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- EME 0001 H Checklist for Consultant/Designers
- EME 0002 H Asset Registration Form
- EME 0003 H Non-Potable Tank Detail
- EME 0004 H Thrust Blocks
- EME 0005 H Laboratory Service Valve Compartment
- EME 0006 H Site Backflow
- EME 0007 H Bore Water Tap
- EME 0008 H Recessed Tundish
- EME 0009 H Laboratory Equipment Cooling
- EME 0010 H Laboratory Reverse Osmosis System
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- EME 0019 H Fire Sprinkler Block Plan
- EME 0020 H Fire Brigade Booster Arrangement
- EME 0021 H Valve Selection Table
- EME 0022 H P&ID Trade Waste Treatment

Schedule of Changes

As a guide only, attention is drawn to amendments that have been made in the following clauses since the last revision

Revision	Date	Details
1.0	March 2026	Creation of separate Lab Standards

E.1. HYDRAULIC AND FIRE SERVICES - LABORATORIES

E.1.1. CHECKLIST FOR HYDRAULIC CONSULTANT / DESIGNER

The checklist shall be completed by the design engineer to verify that the UNSW's specific and general requirements as set out in the UNSW DESIGN & CONSTRUCTION REQUIREMENTS manual have been incorporated into the developmental and final design documents.

By providing a signature or initial in the box, the designer declares that he/she has read and incorporated its intent into the hydraulic contract works. By this the designer will be deemed to have understood and complied with this part of the manual. Note: The whole of the manual shall be read, understood and complied with.

Refer to Diagram EME 0001 H Checklist for Hydraulic Consultant / Designer at the end of Section E.1.

The design engineer shall contribute to the relevant sections of the Sustainability Evaluation Matrix at every development stage and review as required by the UNSW's Estate Management (EM) Development Process procedures.

E.1.1.1. General

This document is to be read in conjunction with E. 1- Hydraulic and Fire Services Design Standard.

These technical requirements shall be adopted in the execution of all UNSW projects, unless specifically altered in writing by the UNSW Senior Manager Engineering Services.

Where requirements clash with each other, the more onerous of conditions shall apply.

UNSW Design and Construction Requirements document herein shall not be referred to or appended to any project documents (Except project briefs and design and construction contracts), but project-specific clauses shall be written into the project specification to ensure construction is carried out to meet those Requirements.

The design engineer shall work with the project team and UNSW's EM teams to identify potential performance levels for the project to meet a desired end state for an outstanding campus experience. The design engineer shall adopt an integrated design approach to ensure that alignment is achieved with the project team to meet these requirements.

Four reviews of designs are required at concept stage, 50%, 75% and 100% complete. At completion, the designer must supply a checklist as evidence that all items and requirements briefed by the UNSW Project Management have been met and that each one shall separately be signed off as incorporated into the design, unless otherwise instructed in writing. Upon completion of Documents, the Design Engineer is required to issue UNSW with a Design Certificate with statutory Codes before they are issued for tender purposes. The Consultant must also supply the completed Sustainability

Evaluation Matrix at the end of each design review and in line with UNSW's EM Development Process procedures.

E.1.1.2. Authorities and Standards

All hydraulic and fire services and associated supply and support infrastructure shall comply with the following codes and standards including amendments and referenced documents as a minimum. Where the requirements of this document exceed the below standards, then the requirements of this document shall take precedence.

FM Global requirements as per UNSW Insurer's requirements.

AS/NZS 2982	Laboratory Design and Construction
2243 SAFETY IN LABORATORY	
AS/NZS 2243.1	Part 1 Planning and Operational Aspects
AS/NZS 2243.2	Part 2 Chemical Aspects
AS/NZS 2243.3	Part 3 Microbiology Aspects and Containment Facilities
AS/NZS 2243.4	Part 4 Ionizing Radiations
AS/NZS 2243.5	Part 5 Non-Ionizing Radiations - Electromagnetic, sounds and ultrasounds
AS/NZS 2243.6	Part 6 Mechanical Aspects
AS/NZS 2243.7	Part 7 Electrical Aspects
AS/NZS 2243.8	Part 8 Fume Cupboards
AS/NZS 2243.9	Part 9 Recirculating Fume Cupboards
AS/NZS 2243.10	Part 10 Storage Chemicals
	CSIRO's Managing Hazardous Areas (HA) Technical Guide
2252 CONTROLLED ENVIRONMENTS	
AS 2252.1	Part 1 Biological Safety Cabinet Class I - Design
AS 2252.2	Part 2 Biological Safety Cabinet Class II - Design
AS 2252.3	Part 3 Biological Safety Cabinet Class III - Design
AS 2252.4	Part 4 Biological Safety Cabinets Class I & Class II - Installation and use
AS 2252.5	Part 5 Cytotoxic Drug Safety Cabinets
AS 2252.6	Part 6 Clean Workstations
AS 2252.7	Part 7 Pharmaceutical Isolators
AS 2507	The Storage and Handling of Agricultural and Veterinary Chemicals
AS/NZS 2566 Buried flexible pipelines	
AS/NZS 2566.1	Part 1: Structural Design
AS/NZS 2566.2	Part 2: Installation
AS 2567	Laminar Flow Cytotoxic Drug Safety Cabinets
AS 2676	Guide to the Installation, maintenance, testing and replacement of secondary batteries in buildings
AS 2714	Storage and handling of Organic Peroxides
AS 3780	Storage and handling of Corrosive Substances
AS 4775	Emergency Eyewash and Shower Equipment
AS 5601	Gas Installation
AS/NZS 1596	Storage and Handling of LPG gas
AS/NZS 2022	Anhydrous Ammonia
AS/NZS 3816	Management of Clinical Waste
AS/NZS 4586	Slip Resistance classifications of new pedestrian surface material
AS 4343	Pressure equipment - Hazard levels
AS 5065	Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications
AS/NZS 60079	Explosive Atmospheres
AS/NZS 60079.10	Part 10 - Classification of areas Explosive Gas Atmospheres
BIOSECURITY	

Gene Technology Act - 2000	Office of the Gene Technology Regulator Guidelines for Certification of Facilities/Containments Requirements
Gene Technology Regulations 2001	
Refer to Department of Agriculture, Fisheries and Forestry	Quarantine - Biological Containment Levels and Requirements
ANIMAL ETHICS	
NHMRC	National Code of Practice for the care and use of animals for Scientific purposes

E.1.1.3. Fit for Purpose

Whilst this document sets out the UNSW additional design and construction technical requirements to those normally contained in the codes and regulations, it is still the designers and the installing contractor's obligation to document and install systems, equipment and materials that are "fit for purpose" from both a WH&S and operational perspective.

Where a system, item of equipment or material selected or installed is not deemed "fit for purpose" by UNSW EM Engineering, it shall be replaced with a UNSW agreed alternative, at no cost to UNSW.

Any disputes in regard to the interpretation of this clause shall be referred to NSW Fair Trading and/or the UNSW Project Manager for a final determination.

Manufacturer's requirements must be adhered to in all instances, unless specifically approved otherwise in writing by UNSW EM Engineering.

E.1.1.4. Design Requirements

Refer also: E.1 Hydraulic and Fire Services Design Standard Section F - SPECIFIC AREA REQUIREMENTS

Prior to documentation of refurbishment works, and in conjunction with UNSW Project Manager, survey all proposed user groups for each building to determine requirement for services.

Organisation of feedback from the user group shall be recorded by UNSW EM with comments to be issued to the design team for incorporation.

E.1.1.5. Asset Registration List

In conjunction with the preparation of the Operating and Maintenance Manual, the Consultant shall list all plant and equipment either removed or installed as new on an attached schedule and include the completed list in the Manual.

Removed assets and newly installed assets shall be updated in the UNSW EM asset register for future maintenance. The contractor shall obtain asset tags (barcodes) from UNSW EM, install on the appropriate plant, fill out the information in the EM asset register template accordingly as per EM requirements and return to UNSW by the end of the project.

Such items could include:

- thermostatic mixing valve,

- gas shut off valve,
- water filter,
- pump sets, including control panel,
- trade waste pits, & or plant,
- safety shower,
- safety eye wash,
- sterilizers,
- dish washer (not equipment supplied by School),
- backflow prevention device,
- hot water unit,
- pH correction plant,
- pressure controls,
- hygiene station,
- water meter,
- gas meter,
- gas regulator,
- flow switch,
- gas safety shut off system,
- RO water treatment equipment,
- DI water treatment equipment,
- EDS plant equipment.

The list shall be identical in all respects with the Microsoft Excel spreadsheet. *Refer to Diagram EME 0002 H Asset Registration Form at the end of Section E.1.*

E.1.1.6. Future Provisions

For new buildings or change of use building works with laboratories, specialist water systems such as RO and Purified water systems shall be spatially provisioned to route services as far as reasonably practical. This shall include allowance of plant rooms and riser space including the provision of pipework to minimise disruptive works at a later stage.

Final allowances shall be agreed with UNSW prior to construction commencing.

E.1.1.7. Main Service Isolating Valves

Each major laboratory and each Physical Containment (PC2 and above) laboratory must include main shut off valves for all services outside and adjacent to the entrance doorway in a Laboratory Service Valve Compartment. This includes potable water, laboratory hot and cold water, natural gas and other reticulated gases.

This applies to PC2 and above buildings as well.

Refer to Diagram EME 0005 H Laboratory Service Valve Compartment at the end of Section E.1.

E.1.1.8. Non-Potable Water Fixture Labels

At all laboratory sinks and other non-potable water outlets, including laboratory hot and cold-water outlets, reverse osmosis and cooling water outlets, supply and fix

permanent labels with the words 'NOT FOR DRINKING' with the appropriate pictogram.

Pipework shall be appropriately labelled and colour wrapped in accordance to AS3500 requirements.

E.1.1.9. Backflow Prevention

Potable water supply to a building containing wet laboratories shall be fitted with a Reduced Pressure Zone Device "ValvCheq RP03" at the point of entry to the building and additional RPZDs shall be provided to the potable water lines serving lab if a dedicated non-potable lab cold water system is not provided.

RPZDs internal to the building shall be located in common corridors and external to the lab where possible for hygiene and to minimise disturbances.

RPZDs shall be recessed in wall within lockable stainless steel enclosures with viewable window and tundish drainage.

These enclosures shall be mounted to a maximum height of 1500mm to allow for ease of maintenance access.

For further requirements refer to E. 1- Hydraulic and Fire Services Design Standard.

E.1.1.9.1. Testing for Cross-Connections

All specifications shall include a requirement as follows:

Upon completion of any works of water supply within buildings housing laboratories, testing of the potable supply for illegal connections to laboratories via other water supplies or laboratory equipment shall be undertaken by the plumbing contractor performing the works. Any risk of contamination shall be immediately brought to the attention of the UNSW Project Manager. Where the contractor has an obligation to rectify the problem, rectification shall commence immediately the risk is apparent.

E.1.1.10. Basis of Design

On the first drawing in the set, provide details on which the design was based. Such information shall include: how flow rate and system pressures were determined, flow rate and pressure determination for pumps, design pressure head at top floor fittings, actual head and flow curve for pump as designed showing duty points, criteria for sizing water storage. The design is to reference appropriate legislation, standards & guidelines.

The Statement of Basis of Design shall include the actual reason the laboratory has been classified a PC3 or PC4, including reference to specific documents of approval by the relevant Authorities receiving the waste, such as: Sydney Water Trade Waste, local Government Council; intractable waste receiving depot; etc. Where special waste treatment or waste management systems are included, these shall be detailed with all management details written as notes to provide building maintenance staff with sufficient detail to provide safe work conditions for such staff.

E.1.2. PHYSICAL CONTAINMENT LABORATORIES

All Physical Containment laboratories shall be designed in accordance with the Laboratory Code AS/NZS 2982 and the Office of Gene Technology Regulator (OGTR) as applicable to the specific laboratory.

PC3 & 4 laboratories are defined in the Laboratory Code AS/NZS 2243.3 as having a 'serious and life threatening' severity to human health. On this premise, the risk has been taken as 'high' with respect to relevant NCC– Section B Water Services – Specification 41 Cross-connection Hazards. Such laboratories details shall be shown on separate drawings with title similar to: "PC3 Laboratory Details"

The Statement of Basis of Design shall include the actual reason the laboratory has been classified a PC3 or PC4, including reference to specific documents of approval by the relevant Authorities receiving the waste, such as: Sydney Water Trade Waste, local Government Council; intractable waste receiving depot; etc. Where special waste treatment or waste management systems are included, these shall be detailed with all management details written as notes to provide building maintenance staff with sufficient detail to provide safe work conditions for such staff.

Each service shall be provided via a Registered Break Tank and pump set for each individual laboratory. Hot water shall be generated within the Containment Area where required. The Consultant shall contact UNSW Senior Manager Engineering Services to formulate satisfactory design.

Refer to Diagram EME 006 H Site Backflow Prevention Schematic at the end of Section E.1.

E.1.2.1. Drainage Pipe Selection Matrix

Material selection to laboratories shall consider the following criteria:

Laboratory Type	HDPE (PE)	PP
General Teaching Labs (schools, universities)	Recommended – handles typical chemical waste; good durability; temp up to 95°C	Suitable but higher performance than necessary
Research Science Labs (chemistry, biology)	Suitable for general drainage; may fall short if strong acids/solvents used frequently	For corrosive lab waste
Industrial / Chemical R&D Labs	Suitable depending on chemicals used; check compatibility	For most corrosive, biological and mixed waste streams

E.1.2.2. Physical Containment 1 Laboratories (PC1)

PC1 labs are intended for low-risk work with organisms that are not known to cause disease in healthy adults (Risk Group 1), and they rely mainly on standard laboratory practices to manage the lowest level of biological containment.

These generally include undergraduate teaching labs, basic biology and biochemistry labs, and research labs working only with Risk Group 1 or inactivated biological material using standard laboratory practices.

E.1.2.2.1. POTABLE WATER SUPPLY

Supply potable water only to wash basins, safety showers and fixed eye wash units without mechanical backflow device protection. Ensure that there are no facilities provided whereby illegal connections can be made to the hand basin, and the safety shower/eye wash units. Safety shower/eye wash units are required to be tested weekly under the Laboratory Code.

Where lab sinks and other equipment is provided with risk of contamination to the system, adequate backflow devices shall be provided and the system shall be considered as non-potable.

Hand basins used for hand decontamination shall be single outlet type arranged for use without hands. Generally, knee operated faucets are preferred.

Valves – Laboratory or Room Isolation

Where a number of fixtures are served with hot or cold water from outside the area, such as teaching laboratory, toilet areas, plant rooms, etc., provide isolating valves on the wall adjacent to the main entry door.

The valves shall be installed in a stainless-steel wall box mounted no higher than 1500mm above the floor.

Refer to Diagram EME 0005 H - Laboratory Service Valve Compartment at the end of Section E.1.

E.1.2.2.2. NON-POTABLE WATER SYSTEMS

Non-potable water (NPW) applies to a dedicated water system supplying directly to potential sources of contamination such as: scrub up sinks, laboratory sinks, x-ray processing, etc. and is separated from drinking water by appropriate backflow prevention devices including break tanks.

Labelling and purple pipework colour shall be in accordance to AS3500.1 requirements.

E.1.2.2.3. LABORATORY HOT WATER

Localised hot water units are preferred to labs in order to provide separation from the potable system and reduce risk of contamination. Where significant water use is estimated or where there are multiple lab facilities in a building, a centralised system may be considered, with the system selection proposal submitted to UNSW EM for review and approval.

Water heaters for Laboratory locations may be of the instantaneous type 60°C temperature dial-controlled unit equal to the Stiebel Eltron DEL18a or DEL27A models only to AS3498.

All other locations where the instantaneous type 60°C temperature dial-controlled unit are proposed shall be submitted to EM Engineering for prior design & operational installation approval BEFORE installation.

Reason – some locations may still require Thermostatic Mixing Valve [TMV] protection to downstream fixtures.

E.1.2.2.4. TRADEWASTE DRAINAGE

Temperature, chemical and pH components of drainage effluent generated by the PC1 lab shall be analysed and generally require pretreatment prior to discharge into the authority sewer system.

For a PC1 lab, the following trade waste pretreatment may be required. Further requirements for this equipment shall be found in Section E.1.4.

- Plaster arrestor
- Basket arrestor
- Dilution pit
- Cooling pit
- pH correction/ Waste neutralisation
- Fume cupboards
- Autoclaves
- Water jet cutting machines

As a minimum HDPE pipework shall be considered for PC1 labs. Refer to Section 1.2.1 for pipework material selection.

Open floor wastes shall not be provided to labs, except to safety showers. Refer to Section E.1.7 for safety shower requirements. Appropriate spill kits and dry cleaning methods shall be discussed and coordinated with the end users.

E.1.2.3. Physical Containment 2 Laboratories (PC2)

PC2 laboratories are defined in Laboratory Code AS/NZS 2243.3 Clause 3.2.2 and Clause 4.3.3 as unlikely to be a significant risk to human health. On this premise, the risk has been taken as 'medium' with respect to AS/NZS 3500.1.2 Tables E1 and E2.

PC2 labs generally handle human samples, live mammalian cells, GMOs (NLRDs), or Risk Group 2 organisms and include bioscience/ microbiology research labs and clinical, pathology & health-care related labs.

E.1.2.3.1. POTABLE WATER SUPPLY

Supply potable water only to wash basins, safety showers and fixed eye wash units without mechanical backflow device protection. Ensure that there are no facilities provided whereby illegal connections can be made to the hand basin, and the safety shower/eye wash units. Safety shower/eye wash units are required to be tested weekly under the Laboratory Code.

Hand basins used for hand decontamination shall be single outlet type arranged for use without hands. Generally, knee operated faucets are preferred.

Where lab sinks and other equipment is provided with risk of contamination to the system, adequate backflow devices shall be provided and the system shall be considered as non-potable.

Valves – Laboratory or Room Isolation

On PC2 facilities ALL potable water supplies shall be provided with, a ValvCheq DC03 testable double check valve (provided at the service supply point outside the lab) due to the potential cross connection risks.

Where a number of fixtures are served with hot or cold water from outside the area, such as teaching laboratory, toilet areas, plant rooms, etc., provide isolating valves on the wall adjacent to the main entry door.

The valves shall be installed in a stainless-steel wall box mounted no higher than 1500mm above the floor.

Refer to Diagram EME 0005 H - Laboratory Service Valve Compartment at the end of Section E.1.

E.1.2.3.2. NON-POTABLE WATER SYSTEMS

Non-potable water (NPW) applies to a dedicated water system supplying directly to potential sources of contamination such as: scrub up sinks, laboratory sinks, x-ray processing, etc. and is separated from drinking water by appropriate backflow prevention devices including break tanks.

On PC2 facilities ALL non-potable water supplies shall be provided with, a ValvCheq RPZD Model RP03 due to the potential cross connection risks.

Labelling and purple pipework colour shall be in accordance to AS3500.1 requirements.

This includes hot water services as well.

E.1.2.3.3. LABORATORY HOT WATER

Localised hot water units are preferred to labs in order to provide separation from the potable system and reduce risk of contamination. Where significant water use is estimated or where there are multiple lab facilities in a building, a centralised system may be considered, with the system selection proposal submitted to UNSW EM for review and approval. It is encouraged to separate reticulation of the flow and return loop to non-potable fixtures from the domestic hot water supply.

Water heaters for Laboratory locations may be of the instantaneous type 60°C temperature dial-controlled unit equal to the Stiebel Eltron DEL18a or DEL27A models only to AS3498.

All other locations where the instantaneous type 60°C temperature dial-controlled unit are proposed shall be submitted to EM Engineering for prior design & operational installation approval BEFORE installation.

Reason – some locations may still require Thermostatic Mixing Valve [TMV] protection to downstream fixtures.

E.1.2.3.4. TRADEWASTE DRAINAGE

Temperature, chemical and pH components of drainage effluent generated by the PC2 lab shall be analysed and generally require pretreatment prior to discharge into the authority sewer system.

Where infectious or potentially infectious biological material is present in PC2 labs, HEPA filters shall be considered in the design of drainage venting and ventilation of trade waste equipment.

For a PC2 lab, the following trade waste pretreatment may be required. Further requirements for this equipment shall be found in Section E.1.4.

- Plaster arrestor
- Basket arrestor
- Dilution pit
- Cooling pit
- pH correction/ Waste neutralisation
- Fume cupboards
- RO Water
- Autoclaves
- Effluent decontamination system - depending on lab use
- Water jet cutting machines
- Rare earth material recovery unit

As a minimum HDPE pipework shall be considered for PC2 labs. Refer to Section 1.2.1 for pipework material selection.

Open floor wastes shall not be provided to labs, except to safety showers. Refer to Section E.1.7 for safety shower requirements. They shall be sealed. Appropriate spill kits and dry cleaning methods shall be discussed and coordinated with the end users.

E.1.2.4. Physical Containment 3 Laboratories (PC3)

PC3 laboratories are defined in Laboratory Code AS/NZS 2243.3 Clause 3.2.2 and Clause 4.3.3 as likely to be a significant risk to human health. On this premise, the risk has been taken as 'high' with respect to AS/NZS 3500.1.2 Tables E1 and E2.

PC3 labs include certain pathology labs, infectious disease labs, work with airborne or high-consequence agents, select recombinant DNA or high-risk research activities and RNA labs.

On PC3 (or greater) facilities ALL potable water supplies & non-potable shall be provided with, a ValvCheq RP03 RPZD (provided at the service supply point outside the lab) due to the potential cross connection risks.

E.1.2.4.1. POTABLE WATER SUPPLY

Potable water shall be provided to lab basins and eyewashes.

Hand basins used for hand decontamination shall be single outlet type arranged for use without hands. Generally, knee operated faucets are preferred.

Where lab sinks and other equipment is provided with risk of contamination to the system, adequate backflow devices shall be provided, and the system shall be considered as non-potable.

Valves – Laboratory or Room Isolation

On PC3 facilities ALL potable water supplies shall be provided with, a ValvCheq RPZD Model RP03 due to the potential cross connection risks.

Where a number of fixtures are served with hot or cold water from outside the area, such as teaching laboratory, toilet areas, plant rooms, etc., provide isolating valves on the wall adjacent to the main entry door.

The valves shall be installed in a stainless-steel wall box mounted no higher than 1500mm above the floor.

Refer to Diagram EME 0005 H - Laboratory Service Valve Compartment at the end of Section E.1.

E.1.2.4.2. NON-POTABLE WATER SYSTEMS

Non-potable water (NPW) applies to a dedicated water system supplying directly to potential sources of contamination such as: scrub up sinks, laboratory sinks, x-ray processing, etc. and is separated from drinking water by appropriate backflow prevention devices including break tanks.

Labelling and purple pipework colour shall be in accordance to AS3500.1 requirements.

On PC3 facilities ALL non-potable water supplies shall be provided with, a ValvCheq RPZD Model RP03 due to the potential cross connection risks.

This includes hot water services as well.

E.1.2.4.3. LABORATORY HOT WATER

Localised hot water units are preferred to labs in order to provide separation from the potable system and reduce risk of contamination. Where significant water use is estimated or where there are multiple lab facilities in a building, a centralised system may be considered, with the system selection proposal submitted to UNSW EM for review and approval. Reticulation on the flow and return loop to non-potable fixtures must be completely separate to the domestic hot water supply.

Water heaters for Laboratory locations may be of the instantaneous type 60°C temperature dial-controlled unit equal to the Stiebel Eltron DEL18a or DEL27A models only to AS3498.

All other locations where the instantaneous type 60°C temperature dial-controlled unit are proposed shall be submitted to EM Engineering for prior design & operational installation approval BEFORE installation.

Reason – some locations may still require Thermostatic Mixing Valve [TMV] protection to downstream fixtures.

E.1.2.4.4. TRADEWASTE DRAINAGE

Temperature, chemical and pH components of drainage effluent generated by the PC3 lab shall be analysed and generally require pretreatment prior to discharge into the authority sewer system.

Where infectious or potentially infectious biological material is present in PC3 labs, HEPA filters shall be considered in the design of drainage venting and ventilation of trade waste equipment.

For a PC3 lab, the following trade waste pretreatment may be required. Further requirements for this equipment shall be found in Section E.1.4.

- Plaster arrestor
- Basket arrestor
- Dilution pit
- Cooling pit
- pH correction/ Waste neutralisation
- Fume cupboards
- RO Water
- Autoclaves
- Effluent decontamination system
- Water jet cutting machines
- Rare earth material recovery unit

As a minimum HDPE pipework shall be considered for PC3 labs. Refer to Section 1.2.1 for pipework material selection.

Open floor wastes shall not be provided to labs. They shall be sealed. Appropriate spill kits and dry cleaning methods shall be discussed and coordinated with the end users.

E.1.3. PIPEWORK AND MATERIALS

E.1.3.1. Pipework

Pipework shall be either:

Type B copper with silver soldered joints and lilac sleeved (before installation), or lilac stripe HDPE pipe, polypropylene PN16 pressure rating or higher to suit specific test pressure. Do not use copper pipe for raw bore water.

UNSW does not endorse the use of cross-linked polyethylene (PEX) pipework due to inconsistencies in product quality across manufacturers. Furthermore, existing campus buildings predominantly utilise copper piping, which is readily available for urgent maintenance and repair requirements.

E.1.3.2. Colour Coating of Copper Pipework

Pipe materials shall comply with water authority requirements for non-potable water supplies, pre-coated lilac pipe. Where pipework is modified for jointing, coat pipes with enamel paint coloured lilac to distinguish it from potable pipework.

Where non-potable lab water and non-potable bore water is present in the building, labelling shall be provided to specifically separate each services. For example:

- Bore water: Bore water
- Lab hot water: Non-potable Lab hot water
- Lab cold water: Non-potable Lab cold water

E.1.3.3. Polyvinylidene fluoride (PVDF) Pipe & Fitting for Ultra High Purity Water Supply

All pipes and fittings shall:

- a) Be in conformity with EN 10204;
- b) Be approved by Local Authority;
- c) Pipes & fittings shall be not less than PN16;
- d) Infra-red butt welded or electro fusion jointed in accordance with manufacturer's instructions;
- e) Approved by Local Authorities and have a 25 year guarantee against failure;
- f) Supplier George Fisher piping system or other approved equal;
- g) Pipe must be installed and fixed in accordance with manufacturer's instructions. Provide certification that the installation has been installed in accordance with the manufacturer's requirements;
- h) Manufacturer to inspect the installation and provide certification that the installation complies with their requirements. Manufacturer to provide warranty certificate for all materials incorporated into the installation.

E.1.3.4. Beta Polypropylene Homopolymer Pipe & Fitting for Reverse Osmosis Water Supply (PP-H 100)

All pipes and fittings shall:

- a) Be in conformity with EN 10204 and DIN 8077;
- b) Be approved by Local Authority;
- c) Pipes & fittings shall be not less than PN10 SDR 11;
- d) IR Plus, infrared fusion butt welded or electro fusion jointed in accordance with manufacturer's instructions;
- e) Approved by Local Authorities and has a 25 year guarantee against failure;
- f) Supplier George Fisher piping system or other approved equal;
- g) Pipe must be installed and fixed in accordance with manufacturer's instructions. Provide certification that the installation has been installed in accordance with the manufacturer's requirements;
- h) Manufacturer to inspect the installation and provide certification that the installation complies with their requirements. Manufacturer to provide warranty certificate for all materials incorporated into the installation.

E.1.3.5. Twin-wall pipes for Lab Drainage

- a) To be provided with PVC pipe is not suitable.
- b) Comply with AS3500, AS5065 and OGTR requirements.

- c) Preferred over PP pipes where suitable and be approved by UNSW EM for use.
- d) Cannot be used for pressurised system.
- e) Material shall be HDPE PE100 with UV and corrosion resistance
- f) Maximum continuous operating temperature: 60 °C.
- g) Pipe material shall be chemically compatible with laboratory effluent and installed strictly in accordance with the manufacturer's recommendations.
- h) Joints shall be push-fit or proprietary type.

E.1.3.6. Polypropylene (PP) Pipe & Fittings for Lab Drainage

All pipes and fittings shall:

- a) Be in conformity with AS 5065, ISO 15874 and ASTM F2389
- b) Be approved for use by UNSW EM
- c) Evaluated against HDPE and used in applications of high chemical resistance and prolonged heat exposure
- d) Mechanical or electrofusion joined in accordance with manufacturer's requirements
- e) The supplier must be readily accessible in the Australian market- Iplex and Vinidex. Alternative manufacturers shall be reviewed for approval by UNSW EM

E.1.3.7. Valve Specifications

Valves shall be from the following manufacturers for Kensington campus:

- Reduced Pressure Zone Device (RPZD): - shall be ValvCheq RPZD Model RP03.
- Double check: - shall be ValvCheq double check valves, Mandatory Requirement: ValvCheq Model DC03.
- Dual Check Valve: - shall be equal to Watts Series 7

All other UNSW sub-campuses shall be compliant with AS3500 backflow prevention requirements.

E.1.3.8. Equipment and Valve Labelling

All equipment shall be labelled and all valves numbered and provided in accordance with E. 1- Hydraulic and Fire Services Design Standard.

Laboratory specific requirements are retained and described below.

E.1.3.8.1. Valve Numbering and Schedule

Where numbering does not exist for a building, the following system shall be adopted. *For non- lab applications, refer to E. 1- Hydraulic and Fire Services Design Standard.*

Valves shall be identified by numbering in consecutive order as follows:

As an example, a main potable water service valve installed on Level 2 of Biological Sciences Building shall be numbered: D26 – 2 – PW – 1, where:

D26 = Building Number

2 = Level 2

PW	=	Potable Water
1	=	Consecutive Number

Service Abbreviations

LCW	-	Laboratory Cold Water
LHW	-	Laboratory Hot Water
ECW	-	Equipment Cooling Water
TW	-	Trade Waste
RO	-	Reverse Osmosis Purified Water
NG	-	Natural gas
CA	-	Compressed Air
N	-	Nitrogen
A	-	Argon
HE	-	Helium
V	-	Vacuum
CO2	-	Carbon Dioxide
H2	-	Hydrogen

E.1.3.9. Water Tanks

Non-potable water tanks serving Primary Containment (PC) labs shall be 316 stainless steel. Standard galvanised mild steel shall not be used. However, purpose-built sectional tanks may be approved, subject to full engineering details on jointing of sections, corrosion protection, tank support, pipe penetrations, roof etc. being approved by UNSW EM Engineering.

All water storage tanks shall have overflow alarms fitted and connected to the campus wide BMS system. Float and level alarm systems are preferred by UNSW.

All water storage tanks shall be fitted with an isolation valve serving each fill valve, outlet pipe and drain.

Refer to Diagram EME 0003 H Non-Potable Tank Standard Details at the end of Section E.1.

E.1.3.10. Break Tank

Materials shall be selected to suit the water stored. e.g. Do not use polyethylene, copper for de-ionised water or bore water. Non-potable water tanks serving Primary Containment (PC) labs shall be 316 stainless-steel.

All tanks shall be fitted with a min of 600mm diameter access hatch.

E.1.3.11. Non-Potable Signage.

Provide a sign “Caution not for Drinking” similar to ‘Safetyman’ over each non-potable outlet fixture wash down taps in trade waste and garbage storage areas.

Provide into all bin or garbage storage and all trade waste areas or trade waste arrestor rooms a 20mm wash down hose tap that is supplied from / off the local bore water reticulation system. The wash down tap shall be located adjacent to the contained area and fixed to either the masonry wall or fixed to a suitable hard wood 75x50mm stake driven into the earth. There is no requirement for UNSW to provide hot water to arrestor sites, as it is operational preference to jet blast with cold water.

E.1.4. TRADE WASTE

E.1.4.1. Basis of Design

Show on the drawings the basis of design of trade waste pre-treatment pits and chemicals known shall be discharged at the time of design. The purpose of pre-treatment shall be identified.

Kensington specific: The UNSW Kensington campus is in the Sydney region is bound to a Commercial Agreement with Sydney Water. This agreement permits wastewater to trade waste pre-treatment devices to only have trace quantities of contaminants including chemicals. Authority approval is required for trade waste installations.

All other campuses: Trade waste pretreatment shall meet local water authority requirements.

Prior to any new project, refurbishment, redevelopment or tenancy fitout involving trade waste discharges to the UNSW sewer drainage network, the proposed works, including proposed chemicals shall be submitted to UNSW EM Engineering for approval (in partnership with Sydney Water Trade Waste Inspector).

In ALL cases the consultant, project manager, contractor (or end user) shall first submit a concept proposal of the intended trade waste pre-treatment system for “pre-installation approval in principle” by UNSW EM Engineering, who will review, comment and approve the concept design.

The application shall include:

- Completed water authority forms
 - For Sydney Water: the completed Sydney Water Tap In form “Discharge trade wastewater application”.
 - For Icon Water: [“Application for Discharge of Liquid Trade Waste to Sewer”](#)
- A detailed plan (1:100 scale min) showing the proposed process & location of the works.
- The proposed equipment/process to be installed including any chemicals to be used in the process.
- The proposed arrestor, treatment system, floor wastes, vents, baskets, any chemical storage associated with the treatment, etc.
- Proposed access requirements for cleaning & maintenance
- Chemical manifest of discharge.

- Proposed method of waste treatment.
- Any other relevant information (temperature of waste discharge, etc.)

The concept and final documentation for the proposed trade waste pre-treatment system shall be presented to UNSW EM Engineering and a consultant who will liaise with the Authority, lodge the application and ensure compliance for the proposed pre-treatment system. Upon completion of the works, UNSW EM Engineering will provide a “Notice of Completion” for the trade waste design and installation.

On the first drawing in the set, provide details on which the design was based. Such information shall include: fixture units on each stack, total drainage discharge flow rate, specifications, flow rate and pressure determination for sewage pumps, actual head and flow curve for pump as designed showing duty points, criteria for sizing pump station storage.

E.1.4.2. Pipework

At minimum, in ground pipework shall be high temperature, high density HDPE and installed in accordance with the manufacturer’s instructions. Where rubber rings are required, they shall be acid resistant when connecting to existing drainage.

All other pipework shall be submitted to UNSW EM Engineering for written approval before installation.

E.1.4.3. Plaster Arrester

Install plaster arresters only where gypsum is present in the waste stream, (do not use for sand, silt or clay), typically 40L Grade 304 stainless steel plaster arrester with removable SS baffles and bolted down SS cover equal to Stainless Metal Craft pattern PA1 or CA1 units. Ensure that a S/S frame 50mm x 50mm on casters to assist with removal of arrester for cleaning purposes.

Locate the unit below sink or as closer to the fixtures it serves.

In each case the appropriate unit is to be selected for the specific task and application, should there be ANY doubt to type, apply to UNSW EM Engineering for approval.

E.1.4.4. Basket Arrester

Provide a fine stainless-steel basket arrester to the inlet of ALL trade waste pits serving laboratories to catch broken glassware, syringes and other foreign objects likely to enter the wastewater. The arrester shall be fitted into its own pit with top access for basket removal. Basket shall be manufactured as follows:

On the inlet side of the pit, a stainless-steel basket to catch all debris larger than 3mm diameter entering the pit via the inlet pipe. It shall be easily removed from above the pit for cleaning without the screenings entering the pit accidentally. The weight of the empty basket shall be no more than **5kg**. The unit shall be complete with stainless steel cradle and basket with extended lifting handle. The cradle shall be fixed to the pit wall by 2 x 6mm stainless steel masonry anchors so that the lip of the basket is immediately under the inlet pipe. Extend handle up to within 20mm of underside of pit cover frame. Approx. size of basket: 460 long x 200 wide x 100 deep front lip x 210 deep back.

Refer to Diagrams EME 0014 H Trade Waste Basket Arrestor at the end of this Section E.1

E.1.4.5. Rare Earth Material Recovery Unit

Shall be considered in electronics research lab applications.

As per user requirements and UNSW EM Engineering approval.

E.1.4.6. pH Correction/ Balancing Pit

Where required by the local water authority and UNSW EM Engineering, a laboratory, building or fitout shall incorporate a trade waste treatment general pH correction system designed in accordance with UNSW EME 0022 (Brief & P&ID) Trade Waste pH Correction.

E.1.4.7. Cooling Pit

Shall be provided to treat liquid wastewater to no more than 38°C or as agreed with the local water authority and be sized to the peak one hour load. The sizing calculation shall be provided to UNSW EM for review.

A water point shall be provided with a hose tap within 5m of the unit for cleaning and maintenance. Bore water and non-potable water sources are preferred over a potable water connection.

E.1.4.8. Dilution Pit

Laboratory drainage shall be provided with a Dilution Pit as a trade waste pre-treatment device. The dilution pit shall provide a capacity of 5 litres per fixture discharging to the pit, and shall be water authority approved, constructed as an inground polythene pit with a minimum Class D lid. The dilution pit shall form part of the laboratory trade waste system and be integrated into the overall hydraulic design.

The pit shall be sized with a flow retention for one hour.

E.1.4.9. Fume Cupboards

Fume Cupboards are to be provided in Laboratories where chemical mixing is required. At least one Single Sided fume cupboard is to be located in each Wet and Damp Laboratory and may also be included in a Dry Laboratory subject to the project brief. If more than one fume cupboard is required consider separate including Fume Cupboards in a separate dedicated Fume Cupboard Room. Fume cupboards are to be located clear of openings and corners in positions as required in the standard.

The ventilation system to strictly comply with AS 2243.8 (Safety in Laboratories Part 8: Fume cupboards). Each fume cupboard is to be provided with a separate independent mechanical system, inclusive of wet scrubber which shall be provided by the mechanical engineer.

The fume cupboard shall be totally factory pre-plumbed and pressure tested to ensure no leaks are encountered on site. (No site plumbing other than the connection of service tails to the main supply shall be carried out on site.). Water and drainage connection shall be provided to service this system.

E.1.4.10. Autoclaves

An appropriate water or RO water point shall be provided to the system with water source to be determined from consultation with end users.

Effluent to be drained from autoclaves is generally over the acceptable 38°C to sewer and will need to be diverted to a cooling pipe. consideration shall be made as to the drainage pipe material to the pit.

Depending on the biological nature of PC1 and PC2 lab and HEPA will need to be considered within the autoclave chamber or to the mechanical exhaust system. This shall be coordinated with the mechanical consultant.

E.1.4.11. Effluent Decontamination Systems (EDS)

An EDS plant may need to be considered for PC3 labs handling high risk biological material and/ or biocontainment facilities.

Consultation with the end user is required to determine lab works being undertaken and peak loads of the system. An EDS supplier shall be consulted in the design stage with the design options being provided to UNSW EM for review and approval.

Corrosion resistant 316 stainless steel or FRP pipework is recommended for drainage material.

Safety showers and eyewashes shall be provided to manage hazards associated with splashes from contaminated effluent or chemicals where applicable in accordance with AS 4775 and AS/NZS 2982.

Hand basins or an alternative means of decontaminating hands shall be provided at the exit of each room where liquid effluent decontamination equipment is located.

The facility shall be designed and constructed to enable safe decontamination of untreated liquid effluent that has escaped the containment system.

Discharge of decontaminated liquid effluent shall meet the parameters including temperature, chemicals, solids and organic material specified by the relevant authority.

Mechanisms shall be in place to prevent overloading of liquid effluent systems. This can occur, for example, if a water supply is left on or if a valve fails without closing properly. Overload due to activation of a fire sprinkler system shall be taken into account, where such a system is fitted.

E.1.4.12. Waterjet Cutting Machines

Review system specification and manufacturer's information and ensure water provision with adequate backflow prevention is supplied.

Review effluent components and provide a trade waste connection and pre-treatment if required.

E.1.4.13. Reverse Osmosis and Ultra High Purity Water Systems – Centralised

Specialist water supplies for Reverse Osmosis plant or laboratory Milli-Q – All specialist water systems shall be presented to EM Engineering for design consideration and pre-approval, prior to contract documentation.

Frequency of use, number of fixtures and plant space availability shall be considered in the selection criteria.

Also see Section E1.8 of this specification.

Generally: Supply and install the Reverse Osmosis Water and Ultra High Purity Water supply to all supply points required in laboratory. Include for pipework, valves, taps, faucets, fittings and other sundry equipment required for the piping installation. Minimum water resistivity for ultra-pure water is 18 Mega Ohms.

The water purification plant shall be a Merc Millipore unless approved otherwise by UNSW EM Engineering.

Where buildings are specifically designed to house wet laboratories, a centralised pure water system shall be designed and installed as follows:

Raw water supply: Shall be obtained from the site bore water system if the building is located on the Kensington campus. Where available treated bore water shall be used, otherwise use raw bore water. Provide backflow prevention as required, bore water sub-meter, sand/carbon filtration, UV disinfection and cartridge micro-filtration prior to the RO process.

Water efficiency: Overall water efficiency of the treatment process shall be at least 80%, obtained using a series of reverse osmosis (RO) processes to concentrate the reject impurities.

Plant production rate: RO plant shall be sized to produce one day's average day demand supply of pure water in 8 hours. Average day demand shall be determined from the users. Where this is not possible, assess requirements based on like installations within UNSW and with the assistance of the users.

Product Specifications: RO water product shall be a Type 2 (analytical grade) to ISO3696 (Water for Analytical Laboratory Use), requiring de-ionising using ion exchange prior to product storage.

Point of Use Treatment: Where Type 1 (Ultrapure grade) is required for specific users, this shall be provided as a "point of use" treatment. These units shall be strictly limited in numbers due to the cost of maintaining such equipment. It is suggested that one unit per building level would be sufficient, with all operation and maintenance requirements provided by the user to ensure quality water to the users' satisfaction.

Product storage: Pure water produced by the RO plant shall be stored in a single translucent polypropylene tank with capacity for a minimum of 8 hours' use.

Circulation: To maintain quality product, the main distribution system shall be a "flow and return" system with UV disinfection controlled by the duty and standby

circulation pumps. Pumps shall be sized to circulate total storage every 4 hours. Duty and standby functions shall alternate each 24 hours.

Branch lines: Off-takes from the ring (flow & return) main shall be made at one only point for each laboratory, with a supply emergency isolation valve located within the laboratory service valve compartment.

Materials: Pipes and fittings used in the installation shall be selected from the following and as specified under materials section. All pipe and fitting must be the same material as the pipework.

- Reverse Osmosis - Beta Polypropylene Homopolymer pipe & fitting (PP-H)
- Ultra-High Purity Water - Polyvinylidene fluoride pipe & fitting (PVDF)

Installation: Install pipework so that all horizontal pipelines slope towards outlet points to ensure service can be completely drained.

- Ultra-High Purity Water valves to be George Fisher SYGEF Plus 3-way diaphragm valve type 519 with butt fusion spigots and connector or other approved equal as confirmed on site with client. Piping from wall to fume cupboard inlet to be piped using matching tube hose connection not through flexible braided hose.
- Reverse Osmosis valve to be PROGEF Standard Diaphragm valve DIASTAR TenPlus FC (Fail safe to close) with butt fusion spigots SDR11 metric (In line branch valve with take-off from recirculated loop). Spigots and connector to suit hose connector to dishwasher.

Flushing & Cleaning of Ultra High Purity Water Service: Immediately after the satisfactory completion of the system's hydraulic pressure tests, the contractor shall flush out, remove all foreign matter and clean the system. The system shall be thoroughly flushed out with clean water. Whenever possible the flushing medium shall be fed into the system at high points and flushed out at low points on the system via suitably sized valve or plugged wash-out points. The whole flushing procedure shall be carried out to the satisfaction of the suppliers of the water generating plant.

The entire systems shall be flushed with domestic cold water to remove all matter from the pipe and equipment. A second flush shall be carried out using 50% sodium hydroxide to further cleanse the piping. Allow to circulate the water for a period of one hour before removing flush water. A third flush shall be carried out using water with 50 ppm of chlorine which shall be circulated for fifteen minutes.

The fourth flush will be carried out using ultra-pure grade water, after which the system shall be left fully charged with ultra-pure grade water, remove all air from the system and the system shall thereafter be maintained full at all times. The contractor shall carefully monitor these operations to ensure the existing system is not contaminated. All components of the system are to be included in the flushing process.

Flushing shall be witnessed and certified by the Superintendent and a copy of these records shall be provided as proof of commissioning.

Flushing & Cleaning of Reverse Osmosis Water Service: Immediately after the satisfactory completion of the system's hydraulic pressure tests the contractor shall flush out, remove all foreign matter and clean the system. The system shall be thoroughly flushed out with clean water. Whenever possible the flushing medium shall be fed into the system at high points and flushed out at low points on the system via suitably sized valve or plugged wash-out points.

The whole flushing procedure shall be carried out to the satisfaction of the suppliers of the water generating plant.

Thoroughly flush the entire system with domestic cold water to remove all matter from the pipe and equipment. A second flush shall be carried out using 50% sodium hydroxide to further cleanse the piping. Allow to circulate the water for a period of one hour before removing flush water. A third flush shall be carried out using water with 50 ppm of chlorine which shall be circulated for fifteen minutes.

The fourth flush will be carried out using the reverse osmosis grade water, after which the system shall be left fully charged with reverse osmosis grade water, remove all air from the system and the system shall thereafter be maintained full at all times. The contractor shall carefully monitor these operations to ensure the existing system is not contaminated. All components of the system are to be included in the flushing process.

Flushing shall be witnessed and certified by EM Engineering and a copy of these records shall be provided as proof of commissioning.

Refer to Diagram EME 0010 H Laboratory RO System Arrangement at the end of Section E.1.

E.1.5. MEDICAL/SPECIALIST GAS SERVICE

Pipework lengths shall be minimised wherever possible to reduce cost, pressure drop, contamination of the gases and condensation build-up.

E.1.5.1. Laboratory Gases

Install gas cylinders with proprietary locking devices such as those supplied by Matheson.

Faucets and taps for all laboratory gases shall be Enware commercial laboratory gas tapware. Finishes as specified in project documents. Allow for submitting indicator button and colouring code schedule for approval prior to procurement.

Secure small diameter gas pipelines with STAUFF pipe clamps.

E.1.5.2. Installation

The methods of installation and joining of piping shall be implemented to prevent contamination of the piping during construction. Pipes and fittings shall be selected to suit the user requirements of hazardous class, gas type, gas purity & pressure.

As a minimum requirement welded copper tube - Type B (OXY CLEANED) shall be used. Compression (crimp) jointed metallic piping systems shall not be used. Stainless steel or coaxial pipework shall be used based on gas purity or type as required.

All welds must use the 'purge weld' procedure and are to be of first quality, free of inclusions, pits, cracks, corrosion or any other defects and conform to Australian Standards.

Suitable purging systems using high purity argon or nitrogen shall be used during welding to minimise oxidisation levels and to maintain purity of the system. During construction piping shall be capped and pressurised with nitrogen or argon to prevent contamination.

Prevent wet contact between electrolytically dissimilar metals by using electrically insulating barriers between the contact zones.

Pipework shall be adequately supported so as to prevent sagging and vibration. Ducts, channels or non-habitable spaces containing pipework shall be well ventilated. Pipework shall not be installed in ventilation shafts.

Branches shall be taken off the top of the mains. Drain valves shall be provided at all low points of reticulated gases. Termination of gas pipework shall be with appropriate valves and regulators.

All valves, fittings, supports, gauges, manifold to be supplied by the piping contractor. Pipework to be compact, neat and occupy minimum space required. Supporting of pipework to be as per Section E.1 Hydraulic and Fire Service Standard.

E.1.5.3. Emergency Isolation

Toxic, flammable and asphyxiant gases shall be automatically isolated upon activation of emergency push button.

The emergency isolation valves (EIVs) shall be capable of full closure to ensure no leakage. EIVs shall have a fail-close operation.

E.1.5.4. Embedded Pipework

Embedded pipework is not permitted. Provide a PVC conduit three times larger than the pipe size where pipes are to be installed cast into walls or below slabs. Pipes cast into walls or below slabs shall be continuous lengths, without fittings, and shall not cross any movement joint or joint between two adjoining sections of reinforced concrete through which the reinforcement does not extend.

E.1.5.5. Mechanical Ventilation

Refer to E.2 Mechanical services for ventilation requirements and BMS connections to the Medical Gas Service System

E.1.5.6. Testing

The medical/specialist gas system shall be tested to the satisfaction of UNSW EM Engineering.

The gas system shall be sealed with all items of plant equipment liable to damage at the test pressure removed from the system. All defects disclosed during testing shall be immediately rectified and fresh tests carried out as required by EM Engineering.

E.1.5.7. Regulators

Regulators shall be installed in accordance with Australian Standards, suitable for the gas used and the rated pressure.

E.1.5.8. Detection

Continuous gas detection system/s shall be installed in accordance with Australian Standards, dangerous goods hazard assessment and other project specific laboratory safety requirements.

The detection system shall be UPS backed and/or fail safe and suitable for the gases used and space served.

E.1.6. LABORATORY SPECIFIC FIRE SERVICES

E.1.6.1. Fire Sprinklers

Sprinkler arrangements - Sprinkler heads shall be exposed type only. Sprinklers concealed with caps shall not be permitted. Where there is risk of damage and accidental offset allow to provide cage around sprinkler.

Provide sprinklers within fume cupboards.

Pre-action systems shall be considered in the design of the Lab, especially for PC2 and higher rated labs where sensitive analytical instruments, electrical and IT heavy equipment, cleanroom or controlled environments or hazardous materials that react with water are present. The designer is to liaise with the University and end users to determine the nature of the lab.

E.1.6.2. Fire Hose Reels

Fire Hose Reels - Consideration shall be made to work with a Fire Engineer to omit Fire Hose reels from lab spaces to maintain hygiene and cleanliness requirements.

E.1.7. FIXTURES, FAUCETS AND TAPS

E.1.7.1. General

All shall be first quality and of one manufacturer. Written warranties on workmanship and materials of at least 1 year required for each unit. All units shall be subject to inspection by EM Engineering. All shall be vandal-proof.

Flowrate for domestic and laboratory sinks and basins not to exceed 6L/min for hot water and 6L/min for cold water. (Cleaners' sinks excluded)

E.1.7.2. Hand Wash Basin

All laboratories shall have basins for hand washing purpose fitted.

Basins shall consider accessibility requirements and in general the Caroma Care 500 complete with ceramic shroud should be provided unless another is required by the PC2 Laboratory certifier.

Where laboratories require installation of a hand wash basin adjacent to the exit, this basin shall be supplied with potable warm water and hands-free operation. To achieve

this, provide hot and cold-water supplies to Aquablend 1500 TMV with an Enware Knee Operated Hands Free Basin Kit over a compatible vitreous china basin. As an alternative to the knee operation, provide Enware (only) sensor operation where directed by a UNSW Project Manager. Laboratory Sink Tapware

Faucets and taps for all fixtures and appliances shall be Enware commercial laboratory tapware including Mini Stop service valves. Finish as specified in project documents. Allow for submitting indicator button and colouring code schedule for approval prior to procurement. Cold water tap indicator shall be marked "NPCW" and hot water marked "NPHW".

Where a product is not available within the Enware range, the contractor can obtain written approval from UNSW EM Engineering, to supply Broen or Gentec commercial laboratory tapware.

E.1.7.3. Safety Showers/ Eyewash

Hand-held eye wash guns fitted to flexible hoses are to be fitted with Dual Check Valves by the manufacturer. This shall be checked by the consultant at design stage. Hand held eyewash/body wash equipment shall only be provided to support self-contained equipment but shall not replace them (AS4775-2007).

On PC3 (or greater) facilities ALL potable water supplies shall be provided with, a Tyco RP03 RPZD (provided at the service supply point outside the lab) due to the potential cross connection risks.

Potential damage resulting from the use of all safety showers shall be considered in the design process. Should a safety shower be used in an emergency, it will result in a discharge of at least 3,500L of water at a flow rate of 76L/min in the event that one person is affected. Where such a discharge will escape from the laboratory, measures shall be designed (as agreed with UNSW Facilities and the User) into the hydraulic works to prevent escape of this water from the laboratory. Such measures may include: Project-specific designed temporary bunding across the doorways along with provision of at least one floor waste draining to the trade waste system; casting grated drains into the slab around the shower; providing project-specific designed portable containment barrier in each laboratory within easy reach of the laboratory manager.

Provide a SPS 304 stainless steel 200mm round push in floor drain (100mm outlet) under safety showers. Connect the eye wash basin to the floor waste.

E.1.7.4. Eye Wash

Provide Enware eye wash unit, Model 'EE180' with drainage. Provide a 20mm (minimum) POTABLE cold water supply to suit unit requirements. Eye wash shall be drained to the most convenient building waste drainage system.

Mandatory Requirement 'EE180' Should Client requirements dictate installation of an Eye/Face Wash, then Model 'EF360' shall be substituted. Hand held eyewash/body

wash equipment shall only be provided to support self-contained equipment but shall not replace them (AS4775-2007).

Due to the potential for cross connection, a Tyco DC03 will also be provided at the service supply point outside the lab.

E.1.7.5. Eye Wash / Body Spray

In addition to the above eye wash and only where directed to do so by the Client, provide Enware bench mounted eye wash/body spray unit Model 'EL450' with chrome finish. Provide 20mm (minimum) POTABLE cold water supply to suit unit requirements. Unit shall be located adjacent to a basin where available. It should be noted that it may be difficult to comply with the exclusion zones for electrical fittings.

E.1.27.9. Laboratory Hand Washing Basins – (AS2982-2010 Clause 6.3) All laboratories shall have basins for hand washing purpose fitted.

E.1.7.6. Laboratory Sink Tapware

Faucets and taps for all fixtures and appliances shall be Enware commercial laboratory tapware including Mini Stop service valves. Finish as specified in project documents. Allow for submitting indicator button and colouring code schedule for approval prior to procurement. Cold water tap indicator shall be marked “NPCW” and hot water marked “NPHW”.

E.1.7.7. Laboratory Equipment Cooling Systems

Where a Laboratory Equipment Cooling is required it shall consist of a pressurised flow and gravity return cooling system to meet the cooling system demands of the equipment likely to be installed. While this system is typically designed and installed by the mechanical trade, the hydraulic designer/contractor needs to liaise closely with the design team & users for the project to ensure they provide all hydraulic information necessary for the system.

E.1.7.7.1. System Description

The Equipment Cooling Water system shall be designed and installed as follows;

1. Source water is to be RO or potable water supply depending on the Users requirements, Provide backflow prevention and tertiary water quality treatment if potable water is used.
2. An automated back-up supply is required for redundancy,
3. Equipment Cooling Water (ECW) is to be stored in an elevated atmospheric storage vessel of 5,000 litres, complete with a graded base to collect particulates and impurities. Provide a solenoid valve with timed controls to discharge/dump to drain, a volume of 500 litres of cooling water at a prescribed interval to remove particulate build-up.
4. Minimum source water make-up flowrate is to be 0.2 l/s,
5. Tank to be located at the lowest level of the building,
6. A primary chilled water circuit shall cool the ECW source water in the tank.

7. A minimum three (3) pumps with variable speed drive is required to provide the required head for Laboratory supply. Each pump shall have a duty of 50% of the total demand'
8. The ECW flow shall be sized to the maximum demand with a 75% diversity factor applied to the maximum flow, e.g.: Q_{max} multiplied by 75%,
9. Flowrates, water quality, backpressure and minimum operating pressure requirements, shall be obtained from the User Group,
10. Minimum and maximum pressure requirements for the equipment/tools shall be obtained from the User Group,
11. The ECW flow shall be balanced to ensure the most disadvantaged supply point has adequate flow. This may require a ring main system,
12. Each equipment point shall be pressure controlled by an adjustable Pressure Reduction Valve,
13. Due to back pressure issues arising from equipment/tool performance in past installations, the ECW return line shall be a gravity system, capable of accommodating the maximum flowrate under gravity conditions,
14. Return lines shall be arranged so as to drain through the laboratory floor and be conveyed to the return riser at high level below. Lateral lines below the laboratory floor shall be laid at a minimum 0.5% grade,
15. Gravity risers and branch lines shall be vented to atmosphere,
16. Return lines/risers shall replenish source tank to complete the ECW circuit. Return flow should incorporate a 'calmed inlet' to the tank,
17. A manual by-pass is to be fitted to the return line, with the branch flowing to waste,
18. ECW system is to be controlled by equipment, designed, supplied and installed by Enhance Cabling Systems (ECS).
19. Tundishes shall only be provided for return water where it is not pressurised and therefore will not flow through a tube connection to a return tap. The top of the tundish shall be raised above the bench to prevent it being used as a sink to deposit wastewater and chemicals.

Refer to Diagram EME 0009 H Laboratory Equipment Cooling System at the end of Section E.1