RMIT STEM College Laboratories
Guideline

General

Below outlines general design considerations/ guidelines relevant to all RMIT STEM College laboratories. These are identified as prompts so that discussions can be had between laboratory design consultants and laboratory stakeholders and end users regarding laboratory design requirements.

Refer to the RMIT general laboratory design standard and STEM Laboratories chapter for specific and prescriptive laboratory design requirements that design consultants are to ensure are satisfied by their designs for laboratory spaces.

Planning and Design

- The laboratory architectural designer is to design the layout to suit flexible laboratory use and ease of future alterations where possible. The architectural designer is to engage the stakeholders regarding the benefits and restrictions for the flexible design.
- The laboratory engineering designer is to design services, including the reticulation of gas and water services, to suit flexible laboratory use and ease of future alterations where possible. The designers are to engage the stakeholders regarding the benefits and restrictions for the flexible design.
- Dangerous goods consultant to be engaged if dangerous goods storage and handling is part of the project as an outcome of stakeholder briefings.
- Laboratory designers to ascertain from stakeholders the requirement for dangerous good storage and use.
- Stakeholders to determine dangerous goods types/classes and quantities for assessment by dangerous goods consultant.
- Consultants to ensure stakeholders and end users (researchers and academics) are consulted regarding storage requirements for current and potential future allowance. All types of required storage are to be considered including waste, consumables, PPE, equipment, dangerous goods, etc. RMIT to nominate a general requirement for the project to maximize storage of all applicable types where possible within laboratories.
- Consultants to ensure requirements for waste storage and handling are to be identified and discussed during the design phase, for example, the requirement for collecting flammable/toxic waste chemicals within a fume cupboard prior to disposal or secure storage of PC2 waste for collection by registered waste contractor or storage of waste chemicals within a dangerous goods store or separation and collection of recyclable materials.
- Consultants to ensure requirements for compliance to AS/NZS 2243.3 and AS/NZS 2982 cleanability requirements to be identified and discussed during the design phase.

- Consultants is to ensure the largest item to be moved into/out of laboratories is to be identified and discussed during the design phase and strategies/approaches to be incorporated into the design to accommodate this identification of required clearances. This will include provision of appropriately sized door openings (e.g., cat & kitten or double doors), removable wall access panels, etc. There is the potential for existing site infrastructure such as goods lift dimensions in multi-story buildings to limit the largest item able to be admitted to the laboratory.
- Consultants to ensure methods of installation and removal of specialist equipment within laboratories to be considered to limit the requirement for cranage for equipment installation/removal.
- Consultants to ensure requirements for regular deliveries to laboratories to be discussed during the design phase to address manual handling issues associated with deliveries i.e., hold-opens at doors, uneven surfaces/provision of ramps, adequate door/corridor widths, paths of travel, etc.
- Consultants to ensure requirements for laboratory wet/wash-up areas to be identified and discussed during the design phase e.g., provision of splash backs at sinks, provision of drying racks, depths/dimensions of wash up sinks, required tapware, required water types (hot/cold non-potable water, Type II Lab Water, RO Water, etc.)
- Consultants to ensure requirements for equipment to be permanently located within fume cupboards to address exhaust ventilation requirements to be identified and discussed during the design phase.
- Consultants to ensure processes for the disposal of laboratory chemicals are to be identified and discussed during the design phase, current best practice of collecting waste chemicals for off-site disposal by a waste contractor is to be the default option. Consideration within the design is required for storage of collected waste chemicals prior to collection.
- Consultants to ensure laboratory occupancy requirements (hours of operation, out of hours use, etc.) to be discussed during the design phase to enable identification of strategies to address this, e.g., out of hours lighting/HVAC/utility mode, lighting motion sensors, etc.
- RMIT to nominate a preference for new laboratories to be co-located with existing laboratories or office spaces that relate to the laboratory function – this is to be identified and discussed during the design phase of laboratory projects.
- Consultants to ensure requirements for laboratory storage of items used to transport equipment/materials within and outside laboratories (e.g., trolleys, carts, etc.) are to be identified and discussed during the design phase with adequate space allowed for circulation.
- Consultants to ensure requirements for laboratory end user capability to control laboratory freezers (turn on/off, alter temperature set point, etc.) to be identified and discussed during design phase to enable incorporation into laboratory freezer specifications.
- Consultants to ensure appropriate risk management and safety in design assessments are required to be undertaken as part of the project design phase and are to consider the level of risk associated with the activities undertaken in the laboratory. Requirement for HAZOP study to be identified during initial safety in design review and a specialist consultant to be engaged to facilitate the HAZOP study.

- Consultants to ensure requirements for laboratory systems and equipment to undergo risk assessment outside of a project safety in design assessment/review are to be identified and discussed with the stakeholders during the design phase.
- Consultants to ensure requirements for laboratory preparation areas and office areas (if and where required) for laboratory support staff are to be identified and discussed during the design phase.
- Consultants to ensure that consideration is to be given to laboratory equipment achieving minimum energy efficiency star ratings where this does not compromise the intended use/performance within the laboratory.
- Consultants to ensure requirements for laboratory equipment to be fitted with timers to ensure equipment shuts down after run-on timer period has elapsed are to be identified and discussed during the design phase as a potential energy saving strategy.
- Consultant to ensure that the largest item required to be moved into/out of a laboratory is to be identified during the design phase (RMIT to advise).
- Architectural design should include 3D rendered images of the laboratory space as part of design stage submissions for stakeholder approval.
- Consultants should prepare, maintain and distribute to RMIT stakeholders a design issues register during the laboratory project to capture all suggestions, questions, issues and answers/resolutions arising during the design phase.
- Tender documents should capture any specialized equipment maintenance during the defect liability period by the original manufacturer/vendor following installation, completion of the project and handover of the laboratory for operation.
- Consultants to ensure the amount and type of solid and contaminated waste is identified and discussed with the Stakeholders and RMIT during the design phase and documented in an RMIT approved waste management plan with sufficient allowance for the storage within the laboratory.
- The Design Team should make use of relevant industry resources for sustainable lab design, including the Labs 21 best practice guides.

Audio Visual

- Consultant to ensure audio visual laboratory requirements including collaborative audio-visual needs and capabilities are to be identified and discussed with stakeholders and RMIT ITS during the design phase.
- Consultants to ensure requirements for AV are considered, discussed with RMIT ITS, and incorporated into design documentation as part of each phase of the project.
- Laboratory AV equipment should only be installed where there is a clear use case, or a stakeholder expresses a specific request.

Electronic Security

- Consultant to ensure laboratory electronic access control requirements i.e., identification of who is permitted laboratory access, when and how is to be discussed during the design phase.
- Where applicable, the consultant is to identify and discuss needs for laboratory equipment to be provided with electronic access control. As identified above, the identification of who is permitted access to such equipment, when and how is to be discussed during the design phase.

Acoustics

- Consultant to identify and discuss with the stakeholders and RMIT, for laboratory specific equipment that does not meet the Laboratory internal noise level criteria, the appropriate engineering solution and/ or additional PPE requirements during the design phase.

Interiors

- Joinery within the laboratory is to be mobile where possible.
- Consultants to ensure reagent shelving, or equivalent, is to be used, where possible, for services reticulation from above the ceiling as well as for overhead shelving.
- Consultants to ensure requirements for visibility/visual monitoring of laboratory occupants to be identified and discussed during the design phase and can be addressed through the provision of windows into the laboratory, CCTV or other measures.
- Consultant to ensure quantity and locations of drying areas and racks required at wash up areas to be discussed during design phase.
- Consultants to ensure requirement for vibration isolation of benches to be identified and discussed during design phase.
- Consultants to ensure requirement to avoid direct sunlight into laboratories or the need for dark spaces within laboratories (e.g., for microscopy) to be identified and discussed during design phase.
- Consultants to ensure laboratories with a regular requirement for movement of equipment/trolleys/furniture/etc. and hence the need for impact protection on walls, columns, etc. are to be identified and discussed during the design phase.
- Consultants to ensure requirements associated with storage of equipment, consumables, PPE, waste, etc. are to be identified and discussed during the design phase. Physical containment laboratories have specific requirements in relation to storages of contaminated material (waste, equipment, used PPE, etc.) from laboratories.
- Consultants to ensure requirements for laboratory freezers/refrigerators to be identified and discussed during the design phase such that these equipment items can be located appropriately within the laboratory.
- Consultants to ensure requirements for laboratory freezers/refrigerators to be in a dedicated room are to be identified and discussed during the design phase.
- Consultants to ensure that paper towel dispensers, relevant PPE holders (safety glasses, glove box holders etc.) and associated waste bins are provided at all laboratory spaces.

Finishes

- Consultants to ensure cleaning processes and cleaning chemical used within laboratories are to be identified and discussed during the design phase so that laboratory internal finishes can be easily cleaned and are compatible with the cleaning chemicals used.
- Consultant to ensure requirements for colored internal finishes within laboratories to be identified and discussed during the design phase.

- Consultants to ensure all stainless-steel fixtures and fittings exposed within the laboratory are constructed of a suitable material for the science and chemicals used within the laboratory
- Consultant to ensure floor has slip resistant materials, particularly in wet areas.

HVAC

- Consultant to ensure laboratory air temperature and relative humidity requirements (including tolerances) are to be identified and discussed during the design phase.
- Consultant to ensure laboratories specific room air quality requirements (room air change rates, air particulate limits, etc.) are to be identified and discussed during the design phase.
- Consultants to ensure requirement for/location of /configuration of localized laboratory exhausts such as Nederman arms are to be identified and discussed during design phase to address ergonomic/OHS/access issues and ensure laboratory equipment does not need to be located within a fume cupboard for operation.
- Consultants to ensure location of equipment within the laboratory and utilities associated with the equipment to be identified and discussed during the design phase.
- Consultant to ensure requirements for laboratory equipment that will reject heat into the room environment are to be identified and discussed during the design phase such that this heat load can be addressed in the design of the HVAC system.
- Consultants to ensure requirements for RMIT network capability and software associated with new laboratory equipment to be purchased are to be identified and discussed with RMIT ITS during the design phase and resolved prior to equipment purchase.
- Fume cupboards should be maintained and serviced by the original manufacturer/vendor during the defect liability period. After the defect liability period the maintenance responsibility shall be with RMIT.
- Consultant to reduce fume cupboard quantity and fume cupboard minimum airflow, where appropriate.
- Consultants to reduce system cooling capacity requirements by including suitable allowances for heat load diversity, and use of heat capture by local exhaust or heat rejection to cooling water systems.
- Consultant to consider more efficient psychrometric processes (e.g., use of a preconditioning AHU).
- Consultant to provide low velocity and pressure drop pipework / ductwork design.

Laboratory Gases and Laboratory Vacuum

- Consultant to ensure laboratory gas and vacuum connection types required at points of use to be discussed during design phase.
- Consultants to ensure location of equipment within the laboratory and utilities associated with the equipment to be identified and discussed during the design phase.
- Consultants to ensure the location of the laboratory gas cylinder store is to be discussed during the design phase with discussions of the positives and negatives associated with locating the gas cylinder store internally within the building or external to the building, dangerous goods requirements associated with internal and

external gas cylinder stores and issues associated with movement/delivery of gas cylinders to gas cylinder stores such as use of goods lifts for transporting gas cylinders in multistorey laboratories and access requirements for gas cylinder trolleys.

- Consultants to ensure specific accessibility requirements associated with gas outlets within laboratories to be identified and discussed during the design phase.
- Consultants to ensure requirement for laboratory gas and vacuum outlets to be identified and discussed during the design stage including requirements for future proofing for additional outlets such as upsizing plant and/or gas/vacuum reticulation piping and/or providing branches with capped valves (for future connection) above the laboratory ceiling.
- During design, determination must be made regarding the requirements for asphyxiating, toxic and flammable gases detection within laboratories. It is noted that laboratory gas detection is not an Australian Standard requirement and adoption or otherwise must be determined by risk assessment. If laboratory gas detection is required, consideration is required regarding the location of gas detectors such that they are unobstructed and located such that they will be effective in detecting gas leaks, the location of audible and visible beacons/sounders to alert laboratory occupants of gas detection and connection of gas detection to systems such as BMS and/or laboratory gas alarm panel for gas alarm monitoring must also be considered.
- Consultants to ensure requirements for RMIT network capability and software associated with new laboratory equipment to be purchased are to be identified and discussed during the design phase and resolved prior to equipment purchase.

Hydraulics

- Consultants to ensure location of equipment within the laboratory and utilities associated with the equipment to be identified and discussed during the design phase.
- Consultants to ensure requirements for laboratory wet/wash-up areas to be identified and discussed during the design phase e.g., required tapware, required water types (hot/cold non-potable water, Type I Lab Water, Type II Lab Water, RO Water, etc.)
- Consultants to ensure requirements for RMIT network capability and software associated with new laboratory equipment to be purchased are to be identified and discussed during the design phase and resolved prior to equipment purchase.
- Consultants to ensure requirements for specific wastewater treatment systems associated with laboratory liquid waste collection are to be identified and discussed during the design phase with reference to trade waste discharge agreements with the relevant water authority.

Lighting

- Consultants to ensure that laboratory lighting levels and modes to be discussed during design phase.

Electrical

- Consultants to ensure requirements for electrical outlets to be identified and discussed during the design stage including requirements for future proofing for additional 10A, 15A, 30A and 3 phase outlets such as upsizing distribution boards and cable trays to provide 30% spare capacity.
- Consultants to ensure requirement for emergency (generator) power and UPS power to be supplied to laboratory equipment items is to be identified and discussed during the design phase.

Communications

- Consultants to ensure requirements for IT infrastructure to meet current and future computer requirements are to be identified and discussed during the design phase.

- Wireless Access Points locations to be identified by RMIT ITS using heat mapping. Wireless Access Points shall be located in accordance with RMIT ITS advice.

Dangerous Goods

- Consultants to ensure requirements for dangerous goods storage are to be identified and discussed during the design phase. Identification of the intended stored dangerous goods quantities and types and how they are permitted to be stored – within laboratory cupboards on spill trays, with chemical storage cabinets or within a dedicated dangerous goods store are to be identified. Dangerous goods storage requirements can impact the HVAC (exhaust ventilation requirements), architectural layout (separation distances from dangerous goods storage to adjacent items), lighting and power (hazardous area zones and the requirement for Ex rated electrical items located within hazardous area zones), hydraulics (provision of combined safety showers and eye washes, hand basins, collection of fire water following activation of sprinklers/hydrants/hose reels), fire protection (requirements for hydrants/hose reels/portable extinguishers and detectors for heat/smoke/flammable vapors) and gas detectors (for flammable, toxic and asphyxiating gases/cryogenic liquids).

- Care is required in identification of what is and is not considered dangerous goods. Any chemical used within a laboratory environment is required to be provided with a Safety Data Sheet (SDS) and review of SDS will enable identification of whether a laboratory chemical is or is not dangerous goods. It is noted that a common misconception that compressed gas cylinders are not dangerous goods – all compressed gas cylinders even medical air are considered dangerous goods.

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
- AS/NZS 1680.2.4 Interior lighting – Industrial tasks and processes

Laboratory Types

While there are 27 different laboratories nominated by RMIT this can be simplified to four general categories – refer to below for the four different laboratory type categories.

The above Sections 8.2 to 8.13 describe general laboratory design considerations/prompts that may be applicable to any laboratory type.

Sections 8.14.1 to 8.14.4 below highlight for each laboratory category where the general laboratory design considerations/prompts are not applicable or where there are specific additional considerations/prompts not covered in Sections 8.2 to 8.13 above.

Laboratory Category 1

The following laboratory types nominated by RMIT have been grouped together within a single category due to their similarities:

- General Dry Laboratories
- Additive and Subtractive Manufacturing Laboratories
- Civil Engineering and Asphalt Laboratories
- Electrical and Electronic Engineering Laboratories
- Electron Microscopy Laboratories
- Furnace and Extreme Heat Laboratories
- Laser Laboratories
- Physics and Applied Physics Laboratories
- Radiation Laboratories

For the above laboratory types the provision of measures to address issues with trade waste discharge requirements should be considered and varies depending to laboratory type and activities.

Consultant to ensure that requirements for Radiation Laboratories to be provided with shielding of radiation source and radiation waste storage areas are identified and discussed during the design phase.

Consultant to ensure that interlock room doors for Laser Laboratories with open bench Class 3 lasers or above are provided and discussed during the design phase.

Consultant to ensure that requirements for Civil Engineering Laboratories to be provided with localised exhaust or other measures to address respiratory hazards associated with silica dusts are identified and discussed during design phase.

Consultant to ensure that requirements for Electron Microscopy Laboratories to be provided with radio frequency (RF) protection such as a Faraday Cage are identified and discussed during design phase.

Consultant to ensure that requirements for Civil Engineering and Asphalt Laboratories, Physics and Applied Physics Laboratories and Radiation Laboratories to handle flammable solvents are identified and discussed during the design phase with the provision of ducted fume cupboard within the laboratory being a requirement where flammable solvents are handled.

Consultant to ensure that requirements for laboratories sitting within Laboratory Category 1 to be provided with electrical body protected power outlets as a future proofing measure to make them suitable for future use as Health or Sports Science Laboratories are to be identified and discussed during the design phase.

Otherwise, the general laboratory design considerations/prompts captured above within Sections 8.2 to 8.13 are applicable to Laboratory Category 1.

Laboratory Category 2

The following laboratory types nominated by RMIT have been grouped together within a single category due to their similarities:

- General Wet Laboratories
- Bioengineering Laboratories
- Biosecurity Laboratories
- Biotechnology and Biology Laboratories
- Wet and Dry Chemistry Laboratories
- Clean Room Laboratories
- Composites Manufacturing Laboratories
- Environmental Science Laboratories
- Food Technology Laboratories
- Medical Enabling (animal Welfare) Laboratories
- Nanomaterials and Nanotechnology Laboratories
- Pathology and Anatomy Laboratories
- Physical Containment Level 1 (PC1) Laboratories
- Physical Containment Level 2 (PC2) Laboratories
- Process and Chemical Engineering Laboratories
- Analytical Instrumentation Laboratories

Otherwise, the general laboratory design considerations/prompts captured above within Sections 8.2 to 8.13 are applicable to Laboratory Category 2.

Laboratory Category 3

The following laboratory types nominated by RMIT have been grouped together within a single category due to their similarities:

- Automotive and Engineering Laboratories

Automotive and engineering laboratories where oils and other hydrocarbons are used may require a triple interceptor associated with liquid waste collection to capture oils present in trade waste – to be identified and discussed during the design phase.

Otherwise, the general laboratory design considerations/prompts captured above within Sections 8.2 to 8.13 are applicable to Laboratory Category 3.

Laboratory Category 4

The following laboratory types nominated by RMIT have been grouped together within a single category due to their similarities:

- Chemical Stores

It is noted that Chemical Stores are not laboratories by themselves but can be located within or outside (and adjacent to) laboratories.

With respect to adaptability and functionality for changing future research themes, chemical stores are designed to respond to what is intended to be stored at a given point in time with a view to minimising unnecessary storage of chemicals/dangerous goods and hence cannot be adaptable for future research themes.

Chemical stores do not contain laboratory gas outlets and as there is no consideration of accessibility of gas outlets required.

Chemical stores, if containing flammable liquids in sufficient quantities, are required to have exhaust ventilation systems that operate continuously and as such the ability to control ventilation systems and shut them down in unoccupied areas out of hours is not applicable in this instance.

Consultants to ensure requirement to capture fire water from chemical stores and dangerous goods storage is addressed.

Where flammable liquids and gases are to be stored consultants to ensure hazardous area zoning requirements are identified and addressed during the design phase and may include Ex rating of electrical items within chemical stores (e.g., room lighting) or locating electrical items outside chemical stores such as card readers, light switches, etc.

As indicated above, chemical stores are to be designed to minimise the quantity of chemicals/dangerous goods required to be stored and hence are not optimised for maximum storage.

Laboratory sinks should not be located with chemical stores and as such considerations regarding laboratory sink sizing are not applicable.

Laboratory gases are not reticulated to within chemical stores and as such considerations regarding which gases are supplied to the room and their location within the room are not applicable.

Considerations regarding the locating of refrigerators and freezers within a dedicated room is not applicable to chemical stores.

The requirement to consider current and future computing requirements are not applicable to a chemical store.

Requirements associated with AV screens and monitors are not applicable to chemical stores.

Software and network capability requirements associated with equipment are not applicable to chemical stores.

Requirements for secure bag storage outside of chemical stores is not relevant.

Requirements for hand basins to be provided with automatic sensor taps are not applicable to chemical stores.

As indicated above, chemical stores cannot be designed for future flexibility/changes in the dangerous goods stored and as such provision for future power outlets (15A, 30A and 3 phase power) are not applicable.

The provision of a landline phone within chemical stores for emergency/safety is not an applicable requirement.

Provision of run-on timers for equipment located within chemical stores is not applicable.