooring.
- Decals to be used on walls and floors to way-finding and to promote the facility.
- Consider the provision of bicycle repair stations, bike vending machines, electric bike charging, drinking fountains and general seating.
- Galvanised steel hoop with bolt-down fixings preferred in internal applications, approx.. 850mm h x 590mm w x 50mm, installed at 1000mm centres.
- Supporting Bike Hub facilities can be found in Section Five – Space Requirement; 5.16 Bicycle Hub Facilities
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4.6.4 External Bicycle Racks

- Racks should enable both wheels to be secured and/or support bicycles in two places.

- Avoid spiral design, which fails to support two bicycles per hoop and creates difficulties for safely securing bicycles at two points.
- Racks should be located close to building entry points to maximise passive surveillance.
- Sufficient space should be provided for ease of manoeuvrability around the racks and should be accessible from front and back.
- The racks should not obstruct pedestrian or motor vehicle flow and should be integrated and harmonised with the local context.
- Stainless steel hoop with bolt-down fixings preferred in external applications, approx. 810mm h x 1000mm w x 50-70mm, installed at 1000mm centres.

4.7 Wind

- Consideration shall be given to local microclimate including prevailing winds.
- Airlocks are to be included at all building entrances - revolving doors are not acceptable.
- Avoid creating adverse weather conditions for neighbouring areas.
- Incorporate wind barrier preventions to maintain stable climate conditions.
- Consider the orientation and protection of entrances to avoid or buffer prevailing winds.
- Materials exposed to wind shall address effects such as structural integrity and potential for “whistling”.

References

- RMIT Thermal Comfort Guidelines: available upon request from Property Services Group

5.0 Space Requirement

5.1 General

- For the following space types, space allocation will be based on work function and determined during the briefing process with Property Services.
- AV systems shall include the capacity to connect and collaborate with other RMIT facilities and industry, both locally and globally.
- Power and USB charging access shall be visible and easily accessible in all student areas, and be mounted for ergonomic access, i.e. above bench height.
- Cabling to locations off walls shall be chased or cored.
- Magnetic or glass whiteboards, pinboards, smartboards to be confirmed through consultation with the Stakeholder User Group and Technical User Group (all must be mechanically fixed).
- Benching shall be 900mm min in length and 1100mm max height above the finished floor level.
- Avoid ceiling-mounted AV to spaces directly below plant rooms.

References

- Section Five Space Requirements to be read in conjunction with, and compliant with, the RMIT Furniture Standards

5.2 Circulation

- Primary paths of travel are to be provided with a design or finish that differs from other secondary paths of travel e.g. different colour scheme, lighting or floor surfaces.
- Central nodes within the building where vertical circulation is located to assists wayfinding. Nodes should be visible from the building entries. Provide design elements such as art, fountains, sculptures, different colours, sounds or smells etc to assist orientation within a building.
- Ramps are preferred to lifts wherever practicable.
- Areas with reduced head height shall be enclosed or provided with another barrier such as waste and recycling bins, planters or seats.
- Provide 2070 x 1540 mm turning areas within 2m of the end of path of travel.
- Include a variety of wheelchair seating spaces at tables.
- Use of Tactile Ground Surface Indicators shall be minimised through careful design and the use of other elements.
- Seating tiers shall be protected at the upper level through the provision of a barrier or additional seating plinth.
- Contrast edge strip shall be provided at any raised platform/podium/seating tiers to clearly delineate the change in level.
- Service cupboard or plant room access through work, teaching or storage areas is not acceptable.
- Durable finishes or alternative suitable protection required to low level wall finishes.
- Locate doors to Teaching and Learning spaces to avoid crowding at change-over times between classes, and/or provide wider circulation spaces for waiting.
- Teaching and Learning Spaces should be able to be viewed from circulation spaces.

5.3 Teaching and Learning Spaces

- Flat floor multi-functional teaching spaces are preferred.
- Learning, teaching and research spaces shall meet or exceed standards set by state government and the Tertiary Education Facilities Management Association (TEFMA).
- Teaching and Learning spaces shall not be obstructed by columns other visual intrusions.

- Presentations at RMIT occur in numerous formats to suit presenter preference – traditionally at a lectern or using Wi-Fi and remotes devices to allow flexibility of location.
- Projection screens, lecterns or other points of delivery, flexible instruction stations to be confirmed through consultation with the Stakeholder User Group and Technical User Group.
- Lecterns/teacher consoles are to be provided in all teaching spaces.
- Lecterns require power and data – ICT and AV liaison is critical.
- Height adjustment options for lecterns are to be scoped to ensure DDA access is accommodated.
- Modesty panels are to incorporate RMIT logo to indicate room location when in lecture or VC capture mode.
- RMIT standard lectern shall be provided with pre-set and integrated AV and lighting controls.
- Do not install downlights above location of presenters.
- Task lighting shall be provided to lecterns.
- Task lighting shall be provided to presenter.
- Wash lighting shall be provided for panel discussion scenarios.
- Controlled natural light is a critical component of Teaching and Learning spaces.
- Blinds provided to external windows for brown-out to be confirmed through consultation with the Stakeholder User Group and Technical User Group.
- Teaching and learning spaces shall be furnished with non-fixed and re-configurable joinery and lightweight, mobile furniture for various space requirements throughout the day or over time.
- Double GPOs providing a total of one power outlet for every four students.
- Spaces shall be designed to support groups of 6 as a standard, with provision for larger groups of 12 to 15 to meet specific requirements.
- Consultant shall provide diagrams demonstrating that a variety of room configurations are achievable, including:
    - AV presentation.
    - Conference.
    - Small group project work.
    - Group work with perimeter access to data connections.
    - Tablet arm chair group work.
- An ‘ante’ space shall be provided to accommodate the peak pedestrian traffic load.
- Mechanically fixed whiteboards or writable surfaces are to be provided to several walls.
- Mechanically fixed pin boards are to be provided to meet specific stakeholder requirements.
- Writable surfaces should be installed in landscape orientation.
- Height adjustment options are to be scoped to ensure DDA access is accommodated.
- Space counters enable utilisation data to be captured in real time throughout the entire year for a given space. In learning and teaching spaces this enables utilisation data to be integrated with timetable data, which enables best outcomes for students and staff to be achieved. The data also provides valuable data for use in the development of property plans and assists in identifying strategies to improve utilisation and efficiency within the existing property portfolio. RMIT requires TPS Group thermal detectors to be specified, with the Building Contractor to engage TPS for the supply, installation and configuration of the space counter.
- Space Counters are to be installed in:
    - All learning and teaching spaces.

- All large seminar and workshop spaces (over 20 seats, i.e. Mega Flex room) which are primarily to be used for students.
- All student collaborative spaces and common spaces.

References

- Tertiary Education Facilities Management Association
- RMIT Furniture Standards

5.4 Lecture Theatres

5.4.1 Access

- Circulation spaces to be sized to allow for easy 'departure' of classes whilst another group is waiting, an 'ante' space shall be provided to accommodate the peak pedestrian traffic load.
- Whilst the primary use of University teaching spaces is the delivery of the academic program, consideration shall be given to ease of access and use by the wider community.
- Large lecture theatres shall have adjacent 'break-out' and waiting space.
- Visual connection is to be provided from adjacent circulation space into lecture theatres.
- Waiting or break-out spaces are to be serviced by adequate toilet and washroom facilities.
- Consideration is to be given to the utilisation of break-out areas for exhibition and events.
- Signage, access, amenities and other services shall also be planned with public use in mind.
- Accessible spaces are to be provided on more than one level within auditoria and lecture spaces in new buildings.
- The front row of seats shall be at the same floor level as entry doors.
- The setback for tiered seats from whiteboards to projection screens shall be coordinated with AV requirements.
- Sufficient clear door widths are provided to allow for a maximum clearance time of 2.5 minutes for quick and efficient changeover between lectures.
- Glare from light sources or adjacent light colour walls onto screens shall be avoided.
- Optical calculations should be undertaken by the Audio-Visual consultant to ensure that viewing angles and distances are acceptable.
- Door/s are to be provided at or near the rear of the theatre for the entry of latecomers to minimise disruption to presenters.
- Writing surface/ laptop support shall be provided, including power points.
- Power points to be easily accessible and highly durable.

5.4.2 Floors

- The lecture theatre floor shall be tiered or raked to provide a clear view of the display areas and the presenter from every seat.
- In preference to sloping theatre floor, raking shall be provided by terracing, to maintain flexibility.
- Aggressive tiering (which can create projection and screen viewing problems) is not to be used except for very small theatres or where existing conditions shall be retained.
- Provide a kerb or plinth seat at the top of any raised viewing areas for people with vision impairments or who use wheeled mobility devices.

5.4.3 Furniture

- All facilities on a podium for use by a speaker / lecturer such as projector, computer keyboard to be located 700-1200mm AFL and within 300-400mm of the front of the lectern. Height adjustment options are to be scoped to ensure DDA access is accommodated.

- All furniture should be scoped as per the RMIT Furniture Standard.

5.4.4 Seating

- Provide adequate space between seating rows to provide sufficient space for tall people with long legs.
- Include wider seating options for people who are accompanied by an assistance animal or who are larger than average size.
- All furniture should be scoped as per the RMIT Furniture Standard.

5.5 Other Teaching and Learning Spaces

5.5.1 Computer Based Learning Spaces

- Circulation space between bench tops shall be a minimum of 1800mm.

5.5.2 Student Study Areas/Portals

These spaces are high-use and support collaborative study.

- Controlled lighting, PA and AV are to be provided.
- Writable surfaces should be installed in landscape orientation. Seating and tables are generally to be fixed and designed for students to comfortably use for medium to long-term study.
- Seats or banquettes without backs are discouraged.
- Seating shall be designed with an adjacent work surface for use of notebooks, laptops and other devices.
- In-desk power and data boxes shall be specified for high use, and of durable construction.
- Concealed or flip-up units are to be avoided.
- All furniture should be scoped as per the RMIT Furniture Standard.

5.5.3 Art/Design Studio

These spaces are high-use multipurpose flat floor spaces.

- Provide access to high-quality natural light.
- Material selection to be robust and extra heavy duty.
- Wet areas are to be provided to meet stakeholder requirements.
- Plaster traps to be provided where required to meet stakeholder requirements.

5.5.4 Specialist Spaces

These spaces are clinical practice-based flat floor consultation spaces which include a variety of specialist teaching modes for various disciplines. Details of their requirements were different from the types above will be provided on a project-by-project basis.

- Appropriate level of privacy both acoustic and visual.
- Clinical Practice Spaces are to accommodate a consultation bed, privacy and hand washing facilities and equipment storage (in-room and/or in adjacent store room).

References

- Section Three – Universal Requirements; 3.9 Hazardous Materials
- Australian Health Facility Guidelines
- Office of the Gene Technology Regulator
- Department of Agriculture, Fisheries and Forestry

5.5.5 Teaching Laboratories – Dry

A Dry Laboratory is a general-purpose space for practical teaching and learning of various sciences, including:

- Electronics
- Mechatronics
- Engineering
- Computing (Hardware)
- Robotics

The needs of these laboratories are varied and can change rapidly and shall be as flexible as possible. Suitability and necessity for registration under the Federal Department of Agriculture and Water Resources (DAWR) and the Office of the Gene Technology Regulator (OGTR) shall be checked by the consultant team.

Refer Section 20 – RMIT STEM College Laboratories for further requirements.

5.5.6 Teaching Laboratories – Wet

A Wet Laboratory is a specifically designed space for practical teaching and learning of various sciences, including;

- Materials Science
- Biology / Molecular Science
- Chemistry

Wet laboratories are likely to require specialised services such as fume cupboards, emergency washing, and other safety equipment. The needs of these laboratories are varied and can change rapidly and shall be as flexible as possible and shall deliver:

- Suitability and necessity for registration under the Federal Department of Agriculture and Water Resources (DAWR) and the Office of the Gene Technology Regulator (OGTR) shall be checked by the consultant team.
- Physical Containment Level 1 minimum.
- Physical Containment Levels 2, 3, 4 may apply, to be confirmed through consultation with the Strategic User Group and Technical User Group.

Refer Section 20 – RMIT STEM College Laboratories for further requirements.

5.6 Research Laboratories

Refer Section 20 – RMIT STEM College Laboratories for further requirements.

5.6.1 Dry Labs

- The needs of these laboratories are varied and can change rapidly and shall be as flexible as possible as the functions undertaken in them could require open plan, generic and flexible or highly specialised spaces.
- Suitability and necessity for registration under the Federal Department of Agriculture and Water Resources (DAWR) and the Office of the Gene Technology Regulator (OGTR) shall be checked by the consultant team.

5.6.2 Wet Labs

- Suitability and necessity for registration under the Federal Department of Agriculture and Water Resources (DAWR) and the Office of the Gene Technology Regulator (OGTR) shall be checked by the consultant team.
- Physical Containment Level 1 PC1 minimum.
- Physical Containment Levels 2, 3, 4 may apply, to be confirmed through consultation with the Strategic User Group and Technical User Group.
- An adequate supply of sinks and running water shall be provided in radioisotope laboratories so that non-radioactive liquid waste can be disposed of via the normal drainage system.
- Locate hydraulics points on the perimeter where possible to avoid future obstacles.

- Floor wastes are to be avoided unless absolutely required. If they are required, they are to be fitted with priming devices to mitigate bacterial growth.
- Reticulate services such as power, electricity and gas from above.
- Provide sensors to lights and any standalone AC units.
- For facilities with radiation sources (e.g. x-ray unit, sealed irradiation units etc.):
    - Radiation sources shall be carefully located with respect to occupied areas. Consideration shall be given to possible radiation beams or scatter through roof, floor and walls.
    - Suitable shielding shall be designed for to ensure safe working conditions in adjacent locations.
    - The design shall be certified by a radiation expert.
- All fume cupboards are to have automatic closing sashes with manual override ability.

5.7 Staff Accommodation

- Design of workplace areas shall allow for flexibility of furniture locations.
- Compactus is not to be used for general storage. Storage units within the floor area of the staff accommodation area are to be used, and all storage is to be managed by the stakeholder group to be essential items only.
- All furniture should be scoped as per the RMIT Furniture Standard.

References

Space allocation will be based on work function and determined during the briefing process with Property Services.

5.8 Meeting Rooms

- Space allocation will be based on work function and determined during the briefing process with Property Services.

5.9 Prayer Rooms

- RMIT is committed to supporting the religious practices of staff and students from a diverse range of faiths. Prayer rooms are available on every campus.
- Provision of Prayer Rooms require a sensitive and thoughtful design approach by Consultants.
- Requirements will be nominated in the Approved Project Brief.

5.10 Retail Facilities

Requirements for the fit-out of retail tenancies are beyond the scope of this Design Standard but are detailed in the RMIT Retail Tenancy Guideline. The Project Manager will provide this guideline on an as required basis.

5.11 Toilet and Shower Facilities

- Incorporate an airlock or exhaust entrance solution for each toilet facility, avoiding direct sight lines.
- Provide sanitary facilities centrally to reduce travel distance to the facilities.
- Ambulant shower cubicles, with a grab rail in wet and dry areas of the cubicle shall be provided.
- WC's and urinals for ambulant disabled shall be provided.
- Toilet Cubicles
    - Minimum toilet/shower cubicle size 1550mm l x 920mm w.
    - Female and accessible toilets shall include space for freestanding sanitary disposal bins, 350mm l x 250mm w.
- Change Cubicles

  - Provide a minimum of one change cubicle with circulation space of minimum 2070 x 1540mm and door clear opening of 850mm.
  - Provide a stable seat or fixed bench seat.
- Dispensers
  - Dimensions and specifications of all dispensers shall be confirmed with RMIT.
  - Wet areas shall include a shelf to place toiletries.
  - Height to be 900m – 1100mm above finished floor level.
- A wash down point to all toilet and shower areas required by industry guidelines and standards.
- Provide shower seats with legs.
- Provide shower curtains with a weighted hem.
- Provide polymer film and ventilated wall-mounted flush mirrors screw-fixed to the walls above each vanity basin.
- Walls on which hand dryers are fixed shall be finished with an impermeable lining.
- Toilet and wet areas shall not have raw concrete or applied surface finishes.
- Separately signed staff and student toilet facilities are not required for RMIT operational reasons.

5.11.1 Accessible Toilets

- Accessible toilets are to be provided within any floor refurbishment project unless there is no lift access to that floor.
- Where more than one accessible toilet is allocated alternative left – and right hand – transfer configurations shall be provided.
- Doors to accessible sanitary facilities shall be automated and provide minimum clear opening of 900mm.
- Provide sanitary facilities centrally to reduce travel distance to the facilities.
- Required luminance contrast shall be provided between the WC seat and the pan, not wall or floor.
- Toilet paper holder outlet shall be no less than 550mm AFFL for greater ease of use.
- Front of wall basin shall be minimum 430mm from the wall to the front of the basin.
- The centreline of the basin shall be 600mm from the side wall to ensure adjacent fixtures such as hand dryers do not restrict a person using the basin.
- Install all dispensers within easy reach of a person at the basin.
- Locker facilities are not to be located within the accessible sanitary facility to allow access when the accessible sanitary facility is in use by another person.
- An accessible shower shall be provided in any location a shower is installed.
- A full-length mirror in addition to a mirror over the basin shall be provided. Lower edge of mirror to shall be minimum 600mm above finished floor level to prevent damage by wheelchair footplates.
- Locate floor drainage grates in areas that are not immediately in front of the WC pan or the basin to prevent ‘rollaway’ of wheeled mobility devices.
- Basins in accessible sole occupancy units shall be a semi-recessed basin with the front of the basin to be 600-650mm from the rear wall.
- Toilet paper holder outlet is at no less than 550mm AFFL for greater ease of use.

5.11.2 All Gender toilets

- All Gender designated facilities shall be provided for LGBTQIA (lesbian, gay, bisexual, transgender, queer or questioning, intersex, and asexual or allied) people.
- All Gender facilities are to be provided adjacent to male/female/accessible sanitary facilities

- Toilets shall have All Gender LGBTQIA signage.
- Door shall have a lock activated from inside which can be opened from outside in case of emergency.
- Door shall have a closer.
- Sanitary napkin disposal units provided in every All Gender Toilet.
- Luminance contrast between the WC seat and the pan is to be provided.
- Flushing buttons which sit proud of the surrounding plate and in a contrasting colour to the backing plate or wall are to be provided.
- Toilet paper holder outlet at no less than 550mm AFFL for greater ease of use.
- Hinge on cubicle door to self-close.
- Cubicles shall have dividers and doors within 100mm of floor level.

References

- RMIT Signage Standards, available through Property Services as PMP
- Section Eight – Physical Security; 8.3 Security Controls: Closed Circuit Television

5.11.3 Changing Places

- Changing Places facilities shall be provided for people with profound and multiple. learning disabilities, as well as people with other physical disabilities space to allow them to use toilets safely and comfortably.
- Provide a Changing Places facility on every campus. The facility should be placed centrally on the campus or provide additional facilities.
- Locations and numbers per specific to be confirmed through consultation with the Strategic User Group and Technical User Group.
- Provide:
    - Height adjustable adult-sized changing bench.
    - Tracking hoist system, or mobile hoist if this is not possible.
    - Adequate space in the changing area for the disabled person and up to two carers.
    - Centrally placed toilet with room on either side.
    - Privacy screen or curtain to allow some privacy.
    - Wide tear off paper roll to cover the bench.
    - Waste bin for disposable pads.
    - Non-slip floor.

5.12 Cleaners Facilities

- One large 'bulk' store per precinct, smaller cleaner's cupboards on each level.
- The consultant is to confirm that a cleaner’s room exists on the floor and ensure no duplication of existing utility spaces.

5.13 Sick Rooms

- Adjacent to a suitable accessible WC or a dedicated WC shall be provided ensuite.
- External window with shade or curtain.
- Impervious floor and wall finish.
- Emergency call button.
- Basin with hot and cold water.

5.14 Parenting Rooms

- Adjacent to a suitable WC or a dedicated WC shall be provided ensuite.
- External window with shade or curtain.
- Impervious floor and wall finish.
- Emergency call button.
- Basin with hot and cold water.
- Baby change tables shall be recessed, vertical type.
- Provide as a separate room, not within sanitary facilities.
- Provide open knee clearance under benchtops and sinks for parents with disabilities.

References

- Australian Breastfeeding Association

5.15 Entrance / Reception Areas

- Dedicated reception desks are generally not appropriate at RMIT, IP phones shall be located within entry spaces were approved by the Technical User Group.
- A minimum width of 900mm for knee clearance is required.
- Unobstructed sightlines should be provided between both sides of benches/desks in a seated or standing position.
- Where a high level of interaction is likely to be required (e.g. writing) a lower section of counter benches/desks 830-870mm with knee clearance of min 800mm in height for a minimum depth of 650mm is recommended.
- Where minimal interaction is likely to be required (e.g. payments) a lower section of benches/desks 830-870mm with knee clearance of min 750mm in height for a minimum depth of 400mm is recommended.
- Where only verbal interaction is likely to be required a lower section of counter benches/desks at max 870mm is recommended. No open knee clearance is considered necessary.
- Furniture and joinery colours shall achieve a luminance contrast with the floor colour to assist people with low vision.
- Provide D-shaped handles on all joinery.
- Ventilation of joinery units shall always be drawn from bottom to top.
- AV racks within joinery to be secure.

References

- Accommodation Policy and Workspace Guideline, Available through Property Services as PMP.
- RMIT Space Allocation, Available through Property Services as PMP.

5.16 Bicycle Hub Facilities

- Provide changing areas, amenities and lockers to support staff and students use of bicycles

5.16.1 Lockers

- A minimum of one locker per bicycle park should be provided.
- Provide lockers suitable for hanging personal clothing items and separate ventilated shoe storage. Refer RMIT Furniture Standards for locker selections.
- Provide waterproof, electronic keypad-type lock to secure lockers with 24-hour release feature, capable of being reprogrammed for both daily and weekly locking options.

5.16.2 Amenities

- Drying Area – provide an airing zone or ventilation cupboard so users can dry damp/wet clothes with towel drying rails (hooks are not suitable). Allow 975mm h x 1200mm w x 600mm d per 5 showers. Consider provision of mechanical ventilation to the drying area.
- Ironing Board & Iron – provide a minimum of one ironing board and iron in both male and female facilities.
- Hairdryers/straighteners – consider provision in both male and female facilities.

5.16.3 Changing Areas

- A changing area must be provided immediately adjacent to lockers and in close proximity to showers and toilets.
- Consider all-gender changing provisions.
- Provide appropriate space and/or seating for users to get changed before and after showering.
- Provide adequate space for users to circulate and change, a minimum of 1500mm wide zone between rows of lockers is recommended, with extra allowance if there is an island bench or integrated bench seating.
- Changing rooms shall be secured with swipe-card access control.

5.16.4 Showers

- Provide showers at a ratio of 1 shower per 25 bikes.
- Provide height-adjustable shower heads (adjustable range 1.5m-2.1m).
- Shower cubicles shall be a minimum of 1000m x 1700mm and be designed to maintain distinct wet and dry zones incorporating glass doors (not curtains).
- Provide a bench and minimum two garment hooks in dry zone of each cubicle.
- Provide a toiletries shelf in wet zone of each cubicle.
- Consider separate zoning of shower area, secured with swipe-card access control.

5.17 Kitchen and Tea Points

5.17.1 General

- Bench space to be provided on the latch side of microwave ovens and on the door handle side of refrigerator to allow items to be placed on the adjacent bench.
- Open knee space shall be provided under sinks and appropriate reach ranges for common functional use.
- Ovens shall have side opening hinged doors with adjacent set down bench space.
- Preference for under bench storage only, however when high level storage is provided, open shelves are to go above sinks rather than cupboards.
- Provision of drawers under benchtops, rather than cupboards.
- Bench height shall be 850-870mm, with open knee clearance under the sink.
- Taps to be provided within 475mm of the front of the bench where open knee clearance is provided.
- Taps to be provided within 300mm of the front of the bench where no open knee clearance is provided.
- Larger lever taps are recommended.
- Boiling water units to be provided within 300mm of the front of the bench.
- Crockery and cutlery storage cupboards/drawers to be lockable.
- Use of engineered stone for benchtops is prohibited. Silica-free material to be used that is fit for intended use (Corian or equivalent).

5.17.2 Kitchens

- A Tea Point or kitchen is considered a utility space at RMIT and shall be designed and located to reflect a level of finish appropriate to such a space.
- Do not duplicate adjacent amenity.
- Design of kitchenettes for self-prepared food are not required to comply with the National Food Standards Code.
- Solid timber and timber veneer products not acceptable.
- Standard laminate finishes are to be used.
- Provide open knee clearance sink and a section of bench.
- Stainless steel bench top and integrated sinks not acceptable.
- High-grade finishes not acceptable.
- Fully welded commercial-grade vinyl flooring with integrated coved skirting required.
- Bins to all kitchens and tea points located in a visible location and not a trip hazard.
- Joinery integrated waste bins not acceptable.
- Splashbacks are to be colour backed glass or ceramic tiles.
- Eliminate crevices and voids that can accumulate food scraps and crumbs which attract insects and vermin Bench top junctions with walls are to be fully sealed with anti-microbial caulk.
- Double bowl stainless steel sink with drainer.
- Tea towel rail.
- Stainless steel dishwasher specified to suit the peak load of kitchen.
- Full height refrigerator with freezer section if required to be confirmed through consultation with the Strategic User Group and Technical User Group, to be stainless steel finish.
- Boiling and Chilled Water Unit to be located within 300mm of the front of the bench.
- Microwave.
- Above bench power points for sandwich press and toaster. Sandwich press and toaster not to be included in specifications.
- A minimum of one power point to be located within 300mm of the front of the bench.
- Cupboard storage for crockery and consumables with adjustable shelving.
- One unit of drawers for cutlery etc. Minimum width 450mm.
- Staff kitchens to include one pin board to accommodate regulatory and staff information.

5.17.3 Tea Points

- No above bench power points are to be provided in tea points.
- Minimum cutlery and crockery storage to be included.
- Boiling and Chilled Water Unit to be located within 300mm of the front of the bench.
- Under bench cupboards to house BWU and cleaning supplies.
- Single bowl stainless sink with drainer.
- Hot and cold water.
- Stainless steel under bench/bar refrigerator.
- Tea towel rail or hook.

5.18 Communication Rooms

- Clear access, unobstructed between communications rooms and loading bays. Access to be off public areas, not teaching space.
- Minimum clearance of 1000 mm around racks with 1200mm clearance to front of rack.
- Final rack locations confirmed with RMIT Information Technology.

5.19 Storage (Chemical)

Provided to relevant Australian Standards and Regulations. Specific needs per to be confirmed through consultation with the Technical User Group.

5.20 Printer Areas

A Printer Area/Space is considered a utility space at RMIT and shall be designed and located to reflect a level of finish appropriate to such a space.

- A minimum 1 metre long layout surface shall be provided adjacent printer with under bench storage for consumables such as paper and toner Including boxes). Stationery supplies are not stored in print areas.
- Manoeuvring space in front of printer 2070 x 1540 mm.
- Printer specifications, locations and quantities are to be coordinated with stakeholders and approved by Strategic Sourcing and Procurement (SS&P).
- Physical clearance for devices located in walkways should exceed 2 metres.
- LAN/Data socket connectivity should be within 1.5m of device location.
- Requirements for increased air changes shall be coordinated with service engineers and included where required.
- Working power point shall be provided within 1.5m of device location. No extension cords are permitted.
- Bins are to be provided to all print areas. Confirm requirements for confidential document bins.
- Pin board minimum A3 size.

5.21 Plant Area and Lift Control Rooms

- Plant room access external to buildings.
- No access through learning areas.
- Layouts to allow for future expanded plant capacity.
- Plant rooms located above ground level.
- Where plant rooms are at risk of flooding, a sump and pump system shall be installed, alarmed to the BMS.

5.21.1 Weather and Vandal Protection

- Adequate and appropriate protection to mechanical and electrical equipment from the weather, tampering and mechanical damage by plant rooms and similar enclosures.
- Mechanical switchboards on roof areas shall be enclosed within plant rooms.

5.21.2 Floors

- Graded to drain to 80mm diameter minimum floor outlets.
- Sealed and painted with epoxy paint including 100mm coved upturns to walls, to locally contain spillages and flooding.
- All floor mounted equipment shall be built on full concrete plinths.
- Bunded areas to locally contain all leakage and spillage from tanks, equipment etc.

- Deep seal traps (75mm).

5.21.3 Services

- Power points for service and maintenance use in all plant rooms and plant areas.
- Water taps to plant rooms and plant areas.
- Chemical store cupboards in plant areas.

5.21.4 Lighting

- Paths of travel to roof and plant areas shall be provided with lighting for all hours use.
- Plant room lighting controlled with movement detector sensors.

5.21.5 Access and Maintenance

- Access to plant rooms and service areas via swipe card only.
- All external proprietary walkway systems sized appropriately for the maintenance tasks to be undertaken and be constructed in galvanised steel, non-slip self-draining and earthed.
- Plant shall not be located in ceiling or confined spaces.
- Stairway access with adequate door clearance to upper level plant enclosures.
- No roof access hatches are permitted.
- Plant rooms to be externally accessible and a direct point of vehicular access or service is desirable.

  Plant room doors to be double – no “cat and kitten” doors.

5.22 Waste Management Areas

- Consultant teams shall develop a waste management plan with RMIT Facilities and Asset Management (FAM) Team (inc Cleaning Contractors) and the Sustainability Team, including final bin selection and layout. Include paths of travel for the movement of bins, goods lift access and clear collection point/s. The operational expenditure shall be considered and associated costs clearly detailed.
- Provide sorting, segregation, compaction, storage, labelling and collection areas for waste and recyclable materials.
- Visual screening shall be provided to back-of-house waste disposal areas.
- Ensure adequate space and clearance height for large vehicles to enter and manoeuvre waste management areas.
- Pavement design shall support large vehicles and withstand ‘tyre scrubbing’ from vehicle manoeuvring.
- Bin wash areas shall be included, with a large cleaner’s cupboard with storage, sink and sufficient power points

5.22.1Waste Generation

The consultant must calculate the project’s waste volumes using the waste generation rates (refer table below) and provide an adequate number of bins to meet the project’s estimated total daily waste generation.

Type of premises	Landfill generation	Recycling Generation	Paper & Cardboard	Organics
Restaurant or Café (back of house)	300 litres per 100 square metres of floor area per day	200 litres per 100 square metres of floor area per day	Space allocation for temporary storage of flattened cardboard	100 litres per 100 square metres per day.
Retail (non-food)	50 litres per 100 square metres of floor area per day	50 litres per 100 square metres of floor area per day		

Education or training (teaching space)	5 litres per 100 square metres of floor area per day or 0.5 litres per student per week	5 litres per 100 square metres of floor area per day or 0.5 litres per student per week	5 litres per 100 square metres of floor area per day	
Student Lounges	60 litres per 100 square metres per day	60 litres per 100 square metres per day	60 litres per 100 square metres per day	
Offices	10 litres per 100 square metres of floor area per day Or 60L multi-sort set per 25 desks.	10 litres per 100 square metres of floor area per day Or 60L multi-sort set per 25 desks.	10 litres per 100 square metres of floor area per day Or 60L multi-sort set per 25 desks.	To be discussed with FAM and Sustainability
Library	20 litres per 100 square metre per day	20 litres per 100 square metre per day	20 litres per 100 square metre per day	
Childcare	350 litres per 100 square metres of floor area per week	350 litres per 100 square metres of floor area per week	To be discussed with FAM and Sustainability	To be discussed with FAM and Sustainability
Printing Areas (Utility Area)	-	-	240L per day	

5.22.2 Standard Bin Specification

The number of bins provided in the project must address the total estimated waste generation calculated, as a minimum. All bins must be placed in sets of two, three or four depending on the type of space/premises and the waste streams generated (refer table below). Adequate space for each bin set must be allowed for in each type of space and incorporated in the project's architectural plans.

Space Type	**Bin Set Required**	**Accepted Bin Suppliers**
Café or Restaurant (back-of-house)	Landfill (Red Lid) Mixed Recycling (Yellow Lid) Organics (Green Lid) Additional space for one additional stream to allow for future expansion Size to be determined per project.	RMIT Cleaning Contractor
Retail (front-of-house)	Landfill (Red Lid) Mixed Recycling (Yellow Lid) Organics (Green Lid) Additional space for one additional stream to allow for future expansion Size to be determined per project.	To be determined per project based on size and volume.
Teaching & Learning	60 LT grey base with:	Source Separation Systems

	Landfill (Red Lid) Mixed Recycling (Yellow Lid)	OR Method Recycling
Student common or circulation areas	120 LT wheelie bin with: Landfill Mixed Recycling To be located within enclosure provided by RMIT Cleaning Contractor: External applications – stainless steel enclosure Internal applications – powdercoated enclosure	Furphy Foundry (for small Student Lounges Method Recycling bins are an acceptable solution.
Offices / Staff Lounges	60 LT grey base with: Landfill (Red Lid) Mixed Recycling (Yellow Lid) Paper & Cardboard (Blue Lid) Additional space for one additional stream to allow for future expansion	Source Separation Systems OR Method Recycling
Kitchenettes	60 LT grey base with: Landfill (Red Lid) Mixed Recycling (Yellow Lid) Organics (Green Lid) Additional space for one additional stream to allow for future expansion	Source Separation Systems OR Method Recycling
Printing Areas	120 LT wheelie bin with: Paper & Cardboard (Blue Lid) Size to be determined per project.	RMIT Waste Contractor supplied
Amenities	60 LT grey base with: Landfill (Red Lid)	Source Separation Systems OR Method Recycling

5.22.3 Bin Storage Area

- Provide a dedicated bin storage area in all new buildings.
- Locate the bin storage area on the same building level as the loading dock(s) or provide a dedicated goods lift to transfer bins.
- Size to ensure adequate capacity to store all waste streams likely to be generated between collection cycles.
- Must be easily accessible to any applicable users including retail tenants.
- Consider ease of cleaning in finishes selections for floors, walls and ceilings of bin storage areas. Rigid, smooth-faced, impermeable materials are preferred.
- Provide an adequate supply of water for cleaning purposes including a tap.

- Provide adequate ventilation (natural and/or mechanical) to the storage area in accordance with relevant Australian Standards.
- Consider future needs in the design of the bin storage area such as container deposit scheme, glass separation and/or organics in consultation with the project's Waste Consultant, RMIT Waste Contractor and RMIT Sustainability team.

References

- RMIT Circular Economy Plan - Waste Management Design Specifications

5.23 Loading Docks

- On-site loading docks must cater for the size of service vehicles, space to safely enter and exit the vehicle, and space for the bins to be presented to the collection vehicle for servicing.
- Ensure the loading dock has sufficient clearance for RMIT Waste Contractor's collection vehicles (Medium Rigid Vehicle) at a minimum. Dimensions for Medium and Heavy Rigid Vehicles are below:

Trucks	Height	Width	Length
Medium Rigid Vehicle	4.5	2.5	8.8
Heavy Rigid Vehicle	4.5	2.5	12.5

A suitably qualified Waste Consultant must provide 'Swept Path Diagrams' to demonstrate sufficient access to loading docks for all waste collection vehicles.

The project team must coordinate a workshop which includes the Waste Consultant, all other relevant project team members and RMIT stakeholders to address loading dock design requirements.

5.23.1 Compactors

- New building developments should include provision for Compactors (specialised or over-sized waste storage equipment) for handling medium-large volumes of general waste, paper, cardboard and other recyclables.
- Where provided, specific vehicular access requirements must be considered by the project's Waste Consultant in consultation with RMIT's Waste Contractor and RMIT stakeholders.
- Allow a minimum 5m height clearance, or greater if required to meet the manufacturer's written recommendations.

6.0 Information Technology

Separately maintained by RMIT ITS, refer Design Standards Webpage.

7.0 Audio Visual

Separately maintained by RMIT ITS, refer Design Standards Webpage.

8.0 Physical Security

This security section proposes fundamental design principles which will inform well-designed environments to facilitate the safety of RMIT community members and the security of RMIT assets.

Whilst deliberately not prescribing urban design solutions, this section seeks to balance what can often be conflicting requirements of security and appeal in the RMIT built environment. It describes principles of planning, location, vision and physical form to aid a sense of safety in public space, as well as defining RMIT's requirements for identifying security risks during the design phase of a building project, as well as RMIT endorsed electronic security controls.

RMIT requires that security elements are incorporated into the design but must do so in a manner which compliments the primary activities of university spaces. RMIT does not wish to turn its campuses fortresses for protection. Neither does it wish to needlessly restrict the activities of the University, through the inappropriate or disproportionate use of physical or electronic security controls.

However, a sense of safety is important to the enjoyment of public space. The perception of personal safety, as well as actual safety, are critical to the overall accessibility of a precinct and have long been recognised as influencing how place and space is used.

The physical security requirements proscribed here are entirely consistent with the sustainable urban design priorities described in other sections of the RMIT Design Standards.

8.1 Design

The security design concept needs to be established during the early stages of a project and protective security measures included in the project design. RMIT Security must be included in project meetings and able to contribute to the Design Team effort during the design phase.

Whilst each Project Brief will outline specific security issues, all consultants are required to demonstrate a risk management understanding of security needs, conditions, threats, and vulnerabilities. RMIT Security will with representatives from Property Services Project team and stakeholder consultants as required, to develop a security system design relevant to the project.

Security design for all RMIT projects should be entirely consistent with:

- Crime Prevention Through Environmental Design (CPTED) principles (detailed below).
- The RMIT Physical Security Zone (PSZ) Model (detailed below).
- Standards Australia HB 188:2021: Base-building physical security handbook – Terrorism and extreme violence.

8.1.1 Crime Prevention Through Environmental Design

Urban planning and design practices that observe **Crime Prevention Through Environmental Design (CPTED)** principles will assist to create controlled spaces where users of RMIT spaces can go about the business of the University without unnecessary fear of becoming a victim of crime.

Overarching CPTED principles relevant to design are:

- **Surveillance:** General outdoor areas should be well-lit and clear of visual obstructions to enable a sense of natural surveillance throughout the precinct.
- **Legibility:** Enable space users to easily navigate their way around the precinct through the inclusion of appropriate wayfinding.
- **Territory:** Use signage and other appropriate barriers to clearly demarcate publicly accessible and university-restricted spaces are clear to encourage appropriate behaviours by space users.
- **Vulnerability:** Avoid designing concealed, physically isolated or segregated and naturally unobservable spaces which may create an unsafe feeling for users and negatively impact overall accessibility.

Examples of positive CPTED approaches are:

- Walkable neighbourhoods – attract people in order to populate spaces.
- Natural surveillance – visibility of entrances.

- Security “barriers”.
- Design streets to increase the presence of people, with adjoining buildings designed so that people have a good view of public space.
- Gathering spaces located in areas where there is natural surveillance from surrounding buildings and public space.
- Designing buildings to provide natural surveillance of the street. For example, windows overlooking footpaths, and building entrances facing the street that are easily visible and accessible from the street frontage and other building exits that are lit and have direct links to car parks and footpaths. Higher density housing and retail and restaurant uses with active frontages to public spaces.
- Ensuring facilities including footpaths and parks are well maintained, that routes have good sightlines to entrances and exits, that landscaping is pruned to ensure that sightlines are clear and opportunities for surveillance are enabled.
- Locating parks, play areas and public open spaces so they are visible from adjoining buildings such as houses, streets and schools.
- On-street parking to calm traffic speeds, support retail and commercial businesses, and provide a buffer between pedestrians and roads.

Examples of negative CPTED approaches are:

- Isolated, physically segregated developments or ’gated communities’ or a ‘fortress’ approach to neighbourhood and building design.
- Dominant use of cul-de-sacs, particularly curved cul-de-sacs which increase walking distances between residential homes and local facilities and increase motor vehicle use, particularly in areas where pedestrian cut through paths are not provided. Be aware that unless pedestrian cut-through paths are well designed to increase surveillance, property crime is likely to increase as well as levels of fear.
- Use of pedestrian underpasses that reduce opportunities for natural surveillance.
- Blank walls and fences, car parks and service areas that separate the fronts of buildings from the street, and excessive widths of garage doors fronting streets.
- Dense vegetation and shrubs around pedestrian routes.
- Any design solution whose “hardness” deters the use of outdoor space by pedestrians or visitors.

Other considerations:

- Security protection shall not interfere with equity of access and pedestrian flows.
- Take care with corners, these can form an entryway onto footpaths and open space for vehicles.
- Will any barriers need to be removed to accommodate events? For example, bollards for outdoor gatherings.
- If barriers are removed for events where does the physical protection for these events occur – that is, the necessary ring of barriers for protection of activities shall be considered.
- Should any barriers be consistent in expression or should each building express an integrated security identity at its threshold, whether entry or kerb.
- Specific threats – in urban setting what would be the highest speed a truck could attain before hitting a barrier? Would a truck hit one barrier or multiple barriers before stopping?

8.1.2 Security Risk Management and Asset Protection Requirements

RMIT Security identifies and controls security risks to RMIT people and assets via the use of an RMIT-tailored PSZ model. RMIT Security is the custodian of the RMIT PSZ model which was endorsed by the RMIT Chief Operating Officer in August 2021.

RMIT’s PSZ model supports the identification of valuable assets and provides a consistent framework for assessing their vulnerability to potential security risks in a consistent manner, based on RMIT’s enterprise risk management framework. During the design phase of a project, RMIT Security will support the use of this

framework by PSG staff and intended RMIT space custodians as needed to determine if the project involves space which will store valuable and vulnerable assets and will therefore require a higher level of security controls.

Identified risks to valuable assets are then mitigated via the installation of proportionate security controls during the build phase of the project. The specific controls are defined in the PSZ model; however, are not detailed in the RMIT Design Standards. Recommendations of RMIT Security staff during the design and build stage of a project will be based upon the standard controls detailed in the PSZ model.

The RMIT PSZ model proscribes four levels of PSZ's at RMIT, each with a set standard of physical, operational and electronic security controls.

An overview of the four zone levels within the RMIT PSZ model is here:

Security Zone	Security Zone Description	Examples (under non-COVID operating conditions)
Zone One (Public Area)	**Open Access** No controls in place to restrict access to anybody.	Publicly accessible external (ie Bowen Street or Bundoora Sports Facility) or internal (ie New Academic Street) space where members of the public can freely enter.
Zone Two (Limitted Access Area)	**Limited Access** Controls in place to restrict access to RMIT community, contractors and approved visitors only.	Open plan office environment where there is a separation between staff and members of the public - ie Our Place. Spaces that house equipment or information which, if compromised, would have a have a Major to Severe impact on RMIT operations (ie IT servers (comms rooms) or BMS equipment (plant rooms).
Zone Three (Controlled Access Area)	**Controlled Access** Controls in place to restrict access to RMIT community, contractors and approved visitors who have a specific, RMIT endorsed, requirement to enter the space only	Office space that houses high profile and / or critical RMIT staff. Laboratory or other specialist space subject to basic regulatory requirements which restrict access to approved individuals only (ie PC2 labs). Spaces that house equipment or information which, if compromised, would have a have a Major to Severe impact on RMIT operations (ie IT servers (comms rooms) or BMS equipment (plant rooms). Spaces where hazards are present which pose risks that could lead to Severe People, Safety and Environment impacts (ie plant rooms or construction sites).
Zone Four (Restricted Access Area)	**Restricted Access** Robust Controls in place to restrict access to RMIT community and contractors who have a specific, RMIT endorsed, requirement to enter the space only.	Laboratory or other specialist space subject to robust regulatory requirements which, due to safety or bio-security considerations, restrict access to approved individuals only.). Spaces that house equipment or information which, if compromised, would have a have an Extreme impact on RMIT operations (ie IT servers which allow direct access to the RMIT Enterprise Warehouse). Spaces where hazards are present which pose risks that could lead to Extreme People, Safety and Environment impacts (ie rooftops or dangerous goods storage areas).

Any queries relating to the RMIT PSZ model should be directed to RMIT Senior Manager, Security Operations or RMIT Manager, Security Operations.

8.2 Security Controls: Electronic Systems Overview

All active Security, Access Control and CCTV Systems shall be designed, installed, commissioned and maintained in accordance with the current release of the performance provisions of the Building Code of Australia (BCA) and current relevant Australian Standards to achieve the most suitable security solution for each project. A list of preferred Security Contractors is available from RMIT Security management upon request. All Security contractors must meet the following requirements.

- All integrators and installers shall hold relevant Security Licenses (Private Security Act).
- All installers must know, and all works shall meet, relevant industry standards including Australian Standards:
    - AS3000 Wiring Rules
    - AS1180.1 & AS1180.2 Information Technology

  - AS2344 Limits of Electromagnetic Interference
  - AS4510 Limits of Electromagnetic Interference for Semi-Conductors Devices
  - Approval and Test Specification for radio interference suppression devices
  - HB 167 Security Risk Management
- All security integrators and installers must meet all current Australian Communications Authority guidelines and regulations.
- Only accredited Infinity installers are permitted to work on and program the Infinity Security System. Installers must be a minimum of Tier 2 Certified and all other contractors connecting to any part of the security system shall be a minimum of Tier 1 Certified.
- Only accredited Motorola / Avigilon installers are permitted to work on and program the CCTV system. Technicians must be certified with Avigilon and approved by RMIT.
- Should RMIT change the base systems only authorized integrators and maintenance providers shall be authorized to work on or in the system.

Given the sensitive nature of the electronic security systems, unless a specific requirement necessitates otherwise, RMIT's current contracted CCTV and EAC maintenance providers should be engaged to complete works on the RMIT CCTV and EAC systems respectively. No other security integrator should be engaged without the express agreement of RMIT Security management.

8.3 Security Controls: Closed Circuit Television

RMIT's current CCTV system is manufactured by Avigilon, a subsidiary of Motorola. All Network Video Recorders (NVR's) shall meet the requirements of the current system and be consistent with the requirements of RMIT.

Requirements for installation or modification of equipment linked to the RMIT Electronic Access Control system are:

- **Camera requirements:** All cameras shall be at minimum 2MP (Megapixels) internal and 5MB and (Megapixels) external with analytics. CCTV Cameras shall meet the requirements of the current system and be consistent with the requirements of RMIT.
  - Cameras shall be of vandal-proof design where tampering or malicious damage can occur;
  - Installed at a height that is safely accessible for maintenance purposes; and
  - Not fixed to heritage buildings without appropriate Heritage approvals.
- Placement of all new CCTV cameras will be deployed subject to the requirements of the project, the RMIT PSZ Model and in consultation with RMIT Security. Generally, cameras must be located and selected according to the following:
- **Internal cameras at building entrance:** Cameras shall monitor pedestrian traffic entering or departing through a building entrance and recording angle must be set to view face/head of building entrants.
- **External cameras at building entry and exit points:** Cameras shall monitor pedestrian traffic entering or going past building entry points and recording angle must be set to view face/head of building entrants.
- **Reception areas and premises where monetary transactions take place:** Cameras shall monitor activity at public-facing reception areas and areas where monetary transactions take place and/or where there are interactions with members of the public
- **Areas of critical infrastructure or where dangerous materials are stored or used:** Cameras shall monitor activity in areas containing animals, equipment, information technologies or communication networks which, if rendered inoperable for an extended period, would significantly impact on the functioning of the University.
- **Areas containing objects of high value or desirability:** Cameras shall monitor activity in high-risk areas containing objects of high value or desirability and may include computer labs, specialist classrooms, teaching spaces or storage areas.

- **Designated safer walkways and zones:** Cameras shall monitor traffic along designated safer walkways, light corridors, heavy traffic routes and corridors outside toilets.
- **Areas subject to common crime types such as petty theft, vandalism, or graffiti:** Cameras shall monitor activity in areas where there is a history of criminal damage or where temporary installations may pose a risk; such areas may include library spaces and other student study areas, 24-hour computer labs and high-profile buildings.
    - RMIT Security tracks security incidents on or near RMIT properties and can provide advice on high-risk areas during project design and delivery.
- **Car Park entrances and exits:** Cameras shall capture vehicle number plates, facial identification of pedestrian traffic, remote monitoring of traffic flows (vehicle and pedestrian) and assist remote management of vehicle access.
    - Licence Plate Recognition (LPR) cameras may be deployed in consultation with RMIT Security.

8.3.1 All CCTV recording equipment shall meet the following requirements:

- The CCTV system shall have fail over capability to ensure that recording is maintained in the event of any failure of equipment in high and/or medium risk areas. The method of fail over shall meet the requirements of the current system and be consistent with the requirements of RMIT.
- Equipment is to have a storage capacity of 30 days minimum; new installs using existing equipment shall ensure the 30-day storage is retained.
- Cameras shall be set to record 24/7.
- Cameras shall be connected to RMIT-ITS network and must meet ITS cabling standards.
- Cameras shall be set for motion detection recording, allowing 30 seconds of pre-recording and 30 seconds of post recording.
- Camera shall be set for alarm / event recording, allowing 30 seconds of pre-recording and post recording.

8.4 Security Access Control: Electronic Access Control System

The current electronic access control system consists of the following:

- Manufacturer, Interlogix.
- Brand, Tecom-Challenger.
- Software (head end), Infinity.

  Door controllers, Interlogix Tecom Intelligent 4 Door controller.
- Door card readers, Interlogix Multiclass - Multi Format (Tecom, HDI).

Requirements for installation or modification of equipment linked to the RMIT Electronic Access Control system are:

- All Security control equipment must be located in a secure area and approved by RMIT Security management.
- Fire and other relevant space-specific building alarm connections required to allow Security doors to release on Fire alarm activation.
- The **Building Controllers** shall meet the requirements of the current system and be consistent with the requirements of RMIT.
- The **Door Controllers** shall meet the requirements of the current system and be consistent with the requirements of RMIT.
- The **Data Gathering Panels** (inclusive of Expanders, Memory modules and Communication devices) shall meet the requirements of the current system and be consistent with the requirements of RMIT.

- The **Access Readers** shall meet the requirements of the current system and be consistent with the requirements of RMIT.
- The **Access Readers** shall be designed to ensure compatibility with legacy credentials and capability to support the future. Technologies to be supported include contactless credentials including mobile access and mobile ID's via NFC and/or Bluetooth.
- **Door Release / Egress Buttons** shall meet the requirements of the current system and be consistent with the requirements of RMIT.
- **Reed Switches** shall meet the requirements of the current system and be consistent with the requirements of RMIT.
- Roller shutter doors and other non-standard door types shall be fitted with **heavy duty robust reed switches** as indicated on the drawings and shall be installed in a position so as not to be damaged by vehicles or other traffic.
- Each **reed switch** shall be connected to an individual alarm input; the only exception shall be double sets of doors, where each leaf shall be alarmed, but connected to a single input.
- **Sonalert buzzers** shall meet the requirements of the current system and be consistent with the requirements of RMIT.
    - Each alert buzzer shall be flush ceiling mounted and complete with sound selection and level adjustment.
    - Alert buzzers shall be located above each access-controlled door.
    - Alert buzzers shall sound if the door remains open longer than a predetermined period, alarm shall then be generated at the security control room.
    - Alert buzzers shall be capable of being isolated via the terminal and be disabled when the associated door is in access mode.
- **Break Glass Release Units** shall meet the requirements of the current system and be consistent with the requirements of RMIT.
    - On activation of a **Break Glass Release Units**, power shall be directly interrupted to the door and an alarm shall be simultaneously raised on the security system indicating the type and location of the alarm.
    - **Break Glass Release Units** shall be white in colour and not require undue force to break the glass.
- **Movement Sensors (PIRs)** shall meet the requirements of the current system and be consistent with the requirements of RMIT.
    - Movement Detection Devices shall be either ceiling or wall mounted.
    - Movement detectors shall be monitored by the Electronic Access Control system.
    - Detectors shall be selected and positioned so that minimum interference is created for the various uses of the area.
    - Each movement detection device shall be connected as an individual alarm input.

8.5 Security Access Control: Security Access Cards

RMIT Security supplies the blank card stock used to create Security/ID cards for staff, students and the wider RMIT community. Security Access Cards required to be provided by third parties shall meet the requirements of the current system and be consistent with the requirements of RMIT.

8.6 Security Controls: Doors

Construction of access portals, including door frames, shall cater for security door hardware and furniture, and of such design as to withstand the physical impact of door closings due to moderately incorrect air conditioning balance, or subject to windy conditions around external doors.

Selection of door locksets and particularly door closers shall depend on the type, size, weight and operation of the doors. Sufficient design shall go into the selection of correct door closers to minimise nuisance alarms and door maintenance.

Requirement

- Manual lock-up of doors by RMIT security personnel shall be avoided.
- Where swing doors, particularly double doors, require free access from both sides during public hours, concealed shear magnetic locks with bond sensors shall be used. Push button release access shall be provided to both sides. If these doors are on an emergency exit route, then emergency break-glass units on both sides of emergency exit corridor doors.

Access controls shall meet the requirements of the current system and be consistent with the requirements of RMIT and in accordance with the 'Door Type Guideline' provided below.

Door Type Guideline Table:

Door Type & Requirements	Application

Type A - Access Reader IN and or IN/OUT
One-Side Access Controlled Door (swing door) with electric lockset shall have the following hardware/features:
• Entry: Proximity card reader installed on the unsecured side of the door, in case of in/out reader second card reader to be installed on secure side
• Egress: Free handle (preferred) within the lockset at the secured side of the door
• Electric mortise lock (normally fail-secure locks on power loss) type:
  o Where applicable fail-safe (unlocks on power loss) type on emergency exit door with exit sign-on in secure side of a corridor door.
  o Lockset reed switch door, inside free handle, key cylinder operation monitoring
• Electromagnetic locks can also be used for this type in high traffic areas
• Local door alarm sounder (for 1st Stage DOTL alarm, silenced during building fire alarm and silenced during 2nd Stage DOTL alarm)
• Reed switch door monitoring (where applicable additional reed switch on fixed leaf of double door)
• Concealed top and bottom deadbolts on fixed leaf on double swing doors, preferably lockable if exposed
• Cover Plate assemblies (where applicable on external, perimeter doors and fire stairwell doors)
	Electric Mortise are used for office spaces and classrooms.
	Card reader in/out are used for High Risk areas.
	DDA compliance required.

Type B – Access Reader IN Only One-Side Access Controlled Door (swing door) with Electronic Magnetic lock shall have the following hardware/features: • Entry: Proximity card reader installed on the unsecured side of the door • Egress: Egress pushbutton installed on the secured side of the door • Integral mag lock LED indicators showing lock/unlock status of mag-lock(s) • Integral mag lock bond sense monitoring; lock bonding when lock is powered • Emergency break-glass door release unit on egress side of door (where applicable on both sides of emergency exit corridor doors)	Type B doors are specified for electronic magnetic lock installs in areas such as entry points to a building reception area or high traffic/use office/ classroom. DDA compliance required.

• Local door alarm sounder (for 1st Stage DOTL alarm, silenced during building fire alarm and silenced during 2nd Stage DOTL alarm) • Reed switch door monitoring (where applicable additional reed switch on fixed leaf of double door) • Cover Plate assemblies (where applicable on external, perimeter doors and fire stairwell doors)	
Type C – Egress only no Access reader Emergency Exit Controlled Door (swing door with electric lockset) shall have the following hardware/features: • Entry: No entry except via lockset key switch on the unsecured side of the door • Egress: Free or fixed spindle handle within the lockset at the secured side of the door • Electric mortise lock (normally fail-safe unlocks on power loss type) • Lockset reed switch door, inside free handle, key cylinder operation monitoring • Local door alarm sounder (for 2nd Stage DOTL alarm, silenced during building fire alarm) • Reed switch door monitoring (where applicable additional reed switch on fixed leaf of double door) • Cover Plate assemblies (where applicable on external, perimeter doors and fire stairwell doors)	Type C doors are used in corridors and internal stairwells that are opened via time-zones, push to exit to allow egress out after hours. DDA compliance required.
Type D – Monitored Door No Access Reader Emergency Exit Controlled Door (swing door with magnetic lock) shall have the following hardware/features: • Entry: No entry from the unsecured side of the door • Egress: No egress from the secured side of the door • Mechanical lockset: Mechanical dead latching mortise lockset with no handle on unsecured side and free handle on secured side of the door • Integral mag-lock LED indicators showing lock/unlock status of mag-lock(s) • Integral mag-lock bond sense monitoring; lock bonding when lock is powered • Emergency Break-glass door release unit on egress side of door (where applicable on both sides of emergency exit corridor doors) • Local door alarm sounder (for 2nd Stage DOTL alarm, silenced during building fire alarm) • Reed switch door monitoring (where applicable additional reed switch on fixed leaf of double door) • Cover Plate assemblies (where applicable on external, perimeter doors and fire stairwell doors)	Type D doors are used for Fire Exits and Fire Stairwells. DDA compliance required.
Type E - Security Monitored Door These Doors shall have the following hardware/features:	

• Local door alarm sounder (where applicable, but for 2nd Stage DOTL alarm, silenced during building fire alarm)
• Reed switch door monitoring (where applicable additional reed switch on fixed leaf of double door)
• Cover Plate assemblies (where applicable on external, perimeter doors and fire stairwell doors)
• Project Architect - to specify and provide:
  o Mechanical lockset: mechanical dead latching mortise lockset with no handle on unsecured side and free handle on secured side of the door
  o Where applicable, lockable deadbolt on fixed leaf on double swing doors
  o Where applicable fixed-type hinges on doors which swing outward into the unsecured side
  o Where there is no alternative to a mag lock, a door head and frame must be sufficient width and strength prevent buckling when Z-brackets need to be installed
  o Glazed windows in door (non-fire corridor doors) to be of impact resistant type i.e. at least 6mm laminated glazing securely installed into the door body	

8.7 Security Controls: Electronic Locks

Supply and install electric locks as required to the access-controlled doors. Electric mortise locks and electromagnetic locks; shall comply with the following specifications.

8.7.1 Electric mortise Locks

- Electronic mortise locks are preferred for use in all office, classroom and computer laboratories.

8.7.2 Electromagnetic Locks

- Shall be used on all ‘double doors’ and can be used on single doors if approved by Security. When a break glass release is operated or when the fire alarm is activated, both leaves of the lock shall release.

8.7.3 Electric Strikes

- Electric strikes are only used in specific circumstances and settings, when and where applicable; guidance should always be sought from RMIT prior to specifying electric strikes. On external doors and high-security areas, cover plate assemblies shall be provided.

8.8 Security Controls: Security Cupboards and Risers

The security cupboard(s) shall be located at a central location, preferably in an RMIT ITS communications room or in adjacent cupboards and shall be accessible to authorized staff only via an ASO key.

- Door locks are to be keyed for an ASO key.
- All external and high-security area door locks are to be keyed for an ASO key.

Security cupboard(s) would typically consist of the following equipment:

- Wall Cabinets.
- Door Controllers.
- Data Gathering Panels.
- Power Supplies.
- CCTV NVR.
- CCTV Power UPS Supplies (10A/h - 8 hour).

A typical cupboard accommodating security and CCTV wall cabinets, shall be not less than 2000mmH x 1800mmW x 1000mmD in size. Larger cupboards shall be 2000mmW and 2400mmW for accommodating larger quantities of equipment:

- The cupboard is to have sufficient natural air ventilation via dust proof mesh vents near the top and sides of the cupboard.
- The general illumination level of cupboards shall be 400 lux and they shall be equipped with additional emergency light fittings.
- If the UPS is to contain batteries exceeding 24 volts or 10 ampere hours, any Comms Rooms will be required to fire separated from the remainder of the building by construction achieving a fire resistance level (FRL) of not less than 120/120/120. Doorway opening to the Comms Room to be protected by a self-closing, fire rated door set, including frame, achieving an FRL of not less than -/120/30.

9.0 Fire Protection

A full function fire mode test shall be completed, and compliance achieved prior to handover.

A cost-option to install an automatic fire sprinkler system must be provided for all new buildings or significant refurbishments for which code requirements do not mandate the provision of a fire sprinkler system.

9.1 Automatic Fire Sprinkler Systems

- All sprinkler heads protecting habitable areas of the University shall be fast response unless deemed unsuitable by the Fire Services Engineer and Fire Risk Engineering.
- All flow switches shall feature a screw adjustable delay mechanism.
- Divide the sprinkler protection area into zones. Form zones using the buildings firewall partitions. Provide individual sprinkler zones for not less than each floor. Each sprinkler alarm zone station shall include a flow switch, monitored isolation valve and flow switch test drain with remote activation solenoid valve and fixed drain connection.
- All addressable devices shall be compatible with RMIT's networked fire panels.
- Discrete asset numbers are to be affixed to each valve, as per RMIT bar-coding protocol.
- Provide Block Plans that clearly identify the area served by each isolation valve including the valve reference barcode, valve monitor identification at the fire panel and valve number (if different).
- Flexible fire sprinkler dropper pipes shall be used for below ceiling fire sprinklers.
- Provide each sprinkler zone remote test drain with a fixed drain connection and sight glass/tundish connection to permit testing without hose connections. Locate test valves in an accessible location (without the use of a ladder) such as cleaner's rooms and plant rooms.
- Locate all valves in readily accessible locations. Provide access panels not smaller than 450x450mm if valves are in the ceiling space. Label access panel with service and valve number.
- Use concealed type sprinklers in all areas with ceiling.
- Provide metal guards to all exposed sprinklers less than 2.4 meters above the floor.
- All new installations shall be equipped with the latest water saving technology, as approved by the RMIT Fire Engineer.
- Water used for flow testing shall be captured and re-used in accordance with 5-star Green Star requirements.
- All new fire sprinkler system installations shall be tested on a monthly, not weekly, basis. Therefore, batteries provided for the fire sprinkler system equipment shall hold charge to suit the monthly testing.
- All gauges shall be fitted with a ball valve to enable the service or replacement of the gauges.
- Doors to pump rooms shall signed appropriately with details of the building(s) which the fire pump services.

9.2 Automatic Fire Detection Systems

- Automatic Fire Detection Systems shall be fully addressable and networked back to the RMIT Security control room and interconnected with the relevant fire graphic system.
- All detectors shall indicate a continuous steady light in an alarm condition. This includes situations where existing detectors are to be connected to a new fire indicator panel.
- The location of OWS speakers and WIP points shall allow the relevant Warden to communicate using the intercommunication system while the warning signal is sounding.
- Size all new fire panels to have space for not less than 130% of the design connected equipment to permit extension without alteration to the panel.

- Where extending or integrating with an existing panel, size the new fire panel to have space for not less than 130% of the design connected equipment to permit extension without alteration to the panel.
- Provide Famco brackets to concealed space detectors located above inaccessible ceilings such as plaster board ceilings and perforated metal panels.
- Manual call points shall be key resettable. Each project to source current samples from RMIT Fire engineer.
- Aspirated Smoke Detection shall be provided in areas where it is not safe to access point type smoke detector, e.g. areas above seating or in high void spaces.
- Provide in Aspirated Smoke Detection pipework a Schroder air valve on a 45° Tee oriented away from the aspirated air unit.
- All works shall include the removal and decommissioning of all redundant equipment including programs within the FDCIE and EWIS panels as well as the fire graphic installation within the security control room.
- Block Plans shall be mounted on the wall with correct orientation with respect to the building. The plan shall have a “You are here” symbol, the date of installation and installer’s contact details.
- Fire Indication Panels (FIPs) shall have LED indication per zone along with zone description as per RMIT format.
- FIP’s shall have PIB’s (Panel-Link IP Bridge) installed as part of using IP (Internet Protocol) addresses for graphic networking capability.
- Smoke detection is to be provided at all electrical switchboards and communication racks.
- Incorporate new architectural backgrounds into the Colour Graphics System, these shall be clean and detail only a limited floor plan of the space.

9.3 Compatibility- Fire Detection and Alarm Systems

- Where changes have been made to FIP programmes, make the required changes to all networked panels on the systems to represent the current additions/ deletions including all software and Colour Graphic backgrounds.
- All fire services shall be compatible with the existing.

9.4 Occupant Warning System (OWS) and Emergency Warning and Intercom System (EWIS)

- Where extending or integrating with an existing panel, size the new panel to have space for not less than 130% of the design connected equipment to permit extension without alteration to the panel.
- All new systems shall be compatible with existing. Provide minimum amplifier rating based on 130% of connected load to allow for future expansion.
- Where a EWIS system is not installed, provide an EWS/OWS (Emergency/Occupant Warning System) / TGEN (Tone Generator) complete with a PA facility.
- Horn speakers shall have minimum 500mm cable extension and only be installed within plant rooms and large open spaces. Other locations shall require approval from the RMIT Fire Engineer.
- Mount OWS speakers clear from WIP and MECP phones to allow clear communication during transmission of alert and evacuation tones.
- Emergency Warning Lights / Strobes shall be installed in all teaching spaces and lecture theatres.
- Strobes shall identify both Alert and Evacuate modes of the warning system.

9.5 Fire Services Ring Mains and Valves

- All fire services ring main isolation valves shall be readily accessible. Locate valves behind access panels in occupied locations.

- All valves shall be labelled in accordance with RMIT bar-coding protocol and recorded on “As-Built” drawings.
- All designs to consider the building’s existing incoming water supply, internal reticulated installation mains, existing valves and connection to the networked monitoring system.
- All existing and new above ground fire mains shall be fitted with adhesive barcode labels, in line with RMIT bar-coding protocol, at 15-meter intervals.
- New installations and extension to installations shall not be less than 100mm diameter. Extensions to existing systems shall, in addition, be fitted with an isolation valve.
- Locate drain valves next to drains capable of safely draining the installation.
- Decommission and remove all redundant services, including redundant pipe supports, power supplies and redundant equipment plinths. Make good penetrations in the building fabric.

9.6 Gaseous Flooding Systems

- All systems shall be protected from accidental discharge by the use of aspirated smoke detection, point type detection in a double interfaced arrangement.
- Each gas system shall be complete with gas control panel and connected into the nearest Fire Indicator Panel via a dedicated loop/zone to comply with AS1670.5.
- Pressure relief vents shall discharge (ducted) directly to outside, not to an adjacent space. Provide insulated relief air vent panels in air-conditioned rooms to prevent condensation forming on the vents. Consider motorised relief vents where the discharge location is exposed to wind/dust that may enter the protected space.
- Provide warning/evacuate lighted signs at each exit from the protected space. Provide audible alarms to cover the whole of the protected area. Provide Activate/De-active stations at each exit door and at the Gas Module control panel.
- Door pressure test all rooms subject to gas flooding to confirm room air tightness. Validate the design using a computer program as nominated in the Gas Suppression code. (Gas discharge shall not be used to validate design).
- Door seals shall be fitted to all doors, (smoke seals are adequate) and motorised dampers (with side and edge seals) on all external mechanical equipment, to reduce gas leakage.

9.7 Fire Hydrants and Fire Hose Reels (FHRs)

- Supply a permanent pressure gauge at the highest hydrant of each riser.
- Provide a safe means to dispose of hydrant test water. Safe means of disposing of test water are either safe access to a roof capable of safely collecting and draining the fire test water back to rain water collection tanks or provision of a 150mm diameter drain extending to a collection tank at the lowest level of the building.
- All buildings shall have their fire hydrant vertical riser pipe looped.
- External Fire Hydrants shall be fitted with identification reflectors or road posts.
- External exposed hydrant outlets shall be fitted with anti-tamper devices to prevent opening by the public. These shall be fitted with FRV approved 003 Padlocks.
- At ground level provide external fire hydrants in preference to equipped internal fire hydrants.
- Where there are multiple buildings and separate boosters, each booster shall have additional signage indicating the building number that the booster services. This is additional to the standard block plan within the booster cabinet.

9.8 Other Fire System Equipment

- All fire pumps shall be fitted with mechanical seals. No drip glands are to be used.
- Fire pumps shall be housed in a dedicated, acoustically rated room with clear signage.

- Provide safe and accessible access to fire pumps, including the ability to maintain and replace parts or whole cycle of the equipment.
- Diesel exhaust pipes shall be acoustically separate to avoid student disruption.
- The fire services Block Plan shall be laminated and framed and installed within the booster cabinet.

9.9 Portable Fire Extinguishers

- Extinguishers shall be mounted on wall studs or columns.
- In areas accessible by the public, consideration should be given to housing extinguishers in a metal cabinet.
- Provide details of proposed sealant before proceeding with the installation.

9.10 Passive Fire Protection

- Provide details of proposed sealant before proceeding with the installation.

9.11 Preferred Manufacturers

- Johnson Controls-Tyco MX 400 fire alarm panels shall be specified.
- Quintrix QE90 occupant warning panel shall be specified.
- NOVEC 1230 shall be used for fire suppression full flooding systems.
- KBS Mortar Seal shall be used for fire sealing. Fire ratings and specifications of any alternative proposed shall be supplied to the Fire Engineer and subsequently approved by the Fire Engineer before being used.

10.0 Acoustics

Control of internal and external noise is required to ensure a suitable acoustic amenity within the University. The following guidelines and criteria shall be adhered to, to ensure suitable acoustics for relevant spaces. References to Standards (AS and ISO standards) are used because compliance with them is not mandatory.

10.1 Noise Criteria

The following noise criteria shall be used during the design process or apply in-situ as indicated. All noise emissions from RMIT buildings and property shall be designed to meet all local mandatory requirements.

Workplaces shall be designed to meet the following standards:

- Peak noise levels no greater than 140dB(C).
- An equivalent continuous noise level not exceeding 85dB(A) over 8 hours of a workday.

Noise from all mechanical services shall be free of tonal and spectral content and not exceed the ambient noise criteria when measured at a distance of 1.2m above floor level and 1.5m from any diffuser or plantroom wall. Continuous noise should be measured in the octave bands 63Hz to 4kHz. Steady state sound levels are to be measured in terms of the LAeq over a period of 60 seconds.

The ambient noise level criteria apply to the combined contribution from building services noise and external noise sources.

Ambient noise levels from ambient sources such as traffic, mechanical services and other constant noise sources shall comply with the criteria stated in the below table. Lower noise levels than those stated below are acceptable however they should not be detrimental to speech privacy. In locations where speech privacy is important, measures such as sound masking should be considered to ensure suitable privacy is maintained.

Short-term noise in occupied spaces from occasional but regular sources (such as fluid noise from cisterns, waste and supply pipes, lift motor noise) shall not exceed a noise level 5 dB above the maximum level recommended in AS/NZS 2107-2016 for the area.

Recommended Noise Levels table:

Recommended design sound level L_{eq} dBA (30 seconds)	**Typical Room Usage**
30-35	Lecture theatres, conference rooms
35-40	Meeting rooms
40-45	Flexible teaching/learning spaces, laboratories/workshops, offices, computer-based learning spaces, student study areas/portals, art/design studios, clinical practice spaces, multi-purpose spaces
45-50	Toilet and shower facilities, circulation spaces, lift lobbies, enclosed tea points and kitchens, store and cleaners' rooms

Spaces not listed in the table shall comply with the recommended design sound levels listed in the latest version of AS2107.

10.2 Speech Privacy and Sound Insulation

To facilitate a suitable speech privacy level in a space, appropriate sound insulation to adjacent spaces is required.

Consideration shall be given to the effect of low noise levels on speech privacy when designing the facade and mechanical services systems. In locations where speech privacy is important, measures should be introduced to ensure suitable privacy is maintained where these conditions occur.

Acoustic detailing around junctions including floors, ceilings, walls, and façades, and detailing around services penetrations shall be sufficient to achieve the criteria.

The Sound Level Difference (Dw) is the criterion for the sound insulation between spaces. Dw represents the sound reduction achieved in situ by the final construction (i.e. the partition including the flanking paths such as over the ceiling).

The rating requirements for operable walls shall be reviewed by an acoustic engineer.

The sound insulation rating between spaces shall comply with those stated in the below table.

Sound insulation criteria table:

		Recommended minimum Room to Room Sound Level Difference, Dw*		
	Space	**To adjacent enclosed spaces**	**To corridor through partition with glazing or door**	**Door sound insulation rating (Rw)**
1	Art/design studios, laboratories/workshops with noisy machinery	50-55	40	Double door airlock
2	Lecture theatres	45	35	Double door airlock
3	Conference Room	45	35	32
4	Flexible teaching/learning spaces, clinical practice spaces, multi-purpose spaces, student study areas/portals, computer-based learning spaces, offices, meeting room, quiet Room/Pods, art/design studios, laboratories/workshops, open plan office spaces	40	30	30
5	Circulation spaces, reception Areas, tea points and kitchens, staff Areas	35	30	25
6	Toilet and shower facilities	40	-	30
7	Plantroom	Specialised advice required.		

Notes

- Where rooms of two different categories abut, the higher rating takes precedence.
- Any walls dividing wet areas from any occupied room shall incorporate a double or staggered wall stud frame system. Pipes to the wet area shall be fixed only to the studs that are supporting the plasterboard that is facing into the wet area.
- In the case of Categories 1, 2 and 3 the ceiling system shall not be of perforated or slotted construction and would typically be 13 mm plasterboard or a compressed acoustic tile having a thickness of at least 15 mm and a weight of 4kg/m2 or more.
- If rooms are not included in this schedule, RMIT shall be consulted to determine the rating required
- Any perforated ceilings shall not degrade the performance of the partition system.

10.3 Reverberation Control and Room Acoustics

Reverberation time shall be minimised to control ambient noise levels and to provide appropriate speech intelligibility within the spaces.

Suitable sound absorption and acoustic diffusion treatments shall be used to control reverberation time and undesirable room acoustic anomalies.

The shape of enclosed spaces shall reduce the presence of unwanted geometrical features that could cause room acoustic anomalies such as flutter echoes, late reflections and focusing.

Reverberation time criteria table:

Room	Recommended reverberation times (s)
Lecture theatres <100 seats	0.4 to 0.6
Lecture theatres >100 seats	Refer to curve 1 of AS2107
Flexible teaching/learning spaces, clinical practice spaces, multi-purpose spaces, Quiet Room/Pods	0.4 to 0.6
Student study areas/portals, computer-based learning spaces, Materials Preparation – Machine Room, Staff Areas	0.6 to 1.0
Art/design studios, laboratories/workshops	0.8 to 1.0
Offices, Meeting Room Conference Room, Reception Areas	0.6 to 0.8
Circulation spaces, Lobbies, Foyers, store, cleaners' rooms, tea points and kitchens, toilet and shower facilities	-

Notes

- If rooms are not included in this schedule, RMIT shall be consulted to determine the rating required.
- Speech transmission index (STI); for Lecture theatres and flexible teaching/learning spaces a minimum STI of 0.7 shall be achieved.

10.4 Hearing Augmentation

Any space that includes audio amplification systems shall also have a hearing augmentation system installed.

Hearing augmentation systems shall comply with the most current version of AS1428.5.

Where loops are being installed, consultants shall check that reinforcing steel or other metal content in floors will not interfere with efficient operation of the loop.

10.5 Vibration

Floor vibration can be generated by human activity such as people walking, mechanical equipment, or from external sources such as trains or road traffic. Floor vibration levels in any part of the building shall comply with the requirements as detailed below.

Vibration isolation of mechanical plant and equipment is to be supplied and installed to limit vibration levels in the building to comply with recommended vibration levels as set out in the most current version of ISO 10137, "Bases for design of structures - Serviceability of buildings and walkways against vibrations".

Vibration from external sources such as trams, trains and vehicles shall also be considered and shall comply with most current version of ISO 10137.

Mechanical Services should be isolated from the structure in accordance with the most current version of ASHRAE HVAC Application Handbook.

10.6 Fire Services

The noise level due to the operation of smoke control systems (including smoke spill fans and air pressurization fans) shall not exceed 65dBA in occupied spaces or 5dBA above the ambient noise levels to a maximum level of 80dBA. Noise levels in fire-isolated exits shall not exceed 80dBA.

10.7 Rain Noise

For category 4 spaces (or better), rain noise should not exceed L10 40dBA, based on a rainfall rate of 30mm/hour.

10.8 Lessons Learned

RMIT requires consultants to pay attention to the following matters which have emerged as issues across campuses:

- Sound transmission between offices with glazed fronts.
- Poorly attenuated ceilings.
- White noise generated by airflow over microphones.
- Plant room noise to adjoining spaces.
- Harmonics of equipment and plant operations interfering with RMIT activities, in particular audio visual and ICT equipment.

11.0 Structural and Civil

The design criteria to be documented by the structural consultant should cover the following scope at a minimum:

- Dead and Live Loads (loading diagrams may be required)
- Wind Loading
- Seismic Design Criteria
- Deflection Limits
- Floor Vibration Limits
- Durability
- Fire Resistance
- Design for Future Flexibility.

11.1 Design Criteria

11.1.1 Floor Loadings

- Beyond Code requirements, RMIT require the following minimum loading for all non-residential floors:
    - General live load 4 kPa.
    - Partitions 0.5 kPa.
    - Ceilings and services 0.3kPa.
    - Comms rooms and other computer equipment areas 5 kPa.
    - Air handling, refrigeration and boiler plant rooms 7.5 kPa.
    - Open roof-top plant platforms 2.5kPa. To be clearly signed on the platform.
- Some heavily loaded areas, such as archives, library shelving, or areas with heavy equipment will require computations to establish the floor loadings.
- Reduce the Portland Cement content of any concrete used.
- Balustrades subject to crowd loadings shall be designed and detailed appropriately. The structural engineer is responsible for the design of the uprights and the base connection only. Handrails and infills are the responsibility of the architect and contractor. Consideration shall be given to the mode of failure to ensure that failure at a single point will not result in the failure of the whole balustrade.

11.1.2 Floor Vibration

- All floors are to be designed to an appropriate footfall vibration criterion, to be determined by the structural engineer. As a minimum, no floor is to be designed with a response factor of more than 8. A response factor of 4 is to be considered for quiet offices.
- Floors in gathering spaces shall be designed to resist rhythmic loads, such as caused by dancing.
- Consideration is required in relation to laboratory and other specialist uses, in particular when used for balancing, microscopy and sensitive laboratory equipment. The structural engineer shall determine the required footfall vibration limits based on the building's functional needs and future flexibility. At a minimum, laboratories intended for undergraduate teaching are to comply with ASHRAE Curve F (response factor no greater than 1.0) at the worst point on the floor. The performance of laboratories intended for research is to be agreed with the University Project Manager based on the equipment intended to be installed. At a minimum, 50% of the floor area of research laboratories is to comply with ASHRAE Curve VcA, (Response factor no greater than 0.5) with the balance complying with Curve F.
- The structural engineer is to provide the University with a plot of the floor performance so that sensitive equipment can be installed in the higher performing areas.
- Vibrations from plant and other equipment is to be addressed by isolation at source.

11.1.3 Durability

- Ensure that unexposed structure will be serviceable for minimum 50 years without maintenance.
- The design life for all structural elements is 50 years.
- Maintenance costs are to be minimised throughout. The minimum time to first maintenance for any finishes to structure is 40 years.
- The Consultant team shall address circumstances in which the provisions of the BCA and adopted standards do not suit the longevity, durability, maintenance, waterproofing or other requirements of RMIT.

11.1.4 Design for Future Flexibility

- University buildings will be refurbished several times for differing purposes over their lifetime. Hence, the structure is to be designed with flexibility for future change in use in mind. A regular column grid is encouraged, and minimal internal structural walls. No floor is to be designed for less than the minimum load nominated above.
- The structural engineer is to establish whether any specific allowances are to be made for future expansion either vertically or horizontally in conjunction with the University Project Manager.
- Roof design to have spare capacity for solar panels.

11.1.5 Slabs with Waterproof Membranes

- Slabs with accessible membranes shall be watertight over the expected lifespan of the membrane with minimum of 25 years.
- Inaccessible membranes shall be avoided.
- Where membranes are inaccessible and necessary, consider the use of alternative waterproofing strategies, including drained cavities or waterproofing admixtures to cement together with post-tensioning. If an inaccessible membrane is unavoidable, it shall have a minimum guaranteed life of 25 years and a projected life in service equal to the service life of the structure or covering material.
- The consequences of membrane failure shall be considered in design. Where the failure of a membrane or waterproofing detail will cause serious disruption to operations, an alternative method of waterproofing shall be employed.
- Vapour barriers shall not be used in situations where liquid water may be present.
- If liquid water is present, an approved membrane shall be employed, or another form of approved waterproofing barrier.
- If waterproof concrete is specified using crystallising materials, the concrete shall be post tensioned or other arrangements made to ensure that the concrete does not crack beyond the limits of the crystallising agent. All designs of this nature shall be the subject of written certifications by the Architect and Structural Engineer where used structurally, or by qualified Consultant in other circumstances.

11.1.6 Floor Slab Design

- Ensure that floor slabs remain dry and flat enough to meet service requirements.
- Slab design shall ensure that retrofit services penetrations up to 200 mm diameter core holes are possible without special provisions to reinforce the slab, to ensure building longevity. Designs using post-tensioning or pre-tensioned membranes shall provide sufficient area for services penetrations between the tendons, and suitable records or marking of the slab shall be provided to show the location of tendons.

11.1.7 Floor Penetrations

- Floor penetrations in laboratories shall be watertight and not allow the transit of liquids to the floor below should there be a spill in a laboratory or an ancillary space, including stores and corridors.
- Floor penetrations in laboratory buildings shall be sealed or bunded to prevent the passage of liquid between floors.
- Any floor penetration required to be watertight shall resist water at a head of 100 mm.

11.1.8 Structural Steel

- Ensure that structural steel members are appropriately protected against corrosion.
- Structural steel members internal to buildings in locations protected from condensation shall be prime painted or better.
- Structural steel members external to buildings or in locations where they are not protected from condensation shall be hot dip galvanised to at least 450g per sqm.
- Structural steel members exposed to extreme conditions shall be hot dip galvanised as above acid etched and painted with an appropriate paint system, depending on the environment to be protected against.

11.1.9 Civil - Stormwater General

- All work shall meet all the requirements of national and local authorities and shall be in accordance with the following in so far as they apply to the work:
    - AS 3500 Plumbing and Drainage;
    - WorkCover
    - Worksafe at Federal Level;
    - OHS regulations;
    - Environment Protection Authority;

11.1.10 Roof Drainage System

- The rainfall intensity for design calculation shall use the latest Australian Bureau of Metrology 1% AEP (100-year ARI) intensities plus 20% increase factor to allow for the potential effects of climate change.
- Rainwater collected from roof areas may be stored in tanks of sufficient size to provide a water supply for toilet flushing, cooling tower use and irrigation.
- The design of the roof drainage system shall generally utilise a gravity downpipe system. Where site constraints limit the feasibility of gravity drainage the designer shall consider the use of a syphonic drainage system.
- Flow rates from the roof drainage system are to be supplied to the Civil consultant for design of the External Stormwater System.

11.1.11 Stormwater Drainage

- Appropriate overland flow paths shall be provided to prevent inundation of buildings in extreme events or in cases where the network becomes blocked.
- Surface stormwater shall be collected via various inlets within the surface such as grated pits, grated trench drains, side-entry pits and channels and conveyed within the underground piped drainage network to the existing trunk drainage systems or to the legal point of discharge as nominated by the responsible council.
- Where the relevant Planning Scheme imposes restrictions on stormwater discharge rates, detention storage shall be provided.
- Grated pits and trench drains within hard pavements shall be flush with their surroundings and ‘heel safe’ rated in pedestrian areas. All pit covers shall be of strength class suitable to their location and shall consider all loading scenarios including emergency vehicles or heavy cleaning equipment.
- Water Sensitive Urban Design (WSUD) elements shall be considered and will typically include elements such as stormwater capture and reuse, urban greening, combatting UHI effect, resilient flora (native or indigenous planting), tree pits, bio-swales, permeable pavement, bioretention cells and systems capable of capturing gross pollutants and sediment.
- Engineering Services Consultant to apply for Legal Point of Discharge.

- Provide stormwater pits at changes in direction, grade, junctions and at spacings no more than 60 meters for pipes 225mm in diameter or greater unless pipes are incorporated into a rainwater harvesting system.
- Stormwater pits to be either precast or insitu concrete.
    - Insitu concrete pits to have a minimum wall thickness of 150mm and placed using inner and outer forms.
- Provide silt traps and litter cages to all external drainage systems.
- Provide step irons in pits exceeding 1.2 meters in depth.
- Consideration shall be made in the stormwater design to exclude garden mulch from entering the drainage system causing blockages and reducing efficiency.

11.1.12 Ceiling & Wall Mounted Panels

- All ceiling and wall mounted panels must be mechanically fixed.
- The existing structure must be assessed for suitability to support ceiling and wall mounted panels.

11.1.13 Portland Cement Content

Portland cement content used in concrete used should be reduced by replacing with supplementary cementitious materials, to a minimum target of 30% (measured by mass across all concrete used in the project).

11.2 Civil Pavements

11.2.1 Flexible Asphalt Pavements

- Design of light and medium duty pavements (design traffic in range of 10^3 to 10^5 ESA's) shall be designed in accordance with 'Austroads Technical Report AP-T36/06-Pavement Design for Light Traffic'.
- Heavy duty pavements with design traffic > 10^5 ESA's pavement designs should be carried out in accordance with Austroads publication 'Pavement Design: A Guide to the Structural Design of Road Pavements.
- Subsoil drainage systems shall be provided where necessary to protect the pavement subgrade formation.

References

- Austroads publication 'Pavement Design: A Guide to the Structural Design of Road Pavements

11.2.2 Rigid (Concrete Pavements)

- Rigid pavements may be designed in accordance with the Cement and Concrete Association of Australia, 1997, "Industrial Pavements - Guidelines for Design, Construction and Specification"

References

- Cement and Concrete Association of Australia, 1997, "Industrial Pavements - Guidelines for Design, Construction and Specification

11.2.3 Pedestrian Paving

- All pedestrian pavements shall achieve a suitably slip-resistant finish and be free of trip hazards along paths of travel.
- Gradients shall be no steeper than 1 in 40 for concrete/paced surfaces; 1 in 33 for bituminous surfaces.

11.2.4 Site Conditions

- It may be necessary to allow for excavation of the areas to be landscaped to a level suitable for the introduction of fresh soil. The Architect/Lead Consultant shall consult with the Technical User Group on the extent of responsibility for provision of new soil, rocks for landscaping, grounds furniture, irrigation systems and plant materials. Soft landscaping (lawns and planting) shall be approved by the Technical User Group.

- All trees on site shall be retained unless otherwise agreed with the Grounds Manager or his/her nominee.

11.2.5 Protection of Trees, Shrubs and Grounds During Construction

- During the design planning stage, the Architect/Lead Consultant shall consult with the Technical User Group regarding the impact of the proposed construction works on trees, shrubs and grounds within the construction site.
- An assessment of each tree within the construction zone shall be carried out by the Architect/Lead Consultant (or through an Arborist engaged through the Architect/Lead Consultant during the design process and any trees requiring protection will be identified at this time. The techniques associated with providing and managing tree protection shall be reviewed with the Technical User Group and allowance included in the in the project budget.
- Any tree, group of trees or shrubs nominated in the tender documents as requiring protection shall have suitable protection. This shall be in the form of a two-metre-high fixed hoarding or chain-link fencing, complete with access gate to be erected, maintained and removed by the Contractor. The fence shall be placed at the outer drip line of the tree(s) or shrubs. No building or construction material or liquid waste is to be stored or disposed of within the designated zone of protection, or other areas of garden.
- Pruning of branches and/or roots and any removal of plants shall only be carried out by the University's Ground Section.

12.0 Enclosure

12.1 Entrances

- Provide weather protection over entrances.
- Finishes and surfaces shall be defined for people with vision and cognitive impairments.
- Property and building entrances shall be visible from the direction of approach from roadways, car parks and paths of travel.
- All entrances shall be accessible to all. Where this cannot be achieved, an accessible entrance shall be no more than 30m from an inaccessible entrance.
- In buildings with a large volume of pedestrian traffic, provide doors that are wide enough to allow for two-way traffic.
- Where the building facade has glazed panels, ensure the entrance is easily distinguishable using glazing treatments that are different from adjacent glazed panels.
- Information boards are to be located within 2 metres of the building entrance, so they can be easily located.

12.2 Stairways, Walkways and Ramps

- Design shall incorporate internal stairs that are visible to building occupants, located within 5 metres of the primary set of lifts or within 20 metres of a main entrance.
- Walkway and ramp widths are to be minimum 2100mm for main paths; 1500mm for secondary paths and 1200mm for all paths. Curved paths to be minimum 1500mm width.
- Where no line of sight is possible along the walkway or ramp, provide 1800mm width to allow passing.
- Finish shall have a luminance contrast on step ramps, kerb ramps and around the border of the splayed sides is to be provided to assist recognition.
- Light fittings shall be installed on landings and not above 2400mm AFFL.

12.2.1 Stairs

- Design shall incorporate going widths of 275mm–300mm and riser heights of 150mm–165mm.
- Effective shade and weather protection shall be provided over external stairs.
- Provide TGSIs where fire stairs are used regularly for travel between floors.
- Provide stairs in a central location.
- Mechanically fixed non-powder coated nosing.
- No rolled carpet nosing.

12.2.2 Ramps

- Walkways shall have a gradient no steeper than 1:21 to allow for construction tolerance.
- Ramps shall have a gradient no steeper than 1:15 to allow for construction tolerance.

12.2.3 Balustrades and handrails

- Shall be installed to both sides of stairs and ramps and shall be 1100mm high.
- Stainless steel or other approved finish.
- Provide a luminance contrast with the background surfaces.
- Handrails are to be installed to both sides of fire stairs.
- Height may increase to 1800mm above finished floor level to address any increased risk of falls.
- A separate handrail is required for balustrades more than 1000mm above finished floor level, which includes refurbishment of existing.

- No climbable items or surfaces are to be located within 900mm radius from the top of balustrades.

12.3 External Doors

External doors shall be designed to resist the effects of weather.

Visual indicators at building entrances are to provide two 75mm wide bands of colours which provide a minimum 30% luminance contrast with the background surface and each other to provide safety during daytime and night time use.

12.3.1 Airlocks and Entries

- Required at all building entrances.
- Minimise indoor wind gusts and draughts.
- Revolving air lock doors not acceptable.
- Airlocks shall be sized to permit the safe closing of doors, allowing each set to close before the next is opened.
- Doors shall be sufficiently recessed into foyers to protect from prevailing wind pressure and rain or weather protected with canopies or airlocks.

12.3.2 Operations

- Doors in primary paths of travel and high traffic areas shall be automatic.
- Door schedules shall integrate all doors required to be connected to RMIT Access Control.
- Power to automatic sliding doors at building entrances to be key switch operated, interfaced in a failsafe manner, activated in an open position at fire alarm.
- Electronic lock and control buttons shall be provided to security access control systems.
- Door controls for auto doors are to be installed minimum 750mm from an internal corner.
- Door control buttons located on a level landing with a maximum grade of 1:40.
- All controls for doors are to be installed on the latch side of the door wherever possible to provide consistency and assist people with low vision locate the controls.
- Weather seals and small aperture drainage grates shall be provided.
- Weatherproof seals shall be fitted to the bottoms and edges of all external doors. Design shall take note of the operation of rotary cleaners on threshold seals.
- Double doors shall be provided to plant rooms.
- 'Push/Pull' signage or arrows on doors are to be provided to indicate the direction of opening.
- Install all break glass door releases at 900-1100mm AFFL and not within 500mm of internal corners.
- The number of hinged external doors is to be minimised.
- External swing back of house doors to be metal clad to both sides with full perimeter channel fixed with countersunk steel screws.

12.3.3 Assembly and Materials

- Entry doors shall be glazed. Frames shall be metal.
- Glazed vision panels in doors to have the lower edge of glazing at maximum 1000mm AFFL, upper edge of glazing at minimum 1600mm AFFL, minimum 150mm width and located maximum 200mm from the edge of the door.
- Glazed doors shall have a 75mmH horizontal white band top edge at 1000mm AFFL per AS1288 and a 75mm wide white perimeter band only for frameless glazed entry doors that are not surrounded by a frame which achieves 30% contrast.
- Timber doors shall be solid core faced with painted waterproof 4mm, A-Bond ply and pre-primed solid top, bottom and edge strips.

- If door is to be unpainted shall be stainless steel with stainless steel fixing.
- Aluminium doors shall be constructed from commercial grade section with solid bottom panel with pivot type hinges complete with floor springs and concealed head closers.

12.4 Roofing – General

- Syphonic roof drainage systems may be used and shall be designed and constructed in accordance with the systems manufacturers requirements.
- Designers shall assess all exhaust distances from outside air intakes and ensure that sufficient clearances are provided to minimise risk of odour issues based on best engineering practice. Use of minimum Standard clearance requirements without consideration of potential IAQ impact is not deemed acceptable.
- Green roofs will be considered by RMIT Property Services. Consultant team shall provide justification for use in terms of responses to these Design Standards and value for money for the University.
- Allow for the inclusion of minimum roof area percentage of a building to be left clear for the installation of solar PV panels as per NCC22 J9D5.2.
- Minimum roof pitches shall be avoided.
- Minimum falls / pitches:
    - membrane roofs - 1:100
    - metal deck roof - 5 degrees. 3 degrees will be considered subject to demonstration of adequate control of water egress but only on a on a steel or concrete structure
    - tile roof (with weather checks to tile) - 17.5 degrees or greater if specified by the manufacturer for the selected tile type.
    - tile roof (without weather checks to tile) - 25 degrees or greater if specified by the manufacturer for the selected tile type.

12.4.1 Roofing – Gutters

- Box/internal gutters and internal downpipes are to be avoided.
- If existing box/internal gutters and internal downpipes are being repaired and upgraded the refurbished installation shall:
    - Be detailed to eliminate the risk of blockage and flooding.
    - Include visible overflows.
    - Have overflows which discharge conspicuously in the event of blockage.
    - Have overflows which avoid staining of external facades.
    - Have overflows directed to main downpipes.
    - Be fully accessible for cleaning.
- Where existing roof is being repaired, if more than 50%of gutters shall be replaced, all gutters shall be replaced.
- New build gutters shall be stainless steel.
- Provide appropriate gutter guards to new or replaced gutters.
- Box gutters and downpipes and other inaccessible components such as valley gutters shall be constructed from stainless steel, copper, zinc or PVC.
- Stainless steel gutters to be welded and shall not rely on sealants.
- All metal gutter joints (apart from stainless steel) to be under flashed.
- Gutters shall be a minimum depth of 90mm with a minimum of 25mm freeboard. 150 deep and 50 freeboard minimum.

- All box gutter sumps shall be fitted with removable galvanised mesh type leaf guards across the full area.
- Sumps are to be a minimum of 450mm and depth of 150mm.
- Eaves gutters are to be run into large, external downpipes of minimum 150mm diameter through rain water heads.
- Where eaves gutters are used, design to 1 in 25-year storm events, plus 20% for climate change.
- Ensure the eaves gutter profile has been nominated by the Architect/Lead Consultant and that the appropriate number of size of downpipes have been designed.
- Box Gutter systems shall be designed to 1 in 100-year storm events plus 20% for climate change. Box gutters shall be sized with appropriate gutter width and depth and shall have the appropriately sized sump designed to standards.

12.4.2 Roofing – Downpipes

- 100% Overflows are to be provided by either side overflow through parapets or dual downpipe system discharging to atmosphere.
- Ensure all downpipe flows do not exceed flows 16L/s for pipework of up to150mm. Overflow flows shall equal downpipe flows.
- Internal downpipes within ducts shall be sanitary plumbing class UPVC or HDPE and shall be oversized (min 100mm diameter).
- Downpipes shall be located in protected areas away from heavy pedestrian or vehicular traffic.
- Where downpipes in vehicular areas are unavoidable, permanent bump protection shall be provided
- Downpipes shall not be cast into concrete columns but shall be enclosed in a suitable duct with inspection openings.
- Downpipes shall be detailed to discharge over collector pits at ground level, each incorporating a leaf trap and grate at ground/surface level. The grate level is to be at least 75mm above any garden mulch. For cleaning purposes clear space is to be allowed between the bottom of downpipes and the grate.
- Internal downpipes within ducts shall be sanitary plumbing class UPVC or HDPE and shall be oversized (min 100mm diameter).
- External downpipes shall have a secure inspection opening at the base.

12.4.3 Roofing – Green Roofs

- Implementation of green infrastructure such as green roofs (also cool roofs) and walls is encouraged.
- The type of roof shall be agreed with Property Services with respect to accessibility and applicability.
- Where “extensive” green roofs are proposed, they cannot support foot traffic but require perimeter protection for personal safety. Only use with a limited variety of hardy plant, noting that they provide only thermal and acoustic insulation benefits These roofs are often suitable for use as retrofit on existing roofs.
- Where “intensive” green roofs are proposed, they shall provide a stronger physical roof structure than extensive roofs. They have greater thermal and acoustic insulation benefits but are difficult to retrofit existing buildings.
- Structural Consultant engineer shall for the total weight of saturated soil and plants.
- Components shall include but not be limited to:
    - waterproofing membrane.
    - root barrier layer.
    - insulation.
    - drainage layer.

- filter fabric.
- growing medium.
- vegetation.

12.4.4 Roofing – Skylights

- Provide internal light sensors linked to internal lighting system to allow latter to dim when the natural lighting levels provide adequate light.
- Shall be shaded in summer.
- Fall prevention for persons on the roof shall be fitted to any skylights, except where skylights incorporate impact resistant material in their design and evidence is provided to Property Services.
- Provide appropriate access to maintain skylights that are not accessible from roof top plant or similar areas, such as ladders, rigging points and/or other such means.

12.5 Facades

- Aluminium composite panels (ACP) with a polyethylene core and expanded polystyrene (EPS) cladding are not acceptable.
- Façade Design life 50 years – warranted by Manufacturer for 25 years.
- External facades, building and services elements shall be designed to mitigate the potential for bird roosting and nesting. Where this is unavoidable, anti-roosting wires, spikes or other appropriate physical deterrents are to be incorporated.
- Flashings are provided to panel drain points, to heads and seals of doors, windows and louvres as well as internal and external corners of facade materials.
- Detailing is to consciously shed water clear of the building and clear of the lower projections and pathways.
    - Parapet capping shall be specified in long lengths to minimise joints. Where joints are unavoidable use under flashing and packing to avoid drip and stain lines on facades.
    - Avoid staining caused by leaching of timber products onto facade and ground elements.

12.5.1 Anti- Graffiti

- Vandal and graffiti resistant finishes shall be incorporated at ground level.
- Anti-graffiti protection shall be applied to all brick and concrete surfaces.

12.5.2 Lightning Protection

- Where appropriate, direct strike lightning protection, power and data protection, and earthing/ grounding systems shall be installed.

References

- Victorian Cladding Taskforce

12.6 Glass and Glazing

- All glass shall be designed with safety in operation as a priority
- Provide visual glazing indicators to all glazing that can be mistaken for an opening
- All new glazing shall be safety glass
- Double glazing as minimum for external doors, internal as required for acoustic purposes. See also Section Ten – Acoustics.
- Visual indicators shall provide identification for people with low vision, and when used in conjunction with signage and wayfinding, provide alternatives for identifying access to spaces
- Increased glass thickness, thermal breaks, shading and tinting shall be incorporated to reduce noise, sun glare, and heat gain to contribute to energy efficiency

- Any contrasting line on the glazing shall provide a minimum of 30% luminance contrast when viewed against the wall surface or surfaces within 2m of the glazing on the opposite side.

12.6.1 Glazed Partitions

- Proprietary commercial aluminium sections
- Powder coated or anodised finish
- Glazing with transom rails do not require visual indicators if the upper edge of the transom rail is not less than 700mm or the lower edge of the rail is not more than 1000mm AFFL.

12.6.2 Glazing Decals

- Decals to full height glazing in teaching spaces shall be provided.
- Obscuring the view into teaching spaces with film or decal is not acceptable
- Decals or film to offices are to ensure that some transparency is maintained to all enclosed spaces.
- Opaque film is not acceptable
- Print on clear film or laser cut decals are acceptable, decal shall be solid and not translucent
- Where a glazed door is positioned within a glazed wall, a decal design or size that differs from the adjacent fixed panels is to be provided on the door to identify the door.

12.7 Windows

- Windows shall be openable, unless inappropriate due to environmental conditioning, and/ or security and/ or health and safety considerations.
- External openable windows on upper levels to be fitted with restrictors to 125mm max opening for safety reasons.
- External windows shall be fully flashed with metal flashings. Reliance on sealant for waterproofing shall not occur.
- All fitted elements to window units, including fly screens, shall be accessible and removable for cleaning, maintenance and replacement.
- Window locations and sizes shall be designed in conjunction with internal lighting systems to reduce energy consumption.
- All external windows shall incorporate glare control blinds unless approved otherwise by Property Services.
- Sashes shall be either sliding or double hung.
- All new windows must be double-glazed with thermally-broken frames.
- The ratio of windows to external walls must be maximum of 50% on any façade orientation, unless it can be demonstrated that the ratio will positively impact the building's energy consumption and thermal comfort.
- Install compressed seals on all operable windows on new buildings and refurbishments where there are changes to facades or windows.

12.8 Insulation

- Building insulation roof and ceiling, external walls, and flooring construction to achieve a 15% increase on the minimum required BCA requirements.
- Use insulation materials with lower embodied energy with the following as a hierarchy of choices:
    - organic (sheep's wool, cellulose, cork, wood fibre, and hemp).
    - inorganic (mineral/glass fibre, perlite and vermiculite (from volcanic rock) and rigid foamed glass.
- Fossil organic (e.g. expanded polystyrene and polyisocyanurate or phenolic foam) shall not be used

- Insulation shall not be located where performance may be substantially reduced by damage or water leakage.
- Vapour barriers shall be located on correct side of construction.
- Cool rooms located on external walls shall be suitably insulated to avoid internal condensation.

References

- Australian Building Codes Board Climate Zone Map

12.9 Air Tightness

- Prioritise the use of airlocks for all significant openings.
- Install compressed seals on all new doors and openable windows on new buildings and refurbishments where there are changes to facades or windows.
- The project team must provide a cost-option to complete an air-permeability test for all new buildings prior to completion. The test results must not exceed maximum air permeability rates of 3m3/(hm2) at 50 Pa.
- Achieve a 15% increase on the minimum required total system R-values specified for roofs, ceilings and floor in Part J4D4 Part J1.3 and J4D7 Part J1.6 of the NCC 2022 (Formerly Part J1.3 and Part J1.6 of the 2019 NCC).
- Provide an upper surface solar absorption of at least 0.05 less than maximum allowable value in Part J1.3 of NCC.
- All new windows must be double-glazed units with aluminium or timber frames.
- Solar heat gain co-efficient of glazing units must be optimised to ensure natural daylight is maximised but does not negatively impact the thermal comfort of the space.
- A thermal comfort study must be provided for all new buildings.

12.10 Adhesives, Sealants and Fasteners

- Avoid extensive use of caulked joints.
- Solutions using flashings and mechanical seals are to be utilised.
- Formaldehyde emissions minimisation: all internally applied.

Table: Maximum TVOC Limits for Paints, Adhesives and Sealants:

Product Category	**Max TVOC content in grams per litre (g/L) of ready to use product.**
General purpose adhesives and sealants	50
Interior wall and ceiling paint, all sheen levels	16
Trim, varnishes and wood stains	75
Primers, sealers and prep coats	65
One and two pack performance coatings for floors	140
Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives	250

Structural glazing adhesive, wood flooring and laminate adhesives and sealants	100

12.11 Termite Management

- Seal subfloors and cavities against vermin and bird access.
- Any pest control measures shall not create hazards to animal species nor humans.

12.12 Tanking, Damp Proofing and Membranes

- Membranes at wall junctions of exposed slabs shall be coved to contain moisture.
- Levels of drainage outlets shall be set to provide a relief point for seepage at the membrane level as well as the normal run off at granolithic level.
- Vapour barriers are not to be used where there is a likelihood of liquid water being present.
- In these situations, an approved membrane shall be installed, or another form of waterproofing barrier approved by the Technical User Group.

13.0 Interiors

Public spaces shall be predominantly furnished with permanently fixed joinery to prevent loss of items through theft and ensure paths of exit are not compromised by loose items

Do not duplicate services or amenities already provided in adjacent areas. On each project, a review of existing amenities is to occur, to identify any additional requirements, if any, to the approval of the Technical User Group:

- Print rooms,
- Kitchens and tea points
- Toilet facilities
- Storage rooms
- Meeting rooms

A minimum 30% luminance colour contrast between walls and flooring, and seats and tables shall be provided to assist people with vision impairments

References

- Section Thirteen Interiors to be read in conjunction with supporting guidelines and plans

  RMIT Furniture Standards

13.1 Linings

- Expensive decorative wall materials and linings are generally to be avoided.

13.2 Partitions

- Villaboard or High impact plasterboard shall be used in high-impact areas – to a height of 1800mm AFFL.
- Villaboard or equivalent is to be used in wet areas.
- Provide corner protection to high-impact external wall corners.
- Walls behind teaching areas are to be monolithic flat surfaces with matt white painted surface finish; keep clear of fittings and services.
- Wall colours in conference space shall be carefully chosen and coordinated with RMIT A/V to assist in teleconference transmission clarity of speakers. Minimal to no patterns on walls behind people.
- Coordinate elevations of various LED screens and wall/stud/nogging.
- Careful consideration of shelf stripping for secure fixture of joinery items such as benches, TV screens, shelves (accounting for heavy book loadings), noticeboards, whiteboards, etc. Is required.
- Additional noggings to be included for heavier loads - 600mm max centres with the top shelf at 1800mm maximum height.
- Shelves maximum depth of 250mm and minimum thickness of 18mm.

13.3 Ceilings

- Safe access shall be provided to all ceiling services and lighting from within the space. Special consideration shall be given to accessing services in stairwells, and workstation areas safely with minimal disruption to University activities.
- Access to ceiling-mounted equipment shall be provided through accessible and secure ceiling tiles or hatches. Equipment located in trafficable ceiling spaces shall have stair access.
- All ceiling linings and any other materials or hardware installed above head height must be mechanically fixed, in accordance with the manufacturer's written recommendations or an approved engineering design.

13.4 Doors

13.4.1 Operations

- Handles and door mechanisms shall be sufficiently robust to withstand vandalism, abuse and the effects of frequent use.
- Door schedules shall integrate all doors required to be connected to RMIT Access Control.
- Doors, other than fire doors shall have a force to open of less than 20 Newtons.
- Doors shall be robust and suitable for the intended purpose of the space.
- Doors or airlocks shall separate areas that are conditioned from areas that are not.
- Door controls shall be installed on latch side of door wherever possible to provide consistency and to assist people with low vision locating the controls.
- Door controls for auto doors shall be located minimum 750mm from an internal corner.
- Doors shall have luminance contrast of minimum 30% between door wall and architrave (frame). If the frame is the only contrasting element it shall be 50mm wide. All materials shall be matt or low sheen finish.
- Doors shall be located minimum of 110 mm form a perpendicular wall to allow door to open 90 degrees.
- Provide hold open mechanisms on doors that are in daily use / high traffic areas that release upon alarm activation.
- 'Push/Pull' signage or arrows on doors shall be provided to indicate direction of opening.
- Break glass door releases at 900-1100mm AFFL and not within 500mm of internal corners
- Doors shall be sized to suit the maximum widths required for the purpose of the space. Consideration is to be given to peak demand times in teaching spaces.
- Oversize doors shall be detailed to include sufficient hinges and hardware to ensure ease of operation and durability.
- Doors shall be located adjacent to walls to provide a definite door stop and thus avoid hinge stress damage due to over extension by the action of wind or students.
- High traffic areas shall have automatic sliding doors.
- Doors should be acoustically rated to comply with the requirements in Section Ten - *Acoustics* of the standard.
- Highly customised doors and door frames shall be avoided.
- Double acting doors shall be detailed to prevent binding between the leaves. If not double acting, double doors shall have rebated stiles, or equivalent metal stop to inactive leaf.
- Access and security controls shall be integrated into doors and frames.
- All two-way doors shall include vision panels.
- Doors in high impact areas, such as areas where trolleys are used, shall include metal kick plates to 1000mmH and be durable and easily cleaned.
- High impact, laboratories and back of house doors shall have kick plates - stainless steel or vinyl.
- All newly installed doors or existing doors undergoing new works must be fitted with Lockwood or equivalent quality door furniture that will accept the RMIT Lockwood MT5 keyed cylinders that need to be ordered and supplied by RMIT's incumbent locksmith prior to project handover.

13.4.2 Assembly and Materials

- Doors to teaching and learning spaces shall have glazed vision panels.

- Glazed vision panels in doors shall have the lower edge of glazing at maximum 1000mm AFFL, upper edge of glazing at minimum 1600mm AFFL, minimum 150mm width and located maximum 200mm from the edge of the door.
- Frameless glazed doors shall be provided by a vertical contrasting band with min 30% luminance contrast which is 25mm wide on the leading edge of the door and 25mm wide on the adjacent glazed panel.
- Cat and Kitten, 1 ½ leaf doors are to be avoided in teaching spaces. Large single doors designed to accommodate peak pedestrian traffic loads are required.
- Timber doors shall be of solid core construction.
- Hollow core doors are not acceptable.
- Doors shall have lever style handles.
- Door widths minimum of 920mm with clear widths of no less than 850mm.
- Clear opening widths for pivot doors measure from the face of the door to the opposing latch shall be minimum 8500mm.
- Doors shall be fitted with a minimum of 3 No heavy duty stainless steel hinges per leaf.
- Door handles and controls shall be in a colour which provides a luminance contrast with the colour of the door or wall on which they are mounted.
- Doors shall be furnished with retainers, door stops, door closers etc. to prevent impact damage to adjacent surfaces.
- Fixings to lightweight metal shall be provided with backing plates for support
- Door frames shall be aluminium or steel and to be fitted with a double rebate to allow for future alterations.
- Door stops shall not be located in close proximity to the hinge.
- Floor mounted door stops shall not be used.
- Where floor mounted door stops are currently installed, a door stay is to be used instead, fixed to the head of the door.
- Where snibs are used they shall have a lever handle of minimum length 45mm from the centre of the spindle.

13.4.3 Fire Doors

- Where magnetic hold open devices for doors are required, wall mounted magnets shall be used incorporating a release button mounted no higher than 1200 mm on the adjacent wall. A release button on the magnetic device will not be accepted.
- Fire doors fitted with magnetic locks shall be connected to the RMIT Security system and the building's FIP, operating in fail safe mode.
- The RMIT approved Door Sequence Device is the COR Series Coordinators.
- Fire doors on a path of travel fitted with closers are likely to exceed 20N force shall be 'hold open' or fitted with closers that only activate during an alarm.
- Fire doors discharging to exterior shall be faced on external side with Colorbond steel sheet, adhesive fixed with fabricated perimeter channel of the same material. Countersunk stainless-steel screw fix through edge.

13.5 Fixtures and Fittings

13.5.1 Sanitary Fittings General

- Accessible sanitary fittings shall be provided
- All fixtures must have nominated WELS Rating
    - Taps 5 stars

  - Urinals 5 stars
  - Toilet 4 stars
  - Showers 3 stars (<9 l/min)
- Floor Wastes
  - Shall have removable chrome plated brass grates.
  - Shall be not less than 80mm diameter
  - Shall be charged with a fixture
- Deep seal (75mm) traps shall be provided to plant/air handling and laboratories

13.5.2 WC's and Urinals

- Waterless urinals are not acceptable.
- White wall hung ceramic pans with white plastic lids.

13.5.3 Sinks and Vanity Basins

- Vanity hand basins shall be vitrified ceramic set into a continuous solid surface material vanity top. Front section a minimum of 150mm deep with services lines concealed from view.
- Kitchen and Tea Point sinks shall be stainless steel proprietary commercial sinks.
- Under mounted or integrated sinks in kitchens or tea points are not acceptable.
- Laboratory and special purpose sinks shall be designed to suit the purpose of the space, and stakeholder requirements.

13.5.4 Showerheads

- Showerheads with fixed arms are to be provided, mounted at a minimum of 1900mm AFFL, adjustable to a height of 1.5m – 2.1m.

13.5.5 Taps and Mixers

- Heavy duty commercial grade touchless taps with adjustable time flow shall be used provided at all vanity basins.
- Tap fittings shall be stainless steel finished and allow for simple operation.
- Include touchless activation sensors.

13.5.6 Hand Dryers

- For all bathrooms hand dryers are to be specified, with no paper towel provision.
- Dyson Airblade V or equivalent hand dryers shall be specified, to comprise as a minimum, HEPA filter, high speed drying and energy efficient properties.

13.5.7 CW/HW Units

Zip Industries units are the preferred supplier for RMIT for Kitchens and Tea Points:

- Boiling and chilled filtered drinking water, with separate hot and cold water tap/mixer.
- OR Zip - HydroTap G4 All-in-One unit. Boil/Chilled + Hot/Cold integrated tap.

13.5.8 Drinking Fountains

- Shall be on a level landing of 1540mm x 2070mm where the gradient does not exceed 1:40.
- Vinyl or similar impervious floor finish for easy cleaning.
- Refrigerated drinking fountains are required.
- Include bottle filler spouts.
- Connected to sewer.

- Drinking fountains shall be installed at 800-830mm AFFL with open knee clearance of min 720mm under.
- Where two drinking fountain units are provided, locate one fountain at 1000mm AFFL and the other as above.
- Controls should be located centrally on drinking fountains, operable by touchless sensors
- Fountains should be provided on a level landing of 1540x2070mm where the gradient does not exceed 1:40.
- Include touchless activation sensors.
- All upgraded or replaced drinking fountains are to be touchless activation sensors.

13.5.9 Coat Hooks

- To the back of all toilet partition doors.
- Provide fixings that can support heavy bags.
- One coat hook to each enclosed office.
- Two coat hooks to each cleaner's store.

13.5.10 Shared coat racks

- Provided in academic workspaces for staff coat storage.
- A suitable size to accommodate the needs of stakeholders.
- Shall not obstruct paths of travel when fully loaded.
- Individual coat storage is not acceptable in open plan office areas.
- May be within a cupboard or firmly mounted to the wall.

13.5.11 Projection System

- Projection screens are not acceptable.
- Flat homogenous white wall free of services shall be provided as a projection surface in lieu of a screen.

13.6 Toilet and Shower Partitions

- Toilet cubicle doors are to be provided with adjustable door hinges such that the door remains in the closed position when the cubicle is unoccupied.
- Full height toilet cubicles constructed from polyurethane finished high-density fibreboard on stainless steel feet, with matching durable edges are to be provided as a minimum standard.
- Closed and locked toilet cubicle doors shall be capable of being removed in an emergency where the occupant becomes incapacitated.
- Toilet and shower cubicle doors shall be fitted with integral coat hook/door stops and with a safety catch and integral vacant/engaged indicators.

13.7 Furniture and Joinery

- RMIT maintains detailed Furniture Standards - the Furniture Standard should be read in conjunction with this document and any departures taken through the same governance process as detailed in 2.5.
- The furniture standard covers (but is not limited to):
    - Design and spatial considerations in relation to furniture
    - Third-party certifications for OHS and Sustainability
    - Workstations
    - Storage

- Chairs
- Tables
- Lounge/Breakout Furniture
- Computer Labs
- Outdoor Furniture

References

- RMIT Furniture Standards

13.8 Domestic Appliances

All domestic appliances installed should meet or exceed the following Energy Star Rating:

- Dishwasher - 3.5 Star
- Refrigerator - 4.5 Star
- Television / Display Screens - 6 Star
- Washing machine - 4 Star
- Clothes dryer - 8 Star
- Air-conditioners - 5.5 Star

13.9 Access hatches and Wall hangings

- All wall and ceiling materials must be mechanically fixed, including acoustically exposed linings, writeable wall services or similar type materials and products.
- The design must allow for a sufficient number of suitable and fit-for-purpose wall and ceiling access hatches to adequately and safely maintain all in-wall and in-ceiling services that require maintenance at any frequency.
- Hinged access hatches are required.
- Access hatches must use a square drive or coin turn lock only. Access hatches which use any type of key lock must not be used.
- Where practicable, isolation valves must be located such that they can be accessed while a person is standing normally on the floor. Valves must be accessible by a suitable and fit-for purpose access hatch.

14.0 Finishes

14.1 General

- Are as far as practical Australian made and locally/nationally available.
- Materials that are untested shall not be used.
- Low maintenance, retain appearance and colour over life, easy to clean, vandal and graffiti resistant.
- Highly durable - resistant to staining, soiling and fungi growth.
- Soft furnishings shall be vinyl to ensure durability and ease of cleaning.
- Minimise number of specialised products.
- Avoid highly patterned carpets, floor finishes or strongly contrasting lighting effects to reduce visual confusion for people with vision impairment.
- Materials that will corrode in the local atmosphere shall not be used.
- Chemical use requirements for maintenance including the availability of products shall be considered.
- All materials and finishes must be certified by one of the following sustainability certification schemes:

- Global GreenTag Certification
- Good Environmental Choice Australia (GECA)
- Australian Furnishing Research and Development Institute (AFRDI)
- Carpet Institute of Australia – Environmental Certification Scheme
- Declare
- Environmental Product Declaration

14.2 Prohibited Materials

The Victorian Government introduced new regulations in 2022 aimed at minimising Victorian workers exposure to crystalline silica and also adding additional regulatory oversight of high-risk crystalline silica work outside of engineered stone across all industries. In response, the following new material selections are prohibited on all RMIT projects:

1. Engineered stone
2. Sandstone containing >70% Crystalline Silica
3. Any product containing >70% Crystalline Silica

14.3 Tiling

- Homogenous products with coved skirtings to be used in wet areas and kitchens, tiled flooring is not to be used in these areas.
- Tile flooring to offices, corridors and foyers, stairwells are only to be used if approved by the Technical User Group.
- If approved, floor shall meet the following requirements:
  - Required slip resistance for intended purpose.
  - Tiles suitable for high traffic commercial applications are to be specified - fully vitrified porcelain, or natural non-porous stone tiles only.
  - Tiled floors in wet areas shall fall to waste with minimal possible tile cutting.
  - Control joints shall be included where large floor areas are tiled.
  - Grout shall be proprietary polymer modified extra fine grout, and antimicrobial.
  - Shall be sealed to prevent staining of tile and grout.
- Bluestone floor tiling shall not be used

14.4 Timber

- All timber used must be either from a reused source or be certified by one of the following certification schemes:
  - FSC International; or
  - PEFC-accredited forest certification scheme.
- Exposed timber edges shall be suitably finished to protect them from impact/damage
- Timber species should be carefully coordinated with FF&E selections, joinery and other building elements.

14.4.1 Engineered Timber Products

- Engineered timber products include particleboard, plywood, Medium Density Fibreboard (MDF), Laminated Veneer Lumber (LVL), High-Pressure Laminate (HPL), Compact Laminate and decorative overlaid timber panels.
- All engineered timber products used must meet the limits specified in the following table or have evidence that it contains no formaldehyde:

Test Protocol	Emission Limit/ Unit of Measurement
AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood	≤1mg/ L
AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1.5 mg/L
AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1mg/ L
AS/NZS 4357.4 - Laminated Veneer Lumber (LVL)	≤1mg/ L
Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL	≤1mg/ L
JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates)	≤0.1 mg/m²hr*
ASTM D5116 (applicable to high pressure laminates and compact laminates)	≤0.1 mg/m²hr
ISO 16000 part 9, 10 and 11 (also known as EN 13419), applicable to high pressure laminates and compact laminates	≤0.1 mg/m²hr (at 3 days)
ASTM D6007	≤0.12mg/m³**
ASTM E1333	≤0.12mg/m³***
EN 717-1 (also known as DIN EN 717-1)	≤0.12mg/m³
EN 717-2 (also known as DIN EN 717-2)	≤3.5mg/m²hr

- All engineered timber products must meet one of the following sustainability certification schemes:
    - Global GreenTag Certification
    - Good Environmental Choice Australia (GECA)
    - Declare
    - Environmental Product Declaration

14.5 Wall surfacing

- Applied finishes such as paint or render are to be avoided to all external elements.

14.6 Floor Surfaces

- Selected products shall address the following:
    - Durability.
    - Capability for economic and rapid repair.
    - Minimised cost of cleaning.
    - Antistatic.

  - Commercial grade.
  - Compliance with Slip resistance.
  - Compliance with fire regulation requirements.
  - Ability to disguise dirt, soil and stains.
  - Single colour or flat matt flooring products are not acceptable. i.e. no black solid colour flooring is permitted.
  - Appropriate thermal and tactile comfort with regards to intended room usage.
- Selected based on appropriateness for volume, intensity and nature of foot traffic to which they are likely to be exposed.
- Genuine low maintenance products, with a clear upper surface treatment incorporated during manufacture and a guarantee for a minimum of five years.
- Low VOC material and adhesives shall be used for all flooring. Refer Section 12.10 Adhesives, Sealants and Fasteners.
- Minimum 2 mm thick sheet commercial grade with solid welded junctions to be fully heat welded on installation.
- Nominated colours and patterns are required to permeate the full thickness of the material.
- For heterogeneous products, the nominated colours and patterns shall permeate the material to a depth of at least 0.7mm.
- Products shall be able to be “wet and dry” cleaned (in turn they are waterproof and weldable)
- Materials shall be stain resistant, a requirement that can be met through the application of clear upper surface treatments.
- All floor materials to be matte or low sheen to avoid glare for people with vision impairment.
- Door thresholds and trims shall be used at all material junctions.
- Preferred threshold strip is the RAVEN RP95, subject to review of use of rotary floor polishers with selected floor finish.
- All tactile surface indicators shall be stainless steel – contrasting with floor colouring. Plastic or PVC or partial plastic are not to be used.
- Timber flooring shall not be selected for areas subject to in excess of 5000 persons per day.
- Floor Coverings Guide sets out and provides the minimum floor finish requirements set out in below table.

References

VOC Emissions Table:

- Section Twelve – Enclosure; 12.10 Adhesives, Sealants and Fasteners

Floor Coverings Guide:

	Chemical/ corrosion/ slip resistant	Non- absorbent urine resistant	Standard seamless finish	Coving	Carpet tiles	Polished sealed concrete	Sealed concrete	Sealed concrete- Chemical Resistant	Grated Floor Waste
Teaching tutorial or lecture theatres	×	×	✓	×	✓	×	×	×	×
Meeting Rooms and Video Conference Rooms	×	×	×	×	✓	×	×	×	×
Offices	×	×	×	×	✓	×	×	×	×
Corridors and Foyers	×	×	✓	×	×	✓	×	×	×
Clinical / Science Labs	✓	×	×	✓	×	×	×	×	×
Gymnasiums	×	×	✓	×	✓	×	×	×	×
Toilets	×	✓	×	✓	×	×	×	×	×
Change-rooms	×	✓	×	✓	×	×	×	×	✓
Cleaners Facilities	×	×	✓	✓	×	✓	×	×	✓
Kitchen Facilities	×	×	✓	✓	×	×	×	×	✓
Plant rooms	✓	×	×	×	×	×	×	✓	✓
Lift Control Rooms	✓	×	×	×	×	×	×	✓	×
Stairwells	×	×	✓	×	×	×	✓	×	×
Fire Hydrant and Hose Reel Facilities	✓	×	×	×	✓	×	✓	×	×

Communications	×	×	✓	✓	×	×	×	×	×
Commercial Tenancies	×	×	×	×	×	×	✓	×	✓

14.7 Carpets

- Carpet tiles only.
- Broadloom carpet floor finishes are not acceptable.
- Carpet tiles shall not be selected for areas subject to in excess of 5000 persons per day
- Floor underlay materials shall be fire and smoke retardant and warranted with the specified carpet tile.
- All carpets shall have at least 40% recycled content.

14.7.1 Carpet tiles

- Heavy duty and hard-wearing modular carpet tiles.
- Loop pile.
- Colours and patterns to be considered for long-term flexibility and replacement.
    - Future non-availability of particular colours or patterns to be discussed during design phase.
    - Confirm with Technical User Group about retention of % of carpet tiles for future use.
- Carpet to be certified under a recognised Product Certification Scheme. Refer to below references.

References

- Carpet Institute of Australia Limited - Environmental Certification Scheme
- Global GreenTag
- Australian Furnishing Research and Development Institute – Green Tick
- Good Environmental Choice Australia (GECA)
- The Institute for Market Transformation to Sustainability – Sustainable Materials Rating Technology

VOC Emissions Table:

- Section Twelve – Enclosure; 12.10 Adhesives, Sealants and Fasteners

14.8 Painting

- Paint finishes (except in toilet, change room or other wet areas) shall be low sheen and on a monolithic flat surface.
- Anti-graffiti to brick, concrete and other impervious surfaces.
- No painting of external facades shall occur.
- All paints to meet the total VOC limit table. Refer below.

References

VOC Emissions Table:

- Section Twelve – Enclosure; 12.10 Adhesives, Sealants and Fasteners

14.8.1 Ceilings

- Flat acrylic generally.
- New - one coat sealer/undercoat and two coats flat acrylic finish coats.
- Existing - thorough sanding and filling/preparation and two coats flat acrylic finish.

14.8.2 Walls (New)

- One coat sealer/undercoat and two coats low sheen acrylic finish coats.

14.8.3 Timber Doors and Trim

- Solvent-based paint is unavoidable (for example Heritage work), but use is discouraged.

- One coat sealer/undercoat and two coats water-based interior/exterior acrylic enamel, or super water-based interior/exterior acrylic enamel gloss or satin finish coats.
- Existing enamel surfaces to be recoated with water-based interior/exterior acrylic enamel.
- If unavoidable to use, all enamel painting to occur out of hours, preferably on a weekend.

VOC Emissions Table:

- Section Twelve – Enclosure; 12.10 Adhesives, Sealants and Fasteners

14.9 Laminates

- Only use standard laminate thicknesses
- For horizontal surfaces fixed to a continuous substrate: 1.2 mm.
- For vertical surfaces fixed to a continuous substrate: 0.8 mm.
- For post formed laminate fixed to a continuous substrate: 0.8 mm.
- For vertical surfaces fixed intermittently (e.g. to studs or framing system): 3.0 mm.
- For edge strips: 0.4 mm.
- Rolled edge detail preferred.

14.10 Entry Matting

- Matting shall be heavy duty recessed matting.
- Mats shall be recessed or have tapered edges formed by brass or aluminium angles set into concrete.
- Brush off matting shall be used in external areas.
- Where exposed to weather, mat recesses shall incorporate self- draining, unless located under shelter or immediately inside doorways.
- External mats shall be at least to the width of the doorway and a minimum of 2 1.2 m in direction of travel.
- Matting shall extend not less than 4 metres in the direction of travel when leading to carpeted surfaces.
- Air lock entrances shall have entry matting laid to their entire enclosed area.
- For fire isolated areas matting shall be fire resistant to comply with fire rating of area.

14.11 Fabrics

- Fabrics are to have a Commercial Textile Association (CTA) approved performance rating of Heavy Duty Commercial.
- Woven single colour and light colour fabrics are not to be used.
- In high use areas fabrics are to be impermeable.

14.12 Window Furnishings

- All external windows shall have roller blinds, concealed within pelmets or other building elements so that when open do not obstruct the view to outside.
- Internal blinds shall control glare and radiant heat; however, they should not be used as a substitute for adequate external solar control devices.
- Blinds shall be non-flammable (compliance with NCC requirements as tested to relevant code), easily adjustable and complete with guide rails and associated fixings.
- Installation of blinds shall allow for ease of removal and replacement of all parts.
- Roller blind fabrics in areas requiring black-out capacity shall be block-out type.
- Curtains should not be used.

- Install anti-hanging device to all blinds with chain pull.
- Motorised blinds shall be connected to the Building Management System.
- Blinds must have a visual light transmittance of less than or equal to 10%

15.0 Mechanical

15.1 Mechanical HVAC Systems Design Standards

Outside air intakes to have clear air for a minimum distance of 20 metres. Designers shall avoid the use of reheat coils for zone temperature control except where no suitable alternative can be provided

15.1.1 Mechanical Services Systems Selections

- A Mechanical Services Options Study shall be conducted, and a report submitted to RMIT to provide recommendations on which system type to adopt based on the following:
    - Whole of life cycle costs based on the Net Present Value Method based on a 25-year term, with appropriate and industry sourced cost escalation rates on utilities.
    - Reliable plant and proven technologies.
    - Minimisation of complexity of operation and maintenance.
    - Readily maintainable with product support and locally source spares.
    - Minimisation of aesthetic, noise and environmental impact.
- Inspect and report on the condition of existing systems to determine suitability for reuse and compliance with current statutory requirements.
- If the project is likely to change the energy performance of the space, provide a report on the following matters:
    - change in energy profiles from baseline.
    - future opportunities and recommendations.
    - and anticipated change in energy performance.

15.1.2 Natural Ventilation

RMIT supports the use of natural ventilation with strong passive design principles to reduce energy consumption and emissions.

If natural ventilation is proposed for an office, learning & teaching or research space with no means of mechanical heating/cooling:

- All reasonable efforts should be made to ensure that the space/building is constructed using passive design principles (i.e. insulation, external shading etc)
- Detailed performance modelling should be conducted over a full thermal cycle to validate that space conditions will be achieved in a number of contingent scenarios:
    - this will include space performance under extended heat wave and increased ambient conditions to ensure spaces are resilient to a changing climate. Exact parameters are to be discussed and agreed with RMIT prior to commencing design.
- Operational strategies to manage scenarios outside of design conditions must be discussed with RMIT PSG and user stakeholders to ensure that any possible impact to RMIT operations are understood.
- Designs are to be suitable for future retrofit of mechanical plant in the event this is deemed necessary at some future time - there will be no design considerations that limit this possibility (i.e. space, structure etc).

15.1.3 General Design Requirements

- The ambient design conditions used in calculations shall be based on design temperatures nominated in the latest AIRAH Load Estimation application manual DA09.
- Unless otherwise advised, the design criteria shall comply with the criteria as scheduled in the “Table: Design Criteria by Type of Space” table below. Where a conditioned space is believed to be outside of the spaces defined in the table below or deviations are proposed, approval shall be sought from RMIT.

Design Criteria by Type of Space:

Space	Summer room design temp. (°C)	Winter room design temp. (°C)	Room Humidity (RH)	Minimum Population density Persons/ m²	Appliance loading allowance (w/m²)	Other
Administration offices	24	22	50%	1/10	25	
Lecture theatre	24	22	50%	1/10	25	
Post Grad space	24	22	50%	1/4	25	
Conference rooms	24	22	50%	1/1.8	25	
Tutorials	24	22	50%	1/2.8	25	
Computer labs	24	22	50%	1/2.8		2.5m² per work station and 110 W/computer drive and screen
Science labs	24	22	50%	1/5	25	
Communications/ Computer server rooms	27				Project specific, 300 W/m² min	

Notes:

- Unless otherwise noted, no active humidity control is required, plant should be designed to achieve the above nominal humidity design criteria + 10% tolerance.
- The actual appliance loading to be coordinated with the architectural and electrical designs and to include all specific known space appliances loadings or the above minimum scheduled allowance, whichever is greater.
- The actual population density within the spaces to be coordinated with the architectural design and RMIT and to include project specific expected population or the above minimum scheduled allowance, whichever is greater.
- All temperature set points are to be adjustable over the range of 18°C to 28°C with an adjustable dead band of 2°C across the set point.
- Where natural ventilation or mixed mode operation is applicable, the internal space temperature conditions can fluctuate within a wider temperature band of 18°C to 26°C dry bulb. Appropriate behavioural and comfort adaptations policy/methods should be incorporated into the design and operation of naturally ventilated or mixed mode operated spaces.
- The expected noise levels from the HVAC systems (including pipe work) designs, and mechanical plant selections shall not exceed the current Australian Standard recommend noise levels and reverberation times for Building Interiors and the criteria as scheduled in the

- The expected noise levels from the HVAC systems designs and mechanical plant selections shall not exceed the EPA requirements for external noise levels and the resultant noise levels will not adversely impact the amenity of adjacent buildings and functional outdoor spaces.
- Where mechanical services penetrate partitions bounding spaces requiring speech privacy, attenuation shall be incorporated in the design such that the acoustic performance of the attenuation exceeds the minimum Weight Level Difference (Dw) as schedules in Table: maximum continuous noise intrusion levels and minimum noise separation for speech privacy and so that the overall Dw rating of the partition is maintained.

Maximum Continuous Noise Intrusion Levels and Minimum Noise Separation for Speech Privacy:

Typical Spaces	**Maximum design noise levels**	**Acoustic privacy rating based on the minimum Weight Level Difference (Dw) of partition being penetrated by Makeup/Relief/Return Air paths**
	Lqds dB(A)	**Noise Rating (NR)**
Lecture theatres, conference rooms, meeting rooms, libraries, Snr offices	35	30
Reader's offices, lecturer's offices, common teaching rooms. laboratories	40	35
Tutor's rooms. Stores, general offices, amenities	45	40
Corridors, services areas and the like	50 Note: 40 (At Toilets)	45

15.2 Air Handling Components

- The HVAC system design shall incorporate individual zone temperature control with common zones shared only by areas with similar functional requirements, similar occupancies and frequency of operating hours and with similar load profiles. No one single room shall be served by two different air conditioning units.
- HVAC systems shall incorporate time clock operation controlled via the University's BMS and include local 0-4 hrs (adjustable) afterhours override pushbuttons within the served space.
- The HVAC systems shall incorporate Demand Ventilation Control (DVC) and monitoring of CO2 levels in the occupied spaces. The DVC system controls the ventilation outside air flow rates to maintain 700 ppm CO2 levels in the occupied spaces.
- CO2 shall not be used as an indicator for control of the DCV systems serving zones with indoor sources of CO2 other than people.
- Carpark exhaust system design shall incorporate energy saving measures including Atmospheric Contaminant Monitoring Systems based on CO monitoring to control the exhaust systems operation and flow rates.

The Air Coil design criteria and selection shall comply with the criteria as scheduled in the table below.

Air Coil Selection Criteria:

Application	Max air velocity through the coil face area	Maximum air pressure Drop	Maximum water side pressure drop	Maximum fin pitch	Factory applied corrosion protection coatings
Cooling coils	Does not exceed 2.4 m/s	To be confirmed during design with consideration of future-proofing and energy efficiency	Does not exceed 30 kPA	Does not exceed 480 fins/m	-
Heating coils	Does not exceed 3.4 m/s	To be confirmed during design with consideration of future-proofing and energy efficiency	Does not exceed 20 kPA	Does not exceed 550 fins/m	-
Condenser coils	Does not exceed 3.4 m/s	To be confirmed during design with consideration of future-proofing and energy efficiency	-	-	Included

The design of filter plenums and filter system selections shall comply with the criteria as scheduled in the Table: Air filter selection criteria below and all filter media shall be disposable type.

Air Filter Selection Criteria:

Application	Primary Filters type and rating to AS 1324.1	Secondary Filter type and rating to AS 1324.1	Max air velocity through the filter face area	Maximum initial air flow resistance for filter system
Air handling units	Extended media deep bed, G4	Extended media multi peak, F8	Does not exceed 2.4 m/s	To be confirmed during design with consideration of future-proofing and energy efficiency
Fan coil units ducted with airflows exceeding 1000 l/s	Extended media F5	-	Does not exceed 2.4 m/s	To be confirmed during design with consideration of future-proofing and energy efficiency

Fan coil units ducted with airflows not exceeding 1000L/s			Does not exceed 2.4 m/s	To be confirmed during design with consideration of future-proofing and energy efficiency

Note: for fan coil units not exceeding 1000 l/s and non-ducted units provide separate outside air filters and filter plenums.

- Filter plenums shall be provided with local manometers filter gauges and differential pressure sensors connected to the Building Management System to provide indication of when filter requires replacement/cleaning.
- Where flexible connections and vibration isolation mounts are specified, provide vibration isolation of HVAC systems and mechanical plant, selected to minimise, structure borne and airborne noise and vibration.
- Fan coil units proposed to be exposed within occupied spaces are to be provided with acoustic enclosures.
- HVAC plant shall be designed and provided with the level of redundancy and spare capacity as scheduled in the Table: Level of redundancy and spare capacities defined below.

Level of Redundancy and Spare Capacities:

Application	**Level of redundancy**	**Spare capacity for future use**	**Comments**
Mechanical Switchboards	-	25%	Includes spare capacity in cable load as well as physical space on the switchboards – all 3-phase equipment to be provide with phase failure, phase reversal and under/over voltage protection
Chillers	N+1	20%	
Boilers	N+1	20%	
Hydronic pipework systems flow capacity	-	25%	
pumps	N+1	25%	
HVAC plant serving Communication equipment rooms	N+1 or N air conditioning units + back up exhaust systems	10%	
HVAC plant Data rooms	N+1	10%	Include N+1 redundancy in power and controllers

FCU and AHU		10%	In general but may change depend on special case and requirements from School. Refer to redundancy comment in relation to labs and specialist equipment.

Note: Denotes the number of plant items required to meet 100 % of the design duty.

- The HVAC systems incorporate heat recovery system to treat outdoor air ventilation rates where the minimum outside air ventilation rate is greater than 30% of the of the supply air flow rate.
- Air handling units will incorporate the following features:
    - Lights to each compartment.
    - Compartments with adequate access for inspection, service and maintenance.
    - Hinged access doors with heavy duty hardware and seals.
    - Stainless steel or PVC condensate trays with 25 mm ID minimum sized bottom drains extending past headers and coil fin blocks.
    - Sandwich panel modular construction or Double skinned modular construction galvanised sheet steel construction mounted on concrete plinths.
    - Removal plugs to measure air on and air off the coil temperatures
    - Fans selected to maximum of 1440 RPM at the design duty and fitted with high quality sealed bearings.
    - Fans motors with minimum of 2 x belt cog drives with adjusting screws to be opposing end and side of motor, direct drive type or EC (electrically commutated) type.
    - External lockable drive motor power isolating switch.
    - High efficiency motors.
- Air-conditioning units serving communication rooms shall be stand-alone refrigerant units, not on the main circulated water system. If a ventilation only solution is adopted, this system shall be provided with filtration.
- All reheat coils shall be provided with access panels upstream and downstream of the coil for maintenance access.
- Where stakeholders have special requirements for operation, i.e. 24hrs (7 days) or to protect equipment such as sensitive microscopes/scanners (high value research outputs) there shall be a provision of redundancy (e.g. standby unit etc) for AHU and FCU designs.

15.3 Ductwork and Components

- Balancing dampers, smoke dampers and valve motorised actuators shall be readily accessible for service and inspection and will incorporate position indicators and self-lubrication bushes. All access panels shall be labelled to provide indication of type and location of dampers.
- Kitchen exhaust ductwork joints shall be sealed with chemical resistant sealants and provided with access panels every 2 m of horizontal ductwork and at every change in direction.

15.4 Piping

- Hydronic system designs shall comply with the Table: Hydronic pipes design maximum frictional loss and maximum design velocities defined below.

Hydronic Pipes Design Maximum Frictional Loss and Maximum Design Velocities:

Application	Maximum velocities in Accessible locations	Maximum velocities in Inaccessible locations	Maximum frictional Loss

Chilled water pipework	3.5 m/s	2.5 m/s	To be confirmed during design with consideration of future-proofing and energy efficiency
Heating and condenser water pipework	2.5 m/s	2.0 m/s	To be confirmed during design with consideration of future-proofing and energy efficiency

- Hydronic systems incorporate automatic dosing water treatment with corrosion inhibiters and microbial control, sludge and dirt separators and Vacuum de-aerating systems.
- Air coils shall incorporate:
    - Mini ball valves air bleed valves on top of the coil.
    - Drain valve fitted at bottom of coils.
    - Coils connected with demountable fittings.
    - Temperature and flow probes inserting points on both the supply and return side of the coils
    - All condensate trays shall be gravity drained to the nearest tundish or approved discharge point.
    - All exposed refrigerant and condensate pipework shall be provided with Proprietary Covers and or colorbond top hat sections to Shield insulation from UV exposure and provide mechanical protection.

15.5 Refrigeration

HVAC and refrigeration equipment design should consider industry best practice for material selection and working gases. This will consider the environmental impact of these design choices, including ozone depletion potential and global warming potential. As an integral part of the design sign-off process, the design team shall rate the proposed solution against other technical options to establish compliance with industry best practice for approval by RMIT.

15.6 Control

- Designers shall consider and incorporate energy saving optimisation control strategies into chiller design.
- The design solution shall require that all separately enclosed spaces can be shut down when not in use or can extend the control band by +/- 2°C when not occupied.
- The design shall ensure that HVAC to individual rooms (per air handling unit/ fan coil unit)/ whole floors/ whole buildings can be shut down through a single switch on the BMS.
- Shared or precinct wide energy systems have been adopted by RMIT at City campus. Accordingly, the designer shall identify to the Technical User Group any potential impacts to the precinct wide systems resulting from systems proposed to be adopted.
- Gas monitoring systems shall be monitored by the BMS system and the security control room.

Reference:

Control and Building Management Systems design requirement:

- Section Nineteen – Building Management System

15.6.1 Building Management Systems

- Review existing BMS platforms for standardisation and consolidation of equipment at design stage and not install new/other brands.
- The mechanical services systems shall incorporate a Building Management System (BMS) to monitor and control all mechanical plant compliance with RMIT's Building Management Architecture

Standard. The BMS will be integrated into the existing RMIT-owned Central Head End via the RMIT VPN utilising BACNet over IP. Refer to the applicable RMIT BMS design and Maintainability Standard.

- HVAC temperature control systems shall incorporate set point set back energy saving strategies for partially occupied spaces and corridors.
- HVAC control systems and plant shall be specified to be monitored and controlled by the University's BACnet Systems with all analogue controls operating on 0-10 Volt or 4-20 mA output signals.
- HVAC plant that uses proprietary control systems incorporate a BACnet High Level Interface (HLI) to connect to the University's BACnet systems where this is optional from the equipment manufacturer, or if HLI is not available as a minimum a BACnet interface is specified with enable /disable, status and fault functions and where proprietary sensors cannot be interfaced additional independent monitoring temperature sensor are specified.
- All mechanical plant, equipment, power and controls is to be labelled in accordance with RMIT's BMS standard and generally to identify the building ID being served, the floor level of the building being served, the type of plant/item and the item sequential designation. Labels to be Traffolyte or similar, UV stabilised, self-adhesive, 2 colours.

Reference:

Section Nineteen – Building Management System; 19.9 BMS Based Metering Systems

15.6.2 Energy Sub Metering

- All mechanical switchboards shall incorporate energy sub-metering that is connected to the BMS
- Provide energy sub-metering to mechanical equipment connected to the BMS in accordance with the Electrical System Design Standard requirements.
- Lighting controls shall be incorporated into the BMS.
- Where possible, energy sub metering should be provided to each floor of the building for light, power and mechanical plant circuits as a minimum to ensure that all power used on floor is able to be categorised.

15.7 Mechanical Electrical

- All 3-phase plant shall be provided with phase failure protection to protect against power and phase failure, phase reversal, over and under voltage and be able to be auto reset on power restoration.
- Mechanical Switchboards shall be located within the Mechanical services plant rooms and within sight of mechanical plant.
- Mechanical plant Switchboards/control panels to be provided, for all mechanical plant items, with auto/off/manual switches with run and fault (LED) lights, lamp test, fire alarm indication with auto rest. The Switchboards shall also incorporate a 15 A single Socket Outlet and be 001 keyed. Cable sizes shall suit the connected loads but be not less than 2.5 mm2. Switchboards shall be sized with minimum additional 25% spare capacity.
- Essential systems including BMS systems, gas detection systems, smoke management control systems shall be provided with battery power backup systems for a minimum of 2 hours of continuous operation.
- Retail tenants shall be provided with Standalone HVAC Systems powered and metered from the tenancy electrical boards.
- HVAC equipment shall not be powered from the light and power main switch boards.

15.7.1 Variable Speed Drives (VSD)

- All variable speed drives shall be specified to incorporate the following minimum features:
    - Minimum IP54 rating for indoor installations without a secondary housing.
    - Minimum of IP66 for outdoor installations without a secondary housing.
    - Factory fitted pad locked mains disconnect switch for auxiliary status indications.

- Rated for full load currents of the connected motor when operated to a maximum ambient temperature of 45°C and with continued operation at permissible reduced performance up to 55°C.
- Min. efficiency of 96% at 100 % load and 94% at 50 % load, loads of 11 kW and >, min. full load efficiency shall be 98%.

- The measured values of TVD (Total Voltage Distortion) and THVD (Total Harmonic Voltage distortion) for VSD's at 100%, 50%, 25% and 0% of rated output, measured between phases and between each phase and neutral at the line and load terminals of the equipment should generate a harmonic (THVD) contribution of less than 4%.
- With any complete installation, any total harmonic contribution beyond the above-mentioned range should be corrected (and to the satisfaction of the Supply Authority if required) to typically 1/3 of 5% THVD.
- Report AP-T36/06 marked in accordance with Australian Communications Authority regulations and include within the VSD enclosure a radio frequency suppression filter and comply with AS 61800.3 with 50 m motor cable (C1 category for <90 kW and C2 category for >90kW.
- Highly proven, High Level Interface (HLI) capabilities with BMS using BACnet protocol.
- VSD shall be located next to mechanical switchboards where practical in fully accessible locations, not mounted on AHU panels within weatherproof enclosures irrespective of manufacturer's IP ratings and provided with shielded cables with isolator at the motor.

15.8 Mechanical Commissioning and Maintenance

15.8.1 Commissioning

The Mechanical Services specification shall stipulate that the system is to be commissioned by an independent commissioning agent qualified to a minimum certificate IV, except for specialised items of plant such as chillers, boilers and the like which require commissioning by the Manufacturer's qualified personnel.

15.8.2 Operating and Maintenance Manuals

- Operation and Maintenance manuals shall provide the following minimum requirement and information:
  - Installers and commissioning agents name and contact details.
  - Detail plant descriptions make and model numbers and design duties (size, capacity, flow values as a minimum) Refer to assess data capture template available on the gateway framework for additional fields required.
  - Operational and controls descriptions.
  - BMS Functional Brief, Control and Operational details and points list.
  - Design and commissioning data and certification.
  - Statutory certificates.
  - Manufacturers literature.
  - Specified and recommended Preventative maintenance procedures and schedules.
  - As built drawings.
  - Fire matrices.
  - Filter list, fire/ smoke damper.

Asset register as per the asset data capture template available on the RMIT Gateway Framework Overview.

- The manuals shall be specified to be provided in PDF and MS Word format with the drawings provided in PDF and DWG format to match the design drawings. As-built drawings shall be fully reflective of final as-constructed layout including incorporating any on-site modifications that occurred during the construction process.

15.8.3 Maintenance and Safety Provision

- Engineering Services Consultant to carry out Safety in Design assessment of the mechanical services systems risks addressing safety, hazards and risks associated with the systems selection, design, installation, operation, maintenance, decommission and disposal.
- The design shall provide for the location, spatial requirements and any constraints of the installation of the mechanical services plant and equipment and the requirements for servicing, preventative maintenance and replacement throughout the life of the installations and the plant.
- All plant and equipment are to be designed, arranged and specified with adequate space and clearances in accordance with the manufacturer's recommendations and to facilitate reasonable, ready able and safe access for commissioning, tuning, maintenance and servicing.
- Where plant is proposed to be installed concealed in ceiling spaces, provide for adequate and labelled ceiling access panels 800 mm x 800 mm minimum size to fully access the plant and in locations that will not be impeded by current and future furniture locations. Incorporate trafficable plant deck in roof spaces and trafficable access walkways.
- Ceiling access panels and the like are to be labelled with the plant/item designation to identify the plant/item being served and should not be key lockable.
- Provide for adequate maintenance and service space around central chiller plant for inspection and removal of heat exchanger tubes in accordance with the equipment manufacturer's requirements.
- Where outdoor roof mounted plant is proposed provide the following:
    - Roof walkway mesh and, if applicable, handrails.
    - A maintenance weatherproof 15 A Single Socket Outlet.

15.9 Energy Efficiency

- All installed fans must achieve a fan motor input power per unit flow rate 15% lower than the reference fan motor input power per unit flow rate calculated from the deemed-to-satisfy requirements of the NCC, Section J.
- All installed pumps must achieve a pump motor input power per unit of flow rate 10% lower than the reference pump motor input power per unit flow rate calculated from the deemed-to-satisfy requirements of the NCC, Section J.

15.10 Carbon Neutral 2025

- All new building designs must include a full building energy model in accordance with the requirements of the NCC, Section J. The energy model must demonstrate that the greenhouse gas emissions from the proposed building are 50% less than the reference building.

16.0 Hydraulic

- All designs and installations shall be in accordance with the following Standards and Codes
- Plumbing Industry Commission Technical Notes
- Water Services Association of Australia Sewerage Code WSA 02
- (as used by Water Authority Agencies, above Australian Standards)
- All materials, valves, fittings, fixtures, tapware and equipment are required to have an Australian Water Mark approval.
- Floor wastes are required within all wet areas i.e. laboratories, toilets, plant rooms, tunnels, laundries, etc. and adequate falls to these points shall be specified and achievable. Floors shall be graded to the floor wastes.

16.1 Safety by Design

- Hydraulic services shall be designed to be able to be safely constructed, operated and maintained.
- Engineering Services Consultant shall coordinate and liaise with the Architect/Lead Consultant to ensure that adequate walkways are provided to hydraulic services equipment to be installed on roofs.

16.2 Hydraulic Site Services

16.2.1 Sewer Drainage

- For all new sites, sewer drainage design shall provide coverage to the entire site and consider connections for future expansion.
- Engineering Services Consultant confirm with the local sewer authority that existing authority assets are suitable for the new load to be added to the authority system. If not, advise the project team and ascertain authority asset upgrade costs.
- All sewer drainage pipework and structures shall conform to Water Services Association of Australia Sewerage Code WSA 02, as used by Water Authority Agencies above Australian Standards.
- Minimum sewer drainage size for site servicing shall be DN150mm.
- Sewer Maintenance Shafts are preferred over sewer inspection shafts. Provide access cover duty applicable for their installed location.
- Sewer Maintenance shafts shall be provided where toilet blocks exit the building, at major intersections and at intervals no further than 60m apart.
- Provide inspection openings to surface in drains exiting the building. I.O. Covers shall be finished in brass or stainless steel.
- A minimum of one compliant overflow relief gully shall be provided to each building on site. Additional overflow relief gullies shall be provided to maximise the protection of buildings against overflowing sewers.
- Reduced grade drainage may be used only where levels do not permit connections via gravity with standard minimum grade. Reduced grade drains cannot be used to limit the depth of the installation.
- Confirm with project geotechnical report that ground conditions are suitable for services to be laid in ground and where conditions require, provide the appropriate installation solutions to protect the asset.
- Sewer pump systems may only be used where drains cannot connect to the sewer system via a gravity connection.

16.2.2 Water Supply

- Engineering Services Consultant to confirm with the local Water authority that existing authority assets are suitable for the new load to be added to the authority system. If not, advise the project team and ascertain authority asset upgrade costs.

- All site infrastructure pipework, valves and fittings shall conform to Water Services Association of Australia Sewerage Code WSA 02, as used by Water Authority Agencies above Australian Standards.
- For all site reticulation, the design shall provide water main pipe sizes to ensure sufficient capacity for future expansion of the site.
- Provide sufficient branches with capped valves for future expansion.
- Provide isolation valves within site water supplies in the following locations:
    - at all branches into buildings.
    - all branches to external equipment such as drinking fountains, ponds, water features etc.
    - tees within the water main.
    - to provide isolation of a minimum of 25% of the water main.
- All in-ground valves to be full bore gate valves and shall be provided with cast iron box covers including identification.
- Confirm water pressure with local water authorities and where pressure exceeds 500Kpa in buildings provide pressure reducing valves. Minimum outlet pressure to fixtures shall be 250Kpa.
- Where water pressure is inadequate confirm with local water authorities for inline pump systems approval or provide break tanks with pressure boosting pumps. All pumps shall be variable speed type with BMS connections.
- Provide water meters to each individual building. Water meter shall be capable of pulse output and be connected to the site or building BMS.
- Provide hose bib outlets to maximum 50m centres around perimeters buildings.
- Exposed internal pipework, i.e. flushometers, etc., exposed to view in all areas other than plant or services areas shall be chrome plated brass or stainless steel.
- Vandal proof tap heads to shall be provided.

16.2.3 Gas

RMIT University is pursuing campus electrification and has committed to no longer installing natural gas assets for building use (this excludes learning, teaching and research requirements). Projects that are considering the replacement of any natural gas-based equipment or infrastructure must develop an all-electric solution.

In the instances where the use of natural gas cannot be avoided, and a departure to the standard has been approved, please note the following:

- No new natural gas supply points are to be added to RMIT buildings
- Where buildings have removed all natural gas-consuming equipment within a building, the gas meter should be removed and the service line should be capped by the relevant gas authority.
- Make application with the gas authority and retailer when all gas loads are confirmed and confirm quotation for work with gas authority.
- Provide external gas meter locations and house gas meters in a suitably ventilated cabinet.
- Where gas meters are internal the room shall be at ground level and adequately ventilated.
- For new sites reticulate gas at high pressure (40Kpa if possible) around the site and reduce pressure to service each building. Allow adequate gas capacity for future site extension.
- For existing sites check the existing gas capacity at the commencement of the project.
- Provide isolation valves within site gas pipework in the following locations:
    - at all branches into buildings
    - tees within the gas main
    - to provide isolation of a minimum of 25% of the gas main.

- All valve covers are to be cast iron with identification.
- Where LPG type gas bottles are to be provided, transportation of the gas bottles shall be assessed and the requirement for a compliant goods lift determined. Gas bottle transportation via a passenger lift is not permitted. This item shall be included and/or resolved during the required Safety by Design phase/discussions including any certification required.

16.2.4 Materials

- The following hydraulic system materials are preferred for external hydraulic services:
  - Sewer Drainage — Sewer Class uPVC
  - Water Supply — HDPE PE100 PN16 with butt welded joints
  - Gas — Type B Copper Tube or HDPE PE100 with butt welded joints
  - Stormwater — uPVC Sewer Class
- All water and gas services to be installed with identification tape and tracing wire.

16.3 Hydraulic Services

16.3.1 Sanitary Plumbing

- All sanitary plumbing systems shall be designed to ensure a gravity connection can be maintained. Where gravity connections cannot be achieved provide sewer pump systems.
- Where possible the use of under bench/sink waste pumps, shall be avoided. Where the use of under sink waste pump(s) is the only alternative the type of pump shall be the macerator type.
- Where the building configuration allows, design the sanitary plumbing systems using elevated drainage principals to achieve maximum flexibility for future installations.
- The use of Air Admittance Valves is permissible however, these should be limited to an absolute minimum. Conventional venting to atmosphere shall be used where possible.
- Where waste pipes transition vertically or horizontally through sensitive spaces or where required by an Acoustic Report, provide acoustic lagging over the pipe.
- Coordinate the location of floor wastes in plantrooms to avoid clashes with floor mounted equipment.
- Floor wastes to have a removable chrome plated brass grate.
- Floor waste risers to be not less than 80mm diameter.
- All risers shall be fitted with an approved flange and shall be cast into the concrete floor slab.
- All floor wastes including plantrooms shall be charged with a fixture or trap seal primer valve.
- Deep seal traps (75mm) to be provided to plant/air handling and laboratories where room pressures positive or negative exist.

16.3.2 Trade Waste

- Trade waste treatment shall be provided to all polluted wastes.
- Prior to the design of any trade waste systems, confirm with the local authority trade waste officers the type of trade waste treatment and the capacity of the treatment system required.
- Trade Waste related tanks shall be stainless steel and High density/polymer plastic.
- Trade Waste tanks/pits are to be located at ground level, and at a sufficient distance from any outside air intake louvres, grilles or openable windows.
- Trade waste tanks shall have clear and safe access.
- Trade waste tanks shall not be installed within plant rooms, particularly in plant rooms that are used for outside air intake for mechanical services.

16.3.3 Greasy Waste

- All greasy waste shall discharge under gravity to a suitable sized grease trap. The grease trap shall be appropriately located external to the building for ease of maintenance. If the grease trap is remote of truck access, provide a suction line for cleaning.
- All drainage shall be installed in HDPE drain pipe suitable for high temperature discharge. Pipe work above the ground in kitchens shall be chrome plated 70/30 Brass or stainless steel except connections to the high temperature fixtures such as dishwashers.
- Provide hot and cold water hose taps adjacent to the grease trap. Water supplies shall have RPZD backflow prevention prior to the hose tap.

16.3.4 Laboratory Waste

- Prior to the design of the laboratory waste system obtain a list of all chemicals and volumes proposed to be used in the facility and confirm with locate trade waste authorities the correct treatment.
- Treatments could indicatively consist of:
    - Mixing Tanks
    - Solvent Interceptor
    - Marble Chip Neutralising
    - Chemical Dosing Neutralising
    - Sediment
    - Straining and Cooling
- All laboratory waste shall discharge under gravity to a suitable sized treatment apparatus. The treatment apparatus shall be appropriately located external to the building or if suitable be located below benches and shall be accessible for maintenance.
- All drainage shall be installed in HDPE or Polypropylene drain pipe suitable for the effluent discharge.

16.3.5 High Temperature Waste

- All high temperature waste shall discharge through HDPE drainage systems and shall discharge through a cooling pit if required before connecting to the sewer drainage system.

16.3.6 Grey Water Recycling

- Investigate grey water systems.

  The installation cost and ongoing maintenance of the system shall provide maximum benefit to the University.

16.3.7 Hot and Cold Water Supply

- The design of the water supply system shall address:
    - isolation of areas/fixtures by suitable valving to permit maintenance
    - provision of mixing valves where domestic hot water is supplied to personal hygiene outlets
    - from the hot water supply
    - provision of RPZD backflow prevention devices for zone protection – Provide in wall access box with drainage.
    - chrome plating on all exposed pipe work
    - provision of pressure limiting devices where pumped systems are installed.
- All valves up to 50mm shall be ball type lever. Valves over 50mm may be geared butterfly type.
- All access to isolation valves and temperature control valves shall be from the floor and shall be housed in lockable stainless-steel cabinets.

- Where water supplies are provided to public amenity areas, ensure that they are sufficiently sized to allow the use of mains pressure flush valves. If the building is existing, check the size of the water supply and upgrade if necessary.
- Ensure water quality is assessed to determine need for filtration. Provide an appropriate water collection device in locations where water spillage during change of filter may cause damage to fitments and or floor coverings.
- Hot water flow and return systems shall be provided with balancing valves and shall be tagged to identify area served and balanced flow rate (L/Sec).
- Hot water pipe lagging to be minimum 25mm thick insulation and shall cross linked polyethylene foam, having a density of 25Kg/m³, and a thermal conductivity of 0.032W/mK at 20°C. Where insulation is exposed to external use the lagging shall be sheathed in metal or uPVC.

16.3.8 Specialised Water Systems

- Where specialised water systems such as deionised, demineralised, reverse osmosis or purified water is required, undertake special design consideration of the system.
- Special water systems are only to be installed where required to service plant, equipment or research purposes. The selection of special water systems should be accurately defined in terms of demand and water quality.
- Consideration should be given to any requirement of pre-treated water, UV sterilisation, carbon filtration, storage tanks / vessels, recirculation pumps, special piping and avoiding dead legs and special metal free tap ware.
- Systems may be stand alone or recirculating depending on quality and quantity.
- Each system shall have its own isolation valve and there shall be a method of containing leaks, spills and discharge.
- Where pumps or other parts are installed which are essential to maintain the system operational then alarming faults shall be provided and connected to the BMS.
- Supply from non-potable source should be considered where appropriate.

  Where excessive waste water is generated, or reticulation is returned that cannot be reused it is preferred that storage tanks be incorporated for grey water, grounds, cooling tower or toilet flushing reuse.

16.3.9 Rainwater Harvesting

- Where stormwater is collected for use with rainwater harvesting undertake Water Sensitive Urban modelling to determine the maximum suitable volume for the rainwater tank. Rainwater tanks may be designed in conjunction with stormwater retention systems.
- Where rainwater can be collected above ground, ensure the rainwater tank has suitable overflow capacity to meet the 1 in 25 year or 1 in 100 storm flows in accordance with the roof drainage design.
- Where underground rainwater collection tank is provided, ensure the underground tank has adequate overflow and has lock down lids. Provide dual tank access for maintenance. Underground Cell type tanks are not permitted.
- Rainwater pumps are to be variable speed.
- Provide water meters to rainwater and domestic cold water makeup and connect to BMS.
- Rainwater filtration and water treatment shall consider the intended use. Water quality shall be filtered to a suitable level for the end use and shall be free of microorganisms and colour that could cause staining to fixtures.
- All electrical equipment such as pumps, UV filtration etc shall be provided with control cabinets suitable for connection to the BMS with run, faults, water level, water meters volume recording.
- Install rainwater system reticulation piping in line with the hot and cold water section of this standard.

16.3.10 Gas Reticulation

RMIT University is pursuing campus electrification and has committed to no longer installing natural gas assets for building use (this excludes learning, teaching and research requirements). For existing gas assets for learning, teaching and research requirements, please use the following guidance:

- Internal gas reticulation pipe work shall be installed with suitable pressure to meet the appliance demand.
- Where external gas pressures exceed the internal reticulated gas pressure within a building provide Over Pressure Safety Shut Off valves and controls and connect to the fire alarm system.
- Provide separate gas meters and regulators to each building and ensure gas meters are suitable for connection to the site or building BMS system.
- Pipework to be labelled to identify the service and pressure.
- Provide isolation valves at appliances.
- Provide master push button safety shut off valve to laboratories.

16.3.11 Irrigation

- Irrigation systems shall be provided to lawn areas, sporting fields and high-profile garden beds.
- If irrigated the following needs to be incorporated.
    - Stop valves to be situated in clear accessible locations and not on roadways.
    - Systems designed to minimize spray to walkways and roads.
    - Shut off valves to be positioned before solenoids and mains.
    - Moisture sensors to be incorporated in system control.
- Design with equipment capable of being connected to the BMS.
- The system installed shall be capable of delivering a minimum of 20mm (precipitation rate) per hour and will ensure that all areas are evenly watered in separate zones.
- The pipe sizes shall be adequate to carry sufficient water to feed the number of sprinklers and supply the water quantities needed to adequately water the entire area.
- Sprinklers shall be placed to provide sufficient overlap of water cover in every direction to adequately irrigate the entire grass area regardless of wind conditions experienced in the area. The sprays shall be adjusted to prevent over spray onto road surface. Sprays shall not be positioned near any objects that will affect the correct operation of spray.
- Drippers shall be installed to all trees (in garden beds) and be self-compensating, sized and located to provide sufficient water to adequately water the type of tree species. Drippers shall be installed so that maintenance can be performed with ease when required. Confirm preferred brand with the Technical User Group.
- All solenoid valves and isolating valves shall be in valve boxes positioned no closer than one (1) meter from back of kerb or pavement edge. The size of the valve shall be relevant to the pipe size it is attached and adequate to sustain the flow rates and pressure of the water in the pipelines.
- Master valve shall be supplied and installed on the main feeder pipelines used in the irrigation systems.

16.3.12 Hydraulic Systems Materials

- The following hydraulic system materials shall be used for internal hydraulic services:
    - Sewer DrainageSewer Class uPVC with solvent welded joints
    - Greasy waste HDPE with electro fusion Joints
    - Laboratory Wastes HDPE or Polypropylene as appropriate
    - Cold water Type B Copper Tube – Pipe sizes 25mm and above – Press Fit
    - Cold Water Cross Linked Polyethylene Rehau - 15mm and 20mm

o	Hot Water	Type B Copper Tube – Pipe sizes 25mm and above – Press Fit
o	Hot Water	Cross Linked Polyethylene Rehau - 15mm and 20mm
o	Rainwater	Type B Copper Tube – Pipe sizes 25mm and above – Press Fit
o	Rainwater	Cross Linked Polyethylene Rehau - 15mm and 20mm
o	Downpipes	uPVC Sewer Class
o	Downpipes	HDPE (Syphonic Systems)
o	Gas	Type B Copper Tube
o	Irrigation	MDPE with threaded connections

16.4 Hydraulic Equipment

16.4.1 Sewer Pumps

- All sewer pump systems shall have the following:
  - Adequately sized storage wet well.
  - Air tight lids.
  - Ventilation.
  - Control cabinet – Weather Proof if external.
  - 1 Phase Power below 1.5 Kw.
  - 3 Phase Power 1.5Kw and above.
  - Dual Pumps – Lead Lag.
  - High/Low level alarms.
  - BMS Connections for Pump run/stop/alarms.
  - Where a site has no BMS ensure audible and visual alarms are provided.

16.4.2 Water Pumps

- Water Supply pumps shall be provided with the following:
  - Control cabinet – Weather Proof if external.
  - 1 Phase Power below 1.5 Kw.
  - 3 Phase Power 1.5Kw and above.
  - Dual Pumps – Duty/Standby - 100%.
  - Fault alarms connected to BMS.
  - BMS Connections for Pump run/stop/alarms.
  - Where a site has no BMS ensure audible and visual alarms are provided.
- All hot water system circulating pumps shall be dual with timer for shutdown during out of hours works.

16.4.3 Boiling/Chilled and Filtered Water Dispensers

- Provide wall-mounted or under-bench type as appropriate, with capacity to suit a particular application and featuring a time clock device for energy efficiency.
- Ensure boiling water units located below benches have adequate ventilation provided within the cabinetry.
- All under bench boiling water units are to be fitted with programmable, daily 24/7 type time clocks with override switches.

16.4.4 Hot Water Systems

RMIT University is pursuing campus electrification and has committed to no longer installing natural gas assets for building use (this excludes learning, teaching and research requirements). Projects that are considering the replacement of any natural gas-based equipment or infrastructure must develop an all-electric solution, including solar hot water with electric boost, continuous flow electric water heaters, electric boilers, and electric pumps. All electric solutions must be appropriate, ensuring issues associated with electrical connection and operational loads have been deemed acceptable for accommodation by the building infrastructure.

Additional guidance for hot water systems:

- Local storage units should be used for areas generating prolonged usage such as shower-change areas and science rooms.
- Consideration for electric under bench heating could be given if excessive pipe runs are involved.
- Continuous-flow electric water units should be considered in areas where short-term low quantity usage is required.
- The use of solar hot-water units (with a gas or electric boost) should be considered in areas of suitable climate.
- The storage capacity of water heaters shall be minimised as far as possible.
- All units shall be energy efficient and gas units shall have a 5 Star Rating Energy Label or better.
- Minimisation of heat losses in circulating loops requires consideration.
- Hot water units shall have automatic reset buttons which operate upon re-instatement of power after failure.
- The selection of an energy-efficient domestic hot water heater or the selection of solar or heat pump systems shall be addressed in the project reporting process.

16.5 Fixtures and Tapware

References

- Section Thirteen – Interiors; 13.5.1 Sanitary Fittings General

Safety Showers / Eye Wash

- All plumbed in safety showers and eye wash stations shall be monitored by security control. BMS is an option based on application and/or user preference.
- Consideration should be taken to specify safety shower and eye wash stations that reduce mess in water spillage/splashing.

16.6 Hydraulic Testing and Commissioning

- HDPE water supply pipework shall be subject to a 5hr pressure test in accordance with pipe manufacturers and Water Services Association Australia testing procedures.
- All necessary tests and adjustments to the plant and equipment shall be undertaken to attain the specified performances and operation.

17.0 Electrical

Note: RMIT are HV customers at City and Bundoora West campus.

The services shall be designed to:

- Electricity connections shall not cross property titles
- Suit the intended application, location and climate condition.
- Maximise energy efficiency and minimise associated greenhouse gas emissions.
- Modularity and flexibility for change.
- Minimise operational and maintenance costs.
- Respond to the building's usage pattern.
- Align light switches at the same height as door furniture, on the latch side for consistency, and not within 500mm of an internal corner.
- Sensor lighting is to be provided where practicable.
- Rocker or toggle style switches, 30x30mm to be used to assist people with limited fine motor skills in all areas.
- A minimum 30% luminance contrast between the switch and the wall surface/backing plate is to be provided.
- Use light switches which are illuminated with LED on/off indicators.
- Up lighting is not to be used where it is the only source of lighting and results in increased glare.
- Lighting levels for sanitary facilities to be 200 lux.
- Lighting levels for kitchens and other task orientated areas to be 300 lux.
- GPOs to be provided within 300mm of the front of tea point and kitchen benches.
- USB points to be provided 600-1100mm and not within 500mm of internal corners. Provide points for use by people in a seated position as well as standing position.
- RCD protection must be provided to lighting circuits as well as power circuits.

17.1 Power Supply

- Lighting: Full Load of lighting installation plus 20%.
- General Power (Offices): 50VA/sqm.
- General Power (Other areas): 30VA/sqm (To be confirmed based on equipment loads).
- Base Building Equipment Loads: Full connected load plus 25%.
- Consumer mains shall be designed to accommodate 125% of the anticipated maximum demand as determined in consultation with RMIT and the Supply Authority.
- Spare capacity shall be included in the Distribution Switchboard design as follows:
    - Base building 50%
    - Tenancy fit-outs 25%
- Design shall allow for no more than 6 x double GPO's per shall be assigned to a 20A final sub-circuit.
- Design shall allow for no more than sixteen LED troffer fittings on a single circuit.
- The use of incandescent, compact fluorescent, mercury vapour and high-pressure sodium lamps are not permitted.
- Ceiling pull cord switches are not acceptable.

- An electrical load study is to be conducted and the adequacy of network infrastructure to provide peak load shall be confirmed with the electrical retailer and power distributor. The electrical load study is to be repeated and verified at the completion of the Detailed Design Phase.

17.2 Standby Power Supply

- The Engineering Services Consultant is to engage with the Strategic User Group and Technical User Group to identify any specialized equipment or instruments that need consistent and constant power.
- As guidance, where no backup power is provided, systems should be capable of 8-hour power outage (unplanned) without any significant impacts and a 24-48hr unplanned outage with manageable impacts.

17.3 UPS Power Supply

- The Engineering Services Consultant is to engage with the Strategic User Group and Technical User Group and prepare and issue for approval in the design report the proposed:
    - Number and size of the UPS
    - Location of each UPS unit
    - Location of each battery unit
    - UPS reticulation system
    - Testing strategy proposed
    - Proposed equipment types and list of manufacturers suitable for the project.

17.4 Lighting

- Maximum maintained illuminance levels shall not exceed 25% of minimum levels.
- Administration areas: Lighting design shall achieve 19 Unified Glare Ratio (UGR) or better with 0.5 uniformity or better at the working plane.

17.5 Substations

- Shared or precinct-wide energy systems have been adopted.
- Accordingly, the designer shall advise RMIT on any potential impacts to precinct-wide systems because of the systems that are proposed to be adopted.
- The electrical supply originates from Supply Authority sub-stations distributed around the campus.
- Where RMIT is a HV network owners, the electrical supply will originate from privately owned substations distributed around the campus.
- Substations should be located on grade and above the above 1 in 100-year flood level in accordance with the requirements of the Supply Authority. Basement Substations are not permitted.
- Substation installed transformer capacity shall be designed to accommodate at least 125% of the anticipated building maximum demand.
- Substation space: shall be designed to accommodate one additional transformer and associated switch gear.
- Consideration of the maximum demand (diversified) to the whole of the site as a HV customer (under both normal and contingent connection scenarios) is required.
- An electrical load study is to be conducted and the adequacy of network infrastructure (inclusive of the impact on onsite generation), to provide peak load shall be confirmed with RMIT.
- No HV switchgear should be installed where an operator shall switch at the unit, remote switching facilities to be provisioned.

17.6 Switch rooms

- Main switch rooms shall always be located as close as possible and preferably immediately adjacent to the substation.

- Main Switchboards and rooms should be located on grade and above the above 1 in 100-year flood level. Basement switch rooms are not permitted.
- For supplies rated 1600 amps, maximum consumers' length is 5m. Up to 1200 amps, the maximum consumers' mains length is 3m.
- Main Switchboards are to be in dedicated 2-hour fire rated rooms requiring two exits if the Main Switchboard is more than 3m in length.
- Doors shall open out and one door should be of sufficient width to enable installation of switchboards. A double door a minimum of 1500 mm clear width is usually required.
- The main switch room needs to incorporate a 300-mm deep zone along one wall to accommodate tariff metering panels and miscellaneous distribution switchboards.
- As a minimum, mechanical ventilation rates of 5L/s/sqm shall be provided.
- The design shall incorporate adequate space for:
    - Supply Authority metering equipment.
    - BMS connections; safely integrated in a separate enclosure to monitor and control designated supplies and status signals.
    - Termination of incoming and outgoing submains.
    - Check metering.
    - Infra-Red transparent clear shrouds and barriers to permit thermographic scanning without the need to remove shrouds and barriers.
    - Surge protection devices with local operation/health indication, replaceable cartridges and status input into the BMS.
    - Connection of power factor correction equipment.
    - Future extensions or additions.
- Ancillary equipment such as UPS and Generators are housed separately from the main Switch room.
- Switchboards are to be in dedicated lockable ventilated rooms or closets separate from other plant and equipment. Equipment such as lighting controllers can occupy the same space. Access shall be provided from a public corridor or similar accessible space, not an office or teaching space.
- Switchboards supplying a building or substructure shall be in that building or substructure that they serve. Switchboards supplying level shall be located on that level.
- Mechanical services are to be separated from light and power supplies.

17.7 Power Supply

Undertake electrical protection, grading and load balance to include:

- Schedule of all protective devices versus equipment loads and short circuit fault levels.
- Demonstrate that all equipment connected is protected against over current and short current circuit current.
- Schedule of all protective devices and proposed settings.
- Overlayed grading curves demonstrating discrimination.
- Balance loads evenly over all phases and provide evidence upon completion of works.
- Power Factor Correction shall be incorporated.

17.8 Power Supply Equipment

17.8.1 Power Generation - Engine Driven

- Generators for normal backup and emergency standby sets shall be diesel.

- Diesel generators shall be installed with a minimum 30% spare capacity.
- Generators are to be in dedicated lockable ventilated rooms separate from other plant and equipment.
- Fuel tanks shall be above ground types and shall be suitably bunded. Bulk fuel tanks shall not occupy the same space as generator sets.
- Generators should be located above the above 1 in 100-year flood level.
- Acoustic – preventing unacceptable noise or vibration breakout into adjacent occupied space or adjacent properties.
- Ventilation/Cooling – required air quantities for cooling the diesel engine are such that large ducts and acoustic attenuators are required.
- The large volumes of air required for generator set cooling and the large area of inlet and outlet air louvers usually determines the practicality of a proposed plant room location.
- Containment to be a fundamental consideration for both internal and external installations (sheltered bunding), for leaking oils, fuel, cooling water, etc.
- Replacement / Maintenance Strategy to be implemented into the design.
- Generators and the standby system are to be provided with their own Power Management Control System (PMCS) if large enough (>500 kVA) and report status to the BMS via a high-level interface connected to the RMIT BAS system. This approach enables the electrical system to be independent of the BMS but report to or take instructions from the BMS.
- RMIT has a number of embedded electricity generation (i.e. Solar PV, generators etc) and storage devices (i.e. batteries) throughout the portfolio. The interaction of these devices with others connected to the network, and/or the incoming electricity supplies in reticulation infrastructure, is an important factor that must be considered when any change of / addition to these systems are made. Designers / Installers must include appropriate fail-safe controls to ensure protection of the equipment that they install (or equipment that is impacted by their installation) and in accordance with the upstream Distributor's requirements to ensure safe and reliable electrical supplies at RMIT are achieved during all operational scenarios of any new and/or impacted equipment (typical and contingent).

17.8.2 Power Generation – Photovoltaic

- Consider future installation of solar photovoltaic systems and allow for additional switchboard capacity, spare MCCB for future solar connection and adequate space in the switchboard for additional cabling.
- A thorough investigation of existing roof spaces and shading shall be undertaken as to the suitability when photovoltaic panels are being considered for the roof or when works are planned for a roof.
- Consider the current and future installation of additional plant, solar panels, rainwater tanks, roof gardens, etc. Consolidate new or existing plant and machinery where possible. Maximise available unshaded roof area for solar panel opportunities.
- Where major refits or new builds are undertaken, onsite solar photovoltaic systems should be installed to minimise grid-sourced electricity consumption and associated greenhouse gas emissions. A Clean Energy Council accredited and RMIT approved solar PV design Consultant should be engaged to assess the existing infrastructure and design a suitable system.

17.8.3 Uninterruptible Power Supply

- UPS units that serve communications system equipment shall be 19-inch rack mounted type when sized at 5kVA or less. Minimum battery autonomy time 15mins.
- UPS systems greater than 5kVA shall be floor mounted and provided with maintenance bypass switch arrangement complete with solenoid interlock to achieve 'make-before-break' changeover.
- For each UPS > 30 kVA a high-level interface connected to the BMS shall be provided.
- Equipment shall be separated from the remainder of the building with fire rated construction as per NCC code requirements.

17.9 Power Distribution Equipment

17.9.1 Main Switchboards

- For the RMIT City campus and Bundoora campus, connection to the high voltage networks and mothballed cogeneration-/ tri-generation systems shall be considered in the design of new projects.
- The Engineering Services Consultant shall confirm with RMIT load capacities (additions or deletions) and the ability to connect to the respective system.
- Main switchboards shall have the capacity to withstand the prospective fault level at the point of supply when the corresponding substations are fitted out with transformers at their possible maximum capacity, or as advised by the Supply Authority and the contribution to fault level from onsite generation.
- Main switchboard corresponding form shall be:
    - Form 1:
        - Sub-distribution boards and applications where loss of a switchboard does not cause serious consequences Up to 6 kA.
    - Form 2a and 2b:
        - Major sub-distribution boards and where a degree of safety is required against accidental contact with live parts 6 kA to 18 kA.
    - Form 3a and 3b:
        - Major distribution boards and main switchboards where loads supplied are important and where a higher degree of safety is required against accidental contact with live parts 18 kA to 50 kA.
    - 4a and 4b:
        - Main switchboards where loads supplied are of vital or where a higher degree of safety is required against accidental contact with live parts. Above 50 kA Arc fault containment Additional requirement to Form 4a and Form 4b where the highest degree of operator safety is required above 50 kA.
    - Protection equipment shall be of CB, MCCB or ACB type, to be selected as appropriate for the magnitude of the corresponding power supply:

        Air circuit breaker (ACB)

        - 800 Amp High current applications (e.g. incoming main supply).
        - ACB's shall be withdrawable.

        Moulded case circuit breaker (MCCB)

        - 100 – 800 Amp Medium current applications (e.g. submain cables and distribution board incoming supplies).

        Miniature circuit breaker (MCB)

        - 1 – 125 Amp Low current applications.

        Spare capacity shall be included in the Main Switchboard and cable design as follows:

        - Minimum physical space spare capacity 25% on both sides.
        - Equipped Spares: 2 x 100 A.
        - Equipped Spares: 1 x 200 A.
        - Minimum 20% number of circuits on every busbar section.
        - Ensure consideration of solar PV futureproofing.
        - Ensure consideration of Electric Vehicle charging infrastructure.

- For switchboards with multiple supplies a bus tie arrangement is to be included fitted with appropriate Mechanical/Electrical interlocks.
- As a minimum main switchboard shall be provided with a degree of protection of IP44. External switchboards should be a minimum of IP55.
- Provide Infra-Red transparent clear shrouds and barriers to permit thermographic scanning without the need to remove shrouds and barriers.

17.9.2 Distribution Switchboards

- All distribution switchboards shall be:
    - Metal clad, fully enclosed, 580mm width minimum, fully enclosed, expandable to permit further chassis to be added, fitted with dust and smoke proof seals and hinged escutcheon panels.
    - Mechanical and electrical distribution switchboards shall be provided with a main switch mounted separate to the distribution and controls chassis.
    - The protective device for electrical distribution switchboards (and load centres) serving final sub-circuits, shall be, as a minimum, rated at 63A.
    - Excluding the main switch, there shall be no less than 12No poles in electrical distribution switchboards.
- Switchboard IP ratings
    - Inside the building – Typically IP40.
    - Outside the building – Typically IP54 (not all external enclosures will be tested and certified as IP rated, in which case care shall be taken to choose and appropriate enclosure.
- Spare capacity shall be included in the Distribution Switchboard design as follows:
    - Electrical load spare capacity.
    - Base building 50%.
    - Tenancy fit outs 25%.
    - Minimum physical space spare capacity 25%.
    - An LED luminaire and power point shall be provided in every switchboard, riser, data, telephone and AV cupboard.
- Control Equipment
    - Be located and mounted in dedicated control cubicles/panels.
    - Be near corresponding switchboards on the same level as the equipment being controlled.
    - Control panels shall be sized as required for 100% spare capacity (panel should be 50% full).

17.9.3 Socket Outlets

General circuits shall be concealed and wired in in not less than 2.5 mm2 TPS cable (black colour).

Provide override and emergency stop buttons as required. No shunt trip on power emergency shut off. Button key reset only. GPO’s to be installed, as a minimum, as follows:

- Internal circulation spaces
    - One double GPO every 10 linear meters.
- Workstations
    - Two double GPO’s per workstation blow desk and one double GPO with combined USB power outlet above the desk (in power rail or drop in box).
- Student positions, fixed benches and island tables
    - One double GPO plus one double GPO every 20 m².

- Collaborative Rooms
    - One double GPO with combined USB power outlet per three students should be placed around the perimeter of collaborative rooms.
- Teaching laboratories
    - Provide double GPO points to wall, perimeter and island lab benches.
    - Provide dedicated power to refrigerators, freezers, special laboratory apparatus.

17.9.4 General Lighting

- General light circuits shall be concealed and wired in not less than 2.5 mm2 TPS cable (white colour).
- All luminaires shall be installed using the plug-in method.
- An LED luminaire and power point shall be provided in every switchboard, riser, data, telephone and AV cupboard.
- Luminaires selected for computer laboratories, office and teaching areas shall be the low brightness type.
- Where four or more switches are located adjacent to each other, they shall be ganged under a common plate. Confirm any requirement for stainless steel plates with RMIT.
- Light switches in tunnels shall be fitted with continuously operating amber coloured indicators.
- Street light poles shall be separately protected with local means of isolation.
- All stair lighting shall be readily accessible by maintenance staff without requiring scaffolding or similar access equipment. Wall mounted and on landings.
- Galvanised metal expansion devices shall be used for securing light fittings to concrete ceilings. Wooden or plastic plugs will not be accepted. The minimum number of fixings per light fitting shall be:
    - 0 to 300 mm wide linear LED— 2 fixings
    - 300 mm wide linear LED— 4 fixings.

17.9.5 Exit and Emergency Lighting

- The design of the emergency lighting system shall include the entire floor area for compliance.
- The system shall be integrated into the campus wide network and set up for remote central automatic monitoring and statutory testing and reporting. It shall display and print faults, test results and provide reference to dates, time and address of the relevant luminaires and shall be adjustable when new luminaires are added or deleted.
- The centralised computerised monitoring shall occur via a RMIT vendor nominated controller back to the centralised monitoring offices.
- Multi-level buildings shall be provided with and individual area controller/s located on each level of the building.

17.9.6 Security and External Lighting

- The number of light fittings on security lighting shall be no more than 5% of the total number of light fittings.
- Each street light pole shall be separately protected with local means of isolation.
- External security lighting shall be provided at all doors, entrances and exits. External lighting shall:
    - Provide safe circulation space around the building.
    - Have a manual override switch installed in switchboard
    - Cables shall be suspended from catenary cables and not ceilings.

17.9.7 Lighting Controls

- The design of the lighting zone allows for all individual and enclosed places to be individually switched. Each switched zone does not exceed 100m2 for 95% of useable floor area. Where sustainability rating tools are proposed, the proposed switching zones may differ from that nominated and a departure is required to be raised with RMIT.
- Lighting control systems shall be a digital control system, proprietary, microprocessor-based system to control lighting under automatic and user interface control, or the installed BAS linked existing system either:
    - Option 1 - The prevalence of sensors and connectivity is increasing in lighting systems with future lighting solutions designed for the explicit purpose of collecting, analysing, and utilising the data gathered by the lighting system, driving efficiency and productivity gains within the spaces where these solutions are used. These systems should be considered as the primary option.
    - Option 2 - Dali ballasts fitted to all light fittings; lighting control system for full monitoring of fitting status for maintenance; daylight harvesting and light depreciation compensation; ultrasonic movement sensors for presence detection.
    - Option 3 - Dali ballasts without connection to a lighting control system; daylight harvesting and light depreciation compensation; ultrasonic movement sensors for presence detection.
    - Option 4 - Controls to provide daylight and light depreciation compensation. Movement sensors also to be connected.
    - Option 5 - 240 Volt controls wiring with sensors in fittings for daylight compensation only. Acoustic / movement sensors also to be connected.
- Lighting in toilet areas shall be controlled only by dual tech movement sensors (Motion and sound) located at strategic locations.
- Circuits for stairwell lighting should originate at a separate sub-distribution board located within the main switchboard. Two circuits shall be provided in each stairwell, with each circuit serving alternate landings/ half landings. 24/7 lighting and/or motion sensor should be applied.
- Plant rooms, corridors, foyers, lobbies and other service areas control shall be circuited to alternate luminaires. Select and nominate alternate phases to eliminate stroboscopic effect.
- Provide manual switching and occupant sensor switching for office areas, lecture theatres, libraries and classrooms.
- Light switches in tunnels shall be IP44 minimum and fitted with continuously operating amber coloured indicators.
- Light switches to be push button control type. Where four or more switches are located adjacent to each other, they shall be ganged under a common plate Confirm any requirement for stainless steel plates with RMIT.
- All external security and street lighting shall be controlled by photo cell and time clock switching. By-pass switches shall be provided on all PE controlled external and street light circuits.
- All lighting controls to be incorporated into BMS. This should include where possible, occupancy status and integration to HVAC control strategies for each space based upon occupancy.

17.9.8 Power Factor Correction

- Power Factor correction equipment shall generally be located as close as possible to the main switchboard or included within.
- Power Factor correction equipment is to be provided for new buildings and major refurbishments of existing buildings and be located within or adjacent to the main switch room.
- All specified equipment shall achieve 0.9 power factor or better. Where required, whole installation (i.e. power factor correction unit installed at switchboard) power factor correction equipment shall be designed to maintain a minimum corrected power factor of 0.95. System faults and performance shall be monitored with BMCS/monitoring systems.

- Harmonic Filters shall be provided to limit harmonic distortion. Locate filters close to known non-linear loads sources.
- Surge Protection devices shall be fitted to all new main switchboards and distribution boards serving communication rack mounted equipment.
- Heat dissipation to Power Factor Correction and Harmonic Filtration equipment shall be provided.

17.10 Electro Magnetic Field (EMF) Mitigation

- Provide magnetic shielding of substation and other aspects of the electrical services installation subjected to high currents, to limit the magnetic field strength measured at 0.7m above floor level at any point in nearby occupiable space to satisfy the World Health Organisation “Interim Guidelines on limits of exposure to 50/60Hz electric and magnetic fields.
- Engage an EMF specialist contractor for the design of EMF shielding to comply with the guidelines mentioned above.
- It is noted that the RMIT City campus operates within the proximity of a number of Tram lines, underground rail tunnels and other EMI producing systems. During design activities, it is critical that the EMI limits are considered for key systems / equipment to ensure that these systems will be able to operate per the OEM requirements under the environmental conditions experienced at RMIT. This is specifically relevant to highly sensitive research equipment and systems.

17.11 Metering

17.11.1 Supply Authority

- Supply Authority metering shall be integrated with the main switchboard where possible and typically accessible during business hours.

17.11.2 Sub-Metering

- Sub-metering shall be provided for substantive energy uses within the building (i.e. all energy uses
- of 100kVa or greater).
- Computer rooms and catering facilities shall be sub-metered
    - All sub-meters are to be selected and installed in accordance with the NABERS Validation Protocol for Accuracy.

17.12 Labelling

- Engraved Traffolyte labels shall be installed on the front door of protection devices enclosures to identify incoming and outgoing circuits, capacity of circuit breaker and adjusted trip setting for circuit breakers 100A and above.
- Labels shall also be installed adjacent to the load terminals.
- Labels shall be installed either at the top of fixing screws or on the face plate of removable front plates.
- Labels shall be engraved with the DB number and the circuit number of the circuit relating to the switch and/or GPO. UPS/generator connections shall be identified.
- The base colour of the identification labels shall match the colour of the switch and/or GPO.
- Labels shall be provided as follows:
    - General:
        - Main Switchboard lift off panels identifying their location and position.
        - Adjacent to load terminals.
        - Emergency stop buttons: “For Emergency Use Only”
        - Each light switch, fan switch, equipment power isolator switch and all GPOs.
    - Essential Supplies:

- Fire protection equipment.
- Fire indicating panel.
- Passenger elevators.
- Circuits supplying computer LAN, WAN or computer equipment.
- Circuits controlling emergency luminaires.
- Circuits controlling security and building access control equipment.

18.0 Vertical Transport

- RMIT prefers escalators to be used for bulk people movement within buildings, in addition to centrally located visible stairs.
- Where escalators are installed, sufficient lifts (at least one) shall also be provided to satisfy DDA and RMIT requirements.
- RMIT requires all externally located lifts to be swipe card activated.
- Goods lift facilities shall be provided for buildings over 3 levels and for all buildings containing laboratories. Goods lifts (or one of the normal service lifts) shall be extended to service the roof level where roof plant and equipment is installed. Where lifts are installed to roof level, weatherproof lift controls and a canopy shall be provided.
- Goods lift cars shall be sized considering the size required to adequately service plant spare parts to the roof level.
- In addition to the minimum requirements of the NCC, all lift installations shall contain at least one lift capable of carrying a standard stretcher.
- Ramps are to be installed instead of lifts wherever practicable, accessible paths of travel to the lift are to be defined for people with vision or cognitive impairments.
- This may include the use of a different colour scheme or floor surface.
- Co-locate lifts with other forms of vertical transport to allow people with disabilities the same or similar travel distance as others.
- Where the location of the lift is not apparent, provide directional signage.
- Cir Circulation space of minimum 1500x1500mm in front of the lift door.
- Circulation space of minimum 1500x1500mm in front of the lift door.
- Lift doors shall achieve a luminance contrast with the adjacent wall.
- Lift call buttons shall provide a luminance contrast against the surrounding wall colour. Surfaces within 300mm of the control buttons are to have a finish which reduces glare.
- Where there is more than one lift, audible information shall be provided above or immediately adjacent to the lift door to assist people with low vision identify which lift has arrived.
- A handrail which achieves a luminance contrast with the background surfaces is to be provided.
- A handrail is to be provided adjacent to all control panels.
- Provide contrast nosing strips on escalator treads. Nosing strips shall be 50-75mm depth across the full width of the tread, set back maximum 15mm from nosing and achieve minimum 30% luminance contrast against the background surface.
- Painting is not acceptable in lift cars.
- Floors shall be standard commercial homogeneous flooring. Carpet is not permitted.
- Floors are to be easily cleaned with no gaps to walls where dirt and dust can collect.
- All wall linings shall be high impact resistant and stain resistant.
- Ceilings shall be removable and all lighting and services accessible from within the lift car.
- Ground level to be indicated as “Ground Level” and not Level 2 or 3 etc.

18.1 Design Capacity

- The building population and design parameters to be used as a basis for the design of RMIT Vertical Transportation installations shall be:
    - Population = total number of lecture theatre / learning and teaching seats plus one person for every other 12 m2.
    - Handling capacity for a 5-minute peak shall be > 12 % of the population.

  - Average waiting interval; 35 seconds.
  - Loading capacity 70%.
- The Vertical Transportation specification shall require tenderers to include a 12-month free maintenance period, commencing from the Date of Practical Completion (or last unit completion whichever is the later) in the contractor's contract.
- Equipment providers are encouraged to offer energy efficient, low environmental impact equipment. Lifts shall be provided with regenerative drives where practicable.
- Lift controllers shall incorporate a limit that when car load reaches or exceeds 80% the car is to travel to destination levels without accepting further car calls or making further loading stops.

18.2 Power Supply

- A separate fire-rated cabled supply shall be provided to each lift directly from the Main Switchboard. Where practicable, lift supplies shall be connected to the live side of the main switch at the Main Switchboard.
- Multiple lifts shall not be supplied from a single submains supply (i.e. local supply splitter boards shall not be provided).
- All lifts and escalators are to be connected to the local standby power supply where one is installed.
- Where there is no local generator, lifts shall be provided with local standby batteries (UPS). Upon loss of mains supply to the lift, the UPS shall enable the lift to automatically move to the nearest floor and open its doors to enable passengers to alight. Thereafter, the lift shall remain on that floor level with its doors open and the lift operation disabled until mains is restored.

18.3 Lifts

- All control equipment drives and access control panels shall be housed in enclosed dust-proof cabinets.
- Door protection shall consist of multi scan door detectors which continually scan the lift entrance.
- All Keying for lifts within RMIT University Buildings and/or Property shall be keyed to the University's restricted keying systems on either Lockwood Status Six or Lockwood TWIN. Specific keying requirements shall be referred to RMIT University Locksmiths. Key Switch Locks shall be a TBs item as specified by RMIT University.
- All landing indicators shall be long-life, back lit, LED type, in a size and colour that provides ease of reading.
- Landing buttons shall be Stainless Steel Vandal-Proof, Red should not be used as an indication colour.
- Touch-panel based controls shall be considered.
- All lift pits shall be provided with a dry sump and flush cover.
- Street level or main entrance level shall be incorporated into labelling for call buttons.
- If initially commissioned as Contractor's lifts, all units shall undergo a second lift inspection prior to handover.
- Auto dial telephones are to be connected to direct dial RMIT Security unless otherwise agreed with the Technical User Group. All lift cars shall be fitted with functioning emergency telephones: emFone LX hands free autodialling emergency communication system. Provide cable connection to RMIT campus system. The emFone system shall be set up with the emFone Remote Phone Monitoring System to provide automatic testing of emergency phones and automatic reporting of faults and malfunctions.
- Lift cars shall be designed with longevity, robustness and anti-vandal characteristics as the prime objective.
- Car lighting shall be LED and indicate car location and direction of travel.
- Doors shall be centre-parting, with electronic motor control.

- Lift and counterweight guides shall be roller guides.
- One set of full height protection blankets shall be provided. The blankets shall be clearly labelled with the building number and the lift number where the lift has been designated as a services or goods lift. The blankets shall be designed for easy installation and removal.
- All lift cars shall be stretcher-compliant with minimum dimensions of 1400mm (W) x 2100 (D) with a 1000mm (W) clear door opening. Lifts may be required to be larger to meet lift performance requirements or transport goods / furniture items and shall be confirmed with RMIT on a project-by-project basis.
- Lift shafts and cars shall be equipped with space and cabling to accept internal CCTV cameras and access control readers. A trailing cable shall be provided for each lift with minimum 25% spare capacity for connection of future security equipment.
- Lift shafts and cars shall be equipped with cabling and internal 20” flat panel displays.
- Flat panel displays shall be equipped and cabled to RMIT networked venue booking system.

18.4 Lift Machine Room

- Provide cooling to lift machine room in accordance with lift manufacturer's requirements. If cooling is not required, provide thermostat controlled filtered fresh air intake and exhaust system to lift machine room.
- Provide a key-safe adjacent to the lift motor room entry door.
- Finishes to walls, floor and ceiling shall be durable and painted in full gloss paint for easy cleaning. The ceiling colour shall be painted white and walls off-white. Floors shall be sealed and receive 2 coats of grey coloured epoxy paving paint.
- LED battens shall be used within lift machine rooms with diffuser and impact rating of not less than IK07.

18.5 Machine Room-less Lifts

- The control cabinet shall be finished satin stainless steel.
- The front cover of control panels shall have acoustic lining on the inside of the cover.
- In the event a high temperature of or exceeding 40 degrees Celsius is registered in the machine area, automatic means shall be installed to prevent the lift from continuing to operate once it is at a floor level and the doors have opened.
- Where there is no capability to observe the lift machine and the over-speed governor operating from exterior control cabinet, closed circuit television viewing shall be provided to a screen in the controller for service staff viewing only with the camera(s) mounted in the lift well. (This would apply where a control cabinet is remotely located from the lift, where the movement of the lift for maintenance or service can be observed through an open landing door or by other means).
- The governor shall be arranged such that there is no necessity to provide an access panel into the lift well for maintenance or resetting the unit. The equipment location shall be within the lift well with a resetting facility from the controller, top floor landing or the unit shall have the capability to reset itself by automatic means.
- No audible alarms are to be fitted local to the controller. Visible alarm indication plus remote alarming via the BMS only.

18.6 Escalators

- Escalators shall be a minimum of 800mm wide for single person access and 1200mm wide for dual person access.
- Escalators shall be set to automatically slow and then stop when there is no traffic with automatic restart.
- Provide a transparent cover to all local “STOP” buttons.
- Fit local audible alarm that sounds as soon as the transparent cover is lifted.

- Provision shall be made for remote resetting of nuisance “STOP” button activations. The person who operates the remote reset switch shall either be able to see the entire escalator or entire moving walk or shall have means of ensuring that nobody is using the escalator or moving walk before making this operation.
- Escalator landing and exiting levels shall be at least two steps long.
- Escalator hand rails shall be internally illuminated.
- All escalator landing and exiting thresholds shall be CCTV monitored.
- Escalator Trip settings are to be adjusted to accept greater than normal step increases in loads to accommodate large numbers of students suddenly entering an escalator.

18.7 Lifts, Escalator and Fault/Status Management System

- The lift emergency communication system shall consist of a self-dialling hands free telephone mounted in the car operating panel. The telephone shall be activated by means of pressing the phone button (to illuminate on pressing) on the car operating panel for 3 seconds, and shall automatically dial a permanently attended location. The communications will be via dual redundant 4/5G Sim enabled equipment. The phone system shall also be capable of receiving calls, and automatically deactivating upon time-out (adjustable), busy tone, etc.
- Lift Signals are to include:
    - Lift common fault alarm.
    - Lift machine room high temperature.
    - Lift shaft high temperature.
    - Lift on NORMAL/FIRE SERVICE.
    - Lift on EXCLUSIVE SERVICE.
    - Lift car alarm.
    - Lift pit moisture sensor alarm.
- Escalator signals are to include:
    - Escalator common fault alarm.
    - STOP button activated

These signals can be connected to the BMS or to a suitable monitoring system associated with the lift. RMIT Facilities management team is to be consulted early in the design process to confirm design alignment with current operational processes.

19.0 Building Management Systems

Term/Abbreviation	Description
BMS	Applies to all or part of a control and monitoring system including field controls, sensors, actuators, global integration hardware, computers, servers and associated software. BMS does not necessarily limit itself to mechanical plant, but can control other systems such as lighting, Vertical Transport, Passive Conditioning, and the like. Alternate descriptions include DDC, BAS, BMCS.
GUI	Graphical user interface – any software element that enables users to view and/or control elements of a BMS.
Field level network (FLN)	Controllers that are often installed local to the equipment which they control (e.g. fan coil units, variable air volume terminal units).
Automation level network (ALN)	Controllers that are generally (although not exclusively) used to provide integration of sub networks of FLN controllers, and to deploy “global” control strategies.
Field interface devices (FID)	Devices such as sensors, actuators or meters that may be deployed in a network as a means of installation and/or costs efficiency.
BMS Server	Computer servers that marshal and monitor a large range of BMS automation and field level hardware, as well as the BMS data points connected to them. (Note, BMS controllers can operate as both clients and servers so care needs to be exercised when referring to vendor specific servers).
BMS Data Object (point)	Most commonly refers to a hardware “point” physically connected to a BMS field level controller (e.g. temperature sensor, control output etc). Software objects refer to time schedules and other internal functions. Most objects are defined by the BACnet standard and will appear as such within the RMIT BMS system.
Telecommunications Outlet (TO)	RJ45 Ethernet outlet that connects to the RMIT data network.
BMS Integration	The exchange of data between compatible BMS hardware devices of different manufacturers.
Open Systems (HVAC)	Hardware and software solutions that provide a standardized method of communication to achieve data exchange.
BACnet	A standardized open system framework for building management systems managed by ASHRAE.
MODbus	A standardized open system framework for industrial, energy and building management systems (see Modbus.org).
E-BMS	Enterprise BMS – A central system to standardize BMS data integration, display, collection, global collection, and retrieval for all approved BMS hardware installed at RMIT properties.

GUI	Graphical User Interface- A computerized interface that presents BMS object data in a graphical, simple to understand format. Vendor specific GUI's are often reliant on proprietary software and/or BACnet to read/write data from BMS field and automation level controllers.

19.1 Acceptable Products and System Selection

Designers are to review the existing system and provide recommendations as to which components of the existing system are required to be replaced or extended.

Designers shall only utilize standard features and functions that are part of systems or components provided by RMIT's preferred BMS providers specific to each site, unless otherwise agreed by the Technical User Group.

Refer to the Technical User Group for details.

19.2 BMS Hardware and Interoperability

The following points provide a summary of the most important features and functions that shall be provided for all systems installed at any RMIT property.

19.2.1 BMS Communications

- BMS systems shall be compatible with the BACnet Testing Lab Certified industry standards. Deviations from the standards are not acceptable. Hardware and software that use proprietary communications solutions shall not be deployed.
- FLN controllers shall communicate using either BACnet MS/TP or BACnet IP.
- ALN controllers shall communicate using BACnet IP.
- FID shall communicate using either BACnet MS/TP or MODbus RTU.
- GUI devices shall communicate using BACnet IP.

19.2.2 Open Systems and Interoperability

- BMS hardware shall be deployed by the installer to allow simple integration with other vendors' controls, software and GUI.
- All hardware inputs and output objects shall be exposed for integration by standard industry tools.
- Set-points, dead-bands, time schedules, holidays, loops shall have all configurable objects exposed for integration by standard industry tools.
- All exposed BACnet objects shall be named (using the "Description" field or similar) in accordance with the equipment standards naming conventions as detailed in RMIT Gateway G4-003 Asset Data Capture Register to enable simple comprehension by integrators of the location and purpose of the object.
- All BACnet objects shall enable both READ and WRITE. License cost associated with this to be clearly specified in the documentation.
- BMS hardware shall not require the use of any proprietary software tools to view and integrate the objects within it.
- Non-autonomous input/output expansion modules shall only be deployed where every object is fully mapped to its host controller and the same BACnet visibility is available as that provided by an ALN or FLN controller. Such expansion modules may not use proprietary protocols without the prior approval of RMIT Technical User Group, even when such hardware may have been previously deployed.

19.3 BMS Field Hardware

19.3.1 Field Sensors, Transmitters and Actuators

- Passive Temperature Sensors

- Installers shall deploy passive RTD type temperature sensors based on curves to be informed by the installation environment and context and as approved by RMIT

- Active Transmitters
  - Installers shall deploy active transmitters that utilize a standard 24VAC power. Other variations shall be considered for approval on a project by project basis.
- High Level Transmitters (Interface)
  - Where networked devices are used for sensing, installers shall deploy only BACnet MS/TP or MODbus RTU. Other communications methods shall be considered for approval on a project by project basis.
- Actuators – Binary
  - All binary actuators shall be isolated from the BMS controller output by a low voltage, 24VAC relay with appropriately sized contacts to pass at least twice the running current of the driven device.
  - Floating control of actuators shall not be utilised.
- Actuators – Analog
  - All modulating actuators shall be powered by 24VAC and positioned.
  - All actuators shall be selected such that their force or torque exceeds the project requirement by at least 30%.

19.4 Water Control Valves

19.4.1 Valves

- Control valves shall be either plug or rotary and shall be sized with appropriate actuators to ensure that there is more than sufficient close off to ensure isolation when required.
- Valves shall be sized such that the pressure drop, and authority ensures good control under all conditions and flows. Authority shall not drop below 0.2 or exceed 0.5.

19.5 Valve and Damper Actuators

19.5.1 Actuators

- Actuators shall be 24VAC powered and sized to provide more than sufficient torque to drive the valve or damper to which they are attached.
- Water control valve close off pressures shall be maintained according to the mechanical services specifications in force for the project.
- Damper actuators shall have spring return to fail-safe position for all fire control applications unless otherwise specified.

19.6 Intent for Integration of BMS and other Services Systems

19.6.1 Independence and Intent

- Integration service providers may be independent from BMS installers.
- The intent is to enable RMIT the freedom to integrate any approved vendor's hardware with the (future) common enterprise BMS system (E-BMS) and associated data servers, and to integrate different vendor's equipment with each other and thereby avoid duplication or early obsolescence of BMS equipment which in every other respect is within its lifecycle.

19.6.2 Project Integration

- All projects that implement or impact mechanical equipment shall be integrated to the common head end GUI (E-BMS or proprietary) and incorporate updated BMS graphics reflecting the installation to enable RMIT visibility of the system.

19.7 Standardised Deployment

19.7.1 Limitations

- Integration service providers shall deploy only approved, standardised RMIT solutions in all activities. Approval shall be sought from the Technical User Group.
- Integration service providers shall NOT install any translation hardware or software without prior approval from the Technical User Group.
- Any translation devices or software that does not comply with standard BACnet or MODbus implementations and that is opaque to other integrators shall not be acceptable.
- Integration service providers shall guarantee data exchange between BMS hardware of similar or differing vendors and generations.

19.7.2 Graphical interfaces

- Integration service providers shall guarantee data storage, retention, retrieval and display from BMS hardware of similar or differing vendors and generations.

19.7.3 Alarms

- Integration service providers shall guarantee alarm annunciation and distribution in timely manner from BMS hardware of similar or differing vendors and generations.

19.7.4 Data Sharing

- Integration service providers shall guarantee read and write data sharing with other RMIT systems from BMS hardware of similar or differing vendors and generations.

19.7.5 Hardware Decommissioning

- Integration service providers shall provide and record decommissioning of all redundant BMS Hardware that has been replaced as part of the defined scope of works.

19.7.6 Software Decommissioning

- Integration service providers shall perform software maintenance tasks associated with the decommissioning of BMS hardware, including:
    - Removal of software references in databases.
    - Removal of software references in graphical user interfaces.
    - Removal of software references in all other systems.
    - Maintenance of points lists, drawings and manuals.
    - Liaison with BMS Hardware Vendors and Installers.
    - Integration service providers shall perform all liaison tasks with nominated BMS vendors and installers to obtain necessary information regarding integration.
    - Service providers shall alert RMIT to any integration issues that may delay completion of the project.

19.7.7 Standard Tasks

- Integration service providers shall always deliver the following as a minimum:
    - Identification of all hardware and software objects to be integrated.
    - Validation that existing software licenses can accept these objects.
    - Expansion or extension to existing software licenses where necessary including expiry dates.
    - Integration of all objects to existing BMS server(s).
    - Integration of selected objects to other BMS systems where necessary (global strategies etc).
    - Generation of appropriate standard BMS graphics and user interface elements.

- Integration of objects with existing data collection, retrieval and display software.
- Integration with alarm handling and annunciation system.
- Documentation of all integrated objects and systems.
- Test and demonstration of all integrated BMS objects and systems with RMIT.

19.8 Integration with RMIT Software Services

19.8.1 Description of Principles

- BMS Integration with other database API applications both on and off campus and on or off site (including cloud hosted) shall conform the RMIT integration principles and integration reference architecture.
  - ITS integration and information (I&IM) platform support.
  - Batch integration.
  - Real time integration including API.
  - Managed file transfer.

19.8.2 Detailed Design

- Integration shall require a detailed solution design and associated engagement including resources at a project cost. Sign off by RMIT/consultant before implementation is required.

19.9 BMS Based Metering Systems

19.9.1 Types of Metering

- Metering refers to the measurement and collection of interval data for the following variables:
  - Electricity – single phase and 3 phase, current, voltage, power (kW, VA, VAR), other relevant parameters.
  - Natural Gas.
  - Thermal Energy – heating, cooling and condenser water.
  - Combustion Fluids – Diesel etc.
  - Potable Water.
  - Waste/Brown Water.
  - Harvested Water.
  - Sewerage.
  - Recycled Water.
  - Lighting Controls.
  - Vertical Transport.
  - Power Factor Correction.
  - Gas suppression systems.
  - Other compliance components/modules (e.g. C02, NH3, etc) in all areas including school/college, retail and commercial spaces.

19.9.2 Preferred Hardware Types

- BMS installers shall deploy meter hardware that uses embedded non-volatile memory technology to record data at set intervals.
- Meter hardware shall be capable of sharing data via communication networks.

19.9.3 Preferred Communications Hardware

- Installers shall deploy interval meters that communicate using RS485 serial or hard-wired Ethernet (CAT 6A only).

19.9.4 Preferred Communications Protocols

- Installers shall deploy BACnet MS/TP, BACnet IP or MODbus RTU.

19.9.5 Alternate Hardware Schemes

- Installers may apply for approval to use alternate metering methods that mimic memory equipped units and redundancy. Any alternative that can demonstrate effective and secure data validation, redundancy and storage techniques shall be reviewed by RMIT/designer prior to implementation.
- Where such alternatives are submitted for approval, installers shall satisfy RMIT that sufficient segregation between BMS and EMS functions has been provided to guarantee that failure of one system will not affect the other.

19.9.6 Alternate Communications Protocols

- Installers may apply for approval to deploy alternate communications protocols where such a change to the Design Standard will deliver benefits to RMIT. Proprietary protocols will not be approved.

19.9.7 Alternate Data Storage Schemes

- Installers may apply for approval to deploy alternate metering data storage schemes. Schemes that cannot demonstrate effective and secure data validation, redundancy and storage techniques will not be considered.

19.9.8 Data Protection

- Loss of any part of a BMS system shall not affect any part of the metering data collection and storage system.
- Energy data shall be protected from loss at least 3 storage locations. (Collection device, intermediate device, IT server). A backup should also be provided for the IT server database.

19.9.9 Data Validation and Repair

- Appropriate software shall be deployed to protect against data corruption. Where utility power supply failures cause data gaps, zero readings shall be recorded.
- Where faults or local power supply failures cause data gaps, appropriate software shall be deployed to re-create the missing data based on a historical analysis of the meter interval data. Alerts shall be enunciated to enable RMIT staff to validate the re-created data intervals.

19.10 Data Collection and Storage

- Definitions - Data collection refers to BMS variables (both “native” and integrated) that are measured, controlled or monitored by any part of the BMS. These variables do not include “Metering” items as outlined in section 19.9.1.

19.10.1 Examples of variables

- Temperature.
- Pressure.
- Flow Rate.
- Valve or damper Position.
- Loop output.
- Set Point.
- Plant Status.
- Optimal start/stop.
- ramp up/down.

- C02 occupancy levels.
- Seasonal and timetabling settings.
- Adhoc and planned events.

19.10.2 Collection and Local Storage

- BMS systems shall provide the following minimum data storage functions:
- Each ALN controller shall be fully programmable for data collection in regards to object, parameter and frequency interval. Each ALN shall have capacity to collect sample data for all hardware points connected to itself and its subordinate FLN controllers at a 15-minute collection interval.

19.10.3 Database Storage

- Each ALN will allow the automatic uploading of the collected data at times set within the ALN to both a proprietary and standard SQL database structures. ITS to review proposal and confirm approval.
- Where vendors provide proprietary databases, these databases shall provide a method for automatically exporting data to a standard SQL database structure.

19.10.4 Data Backup

- Server-data will be backed up using the standard RMIT enterprise backup solution (“Commvault”) so the system can be restored in the event of a system failure. Vendors may also elect to provide their own data backup solutions. ITS to review proposal and confirm approval.
- Installers shall provide all necessary details regarding storage locations within servers as part of the O&M documentation.

19.11 BMS Installation, Enclosures, Cabling and Labelling

19.11.1 Space Allowance for BMS Enclosures

- Space shall be allocated specifically for BMS control enclosures at all required locations, especially within mechanical plant rooms and risers.

19.11.2 BMS Enclosures

- Hardware shall be mounted in suitable enclosures and provided with oversized voltage transformers to enable future expansion of 15%.
- Enclosure mounted hardware shall be provided with plastic ducting or other cable tidy solutions to ensure a neat and tidy appearance.
- All BMS and associated items within enclosures shall be mounted on a gear tray.
- Enclosures shall contain a suitable document holder large enough to accommodate points lists, drawings and manuals.
- BMS enclosures shall be provided with external labels that identify the manufacturer of the hardware, the installer, building, level, location and ID number of the BMS equipment.
- Each item within the enclosure shall be identified with a label that details the name and unique ID of the component.
- Small enclosures (< 0.2 m^2) shall be either polycarbonate, aluminium or steel.
- Large enclosures (> 0.2 m^2) shall be aluminium or steel.
- Cable entry points to enclosures shall be protected with rubber grommets, plastic bushes or other similar permanently mounted cable protection methods. Each entry point shall be reasonably occupied, with spare space to allow for tracing and expansion.

19.11.3 BMS Equipment

- Hardware shall be AC powered.
- All equipment connections shall be provided with removable plugs equipped with screw terminals.
- Terminals shall accept at least one 1.0 mm^2 cable.

- Terminals shall be limited to no more than two cables.
- Terminal unit controllers (FCU, VAV etc.) shall be mounted directly onto the mechanical system hardware which it controls but shall be provided with dust protection and easy access to all connections.

19.12 Labelling of BMS and Associated Equipment

- Each BMS equipment item (or related item such as transformers) shall be identified with an engraved label.
- All labels shall be manufactured from robust plastic and engraved i.e. Traffolyte label or similar.
- All text shall be a minimum of 5 mm height.
- All labels shall be affixed using both adhesive and screws or plugs.

19.12.1 BMS Cabling and Termination

- The BMS cabling requirements in this section refer specifically to BMS systems, whilst excluding Ethernet/CAT6A cabling.

19.12.2 Cable Classes and Types

- All analogy and digital sensor cabling shall be ran using twisted shielded cable of a size and type to suit the vendor's hardware.
- All signal output cabling shall ran using twisted shielded cable of a size and type to suit the vendor's hardware.
- All binary outputs shall be connected using 0.75 mm2 (minimum) building wire where interfacing relays are used.
- Multicore cables are acceptable for binary outputs, such cables shall be manufactured with each core identified.
- All connections to BMS systems and associated interface devices shall be tidy and use suitable ferrules.

19.12.3 Cable Marking

- All BMS cables shall be identified (including those on interface devices).
- BMS cables shall be marked at each termination point.
- Each BMS cable connection shall be marked with a suitable identification label. Handwritten labels are not acceptable.
- Marking systems shall be permanent and have the capacity to include all the characters demanded by the RMIT naming conventions.
- Cable marking need not include the building number where it is obvious to the observer at either end of the cable.
- Where cables run between cables, the originating building number shall be included in the cable marker (i.e. where the BMS field controller resides).

19.12.4 Segregation and Bundling

- BMS cables shall be segregated from other system functions providing enough clearance to avoid electrical interference.
- All BMS cable bundles shall be grouped and clearly marked as BMS every 3 meters (minimum).

19.12.5 BMS Equipment Naming Conventions

- FLN and ALN controllers shall be provided with one label each that uniquely identifies them within the RMIT organization. The label shall include
- Building Number ("B" plus 3 characters max)
- Level number (3 characters max)

- ALN number (3 characters max, shall match installer drawings and points lists)
- FLN number (3 characters max, shall match installer drawings and points lists)
- All identifying codes shall be clearly separated using a dot.
- FLN hardware input/output numbers shall always be marked with 2 digits with leading zero where necessary.
- Where input/output expansion modules are used, the host address shall be inserted preceded by “X”

19.12.6 Controller Label Samples

Sample 1

- B12.GND.1.22
- Vis: Building 12, Ground Floor, ALN number one (within the building), FLN number 22 (hosted by ALN one)

Sample 2

- B115.8.3.1.X1
- Vis: Building 115, level 8, ALN 3, FLN 1, I/O expansion module 1

19.12.7 BMS Cable Naming Conventions

- All sensors and controlled devices connecting signal cables shall be provided with cable marking that includes:
    - ALN number (2 characters max, shall match installer drawings and points lists).
    - FLN number (3 characters max, shall match installer drawings and points lists).
    - FLN hardware input/output type (2 characters), or
    - FLN hardware input/output number (2 characters).
    - Note: Where ALN controllers provide more than one FLN network, the character “N” should be inserted prior to the FLN. Network “1” may be omitted where is it deployed as the default.
    - All identifying codes shall be clearly separated using a dot.
    - FLN hardware input/output types shall be as follows (regardless of the manufacturer’s preferred naming which may vary slightly):
        - UI: Analog/Universal input.
        - BI: Binary/digital input.
        - UO: Analog/universal output.
        - BO: Binary/digital output.
- Where two BO points are used to create a floating analogue output, these shall be marked as BO.
- Multiplexed input points shall be marked as UIxMIy.
- Multiplexed output points shall be marked as UOxMOy.
- Power supplies to devices shall be clearly marked with the originating enclosure number and the polarity (A or N).

19.12.8 Cable Marker Samples

- Sample 1
    - 1.22.AI.3
    - Vis: ALN 1, FLN 22, Analog Input 3
- Sample 2
    - 3.N2.15.BO.2

- Vis: ALN 3, Network 2, FLN 15, Binary output 2

19.13 BMS UPS Systems

19.13.1 UPS

- This section describes the deployment of UPS systems for BMS related applications only. It does NOT cover UPS systems for any other purposes.

19.13.2 Power Backup Design

- BMS designers and installers shall ensure that any BMS hardware required to maintain its status during failure of the mains power supply shall be provided with a backup power supply.
- BMS installers shall utilize RMIT UPS systems where they exist. Where a UPS is required for the BMS solution, but no RMIT UPS system exists, installers are to refer to Technical User Group requirements prior to providing their own, independent, non-approved UPS system.
- Designers shall liaise with RMIT to ensure that the BMS makes use of any existing large-scale UPS solution.
- Where no UPS exists, the supply of this shall be the responsibility of the electrical services contractor.

19.13.3 UPS Power Supply Sizing and Alerts

- BMS hardware shall fitted with a communications connection to a power backup solution using BACnet of MODbus.
- The UPS solution shall be incrementally sized according to the required BMS load and be integrated to the BMS such that status changes or failures of, or alerts from the backup solution are always transmitted to the BMS. The minimum indications from UPS systems shall be:
  - Mains power status.
  - UPS output power status.
  - UPS failure.
  - Battery status.

19.13.4 Other Equipment

- Items controlled by the UPS-backed BMS equipment shall also be provided with backup power where necessary for operation during mains power failures.

19.14 BMS Embedded Software and Control Strategies

Installers and BMS programmers shall request copies of standard control strategies from RMIT prior to commencing the programming of the system. RMIT intend that simple mechanical items (such as FCU or VAV) be programmed and controlled in a uniform way to enable easier service and integration across the entire campus.

19.14.1 Energy Optimization and Global Strategies

- Installers and BMS programmers shall deploy algorithms to minimise energy consumption and shall ensure that set points and dead-bands are programmed in accordance with current RMIT strategies. Refer to RMIT Design Standard of Mechanical Equipment for general temperature setpoints and dead band requirements.
- Heating and cooling call strategies shall be discussed with RMIT prior to deployment to ensure that new mechanical works integrate without disrupting existing energy profiles and sequences whilst accommodating changed heating and cooling loads.

19.14.2 Time Schedules and Occupancy Control

- Time schedules should be set during commissioning and agreed to by the Facility Manager prior to handover.
- Where occupancy detection strategies are deployed as part of the project, BMS installers shall provide graphical indication of the initiating system's status for each zone.

- Time schedules will be able to be defined to each zone, however, global adjustments should be possible per floor with a simple override function within the BMS to alter the operating window of an entire floor.

19.14.3 Optimisation and Global Control Strategies

- BMS installers shall ensure that all control strategies are optimized. This optimisation shall then be signed off by RMIT prior to deployment to minimize energy consumption whilst delivering stable, comfortable conditions.
- BMS installers shall ensure that global control strategies are robust and do not fail or cause any loss of control following failure of any node.
- BMS installers shall integrate with all relevant global control strategies, for example:
    - Ambient lockouts.
    - Common-set points.
    - Maximum demand limits and load sheds.
    - Cooling and heating “Calls”.
    - Power generation plant balancing.

19.15 Setpoints

- BMS installers shall limit zone temperature set-points adjustment to 20 – 25 degrees C. However, RMIT Property Services shall be able to adjust this set point at BMS front end to meet specific requirement of the room as requested by the user and approved by RMIT Property Services.

19.15.1 Fall-back Strategies

- BMS installers shall ensure that all levels of the BMS system be properly configured to maintain local conditions during network communications hardware failure.
- Network Communications failure shall trigger an alarm annunciation event.

19.15.2 Fire Control

- Fire Status Indication
    - BMS systems shall monitor the status of the FIP for the building (either directly from the FIP or via mechanical services switchboards).
    - BMS graphics for each controlled item will indicate the fire signal status.
    - A dedicated BMS graphical page shall indicate the overall fire status of the building.
    - All fire signals shall initiate an alarm annunciation event.
    - Fire signals shall suppress other alarms that may be caused due to control strategies overrides and interruptions.
- Fire Condition Control
    - Fire conditions shall automatically control mechanical equipment using “Relay Logic” within mechanical switchboards.
    - Dampers shall also be controlled using relay logic.
    - Life safety Mechanical Services equipment operation during Fire condition shall be able to be manually controlled from Fire Fan Control Panel (FFCP) which includes zone smoke control damper, supply air fan, exhaust fan and smoke exhaust fan.
    - BMS system shall only monitor the status of the Mechanical equipment but not to be used to control the Life Safety Mechanical equipment that need to operate during fire alarm.
    - Field controllers (FLN) that provide control of terminal equipment (e.g. VAV units) shall be programmed to drive dampers to positions specified by the fire and mechanical services.

19.15.3 BMS Embedded User Interfaces

- Instructions for Hardware Solutions

  - Where hardware embedded user interfaces are available (e.g. LCD screens), installers shall provide instructions adjacent to the device describing the operational methods, entering user name and password details (where necessary). This procedure shall be confirmed by RMIT ITS security team.
  - Credentials will not be displayed at the embedded interface location, being available to property services personnel only. Default credentials shall be erased at all embedded interface locations.
  - All users (i.e. RMIT PSG, authorised contractors, maintenance staff, etc) shall have a valid e-number and single-sign-on authentication that is administer by RMIT ITS. This authentication governs not only access to the BMS, but also permissions within the application, i.e. read/write, access to specific areas, etc.

- Embedded Web Servers
  - Where embedded user interfaces are deployed using embedded web servers, installers shall provide an indication on the device that this is an available option.
  - Such information shall also include the IP address, with all credential information being available only by liaison with RMIT Property Services.

19.16 BMS Commissioning

19.16.1 Methods

- Installers shall deploy an RMIT approved method of hardware and software commissioning that is accompanied by standardised documentation. Installers shall provide documentation for RMIT review prior to implementation.

19.16.2 Documentation

- Points schedules may be modified for use as point-to-point commissioning check sheets. Technicians shall verify the following items for each hardware point during commissioning:
  - Functional.
  - Calibrated.
  - Integrated in all control algorithms.
  - Visible on BMS Server.
  - Visible on GUI.
  - Alarm annunciation tested.
  - Data logging.
  - Available for use via BACnet MSTP and IP (where appropriate).

19.16.3 Software Testing

- Software algorithms shall be fully tested and commissioned both independently and as part of the global strategy for the building and campus.

19.16.4 User Interfaces

- Graphical interfaces, data collection and retrieval and alarm annunciation shall all be subject to the same commissioning techniques and documentation as hardware. Refer to the previous section in this volume for details. All GUIs shall be signed off by RMIT before acceptance is granted.
- Quality assurance techniques shall be deployed to enable auditing of the commissioning and testing process.

19.17 BMS Operation and Maintenance Documentation

- Each BMS project shall be supplied with a complete set of O&M documentation in addition to the points schedules, design drawings and software documentation.
- O&M documentation shall be supplied in electronic format.

- O&M documentation shall be available directly from the GUI accessible via both web and client, mobile and fixed, tablet/phone and PC.
- The O&M documentation is required to include all equipment utilised for the project, including equipment being re-used which was deployed in a previous project. This ensures that the O&M manual is comprehensive for the specific project.

19.17.1 Design Documentation

Installers shall provide the following documentation prior to work commencing for review:

- Functional Description
    - Functional Description of the proposed control strategy for all Mechanical Services equipment in detail.
- Points Schedules
    - Points lists including ALN and FLN addresses, point addresses, point names, device type and part number including alarm schedules.
- End Device Schedules
    - Control valve schedule, including size, type, ports, flow, pressure drop, manufacturer, model, actuator manufacture, model, supply voltage, control signal type and torque or force rating.
    - Damper actuator schedule, including manufacturer, model, supply voltage, control signal type, torque rating.
- Integration Schedules
    - Third party device schedule to be integrated via BACnet or MODbus, including IP or instance addresses where appropriate (use placeholders where final address is unavailable).
- BMS Network Architecture
    - Network architecture drawing, including all ALN and FLN devices, expansion modules, third party interface devices and servers. IP addresses where appropriate (use placeholders where the final address is unknown). Addresses (or range where consecutive) of all FLN controllers.
- Controller Wiring Diagrams
    - Every field level controller (FLN) shall have a dedicated drawing showing the connection details for each BMS point.
    - Where ALN controllers also have field points connected, they shall be provided with a connection diagram.
    - Typical drawings may be submitted where replication of a standard has been deployed (e.g. VAV or FCU terminal units)
    - Replication drawings shall list all units that the drawing applies to.
    - Enclosure drawings and typical power supply arrangement.
- IP Rack Allocation Record
    - A completed copy of the IP allocation sheet location of equipment using RMIT standardised address formats:
        - BB.LL.RRR (Building, Level, Rack)
        - IP address
        - Field outlet numbers
        - MAC address
    - A copy of this schedule shall be available from the BMS GUI

19.17.2 Operational Documentation

Installers shall provide sufficient documentation with appropriate detail to enable the comprehension of the following items by RMIT and other support staff reasonably familiar with BMS systems:

- Structure of the BMS installed, including networks and locations of controllers.
- An overview of the equipment controlled and monitored.
- A general description of the overall control philosophy (initiation, occupancy, sequences etc).
- Detailed functional descriptions of control for each typical item of plant, including single line diagrams of plant (air, water, electricity, gas) and sequence diagrams.
- Control maps showing the interconnection of objects and functions (or lists of code where object orientation is not deployed).
- Detailed description of heating and cooling call methodologies.
- Detailed description of energy efficiency algorithms.
- Detailed description of data gathering and methods of retrieval and display.
- Detailed descriptions of alarm settings and associated actions.
- Description of any proprietary software necessary to program the ALN, FLN or other devices included within the BMS scope.
- The service provider shall provide a detailed maintenance schedule in the O&M manuals with recommended maintenance requirements over a period of 5 years for RMIT's perusal.

Installers shall incorporate the documentation listed above to BMS Operation and Maintenance manual (O&M manual).

19.17.3 Manufacturer's Datasheet

Installers shall provide data sheets for each item installed as part of the BMS scope, including:

- Description and photograph.
- Technical specifications.
- Part number of actual item used (where alternatives are specified on the same sheet).
- User guides for systems where such would be necessary for operation, service or repair.

Installers shall incorporate the documentation listed above to BMS Operation and Maintenance manual (O&M manual).

19.18 BMS Training

19.18.1 Gap Analysis

Installers shall provide a training for each BMS project.

19.18.2 Purpose of Training

- Training shall enable RMIT property services to:
    - Understand, locate and identify controlled equipment.
    - Locate the BMS equipment responsible for control of plant and equipment.
    - Physically identify the BMS hardware within each control enclosure.
    - Comprehend the structure of O&M documentation describing the system.

19.18.3 Specific Items

- Training shall guide the users in:
    - Options for accessing the BMS.
    - Logging in and out of the BMS.
    - Navigating the GUI to find plant items.

- Understanding each item of feedback.
- Understanding the control of equipment.
- Time schedules, holidays, occupancy control.
- Set point modification.
- Accessing data logging and the retrieval of the same.
- Use of special functions.
- Locating the alarm history, acknowledgement of alarms.
- Understanding each system integration and any special items associated with integrations of other building services.
- Fire conditions, life safety control monitoring, plant default states.

19.19 Maintenance and Service

19.19.1 Intent

- Allows RMIT to determine which vendors and installers are qualified to provide maintenance and service of BMS systems within the University's built environment, regardless of the manufacturer, vendor, installer of integrator.

19.19.2 Qualifications and Experience

- Service providers shall demonstrate qualifications and competence in the following areas to RMIT satisfaction and approval:
  - General BMS knowledge
  - General mechanical services knowledge
  - Hardware and software specific knowledge and experience
  - Controls strategies and energy efficiency
  - IT systems knowledge and experience
  - Networking and infrastructure
  - IT security principles

19.19.3 Response Times

- Service providers shall be required to meet the response time requirements of RMIT property services
- Normal hours 1 hours
- After hours 2 hours

19.19.4 Site Knowledge

Site knowledge and experience regarding access to plant and equipment shall be maintained by the contractor and shall be demonstrated to property services based on their maintenance and service works track record on site.

19.19.5 Hardware and Software Support

- Service providers shall demonstrate their possession of appropriate licenses and qualifications regarding the BMS hardware and software by providing them as part of the site induction process prior to commencement of work on site.
- Collaborative arrangements are tolerated provided the response times are maintained.
- Service providers shall ensure that service personnel laptops, tablets etc. used as tools of trade are maintained with updated operating systems including patching and up to date anti-virus and anti-malware software comply to RMIT IT Standards.
- Passwords to all tools of trade shall also comply with RMIT Infrastructure & Asset Security Policy – available upon request

- RMIT will provide user accounts to enable access to RMIT wireless network.

19.19.6 Spare parts

All spare parts to the service provider's BMS at Automation Level shall be available within 6 weeks from placement of order to delivery on-site to RMIT. All spare parts at Field Level Network controller and below shall be available within 5 days from placement of order to delivery on-site to RMIT. Devices controlling critical plant and equipment, generally trigeneration/co-generation plant, chillers, boilers and AHUs shall be available within 2 days from placement of order to delivery on-site to RMIT unless prior written approval is obtained from RMIT in the case of specialised devices.

19.19.7 Tuning and Continuous Commissioning

- Service providers shall demonstrate their competence in constant commissioning and tuning, including the analysis of stored data and associated trends and alarms as part of site continuous improvement, early fault detection and troubleshooting.
- Maintenance and service shall include a component of these activities that shall be demonstrated monthly through the combined use of BMS reports and written summaries provided as addenda to the standard service and maintenance reports.

19.20 IT Related – Hardware: Servers and Workstations

19.20.1 Servers

- Server hardware and associated operating software shall not be provided by BMS vendors.
- ITS will provide solutions meeting the specifications as part of IT scope for the project).
- BMS servers shall never be located within the buildings which they service.
- The minimum server hardware shall be specified by the BMS vendor/installer to match the performance required to support the BMS points, objects and features.
- The preferred server software shall be provided by RMIT ITS as part of the IT scope.
- BMS vendors/installers shall advise RMIT ITS of any special software requirements.
- Servers for BMS functions shall always be virtualized and managed by RMIT ITS.
- Access to the server shall be provided by RMIT ITS via standard RMIT remote access methodology.

19.20.2 “Thick” Clients

- The minimum workstation hardware shall be specified to match the purpose.
- Workstations shall be RMIT supplied leased hardware (at project cost) and installed with RMIT managed operating environment that included anti-virus and anti-malware.
- BMS vendors/installers shall advise RMIT ITS of any special software requirements.
- BMS vendors/installers shall advise RMIT ITS of TCP/IP requirements.

19.20.3 “Thin” Clients

- The minimum workstation hardware shall be specified to match the purpose.
- RMIT support Internet Explorer 11, Firefox (latest) and Chrome (latest).
- BMS vendors/installers shall advise RMIT ITS of any special software requirements.
- BMS vendors/installers shall advise RMIT ITS of TCP/IP requirements

19.21 IT Related - Software: Servers and Workstations

19.21.1 BMS Software - Purpose

- Software licenses are usually required for servers that manage BMS systems hardware. Each vendor/manufacturer supplies a proprietary version of software which is necessary for some functions. Examples of software applications are:
    - BMS Database management servers

- Graphical user interface creation and display servers
- Alarm management servers
- Data storage and retrieval

- The following clauses ensure that all BMS hardware is supplied with appropriate software.

19.21.2 BMS Server/Workstation Software Applications

- BMS vendors/installers shall ensure that all necessary software is installed for the correct deployment and ongoing management of their BMS field hardware. Subsequent expansions to the base system shall have the software licenses upgrade to match the project.
- Installers who use equipment that has not been previously deployed at RMIT and/or has not been provided with a user interface shall supply a software license sufficient for the quantity
- New BMS solutions will require IT design and analysis to ensure server software is suitable for deployment at RMIT.
- Installers expanding existing networks of the same (or compatible) manufacturer shall provide license extensions sufficient for the quantity of objects/points being installed as part of the works project.

19.21.3 Operating Systems

- Only operating systems reviewed and approved by ITS shall be deployed for BMS servers and workstations.
- Operating systems shall be reviewed on a regular basis, with security patches being deployed in accordance with RMIT ITS procedures. ITS perform security patching once per month.
- Vendors shall advise ITS if pending patches will have an adverse effect on any installed BMS software.

19.22 BMS Field Equipment Firmware Updates

19.22.1 Qualifications

- BMS field hardware requiring firmware updates shall be updated only by qualified vendors and installers after agreement with both ITS and Property Services.

19.22.2 Testing

- All firmware shall be fully tested prior to installation and shall not adversely affect any existing BMS control or monitoring tasks.

19.22.3 Notice

- Vendors and installers shall notify and liaise with RMIT ITS and property services prior to any firmware updates.

19.22.4 Record of Firmware

- Firmware revisions shall be constant throughout the RMIT campuses for all devices of the same model.
- A record shall be kept by the vendor of the current firmware revision and all firmware updates. This record is to be accessible from the GUI.

19.22.5 Reboot/Restart

- Any BMS hardware reboots required because of firmware updates shall be carried out at a time that does not affect the operational capacity of the serviced area, unless otherwise agreed with Property Services.

19.23 ITS Related - BMS Hardware and RMIT ITS Infrastructure

19.23.1 Pre-Deployment

- Designers that deploy systems with IP capability, and which are intended to be connected to the RMIT IT network infrastructure shall:
    - Guarantee that hardware does not interfere with existing IT infrastructure
    - Submit for approval by the Property Services vendor's panel any new item of equipment

19.23.2 Security

- All BMS devices shall comply with RMIT ITS security guidelines.
- Any BMS equipment to be connected to the RMIT ITS infrastructure shall first obtain approval from ITS through the raising of an ITS service "Ticket" raised by RMIT project management (via service desk) or directly by the property services team.

19.23.3 Design

- BMS vendors / installers shall provide RMIT ITS a comprehensive network topology diagram with the ticket.

19.23.4 BMS IP Addresses

- ITS shall assign and manage specific "Subnet" ranges where BMS devices are hosted at Campus levels. These addresses will be provided in response to the "Ticket" outlined above. ITS network team will allocate and assign the correct IP ranges for the BMS project.
- Note: Information required to submit is outlined in the RMIT Design Standards Section 6 Information Technology

19.23.5 IP Standards

- Devices deployed in the field shall support IPV4 address allocation using DHCP, variable subnet mask, and operate in a Layer 3 routed network.
    - NTP and DNS support is recommended

19.23.6 Integration of BMS Hardware with Services IP Systems

- Prior to deployment, installers shall provide a written description of the method of integration with other building services devices residing on the RMIT IT network infrastructure including:
    - Purpose of integration
    - Protocols
    - Addresses
    - Data requests and responses
    - Estimated required bandwidth
    - Server location and IP address
    - Redundancy levels during network failure
    - Amount of data (transactional data) that needs to traverse the environment (IE: from the controller to the server or vice versa).
    - Amount of data (backup related data).
    - Time the data transfer is initiated and the interval that the data transfer is initiated.
    - Flow diagram or topology of the BMS environment detailing which units communicate together.
    - Which TCP/IP ports are utilized

Note: This document can be incorporated into the BMS network topology diagram where appropriate and such information does not cause complication and/or confusion.

19.23.7 TCP/IP and UDP Ports

- BMS Vendor/installer shall provide the required TCP or UDP ports and data flow and/or direction.
- This port information shall be included with the network topology at the time of the raising of the ticket and shall include:

Source	Location	Destination	Port Type	Port Number
ALN ID#	B8, L10, C3	Server, Siemens	TCP	22
Server, Siemens	Data Centre	ALN ID#	UDP	5888

19.23.8 Ethernet Cabling of BMS IP Enabled Equipment

- All Ethernet cabling for the connection of field BMS equipment to the RMIT IT network is to conform to the RMIT RMIT Design Standards - Section 6 Information Technology.
- This includes but is not limited to:
    - Ethernet UTP cabling shall conform to CommScope's Krone Cat 6 solution.
    - Cabling is terminated on RJ45 outlet in the field and connected to equipment using a CommScope Krone factory made and tested blue patch lead as approved by ITS for use in Cat 6 solutions.

19.23.9 IP Networking and Communication Hardware

- BMS IP equipment shall only use RMIT supplied switches and routers. BMS vendors shall not supply any network equipment that will be permanently deployed.
- No isolated IP networks and or network equipment are to be installed unless approved by ITS senior network manager.

19.24 ITS Related - Wireless Technologies

19.24.1 Definition and Limitations

- Wireless technologies in the 2.4 Ghz and 5 Ghz spectrum shall not be permanently deployed within the RMIT campus at any time. This includes, but is not limited to:
    - WiFi IEEE 802.11 and future iterations
    - Bluetooth IEEE 802.15.1 and future iterations
    - ZigBee IEEE 802.15.4 and future iterations

19.24.2 Temporary Wireless Networks

- Temporary wireless technologies may be deployed during commissioning by BMS installers and commissioning technicians.
- Such networks shall be approved by RMIT ITS prior to their deployment to ensure no interference with any existing wireless networks in the same area.
- All temporary wireless networks shall be decommissioned and removed prior to handover and the commencement of defects liability period.
- Prior to installing any temporary wireless, the BMS vendor/installer shall inform RMIT ITS via Project Management team or Property Services by the raising of a BAU ticket.
- Temporary WIFI solution design proposals shall satisfy RMIT ITS that any temporary solution shall not interfere with existing WIFI networks or associated infrastructure.
- BMS vendors/installers shall also confirm to RMIT ITS that the WIFI solution will be de-commissioned at the end of commissioning.

19.25 De-Activation

- RMIT ITS will de-activate any temporary WIFI network that either:
    - Was unapproved by ITS.
    - Was approved but causes interference with other ITS infrastructure.

19.26 ITS Related – Security

19.26.1 ALN and FLN (Automation and Field Level Networks)

- Installers shall provide an administrator's level password to RMIT prior to the commencement of defects liability period (DLP).
- Passwords shall comply with RMIT ITS standards and shall be maintained according to the same standards.

19.26.2 Passwords

- Format shall as far as possible match standard RMIT ITS guidelines:
    - Complexity
    - Storage
    - Integration with windows credential manager

19.26.3 Off Site Access

Access to BMS systems shall NOT be possible other than through the approved RMIT ITS internet connection. Installers shall not attach secondary access systems to any part of the BMS system.

19.26.4 Physical Security

- BMS hardware that provides an access point capability shall be provided with a secure enclosure complete with a standard RMIT key-lock. Where BMS hardware is located within cupboards and risers, security shall be provided by a standard RMIT key-lock.
- BMS hardware shall at no time be freely accessible by staff, students or the public.

19.26.5 "Dongle" Ports

- Where BMS field hardware has the capability of utilizing a wireless dongle for direct communications to the internet (i.e. via 3G/4G modem) this capability shall be disabled both by software configuration and by permanent hardware physical blocking.
- Ports that do not enable remote access directly via wireless 3G/4G modems do not need to be permanently disabled.
- Where local ports that do enable remote access directly via wireless 3G/4G modems and are required for service and maintenance (e.g. in the case of TCP/IP failure) RMIT ITS shall be notified.

19.26.6 Maintenance of Security

Maintenance of all software related security issues shall be the responsibility of the nominated BMS service contractor. This contractor shall advise property services as security patches become available. This contractor shall also advise property services if physical security is compromised.

19.26.7 Documentation

- Vendors and installers shall provide sufficient comprehensive documentation to enable RMIT property services and ITS to manage security concerns. Deployment of patches shall remain the vendor's and/or service contractor's responsibility.
- Devices that have been identified as not meeting RMIT security requirements may be disconnected from the IT infrastructure by ITS.

19.27 ITS Related - Remote Access

- Remote access to BMS systems may only be achieved with the prior approval of ITS and using only approved methods of access.

- Approved methods of access are limited to SSL VPN with a specific vendor account, which can be obtained by Property Services raising a ticket on behalf of the vendor.

19.27.1 Direct Internet Access

- Direct access from the internet to BMS network hardware via modems and dongles not part of the RMIT ITS managed network is expressly prohibited.
- BMS automation level (ALN) hardware that provides hardware ports that enable such access to be achieved shall be physically disabled.
- BMS field level (FLN) I/O hardware that allows access across the field level network to other I/O controllers shall have access restricted to a single MS/TP network.
- BMS automation level (IP) hardware that allows access to other BMS automation and/or field level hardware on the network either via proprietary software or standard terminal style interfaces shall be disabled and protected until required for use. Only authorized BMS technicians shall have access to these hardware ports. RMIT ITS shall be advised of these access ports.

19.27.2 Tunnelling from External Locations

- Proprietary BMS configuration and service tunnelling software shall gain access only through the approved methods of access. (SSL VPN with vendor account)

19.27.3 RMIT Intranet Access

- Access to BMS hardware and servers shall be available from inside the RMIT firewalls. BMS vendors/installers shall provide all necessary information to RMIT ITS via the raising of a ticket. Such information shall include:
    - Software description
    - TCP/IP ports requirements
    - IP Address requirements

19.28 ITS Related - Audit Trail

An audit trail is required to track changes made by any users of the BMS system.

Audit trails on servers shall be configured to record the following information:

- Time and date of all items and activities collected.
- User log on/off time and date.
- Overrides and changes to values time and date.
- Activity regarding hardware database change, reloads, firmware upgrades etc. time and date.

19.29 ITS Related - Alarms and Alerts

- Alarms are to be generated by BMS systems field equipment and directed to the vendor's BMS server. Alarms are to be recorded within the server's database and re-directed to users' email and SMS accounts.

19.29.1 Alarm Routing

- The routing of the alarms to users shall be via the use of RMIT's email and SMS alarm handling systems.

19.29.2 Annunciation and Message Format

- Installers shall provide a common data output format that is directed to a common RMIT alarm handling and annunciation system for distribution to recipients via email and SMS.
- The formatting of the message shall be discussed with RMIT property services prior to deployment.

19.29.3 Alarm History Sharing

- Vendors shall provide a method of sharing all alarm events with a common database application that shall be part of the future E-BMS.

20.0 RMIT STEM College Laboratories

20.1 General

This chapter identifies prescriptive design requirements relevant to RMIT STEM College laboratories. Where design consultants cannot satisfy the design requirements described below within the design of a laboratory, endorsement from the RMIT Technical User Group and approval from the Design Compliance Group (via Property Services) is required.

This chapter takes precedence over other RMIT Design Standards for laboratory spaces and is also additive to any requirements identified within RMIT Design Standards that are not listed here.

Refer to the RMIT STEM Laboratory Design Guideline document for discussion prompts regarding design considerations relevant to all RMIT laboratories. The RMIT laboratory design guideline document seeks to identify generic design requirements/aspects that may need to be addressed by the laboratory design such that discussion can occur between the design consultant and laboratory stakeholders and end users to address design requirements/aspects.

20.2 Planning and Design

- Teaching laboratories shall be provided with secure lockers outside of laboratory spaces.
- All equipment can be removed from the space without damage to or modification of the laboratory.
- Ceiling mounted equipment/utilities/joinery/etc. within laboratories shall be located above nominal 2.05 meters above finished floor level.
- Where blinds are used within physical containment laboratories, they shall be suitable (i.e., cleanable). Where blind cleanability is an issue, alternatives such as films applied to windows or blind within jockey sash shall be used.
- Fridge and freezers shall not be positioned at the end of benches.

20.3 Audio Visual

- Laboratory AV equipment shall be provided with signage that indicates the purpose of the item in a clear and distinct manner.

20.4 Electronic Security

- Electronic access control shall be provided at laboratory entry/exit points to restrict access to authorized personnel.

20.5 Acoustics

- Consultants to ensure laboratory internal noise level criteria (Leq, dB(A)) acoustic requirements to meet AS2107 or the following requirements, whichever is higher:

Laboratory Space Type / Equipment	Laboratory Internal Noise Level Criteria (Leq, dB(A))
Fume Cupboard without scrubber	40
Fume Cupboard with scrubber	45
Teaching Laboratory	40
Working/ Research Laboratory	45

- Labs require low velocity air distribution system with in-duct attenuation (attenuators and/or internally lined ductwork). Internal acoustic lining to be glass wool insulation with a minimum density of 32kg/m^3, faced with perforated foil facing and start as close as possible to the noise emitting equipment. All flexible ductworks shall be R1.0 thermally insulated, with a minimum duct length of 1000mm.
- Velocities in ductwork shall be limited to:

HVAC duct	Max. Velocity [m/s]
Main supply ducts	6.5
Main return ducts	5.5
Branch supply ducts	5.0
Branch return ducts	4.0
Run out	3.0

- Consultant shall select low noise units only and locate equipment away from most sensitive receiver.
- In-ceiling plant and equipment require either external acoustic wrapping or to be enclosed within a plasterboard enclosure complete with 50mm thick acoustic insulation.
- In-ceiling plant and equipment shall be support on steel springs and/or neoprene/rubber pads.
- All hydraulic piping (also including vent pipes) must be isolated at each support point.
- All stormwater and waste pipes located in ceiling voids above occupied areas shall be acoustically lagged. “Acoustic” pipe systems perform significantly worse at higher frequencies compared to lagged PVC/HDPE pipes. Such pipes will still require acoustic lagging if they occur within ceiling voids.
- When duct or pipework penetrates the wall, the duct or pipe should be sealed with polyurethane sealant on both sides of the wall partition with a minimum rated flexibility of ±25%.
- Cable trays penetrating wall, ceiling or floors the cable tray shall be filled with fiberglass blanket and heavy bodies mastic sealant on both sides.

20.6 Interiors

- Combined laboratory safety shower and eyewash shall be in an alcove.
- Where mobile benches, drawers and cupboards are provided they shall be modular.
- Laboratory benches to Teaching Laboratories to have lockable castors
- Laboratory benches to research Laboratories to have adjustable feet
- Where mobile benches, drawers and cupboards are provided they shall be provided with lockable castors.
- Benches shall be provided with a nominated weight limit legibly and permanently indicated on the bench.
- Weigh benches and benches accommodating other temperature sensitive equipment shall be located away from radiant heat sources such as windows.
- All laboratories shall satisfy AS/NZS 2243.3 PC2 microbiological laboratory requirements with respect to laboratory finishes to provide future flexibility.
- Laboratory seats and stools shall be provided with slides or weight activated friction castors.
- All laboratory benches shall be provided with sufficiently rounded corners to ensure clothing cannot be caught or personnel injured by protruding bench corners.
- Laboratory bench heights shall be 920 mm above finished floor level to permit under bench storage including chemical storage cabinets for dangerous goods.
- Laboratories shall be provided with a ‘safety station’ where first aid kits, spill kits and safety information (first aider and warden lists, etc.) are located.
- PPE (lab coats/gowns) storage hooks shall be provided within laboratories adjacent to the laboratory entry/egress point.

- Spacing of PPE storage hooks within the laboratory shall prevent contamination of any lab coat/gown by an adjacent lab coat/gown.
- PPE storage hooks within the laboratory shall not obscure or obstruct access to items located at the laboratory entry/egress point including but not limited to light switches, emergency stop buttons, door exit buttons, etc.
- Sufficient space shall be provided at the laboratory entry/exit point for the fitting of PPE required to be worn within the laboratory.
- The largest item required to washed in laboratory wet/wash-up areas is to be identified during the design phase and the depths/dimensions of provided wash up sinks shall ensure that the largest identified item can be adequately washed.
- Doors to occupied spaces within laboratories shall be fully glazed apart from storage facility doors, laboratory secure entry/egress points and doors to rooms with a lighting control requirement e.g., dark rooms, animal rooms, etc.

20.7 Finishes

- Laboratory internal finishes shall be compatible with RMIT nominated cleaning chemicals and routine cleaning processes such that finishes are not negatively impacted (corroded, discoloured, warped, delaminated, bubbled, etc.) by laboratory cleaning activities.
- Combined safety shower/eyewash stations within laboratories shall be provided with different coloured finishes for ease of identification.
- All laboratory seat and stool coverings shall be chemically resistant to the RMIT nominated chemicals used in the laboratory in which they are located. They shall be able to be wiped down with a nominated agent to decontaminate the surface in the event of a biological contamination.
- All laboratories shall satisfy AS/NZS 2243.3 PC2 microbiological laboratory requirements with respect to laboratory finishes to provide future flexibility.
- All stainless-steel fixtures and fittings exposed within laboratories shall be constructed of materials of at least Grade 304 stainless steel.
- Lighter colours shall be used for laboratory internal finishes for easier cleaning.
- Use of engineered stone for benchtops is prohibited. Silica-free or material with less than 30% Silica to be used that is fit for intended use (compact laminate/Trespa/grey granite for balance tables or equivalent).

20.8 HVAC

- Laboratory fume cupboards shall be ducted type with exhaust discharge external to the building.
- All laboratory fume cupboards shall be provided with cold non-potable water supply and laboratory sink.
- Local exhaust systems and equipment exhausting to the environment with an airflow greater then 300L/s shall come with an energy recovery system.
- Laboratory fume cupboards shall include functionality of auto-closing sashes for all installations.
- AHU systems shall be recirculation type.
- Heating hot water systems and heat exchangers in AHU’s shall be designed for the use of low temperature heating hot water systems (i.e., heat pumps).
- Use demand-controlled ventilation (DCV) systems shall maintain optimized ventilation rates in the laboratory.
- Local exhaust systems (i.e., Nederman arms) shall be able to shut down locally when not in use.
- Multiple air conditioning systems servicing the same area shall not heat and cool at the same time.
- ‘Once through' open loop water systems shall not be used. Water reuse systems (e.g., condensate collection, closed cooling loops instead of potable water cooling) shall be provided.

20.9 Laboratory Gases and Laboratory Vacuum

- Laboratory gas emergency stop buttons shall be provided with adequate signage to indicate function.
- Laboratory gas emergency stop buttons shall be protected with a cover to prevent accidental/unintentional activation while located without obstruction and in clear sight.
- Rational points of isolation within laboratory gas and laboratory vacuum reticulation systems shall be provided to facilitate pressure and leakage testing of piping reticulation systems.
- Gas alarm panels associated with laboratory gas detection shall be located at the entry/egress point to the laboratory without obstruction and in clear sight.
- Gas alarm panels associated with laboratory gas detection shall be Noventis brand or approved equivalent.
- Any gas alarms shall alarm to Security via EAC (safety critical) and to BMS (operational). Gas detectors should be accompanied by a strobe light and audible alarm positioned just outside the room when activated.

20.10 Hydraulics

- Hands-free sensor taps shall be provided at all hand basins within laboratories. A basin shall be located near the exit doors and connected to a potable water supply.
- Only combined safety showers and eyewashes shall be provided within laboratories.
- Combined personnel safety showers and eyewashes shall be provided with a floor waste with connection to a pit for neutralization of chemicals potentially present in water from safety shower and eyewash.
- Chemical neutralization process and associated infrastructure shall be provided for collected wastewater from combined personnel safety showers and eyewashes based on the nominated chemicals used for laboratory operations/activities.
- Combined laboratory safety shower and eyewash activation shall alarm to Security via EAC (safety critical) and to optional BMS (operational).

20.11 Lighting

- Occupancy (motion) sensors to control laboratory lighting shall be provided sufficient “OFF” delay time (30 minutes) for the activities undertaken in the laboratory. RMIT to nominate “OFF” delay time specific to each laboratory.
- Minimum 400 lux laboratory lighting levels (as defined by AS/NZS 1680.2.4 Interior lighting – Industrial tasks and processes) in laboratories.

20.12 Electrical

- Laboratory electrical emergency stop buttons shall be provided with adequate signage to indicate function near laboratory exit doors.
- Laboratory electrical emergency stop buttons shall be protected to prevent accidental/unintentional activation while located without obstruction and in clear sight.
- Refrigerators and freezers located in chemistry laboratories shall be Ex rated to address hazards associated with flammable liquid vapors and flammable gases.
- Fridges and freezers shall have controls that can be accessed by users, allowing on/off control as well as the modification of temperature setpoints.
- Timers shall be installed on general equipment that has no operational requirement to remain consistently on.
- In addition to the minimum energy star ratings for general equipment noted in general design standards under 14.10 freezers shall be at least 4.5 Star.

20.13 Communications

- Laboratories requiring emergency protocols shall be provided with a telephone system that does not rely on Post Implementation Review.

20.14 Key Standards

- AS/NZS 2982 for laboratory design and construction
- AS 4775 for emergency shower and eyewash stations
- AS/NZS 2252.4 for siting of BSC Class II
- AS/NZS 2243.3 for laboratory microbiological safety and containment
- AS/NZS 2243.8 for design and siting of fume cupboards
- AS/NZS 2243.10 for storage of chemicals in laboratories

20.15 References

- RMIT STEM College Laboratory Guidelines

21.0 Index

2.0 Introduction

- RMIT Property Services Design Standards web page

  https://www.rmit.edu.au/about/our-locations-and-facilities/facilities/safety-security/building-and-safety-information

2.1 Context

- Section Three – Universal Requirements
- Section Four – Planning and Design

3.1 Inclusion, Diversity, Equity and Access

- Inclusion, Diversity, Equity and Access (IDEA) Framework

  https://www.rmit.edu.au/about/our-values/diversity-and-inclusion

3.3 Disability and Discrimination

- Inclusion, Diversity, Equity and Access (IDEA) Framework

  https://www.rmit.edu.au/about/our-values/diversity-and-inclusion
- Section Five - Space Requirements
- RMIT Furniture Standards

  https://www.rmit.edu.au/about/our-locations-and-facilities/facilities/safety-security/building-and-safety-information

3.4 Sustainability

- RMIT Carbon Management Plan

  https://www.rmit.edu.au/about/our-values/sustainability/carbon-and-climate
- Sustainability Homepage

  https://www.rmit.edu.au/about/our-values/sustainability
- RMIT's Sustainability Plans

  https://www.rmit.edu.au/about/our-values/sustainability/governance

3.5 Occupational Health and Safety

- Crime Prevention Through Environmental Design (CPTED)

  https://www.police.vic.gov.au/business-and-commercial#crime-prevention-through-environmental-design
- WorkSafe Registration Requirement on Plant & Equipment

  https://www.worksafe.vic.gov.au/plant-and-equipment-design-registration-or-alteration

3.6 Safety In Design (SiD)

- WorkSafe – Safe Design

  https://www.worksafe.vic.gov.au/safe-design

4.1 Town Planning

- RMIT Website

  https://www.rmit.edu.au/
- Melbourne – Melbourne Planning Scheme

  http://planningschemes.dpcd.vic.gov.au/schemes/melbourne
- Bundoora - Whittlesea Planning Scheme

http://planning-schemes.delwp.vic.gov.au/schemes/whittlesea

- Brunswick - Merri-bek Planning Scheme

  http://planning-schemes.delwp.vic.gov.au/schemes/moreland

- Point Cook - Wyndham Planning Scheme

  http://planning-schemes.delwp.vic.gov.au/schemes/wyndham

4.4 Art Works

- RMIT Gallery

  https://rmitgallery.com/

4.5 Heritage and Legacy

- Aboriginal Heritage Act 2006 (Vic)

  https://www.legislation.vic.gov.au/in-force/acts/aboriginal-heritage-act-2006

- Code on the Ethics of Co-existence in Conserving Significant Places

  http://australia.icomos.org/wp-content/uploads/Code-on-the-Ethics-of-Co-existence.pdf

- Victorian Heritage Act 2017

  https://www.legislation.vic.gov.au/in-force/acts/heritage-act-2017

- Burra Charter 2013

  http://australia.icomos.org/wp-content/uploads/The-Burra-Charter-2013-Adopted-31.10.2013.pdf

4.6.3 Secure Bicycle Parking

- Section Five – Space Requirement; 5.16 Bicycle Hub Facilities

4.7 Wind

- RMIT Thermal Comfort Guidelines

  RMIT Thermal Comfort Guidelines – available upon request from Property Services Group

5.0 Space Requirements

- RMIT Furniture Standards

  https://www.rmit.edu.au/about/our-locations-and-facilities/facilities/safety-security/building-and-safety-information

5.3 Teaching Spaces

- Tertiary Education Facilities Management Association (TEFMA)

  https://www.tefma.com/

- RMIT Furniture Standards

  https://www.rmit.edu.au/about/our-locations-and-facilities/facilities/safety-security/building-and-safety-information

5.4.3 Furniture

- RMIT Furniture Standards

  https://www.rmit.edu.au/about/our-locations-and-facilities/facilities/safety-security/building-and-safety-information

5.4.4 Seating

- RMIT Furniture Standards

  https://www.rmit.edu.au/about/our-locations-and-facilities/facilities/safety-security/building-and-safety-information

5.5.2 Student Study Areas/Portals

- RMIT Furniture Standards

  https://www.rmit.edu.au/about/our-locations-and-facilities/facilities/safety-security/building-and-safety-information

5.5.4 Specialist Spaces

- Section Three – Universal Requirements; 3.9 Hazardous Materials
- Australian Health Facility Guidelines

  https://www.healthfacilityguidelines.com.au/
- Office of the Gene Technology Regulator

  http://www.ogtr.gov.au/
- Department of Agriculture, Fisheries and Forestry

  http://www.agriculture.gov.au/biosecurity

5.5.5 Teaching Laboratories – Dry

- Section 20 – RMIT STEM College Laboratories

5.5.6 Teaching Laboratories – Wet

- Section 20 – RMIT STEM College Laboratories

5.6 Research Laboratories

- Section 20 – RMIT STEM College Laboratories

5.7 Staff Accommodation

- RMIT Space Allocation, available through Property Services as PMP
- RMIT Furniture Standards

  https://www.rmit.edu.au/about/our-locations-and-facilities/facilities/safety-security/building-and-safety-information

5.11.2 All Gender toilets

- RMIT Signage Standards available through Property Services as PMP
- Section Eight – Physical Security; 8.3 Security Controls: Closed Circuit Television

5.14 Parenting Rooms

- Australian Breastfeeding Association

  https://www.breastfeeding.asn.au/workplace

5.22.3 Bin Storage Area

- RMIT Circular Economy Plan- Waste Management Design Specifications

  https://www.rmit.edu.au/about/our-values/sustainability/circular-economy

6.0 Information Technology

- Separately maintained by RMIT ITS
- https://www.rmit.edu.au/about/our-locations-and-facilities/facilities/safety-security/building-and-safety-information

7.0 Audio Visual

- Separately maintained by RMIT ITS
- https://www.rmit.edu.au/about/our-locations-and-facilities/facilities/safety-security/building-and-safety-information

11.2.1 Flexible Asphalt Pavements

- Austroads publication 'Pavement Design: A Guide to the Structural Design of Road Pavements:

https://austroads.com.au/publications

11.2.2 Rigid (Concrete Pavements)

- Cement and Concrete Association of Australia, 1997, "Industrial Pavements - Guidelines for Design, Construction and Specification:

  https://www.ccaa.com.au/CCAA/Public_Content/PUBLICATIONS/Technical_Publications/Guides/Guide_to_industrial_floors_and_pavements.aspx?WebsiteKey=4998d6ce-2791-4962-b1e2-6b717f54a8d3

12.5.2 Lightning Protection

- Victorian Cladding Taskforce

  https://www.planning.vic.gov.au/__data/assets/pdf_file/0016/90412/Victorian-Cladding-Taskforce-Interim-Report-November-2017.pdf

12.8 Insulation

- Australian Building Codes Board Climatic Region

  https://www.abcb.gov.au/resources/climate-zone-map

13.0 Interiors

- RMIT Furniture Standards

  https://www.rmit.edu.au/about/our-locations-and-facilities/facilities/safety-security/building-and-safety-information

13.7 Furniture and Joinery

- RMIT Furniture Standards

  https://www.rmit.edu.au/about/our-locations-and-facilities/facilities/safety-security/building-and-safety-information

14.1 Finishes – General

- Global GreenTag Certification

  https://www.globalgreentag.com/

- Good Environmental Choice Australia (GECA)

  https://geca.eco/product-finder/

- Australian Furnishing Research and Development Institute (AFRDI)

  http://www.furntech.org.au/

- Carpet Institute of Australia – Environmental Certification Scheme

  https://www.carpetinstitute.com.au/environmental/

- Declare

  https://living-future.org.au/declare/

- Environmental Product Declaration

  https://epd-australasia.com/

14.4.1 Engineered Timber Products

- Global GreenTag Certification

  https://www.globalgreentag.com/

- Good Environmental Choice Australia (GECA)

  https://geca.eco/product-finder/

- Declare

https://living-future.org.au/declare/

- Environmental Product Declaration
  https://epd-australasia.com/

14.6 Floor Surfaces

VOC Emissions Table:

- Section Twelve – Enclosure; 12.10 Adhesives, Sealants and Fasteners

14.7.1 Carpet Tiles

Carpet to be certified under a recognised Product Certification Scheme such as:

- Carpet Institute of Australia Limited - Environmental Certification Scheme
  https://www.carpetinstitute.com.au/environmental/
- Global GreenTag
  https://www.globalgreentag.com/
- Australian Furnishing Research and Development Institute – Green Tick
  https://www.furntech.org.au/afrdi-green-tick/
- Good Environmental Choice Australia (GECA)
  http://www.geca.eco/
- The Institute for Market Transformation to Sustainability – Sustainable Materials Rating Technology
  http://mts.sustainableproducts.com/index.htm

VOC Emissions Table:

- Section Twelve – Enclosure; 12.10 Adhesives, Sealants and Fasteners

14.8 Painting

VOC Emissions Table:

- Section Twelve – Enclosure; 12.10 Adhesives, Sealants and Fasteners

14.8.3 Timber Doors and Trim

VOC Emissions Table:

- Section Twelve – Enclosure; 12.10 Adhesives, Sealants and Fasteners

15.6 Control

- Section Nineteen – Building Management System

15.6.1 Building Management Systems

Section Nineteen – Building Management System; 19.9 BMS Based Metering Systems

16.5 Fixtures and Tapware

- Section Thirteen – Interiors; 13.5.1 Sanitary Fittings General

20.15 References

- RMIT STEM Laboratory Design Guideline
  https://www.rmit.edu.au/about/our-locations-and-facilities/facilities/safety-security/building-and-safety-information

22.0 Version Control

Version	Date	Responsibility	Summary of changes
1.0	25/01/2019	Director, CW	Initial Release
2.0	28/10/2019	Director, CW	Consultant Review & Update
2.1	2/12/2019	Quality Admin Director, CW	1. Inserted Version Control Table 2. Compactus - Please delete clauses 5.19 and 12.1.1 3. Ceiling & Wall mounted panels: new requirement " All ceiling and wall mounted panels must be mechanically fixed".
2.2	01/03/2021	Senior Manager, Campus Planning	4. Annual revision including: • Clause 3.4 Sustainability updated • Clause 3.4.1 Certification updated • Clause 3.4.2 Carbon Neutral 2030 introduced • Clause 3.6 Safety in Design updated • Clause 3.9 Hazardous Materials updated • Clause 4.6.3 Secure Bicycle Parking introduced • Clause 4.6.4 External Bicycle Racks introduced • Clause 5.15 Entrance / Reception Areas • Clause 5.17.1 Kitchen and Tea Points updated • Clause 5.22 Management Areas introduced • Clause 5.22.1 Waste Generation introduced • Clause 5.22.2 Standard Bin Specification introduced • Clause 5.22.3 Bin Storage Area introduced • Clause 5.23 Loading Docks amended • Clause 5.23.1 Compactors introduced • Clause 5.24 Bicycle Hub Facilities introduced • Clause 10.0 Fire Protection updated • Clause 12.1.12 Ceiling & Wall Mounted Panels updated • Clause 12.1.13 Portland Cement Content introduced • Clause 13.2.3 Balustrades and Handrails updated • Clause 13.13 Air Tightness introduced • Clause 14.3 Ceilings updated • Clause 14.6.5 Taps and Mixers updated • Clause 14.6.8 Drinking Fountains updated • Clause 15.1 General (Finishes) updated • Clause 15.3 Timber updated • Clause 15.3.1 Engineering Timber Products introduced • Clause 16.9 Energy Efficiency introduced • Clause 16.10 Carbon Neutral 2030 introduced • Clause 17.2.3 Gas updated

			• Clause 17.4.4 Hot Water Systems updated • Clause 18.0 Electrical updated • Index 3.6 Safety in Design updated • Index 3.10 Hazardous Materials updated
3.0	15/11/2022	Associate Director, Capital Works	• Clause 1.1 RMIT Gateway Framework • Clause 1.3 Scope • Clause 1.4 Document Control • Clause 2.0 Introduction • Clause 2.1 Context • Clause 2.3 Primary Objectives • Clause 2.3 Indigenous Reconciliation • Clause 3.4 Sustainability • Clause 3.4.1 Certification • Clause 3.4.2 Carbon Neutral 2025 • Clause 3.5 Occupational Health and Safety • Clause 4.1 Town Planning • Clause 5.5.5 Teaching Laboratories – Dry • Clause 5.5.6 Teaching Laboratories – Wet • Clause 5.6.1 Research Laboratories – Dry • Clause 5.6.2 Research Laboratories – Wet • Clause 5.11.2 All Gender toilets • Clause 5.22.2 Standard Bin Specification • Clause 8.0 Physical Security • Clause 9.8 Other Fire System Equipment • Clause 12.4.4 Roofing – skylights • Clause 13.5.5 Taps and Mixers • Clause 13.5.6 Hand Dryers • Clause 13.5.8 Drinking fountains • Clause 13.7 Furniture and Joinery • Multiple Clauses Furniture Standards • Clause 13.9 Access Hatches and Wall hangings • Multiple Clauses Carbon Neutral 2025 • Clause 16.5.1 Safety showers / Eye Wash • Clause 17.8.1 Power Generation - Engine Driven • Clause 18 Vertical Transport • Clause 18.4 Lift Motor Room • Clause 19.26.4 Physical Security • Clause 20 RMIT STEM College Laboratories
3.1	23/11/2022	Governance and Compliance Officer	• Clause 5.3 Teaching and Learning Spaces
3.2	01/12/2022	Senior Manager, Sustainability	• Clause 5.4.3 Lecture Theatres • Clause 5.11 Toilet and Shower Facilities • Clause 13.5.6 Hand Dryers • Clause 13.7 Furniture and Joinery
3.3	12/05/2023	DSGG	• Clause 5.17.1 Kitchen and Tea Points – General • Clause 13.4.1 Doors – Operation • Clause 14.2 Finishes – Prohibited Materials • Clause 20.7 RMIT STEM College Laboratories – Finishes

4.0	04/04/2024	DSGG	2023/2024 Revision including updates to: • Clause 2.0 Introduction • Clause 3.0 Universal Requirements • Clause 4.6.3 Secure Bicycle Parking • Clause 5.11 Toilet and Shower Facilities • Clause 8.2 Security Controls: Electronic Systems Overview • Clause 9.1 Automatic Fire Sprinkler Systems • Clause 9.2 Automatic Fire Detection Systems • Clause 9.6 Gaseous Flooding Systems • Clause 9.7 Fire Hydrants and Fire Hose Reels (FHRs) • Clause 9.11 Preferred Manufacturers • Clause 11.1.4 Design for Future Flexibility • Clause 11.1.11 Stormwater Drainage • Clause 12.4 Roofing – General • Clause 12.7 Windows • Clause 12.9 Air Tightness • Clause 14.12 Window Furnishings • Clause 15.1.2 Natural Ventilation • Clause 15.2 Air Handling Components • Clause 15.4 Piping • Clause 15.5 Refrigeration • Clause 15.6.2 Energy Sub Metering • Clause 16.2.2 Water Supply • Clause 16.2.3 Gas • Clause 16.3.10 Gas Reticulation • Clause 16.4.4 Hot Water Systems • Clause 16.5.1 Safety Showers/Eye Wash • Clause 17.2 Standby Power Supply • Clause 17.6 Switch rooms • Clause 17.8.1 Power Generation – Engine Driven • Clause 17.8.3 Uninterruptible Power Supply • Clause 17.9.1 Main Switchboards • Clause 17.9.7 Lighting Controls • Clause 17.10 Electro Magnetic Field (EMF) Mitigation • Clause 18.7 Lifts, Escalator and Fault/Status Management System • Clause 19.14.2 Time Schedules and Occupancy Control • Clause 20.6 Interiors • Clause 20.10 Hydraulics