Hydraulic Services

Design Standard

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TAFE NSW would like to pay our respect and acknowledge Aboriginal and Torres Strait Islander Peoples as the Traditional Custodians of the Land, Rivers and Sea. We acknowledge and pay our respect to the Elders; past, present and emerging of all Nations.

TAFE NSW Granville Electrotechnology Workshop

Rev	Issue date	Issue	Amendments since previous issue
P1	18 March 2022	Draft 1	N/A – Initial Draft
P2	29 March 2022	Draft 2	Updates and inclusions from Initial focus meetings
P3	03 May 2022	Draft 3	Updates and Inclusions from Workshops
A	20 May 2022	Final 1	Updates and Inclusions from Workshops
B	10 June 2022	Final 2	Updates as per comments
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E	04 November 2022	Final 5	Updates as per comments

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The project team retains responsibility for the coordination, design, procurement, and delivery of hydraulic systems which will include taking all reasonable steps to make sure that the hydraulic system design, and selection complies with all applicable Australian Standards required by the NCC, WHS Legislation, Statutory planning approval processes, TAFE NSW Procedures & Policies, and all other relevant statutory requirements.

TAFE NSW Wetherill Park

Contents

Introduction

1 Introduction

1.1 Overview

This document forms part of the TAFE NSW ITN Design Book and is to be read in conjunction with the overarching design principles described in the TAFE NSW ITN Design Principles, the TAFE NSW ITN Design Procedures and other relevant TAFE NSW Design Standards.

This Design Standard provides specific guidelines for the planning, design, operation and maintenance of hydraulic systems design within built environment projects across TAFE NSW.

This Design Standard applies to a variety of physical environments including but not limited to new buildings, refurbishments, or a cluster of learning areas or spaces within existing or new buildings.

1 Introduction

1.2 Audience

The table below broadly defines the diverse audience this Design Standard is written for and the roles they play through the design, selection and delivery process.

Table 1 Who should use this Design Standard?

Group	Members	Group's Roles
Consultants	▪ Architects ▪ Interior Designers ▪ Engineers ▪ Project Managers	▪ Design and develop hydraulic systems to suit project needs and meet the requirements of this Design Standard ▪ Consult with the TAFE NSW project team, stakeholders and end users ▪ Understand hydraulic design strategies & how hydraulic equipment can contribute to learning, teaching and timetabling
TAFE NSW Project Team	▪ Program Managers ▪ Design Managers ▪ Strategic Planning ▪ Procurement ▪ Facility Management ▪ Sustainability ▪ Logistics ▪ Systems Group	▪ Manage the design and development of hydraulic systems to suit project needs ▪ Assist with project hydraulic briefing requirements ▪ Manage the design consultants and contractors to deliver the hydraulic design in accordance with this Design Standard ▪ Review the hydraulic design & deliverables to ensure compliance with this Design Standard ▪ Guide project stakeholders through design development & facilitate collaboration with hydraulic designers
TAFE NSW Operations & End Users	▪ Teaching Staff ▪ Education Planning & Services Delivery ▪ Student Experience Group ▪ Product Group ▪ Change Management ▪ Student support groups ▪ Industry Partners	▪ Understand hydraulic design requirements and assist in developing the brief for specialist hydraulic systems ▪ Collaborate with hydraulic designers and provide feedback on hydraulic designs ▪ Understand design principles & how hydraulic equipment can contribute to learning, teaching and timetabling ▪ Understand the hydraulic equipment and requirements to meet future teaching delivery needs
Contractors	▪ Construction Contractors	▪ Outline TAFE NSW technical requirements ▪ Assist with preparation of TAFE NSW quotes, and plant selection/suggestions
Suppliers	▪ Hydraulic system suppliers ▪ Hydraulic system manufacturers	▪ Understand TAFE NSW requirements for hydraulic systems ▪ Provide advice to project or hydraulic designers regarding products or systems that comply with this standard

1 Introduction

1.3 Standards & Documents

The following standards and documents, as relevant to the project, should be read in conjunction with this Design Standard when designing, documenting & delivering hydraulic systems. This list is not exhaustive and other documents may apply.

1.3.1 External Requirements

Statutory Requirements

The planning and design must incorporate the relevant requirements as stipulated by the following Statutory Authority bodies:

- State Environmental Planning and Assessment Legislation
- All Commonwealth, State and Local Government Legislation
- Any conditions of consent identified through the statutory approvals process
- Insurance Council of Australia
- Fire & Rescue NSW
- Australian Communication Authority
- National Construction Code/Building Code of Australia
- Principal Certifying Authority (person qualified to conduct a Certification of Crown Building Works)
- Electricity Distributor's (Network) Requirements
- Electricity Retailer's Requirements
- NSW Wiring and Installation Rules
- Clean Energy Council
- Work Health and Safety Act
- Safe Work NSW Authority Requirements
- Disability Discrimination Act
- Disability (Access to Premises - Buildings) Standards
- Disability Standards for Education
- NSW Anti-Discrimination Act
- NSW Fair Trading
- Local: Water, Sewer and Gas Authority
- Any other authority having jurisdiction

External Certification Schemes

- Green Building Council of Australia (Green Star) and other recognised certification schemes (e.g. GECA, etc)

NSW Government Policies

- Workplace Design Principles (NSW Department of Planning, Industry and Environment)
- NSW Government Electric Vehicle Strategy
- NSW Climate Change Policy Framework
- Better Placed - Design objectives for NSW (Government Architects NSW)
- NSW Government Resource Efficiency Policy (GREP)
- NSW Government Net Zero Plan Stage 1 2020-2030

1 Introduction

1.3 Standards & Documents

1.3.2 TAFE NSW Requirements

TAFE NSW Design Standards

- Any other Design Standards relevant to the project

TAFE NSW Policies

- Environmental Sustainability Policy
- Reconciliation Action Plan
- Diversity and Inclusion Policy
- Work Health and Safety Policy
- Disability Inclusion Action Plan and Implementation Guide

1 Introduction

1.3 Standards & Documents

1.3.3 Standards

Australian Standards

Code Standards	Description
Australian Standard AS/NZS 3500.1	Plumbing and Drainage – Water Services
Australian Standard AS/NZS 3500.2	Plumbing and Drainage – Sanitary Plumbing and Drainage
Australian Standard AS/NZS 3500.3	Plumbing and Drainage – Stormwater Drainage
Australian Standard AS/NZS 3500.4	Plumbing and Drainage – Heated Water Services
Australian Standard AS 5601	Gas Installations – Gas Services
Australian Standard AS 2419.1	Fire Hydrant Installations
Australian Standard AS 2444	Fire Hose Reel Installations
Australian Standard AS 2118.1	Automatic Fire Sprinkler Systems – General Systems
Australian Standard AS 2118.6	Automatic Fire Sprinkler Systems – Combined Sprinkler and Hydrant Systems
Australian Standard AS 2941	Fixed Fire Protection – Pumpset Systems
Australian Standard AS 2444	Portable Fire Extinguishers and Fire Blankets – Selection and Location
Australian Standard AS 1428.1 & 1428.2	Design for access and mobility
Australian Standard AS/NZS 3000	Wiring Rules

1 Introduction

1.4 Definitions

1.4.1 Abbreviations

Abbreviations	Description
AFFL	Above Finished Floor Level
AS	Australian Standard
AS/NZS	Australian/New Zealand Standard
BMCS	Building Management and Control System
CO_2	Carbon Dioxide
CW	Cold Water
DBYD	Dial Before You Dig underground search
DP	Downpipe
FFL	Finished Floor Level
FH	Fire Hydrant
FHR	Fire Hose Reel
FU	Fixture Unit
FW	Floor Waste
G	Gas
HW	Hot Water
NCC	National Construction Code of Australia
QA	Quality Assurance
RPZD	Reduced Pressure Zone Device
SW	Sydney Water
TW	Trade Waste
WSC	Water Servicing Coordinator

1 Introduction

1.4 Definitions

1.4.2 Terms

Terms	Description
Supply	"Supply", "furnish" and similar expressions mean "supply only".
Provide	"Provide" and similar expressions mean "supply, install and commission".
Approved	"Approved", "reviewed", "directed", "rejected", "endorsed" and similar expressions mean "approved (reviewed, directed, rejected, endorsed) in writing by the TAFE NSW appointed delegate".
Give notice	"Give notice", "submit", "advise", "inform" and similar expressions mean "give notice (submit, advise, inform) in writing to the TAFE NSW appointed delegate".
Obtain	"Obtain", "seek" and similar expressions mean "obtain (seek) in writing from the TAFE NSW appointed delegate".
Proprietary	"Proprietary" mean identifiable by naming manufacturer, supplier, installer, trade name, brand name, catalogue, or reference number.
Samples	Includes samples, prototypes and sample panels.
this Design Standard	TAFE NSW Hydraulic Services Design Standard

Applications

2 Applications

2.1 Scope

2.1.1 How This Design Standard Applies

Compliance

This Design Standard is intended to support and assist the selection, design and procurement of hydraulic systems.

This Design Standard must also be read in conjunction with:

- Statutory and legislative requirements
- Contractual agreement with TAFE NSW
- The project brief and relevant project requirements
- Any other TAFE NSW Design Standards

Where there is a conflict between this Design Standard and any statutory or legislative requirement, the higher standard applies.

Mandatory/Must

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

Preferred/Should

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

Contractual Responsibility

The contents of this Design Standard does not relieve any consultant, contractor or supplier from their contractual responsibility relevant to the project.

It remains the responsibility of the consultant, contractor or supplier to fully complete, coordinate and identify any errors or omissions in the documentation produced for the hydraulic design.

Queries

Any project specific queries are to be raised through the TAFE NSW project lead, or project manager as applicable.

If this document appears to contradict or deviate from good industry practice or any statutory requirements, this is to be brought to the attention of the TAFE NSW project lead responsible for the delivery of the hydraulic design project.

2 Applications

2.1 Scope

2.1.2 Hydraulic Systems Covered By This Standard

This standard outlines the general hydraulic services scope as follows:

- Sanitary plumbing and drainage
- Grease waste plumbing and drainage
- Gutters, roof outlets and downpipes and stormwater drainage from the roof areas to the point of connection at ground level (external to building footprint) by the Civil Engineer
- Potable cold water service
- Rainwater reuse service
- Hot & warm water services
- Natural gas service
- LP gas service
- Sanitary fixtures, taps and outlets;
- Fire hydrant service
- Fire sprinkler service
- Fire hose reel service
- Portable fire extinguishers

In addition to general hydraulic design covered by this Design Standard, hydraulic designers must liaise, consult and collaborate with TAFE NSW stakeholders and user groups to include specific hydraulic design, operation and maintenance requirements for the following faculty specialist areas:

- Engineering and electrotechnology systems
- Welding, fitting, machining, metal fabrication, carpentry and other building services trades
- Hospitality and food preparation
- Laboratory, and science preparation
- Nursing, dental, allied healthcare and research areas
- Photography and film, TV, digital media
- Vehicle painting, automotive trades
- Printing, graphic arts
- Watchmaking and detailed working
- EDI/theatre spaces
- Horticulture/greenhouses
- Dangerous goods and hazardous material storage areas
- Visual merchandising and retail tenancies
- Multiple use learning spaces
- Hairdressing
- Animal Care
- Any other specialist faculty or learning areas not covered by this Design Standard

2 Applications

2.2 Project Application

2.2.1 Project Types

This design standard is intended to support the hydraulic services design and delivery of a variety of physical environments including but not limited to the project types below:

Project designers are to assess the specific project design restrictions and scope against this design standard and apply the requirements as appropriate to the project scope. It is recognised that there may be existing building constraints that prevent full compliance. Deviations from this standard are to be identified to the project team as departures. They are to be formally approved prior to proceeding.

Major Capital Works & Special Projects

- All new building and major refurbishment projects must comply with this design standard.
- All existing hydraulic infrastructure (either campus or authority owned), including potable water supplies, natural gas, fire hydrant systems, fire sprinkler systems, sanitary drainage and stormwater systems must be assessed for suitability, capacity and compliance with the new works. Where assessment deems any of these systems not suitable, works to upgrade the system, replace or remediate may be required.

Minor Works

- All building alterations and additions must comply with this standard

Mini-Minor Works

- All minor fitouts should make every effort to comply with this standard where physically possible, practical and financially feasible to do so. Any deviation to the standard is to be supplied to TAFE for review and confirmation prior to proceeding

2.2.2 Project Stages

This Design Standard is to be used for the whole life cycle of the project. Depending on the user and project type, the requirements in this Design Standard should be used in all or only select stages.

2 Applications

2.2 Project Application

2.2.3 Project Designer

The hydraulic designer or consultant must be an experienced and suitably qualified hydraulic services designer covered by professional indemnity and public liability insurance in accordance with the TAFE NSW contract and relevant industry requirements.

At the completion of the briefing stage and at every design stage, the hydraulic designer must obtain endorsement of the proposed design from the TAFE NSW project team to proceed to the next stage.

In addition to the project deliverables, the hydraulic designer has the following obligations:

- Confirm with TAFE NSW if there are any specific TAFE NSW procurement agreements for major plant at the time of pricing. Where relevant, include reference to these agreements for specific plant, directing biding contractors to make use of the agreement
- Review of all documents and specifications provided by the installer to maintain quality of the installation in accordance with the design
- Review of samples provided by the installer to maintain quality of the installation in accordance with the design.
- Inspect the new installation for compliance with the project design documentation, NCC and relevant standards

2.2.4 Project Installer

The hydraulic installer or contractor must be an experienced and suitably qualified hydraulic services designer covered by professional indemnity and public liability insurance in accordance with the TAFE NSW contract and relevant industry requirements.

At the completion of every design stage, the hydraulic installer must obtain endorsement of the proposed design from the TAFE NSW project team to proceed to the next stage.

In addition to the project deliverables, the hydraulic installer has the following obligations:

- Confirm with TAFE NSW if there are any specific TAFE NSW procurement agreements for major plant at the time of pricing. If an alternative to the procurement plan is proposed, provide justification for the selection, and receive TAFE NSW approval prior to proceeding.
- To provide detailed on-site measurement, co-ordination with building elements and other services to establish final set-out, location of equipment allowing for maintenance access envelope requirements
- To provide detailed programs including milestones indicating shutdowns, temporary requirements to maintain occupancy, staging of works and commissioning prior to handover
- To provide manufacturer's workshop, equipment specifications and construction drawings, schedules and details
- Provide handover training to TAFE NSW user groups and facilities management staff at the completion of the project detailing full operation, and relevant maintenance requirements for the installed systems

2 Applications

2.3 Project Design Documents

2.3.1 Designer Deliverables

The hydraulic designer or consultant must prepare and submit all reports, design documents and certification as required to fully describe the design and to suit the scale and complexity of the project. The minimum documentation is as indicated below:

Site Investigation and Audit

Site investigation and audit report must include:

- A detailed site investigation and audit must be undertaken for the entire existing hydraulic services including incoming/outgoing hydraulic infrastructure (potable water, fire hydrant, natural gas/LPG, sanitary drainage and stormwater), hydraulic pump duties, drainage pre-treatment devices, hydraulic plant and equipment, pipework etc. This must include:
- An assessment of the condition, available spare capacity and compliance for the intended existing equipment and/or system and whether it is suitable for re-use
- A due diligence review of any non-conformances to any applicable standards and authority requirements
- List all non-compliance items with TAFE NSW standards and/or any other reference documents provided
- Any site constraints, potential hazards or risks
- An outline of the findings, outcomes and recommendations.

Return Services Brief

Return Services Brief must be prepared and submitted to:

- Identify and qualify the strategic deliverables to be achieved
- Incorporate all site audit investigation findings and outcomes
- Indicate demolition, disconnection, making safe, dismantling and de-commissioning of existing redundant systems
- Identify site storage, disposal and removal of redundant equipment
- Outline staging of works in accordance with the construction deliverables satisfying stakeholder and user group requirements
- Investigate temporary construction supply requirements and indicate the origin, ability to maintain reliability and availability of the supply serving the buildings affected
- Ensure all hydraulic services location and spatial considerations including maintenance envelopes, access to equipment and egress requirements of hydraulic plant and equipment, hydraulic risers are considered and incorporated within layouts
- Outline findings identified as part of TAFE NSW stakeholder consultation and all other design consultant input for hydraulic services to be provided for each specific area
- Identify Green Star metering initiatives and their design requirements
- Outline spare capacity and modular additions including spatial considerations
- Outline coordination of all hydraulic services demarcation with interfaces and in connection with other trades

- Nominate sample submission requirements and applicable warranties of proposed equipment
- Describe a comprehensive labelling methodology
- Confirm compliance with mandatory standards and regulatory authorities
- Confirm compliance with this Design Standard and any other relevant TAFE NSW standard
- Identify where there is any ambiguity, conflict or discrepancies and highlight these within the return services brief

Budget Cost Summary

Budget Cost Summary must be prepared and submitted identifying costs for all hydraulic services systems at each specific area in accordance with the return services brief. Outline any assumptions and exclusions.

Any Proposed Alternate Innovative Design

Any proposed alternate innovative hydraulic design solutions must undertake a cost/benefit analysis study. This must identify capital costs, ongoing energy and maintenance costs, along with a qualitative analysis illustrating the reliability, longevity, and maintenance regime for the alternative proposal against the option put forward by the standard. Offer a fair, comparative assessment of the capital and operational costs of this alternative solution when compared with the applicable specified provisions.

Design Calculation Report

Refer to relevant technical sections for details.

Risk Management Report

Risk Management Report must be prepared and submitted for all new projects at the design stage, and at the commencement of construction, identifying:

- Safety and design requirements for construction, operation and maintenance
- The origin of all identified risks
- Work to be carried out in hazardous and confined spaces

Risk-Management – additional reporting for non-mechanical items is to be provided by others.

- Asbestos retention and/or removal
- Hazardous goods handling and storage areas
- Any specific stakeholder insurance risk requirements
- Potential latent conditions including the process for early resolution to agree costs involved prior to proceeding with works and to avoid/mitigate construction delays.

2 Applications

2.3 Project Design Documents

Certification

Certification must be submitted to the Principal Certifying Authority/person qualified to conduct a Certification of Crown Building Works if required in accordance with the NCC/BCA, statutory and regulatory authority requirements, this Design Standard any other relevant TAFE NSW standard.

Specification Documentation

Specification Documentation must incorporate and further develop the detail of the hydraulic services design including requirements of all relevant report findings and outcomes, along with the inclusion of the following as a minimum:

- Address the design principles and strategies of this Design Standard
- Address the project specific design strategies
- Clear description of hydraulic services scope of works
- List of codes and standards that the project design is in compliance with
- A comprehensive project specific scope of hydraulic services systems, schedules equipment and all associated technical requirements
- Detailed demarcation requirements for the specified works with existing installations, and works by others
- Be co-ordinated with the latest reference documents and each trade services design input
- Commissioning, testing and quality monitoring framework during the construction works
- TAFE NSW staff training and handover procedures
- Identify working and final documents and record requirements
- Identify a comprehensive Operating and Maintenance Manual requirements
- Installer deliverables as detailed in Section 2.3.2 of this Standard

2.3.2 Installer Deliverables

The hydraulic installer or contractor must prepare and submit all reports, design documents and certification as required to suit the scale and complexity of the project. The minimum requirements for deliverables are as indicated below:

Samples

Submit all specified hydraulic services plant and equipment, pipework materials, backfill material, fire rated fixing and supports and any installer proposed alternative samples for review and comparison by the design team.

Alternative Design Verification

Where alternatives are proposed, provide an alternative design assessment report indicating compliance with the hydraulic design intent and design criteria. Provide all supporting technical data, and associated installation methodology which must be compliant with statutory requirements.

Risk Management Report is to be prepared and submitted identifying:

- Safety in Design requirements for construction and installation
- The origin of all identified risk
- Any potential hydraulic hazards
- Any work to be carried out in hazardous and confined spaces
- Asbestos retention and/or removal
- Hazardous goods handling and storage

Interruption of Supply Notices

Notice of interruption of supply is to be submitted for acceptance when undertaking any planned interruption of supply to existing areas of an occupied building.

Commissioning and Testing

The hydraulic contractor must develop and submit a project specific commissioning and testing plan in accordance with their quality assurance plan. This must be consistent with the builder's construction program including:

- All defined handovers including staged areas
- All milestones
- Notice for witness upon completion of all acceptance testing and commissioning activities
- Completion of all mandatory site tests in compliance with standards and authority requirements
- Detail of testing for each system and associated sub-component
- All acceptance testing and commissioning records and certificates
- All commissioning and test reports and certificates indicating observations and results of tests, commissioning and compliance or non-compliance with statutory authority requirements
- All final and acceptance test records in suitable format for the inclusion in Operating and Maintenance manuals

- For major projects, and where called for in the project specification, a Twelve month building tuning process must be provided for the calibration of systems and meters with commencement at handover to TAFE NSW with systems monitoring monthly reporting from energy management system to be assessed each three month period to include feedback from the TAFE NSW staff.
- All programming back up data for the EMS system

Workshop Drawings

Submit further developed detailed design drawings, addressing method of installation, mounting and fixing, temporary works and staging, minor alterations in construction, approved value engineering initiatives and alternative designs. Workshop drawings documentation is to confirm to the digital standards as setout by the TAFE NSW Smart Campus Design Standard, and the project specific BIM management plan (if available).

As-built Drawings

Submit revised As-installed drawings, revised equipment schedules, illustrating as-installed mounting and fixing details and as installed condition for record and maintenance purposes. As-builts to be provided in the following formats: full size PDF's, CAD/DWG, Revit Model (if available for the project). As-built documentation is to confirm to the digital standards as setout by the TAFE NSW Smart Campus Design Standard, and the project specific BIM management plan (if available). Potential items could include, but are not limited to: BIM modelling level, geo-location of plant, and specific plant metadata.

Warranties

Submit all warranties for all installed works covering the hydraulic contractor's works and installed plant. Specific warranties are to be provided for major hydraulic plant. Refer to technical sections of this specification for any extended warranty requirements.

Operating and Maintenance Manuals

Prepare and submit an operating and maintenance manual with the inclusion of the following project specific detailed requirements:

- Table of contents: As per contractual requirements
- Directory: As per contractual requirements
- Format: As per contractual requirements
- Installation description: General description of installation.
- Systems descriptions: Technical description of the systems installed, written to ensure that the Proprietor's staff fully understands the scope and facilities provided. Identify function, normal operating characteristics, and limiting conditions.
- Systems performance: Technical description of the mode of operation of the systems installed.
- Certificates:
  - Certificates from Authorities
  - Product certification

  - Contractor waterproof sealing of penetrations certificate
  - Contractor fire and smoke sealing penetrations certificate
  - Contractor acoustic sealing of penetration certificate
  - Seismic restraint mounting certification
  - Calibration certificates at acceptance testing and final testing
  - Design certificates demonstrating compliance to TAFE NSW Standards, all statutory & authority requirements, and the NCC
  - Installation certificates to TAFE NSW Standards, all statutory & authority requirements, and the NCC
  - Supply authority completion forms and inspection records
  - Inspection and contractor rectification records
- Drawings and technical data: As necessary for the efficient operation and maintenance of the installation
- Equipment descriptions:
  - Name, address, telephone and email address of the manufacturer and supplier of items of equipment installed, together with catalogue list numbers
  - Schedules of fittings, plant and equipment. Include identification locations, metering and control settings, performance figures and dates of manufacture. Provide a unique code (Asset) number
  - Schedules of fitting, plant and equipment to include cross-reference to the record and diagrammatic drawings and schedules, including easy to find spare parts schedule, for each item of equipment installed
  - Schedules of fitting, plant and equipment to include manufacturers' technical literature for all plant items, equipment, metering and associated controls, outlets, and all other hydraulic equipment installed, assembled specifically for the project, excluding irrelevant matter.
  - Generic Brochures are not acceptable. Provide project specific technical data of items installed
  - Mounting and fixing to product data to illustrate relations of component parts. Include typed text as necessary.
- Manufacturer’s product data for proprietary equipment, including:
  - Technical specifications and drawings
  - Verification reports
  - Performance and rating tables
  - Recommendations for installation and maintenance
  - Schedule of proposed major products that are not specified as proprietary items
  - Product certification
- Operation procedures:
  - Manufacturer's technical literature as appropriate
  - Safe starting up, running-in, operating and shutting down procedures for systems installed. Include logical step-by-step sequence of instructions for each procedure including automatic and manual control override procedures
  - Switchgear, metering and control schedule of settings established at acceptance and final commissioning and testing, making reference to each switchboard
  - Control sequences and flow diagrams for systems installed

  - Compile a hydraulic services switchgear, metering and control user interface guide to include all operating instructions to enable user to configure equipment to achieve a reliable, energy efficient, safe and fully functional operation
- Maintenance procedures:
  - Manufacturer's technical literature as appropriate. Register with manufacturer as necessary. Retain copies delivered with equipment
  - Safe trouble-shooting, disassembly, repair and reassembly, cleaning, alignment and adjustment, and checking procedures. Provide logical step-by-step sequence of instructions for each procedure
  - Schedule of spares recommended to be held on site, being those items subject to wear or deterioration and which may involve the Proprietor in extended delivery times when replacements are required. Include complete nomenclature and model numbers, and local sources of supply
  - Instructions for use of tools and testing equipment
  - Emergency procedures, including telephone numbers for emergency services, and procedures for fault finding
- Records and Documents:
  - All construction drawings should be revised to ensure inclusion of all additions, modifications and alterations during the construction stage to be submitted as As-built drawings, to same scale and format
  - All fabrication and workshop drawings should be revised to ensure inclusion of all additions, modifications and alterations during the construction stage to be submitted as As-built drawings, to same scale and format
  - All hydraulic services system and control schematics
  - All licensed versions of computerised software required to program and monitor systems
  - All security code access, usernames and passwords, configuring, data base and recovery protocols stored in digital format on an external hard drive, required to reset and access all energy management software
  - Equipment asset numbered schedules, identifying condition and use with unique label.
- Commissioning and Testing Records
  - Contractors completed self-regulated inspection & test plans for each hydraulic services system installed
  - Completed logbooks and the like
- Warranties

Installation Certification

Installation Certification is to be submitted to the Principal Certifying Authority/person qualified to conduct a Certification of Crown Building Works if required in accordance with design documents, NCC/BCA, statutory and regulatory authority requirements, this Design Standard or and any other relevant TAFE NSW standard.

2 Applications

2.3 Project Design Documents

Handover Training Records

Provide written report outlining the details for the handover training provided to user groups and facilities management staff. This will include but not be limited to:

- Record of parties who conducted and received the training
- Dates provided
- Summary of mechanical services/plant covered
- Details of specific training provided

Design Strategies

3 Design Strategies

3.1 User Well-Being

Create a safe environment for occupants with user friendly interfaces that are readily accessible.

Strategy	Requirement
Safety	Identify potential hazards and undertake a risk assessment, to implement safe installation, operational procedures, ongoing maintenance, cleaning, and replacement of plant.
Accessibility	Create an environment that promotes equitable access for all users regardless of ability. Potential accessible features for user interfaces could include: User interface metering, controls and outlets to be accessible and clear from any obstructions, use of accessible fixture and tapware with clearances maintained under accessible compliant sinks.
User Interface	Enable easy user-friendly interface with non-technical operating instructions to facilitate intended use.

3 Design Strategies

3.2 Adaptability

Hydraulic equipment design to be consistent and compatible, allow multifunction use and future growth requirements.

Strategy	Requirement
Consistency	Ensure consistency of manufacture and model type within adjoining buildings, areas or rooms within the building. Select components which complement the architectural and interior design finishes and address items of heritage significance.
Compatibility	Accommodate existing installations including site conditions, building elements, ceiling types, structure and other services penetrations, control and interfacing requirements. Ensure selections are suitable for their intended purpose and the area serviced.
Future growth	Allow spare capacity and modular system framework to support future expansion. 20% additional capacity for all services infrastructure is to be provided when supplying new infrastructure.
Multi-function	Location and installation method to allow flexible user operation.
Environment	Address the longevity of the installation subject to the environmental conditions of the area such as high ambient temperatures, dust, moisture and/ or impact on outlets, equipment and the like.
Innovation	TAFE NSW supports innovation across all scales of project delivery. Where a consultant/contractor identifies an opportunity to implement innovative solutions these may be submitted to the TAFE NSW project lead for review.

3 Design Strategies

3.3 Understanding Context

Address the project scope, construction, cost, maintenance, sustainability and quality requirements.

Strategy	Requirement
Project Type	Facilitate the specific project scale, site conditions and campus location.
Construction	Resilient and robust construction to allow reliable use within the installed environment.
Cost	Undertake a holistic cost-effective design to mitigate procurement, installation, and ongoing maintenance costs and support the longevity of the proposed hydraulic services installation.
Selection	Select components that are readily available from local suppliers.
Maintenance	Facilitate ongoing monitoring procedures, and enable installation and maintenance without any access constraints or the need for dismantling or demolition.
Sustainability	Incorporate energy saving initiatives that allow the user to monitor energy usage and provide reporting to mitigate operational energy consumption.
Quality	Assess, evaluate and verify performance, method of installation, commissioning and testing to meet functional and operational requirements and achieve longevity of the installation in accordance with warranties provided.
Amenity	Location, operation and maintenance of equipment must not have a detrimental impact on the use of adjacent spaces and facilities. Locate equipment away from primary circulation routes, main building entries, windows, landscape features, recreational spaces and the like. Operation and maintenance of equipment must not impact the use and amenity of adjacent spaces and facilities including physical access, visual and acoustic impacts, odours, and service continuity.

Technical Sections

4 Technical Sections

4.1 Potable Water Supply

4.1.1 Summary

Potable water shall be provided from the reticulated Authority's potable water main into the property boundary/development to the Authority's requirements.

The potable water supply should originate from either:

- Existing spare capacity within the site infrastructure, or
- A new connection from the water authority supply network

The consultant/contractor must allow to investigate and obtain all available details of the existing infrastructure, including the location and survey of underground services, as required.

Where existing information is not available, the project team must arrange for further investigative works.

Site Investigation

Undertake a site investigation to document site conditions, existing equipment required to be re-connected and to review the origin of potable water supply to determine if spare capacity available for the proposed project.

Supply

Make a planning assessment to review the preferred point of supply from an existing water supply to accommodate the proposed project requirements.

Where existing spare capacity is found to be insufficient, upgrade of the existing infrastructure may be required. The TAFE NSW project team is to be advised if major infrastructure upgrades is required to accommodate the proposed project requirements.

4.1.2 Design

Design Parameters

- Probable Simultaneous Demand (PSD) must be undertaken in accordance with AS/NZS 3500.1
- The water supply pressure to any fixture is to be 250 - 500 kPa
- Maximum 1.5m/s operating water velocity in pipework

For breakout areas (both student and staff) a filtered potable water supply shall be provided with a 25L electric storage hot water unit located under the sink to provide hot water at a minimum.

4 Technical Sections

4.1 Potable Water Supply

Materials

Potable water pipe to be installed in the following materials:

- In-ground pipe and fittings to be either silver soldered type “B” copper, approved polyethylene, PN20 or MDPE pipe with electro fusion joints pipe and fittings. Pipe to be fitted with trace wire and tested for continuity prior to handover. All pipework shall be equal to Vinidex or Iplex
- Reticulated above ground pipe and fittings to be copper type “B” or Grade 316 stainless steel with press-fit joints. Pipework and fittings shall be equal to Viega or Allmach
- Rough-in pipe and fittings to stud walls to be peroxide-cross linked Polyethylene (PE-Xa), with compression sleeve connections. Pipework and fittings shall be equal to Rehau Rautitan/Auspex
- Within masonry walls, pipe and fittings shall be Silver soldered type “B” copper pipe and fittings with Kemlag or equivalent insulation

4.1.3 Components

Typical All Components

All plant, meters, equipment and the like are to be protected by unauthorised access via a lockable cabinet, enclosure or cage. These shall be located where most suitable for the development. All plant locations, equipment etc. are to be submitted and coordinated with the TAFE NSW team through the spatial planning stages.

Water Filtration – Incoming water supply

- For new development sites, the main incoming water supply shall be fitted with dual automatic backwash filters with stainless steel screens directly after the water meter and housed within a waterproof, lockable enclosure
- No interruption to water supply to occur during backwash cycle
- Full-flow by-pass to be provided around the filter assembly
- Monitored by the BMCS (where available)

Safety Showers/Eye Wash

- Safety Showers/Eye Wash are to be installed with potable water only and to be accessible

Isolation Valves

- Isolation valves for shut-off shall be located in accessible locations and within the room they serve. E.g. a bathroom shall have a set of isolation valves within a valve box enclosure behind the door prior to extending to the fixtures. For existing infrastructure/refurbishments, this may be located via an access panel at high level following TAFE NSW review and confirmation
- Where isolation valves are installed in valve box enclosures, they should be set flush within the wall
- Isolation valves shall be provided to each new building, at each floor and at each wet area. Valves are also to be installed to areas or fixtures that are in remote locations

4 Technical Sections

4.1 Potable Water Supply

- For all underground valves, provide a square cast iron surface box with hinged cover marked “SV” or “Water”

Flexible Hose Piping

- Flexible hose piping is not permitted for use in concealed cold water connections. Any connections which utilise flexible hoses to fixtures must be accessible for maintenance

Tapware

- Tapware to all staff and student breakout areas shall be accessible type tapware

Water Meters

- For new development site or new major project new buildings, water meters shall be provided at each building. Water meters shall include pulse lead type attachments to connect into the BMCS/EMS.
- Sub-meter are to be installed for all major building plant and equipment, including, but not limited to:
  - Mechanical cooling towers;
  - Domestic and heating hot water plants
  - Laboratories
  - Irrigation supplies
  - Top up water supplies for rainwater tanks

Potable Water Tanks

- Potable and non-potable water tanks to be 316 stainless steel modular panel type tanks
- Bladder or liner tanks will not be accepted
- Tank water level indicators must be provided
- Minimum clearance of 600mm around tank is required and 1000mm above top of tank

Potable Water Pumps

- Pumps are to be in minimum duplex arrangement with duty/standby operation
- Potable water pumps must be installed adjacent to potable water tanks, on or below the lowest level of the tanks, to adequately prime the pumps

Backflow Prevention Device

- Each individual site/building must be deemed a separate property for the purposes of containment protection and must be installed with individual dual backflow prevention devices at the main water supply connection point
- Backflow prevention devices must be fitted to rainwater reuse supply

4 Technical Sections

4.1 Potable Water Supply

4.1.4 Deliverables

General

Please refer to Section 2.3 Project Design Documents for project deliverables, and specific system deliverables as noted in this section.

- Justification/outline of process for selected potable water system, notably inclusion and sizing of pump and tanks if applicable
- TAFE NSW Hydraulic Design Standard departures
- Authority approvals for water service connection/water usage (i.e. Section 73 compliance certification)
- Statement of available pressure and flow
- A current P&F Statement to be obtained throughout all project phases

4 Technical Sections

4.2 Hot Water Services

4.2.1 Summary

The consultant/contractor must ensure the most efficient hot water supply is designed and installed to suit the building operations and demand. This may take the form of a centralised hot water system with a recirculated hot water flow and return loop, or dedicated point-of-use systems.

System Types

Permissible hot water system types are:

- Electric storage
- Heat pump
- Electric instantaneous
- Gas instantaneous

Electric systems are preferred and may be required for new installations under the TAFE NSW Sustainability Design Standard and to meet TAFE NSW energy targets. Typically, gas systems are only to be installed for specialist training environments.

Site Investigation

Undertake a site investigation to document the existing hot water service equipment to understand if spare capacity is available and suitable for reuse for the project.

4.2.2 Design

Design Parameters

- Heat and energy loss must be minimised by installing adequate insulation on all hot water pipework and by locating hot water units in the vicinity of areas with the greatest demand
- The water supply pressure to any fixture is to be 250 - 500 kPa
- Minimum 65°C storage at hot water plant
- Minimum 60°C return water temperature
- 43°C to accessible bathroom and shower amenities
- 45°C to staff bathrooms and shower amenities
- 50°C to staff kitchens and kitchenettes
- 60°C to commercial kitchens
- Warm water return pipework is to be sized for a maximum temperature loss of ± 2°C
- Hot water return pipework is to be sized for a maximum temperature loss of ± 5°C
- Maximum hot water dead leg allowable is 10 metres
- Maximum warm water dead leg allow able is 5 metres

4 Technical Sections

4.2 Hot Water Services

Materials

Hot and warm water pipe to be installed in the following materials:

- Reticulated above ground pipe and fittings to be copper type “B” or Grade 316 stainless steel with press-fit joints. Pipework and fittings shall be equal to Viega or Allmach
- Rough-in pipe and fittings to stud walls to be peroxide-cross linked Polyethylene (PE-Xa), with compression sleeve connections
- Pipework and fittings shall be equal to Rehau Rautitan/Auspex
- Within masonry walls, pipe and fittings shall be Silver soldered type “B” copper pipe and fittings with Kemlag, or equivalent lagging

4.2.3 Components

Solar preheat is to be considered and included where practical.

Thermostatic Mixing Valves (TMV)

- For new developments, hot water to ablution fixtures must be tempered through Thermostatic Mixing Valves. Tempering valves are not to be utilised.
- Thermostatic Mixing Vales are to be installed in a stainless steel lockable box set flush within the wall, accessible at approximately 1500mm high
- TMVs shall be installed within the room they are serving

Tempering Valves (TV)

- Tempering Vales may be installed to temper water to ablution or any other hot water fixtures in refurbishment works only

Flexible Hose Piping

- Flexible hose piping is not permitted for use in concealed hot water connections. Any connections which utilise flexible hoses to fixtures must be accessible for maintenance

Insulation

- Minimum 25mm thickness equal or equivalent to Thermotec

Circulating Hot Water Pumps

- Must be installed in a duty/standby arrangement with auto changeover
- Pump control panel must be provided with auto/off/manual switches for each pump
- Monitored by the BMCS (if available)

4 Technical Sections

4.2 Hot Water Services

4.2.4 Deliverables

General

Please refer to Section 2.3 Project Design Documents for project deliverables, and specific system deliverables as noted in this section.

- Justification/outline of process for selected hot water system
- TAFE NSW Hydraulic Design Standard departures

4 Technical Sections

4.3 Natural Gas/LP Gas

4.3.1 Summary

Natural gas shall be designed and installed in accordance with AS 5601 and the local gas authority gas fitting rules.

Where the site fronts a reticulated Authority's gas main, natural gas is to be supplied to the site. Should the site not have direct frontage to a reticulated supply, the engineer shall identify a suitable solution to either provide a gas mains extension to the site or provide LPG storage if gas is a requirement to the development. Options shall be detailed and reviewed and provided to TAFE NSW for review and sign-off.

Site Investigation

Undertake a site investigation to document site conditions, existing equipment required to be re-connected and to review the origin of natural gas/LP gas to determine if spare capacity available for the proposed project.

4.3.2 Design

Design Parameters

- Internal gas pressure shall be reticulated at 2.75kPa - 5kPa.

Materials

Natural gas/LP gas to be installed in the following materials:

- In ground pipe and fittings to be either silver soldered type "B" Copper, approved polyethylene, PN20 or MDPE pipe with electro fusion joints, pipe and fittings. Pipe to be fitted with trace wire and tested for continuity prior to handover. All pipework shall be equal to Vinidex or Iplex;
- Reticulated above ground pipe and fittings to be copper type "B" or Grade 316 stainless steel with press-fit joints. Pipework and fittings shall be equal to Viega or Allmach.
- Rough-in pipe and fittings to stud walls to be peroxide-cross linked Polyethylene (PE-Xa), with compression sleeve connections. Pipework and fittings shall be equal to Rehau Rautitan/Auspex. Within masonry walls, pipe and fittings shall be silver soldered type "B" Copper pipe and fittings.

4 Technical Sections

4.3 Natural Gas/LP Gas

4.3.3 Components

Gas Meters

- Gas meters shall be provided at each building complete with a data logger and connection to the BMCS/EMS
- Sub-meter are to be installed for all major building plant and equipment, including, but not limited to):
  - Centralised hot water systems
  - Steam boilers
  - Commercial kitchens
  - Laboratories

Isolation Valves

- Isolation valves for shut-off shall be located in accessible locations
- For all underground valves, provide a square cast iron surface box with hinged cover marked “G" or GAS"

Safety Shutoff Valves

- Gas safety Shutoff valves must be provided with signage and reset procedure instructions in a visible location at the valve
- Automatic gas shutdown devices must be connected to fire alarm systems where required by Australian Standards

Gas Detection System

- Gas Detection Systems shall be provided to all relevant training facilities to monitor the gas levels within the room. The gas detection system shall be connected to the BMCS (if available), otherwise be provided with visible and audible alarms as a minimum

Flexible Hose Piping

- Flexible hose piping is not permitted for use in gas connections. Solid fixed pipework is to be utilise in all situation

Fluing of Equipment

- Fluing of gas fixtures shall be minimised, e.g. combined/common flues over separate appliance flues

4.3.4 Deliverables

General

Please refer to Section 2.3 Project Design Documents for project deliverables, and specific system deliverables as noted in this section.

- Justification/outline of process for selected natural gas system
- TAFE NSW Hydraulic Design Standard departures
- Authority approvals for connection into natural gas main
- LPG tank sizing calculations

4 Technical Sections

4.4 Sanitary Plumbing and Drainage

4.4.1 Summary

The sanitary plumbing and drainage system includes all the associated drainage and venting pipework, equipment and pits required for the discharge of sanitary drainage.

Where possible, all sanitary fixtures shall gravity drain to the authority's sewer drainage main.

Should the site/building or parts thereof not be able to gravity drain to the authority's main, the engineer shall identify suitable disposal methods for those areas not achieving gravity connection.

A typical solution for disposal is a dedicated Sewer Pumping Station (SPS). The engineer shall advise TAFE NSW if gravity cannot be achieved and a justification onto the sizing of the SPS, nominating the total hours storage, be provided to TAFE NSW for review and sign-off.

Consultation with the geotechnical engineer is required (if applicable) to determine whether additional in-ground supports or provisions for movement/expansion is required for in-ground drainage.

Site Investigation

Undertake a site investigation to document site conditions and existing sanitary drainage services to determine if suitable for reconnection for the proposed project.

4.4.2 Design

Materials

Sewer drainage and sanitary plumbing pipe to be installed in the following materials:

- In-ground pipe and fittings to be sewer grade SN8 uPVC pipe, with solvent cement joints
- Above ground sewer drainage pipe and fittings to be sewer grade SN4 uPVC pipe, with solvent cement joints
- Rising mains to be PN18 pressure grade PVC. All rising mains shall connect to the boundary trap and protect the building from surcharge via an overflow gully
- All exposed traps and pipework will be chrome plated brass or copper

4.4.3 Components

Air Admittance Valves

- Air Admittance Valves (AAVs) are acceptable however must be installed in a readily accessible position for inspection and maintenance

Fixture Traps

- Bottle traps are not permitted to be installed. All fixture traps are to be installed in uPVC or HDPE for high temperature discharge and be accessible

Floor Wastes

- Floor wastes are to be chrome plated brass screw in type with 100mm diameter and puddle flange
- Floor wastes to bathrooms may be considered to be omitted from refurbishment works if beneficial for the project from a risk-mitigation perspective

Tundishes

- Adequate access is to be provided for all tundishes
- Waterless trap type tundishes are acceptable
- Where located within a wall, tundishes shall be installed between 300mm and 1500mm from finish floor level, and provided with a clear perspex viewing panel
- Tundishes to be located where there are existing drainage services (i.e. under sinks)
- Condensate lines to be run into a single tundish where possible

Inspection Openings/Clear Outs

- Clear outs/inspection points are to be provided to all WCs where installed on slab on ground
- Clear outs/inspection point can be omitted to WCs installed above ground floor level if adequate access from the level below is provided for maintenance. Removing the WC pan is not an acceptable method of gaining access to the waste pipe.

4 Technical Sections

4.4 Sanitary Plumbing and Drainage

Sewer Pumping Station (SPS)

- All pumped drainage solutions must be submitted to TAFE NSW for approval with sufficient information demonstrating that gravity drainage cannot be achieved
- Sewer pumps and pit to be connected and monitored by the BMCS
- A visual strobe light and audible alarm shall be nominated at the control panel triggered when the high level sensor/level is reached in the sewer pumping station
- External sewer pumping stations must be located where there will be least disruptions to adjacent facilities and operations during maintenance activities
- Sewer pumping stations must not be located within or adjacent to a primary circulation path or building entry
- Internal sewer pumping stations must be located within a dedicated, sealed room so as to isolate odours during maintenance activities
- Sewer pumping stations must have a minimum capacity greater than a 2 hour peak period

Safety Shower/Eye Wash

- Safety Shower/Eye Wash stations must be provided with a floor waste. All floor wastes serving a safety shower/eye wash must be nominated with a rubber grate seal to slow down drying of the water seal

Access Chambers and Pits

- Where subject to vehicular traffic, pit covers must be of Class D rating
- Where a pit is identified as a confined space area, pit covers shall be provided with appropriate confined space signage

4.4.4 Deliverables

General

Please refer to Section 2.3 Project Design Documents for project deliverables, and specific system deliverables as noted in this section.

- Justification/outline of process for selected sanitary drainage systems
- TAFE NSW Hydraulic Design Standard departures
- Authority approvals for sewer service connection/sewer discharge (i.e. Section 73 compliance certification)
- Building Plan Approval (BPA) if applicable to water authority

4 Technical Sections

4.5 Trade Waste Plumbing and Drainage

4.5.1 Summary

Consultation with the geotechnical engineer is required (if applicable) to determine whether additional in-ground supports or provisions for movement/expansion is required for in-ground drainage.

Site Investigation

Undertake a site investigation to document site conditions and existing trade waste drainage services to determine if suitable for reconnection for the proposed project. Allow to review existing agreements with the relevant sewer authority to determine if reconnection is feasible.

4.5.2 Design

Materials

Sewer drainage and sanitary plumbing pipe to be installed in the following materials:

- In-ground pipe and fittings to be HDPE SDR26, with electrofusion welded joint
- Above ground pipe and fittings to be HDPE SDR26, with electrofusion welded joint

4.5.3 Components

Grease Arrestor

- Grease arrestors must be Sydney Water or local authority approved
- Polyethylene grease arrestors above ground are preferred
- Hot and cold water wash down taps are to be provided within the grease arrestor room
- External grease arrestors must be located where there will be least disruptions to adjacent facilities and operations during maintenance activities
- Grease arrestors must not be located within or adjacent to a primary circulation path or building entry
- Internal grease arrestors must be located within a dedicated, sealed room so as to isolate odours during maintenance activities

Dilution Pit

- Dilution pits are typically required by the water authority for all science laboratories waste disposal from science sinks
- External dilution pits must be located where there will be least disruptions to adjacent facilities and operations during maintenance activities
- Dilution pits must not be located within or adjacent to a primary circulation path or building entry
- Internal dilution pits are to be located within a dedicated, sealed room so as to isolate odours during maintenance activities

4 Technical Sections

4.5 Trade Waste Plumbing and Drainage

4.5.4 Deliverables

General

Please refer to Section 2.3 Project Design Documents for project deliverables, and specific system deliverables as noted in this section.

- Justification/outline of process for selected potable water system, notably inclusion and sizing of pump and tanks if applicable
- TAFE NSW Hydraulic Design Standard departures
- Authority approvals for trade waste service discharge

4 Technical Sections

4.6 Stormwater Drainage

4.6.1 Summary

The stormwater system proposed will be designed in accordance with the Local council's code and requirements, Sydney Water Corporation/local authority, AS 3500 and other relevant Australian Standards.

External stormwater drainage system (external to building footprint) OSD tanks, subsoil drainage/pump-out, overland flow paths etc. will be designed and documented by the Civil Engineer.

The hydraulic design engineer shall design systems to collect the roof water and balcony outlets and reticulated throughout the building to connect to the external collection points or pits as documented by the Civil Engineer for the development.

Prior to any design works, the hydraulic engineer must agree and confirm, along with the civil engineer, the demarcation of scope between hydraulic and civil with the Head Contractor.

Rainwater from the roof shall be captured and directed into the rainwater reuse tank. Where possible, an in-ground rainwater tank shall be nominated which can overflow via gravity into the civil OSD tank (if nominated).

Consultation with the geotechnical engineer is required (if applicable) to determine whether additional in-ground supports or provisions for movement/expansion is required for in-ground drainage.

Site Investigation

Undertake a site investigation to document site conditions and existing stormwater services to determine if suitable for reconnection for the proposed project.

4.6.2 Design

Design Parameters

Stormwater drainage systems are to be designed to the following criteria:

- Eaves gutters: ARI 20, 5-minute intensity
- Rainwater harvesting tanks are to be designed to HB 230
- Overflows from roof shall be directed away from pedestrian thoroughfares
- Only roof water from non-trafficable areas (not including maintainable roofs) are to be harvested where necessary
- Surface drainage: ARI 100, 5-minute intensity with overflows designed to a 1 in 200 yr/5 minute ARI
- Box gutters are not permitted for any new installations. For upgrades and refurbishments, box gutters are to be removed where possible or are to meet the minimum design requirements where it is not possible to remove them, should all alternatives be exhausted and following approval by TAFE NSW.

4 Technical Sections

4.6 Stormwater Drainage

Materials

Stormwater drainage and sanitary plumbing pipe to be installed in the following materials:

- In-ground pipe and fittings to be SN8 uPVC pipe, with solvent cement joints
- Above ground drainage pipe and fittings to be SN4 uPVC pipe, with solvent cement joints
- External downpipes shall be in accordance with the architectural requirements

4.6.3 Components

Eaves Gutters

- Eaves gutters must overflow to the external side of the gutter, outside the building footprint. Overflows must not rise above the edge of the roof

Rainwater Pumps

- The rainwater reuse system will incorporated dual pumps (duty/standby arrangement) and rainwater reuse pipework to serve for irrigation purposes only. Reused rainwater is not to be used for WC/urinal flushing

Downpipes

- Downpipes shall not connect directly into the in-ground stormwater pipe, but be provided with a splayed 30 degree bottom, finishing 100mm off the ground, with the lowest edge closest to the column/wall which it is affixed to
- A stormwater sump shall be provided at the base of the downpipe to convey roof water into the stormwater drainage system. The sump must be a minimum 1 size larger than the downpipe diameter size
- Where stormwater sumps for down pipes are nominated within paths of travel, the sumps must not be higher than the surrounding finish floor level to avoid trip hazards
- Where downpipes are proposed to discharge into an above-ground rainwater tank, the incoming pipe must discharge into a rainwater head with leaf screen at the rainwater tank

First Flush Diverter

- All harvested rainwater must be pre-treated through a first flush diverter
- First flush diverters are to be located adjacent the rainwater tank and be provided with a method of drainage to flush out contents

Potable Water Change Over System

- In the event of low rainfall, a potable water change over system (via solenoid valve arrangement) shall ensure water is being delivered for irrigation purposes

4 Technical Sections

4.6 Stormwater Drainage

Grated Trench Drains

- Grated trench drains shall be stainless steel 316 heelproof anti-slip grates
- All grated trench drains are to be minimum 100mm wide x 100mm deep and sized to the required area and to a 1:100 year ARI

Podium and Balcony RWOs

- Rainwater outlets shall be stainless steel grate and membrane, cast iron assembly, integral puddle flanges with weep holes
- All podium and balcony drains are to be sized to the required area, to 1:80 falls and to a 1:100 year ARI with overflows achieving the same capacity

Pit Grates and Covers

- Pit grates shall be as a minimum class loading in accordance to AS 3996-2006

Rainwater Harvesting Tanks

- Rainwater harvesting tanks may be polyethylene or corrugated metal, to architectural colour
- Bladder or liner tanks will not be accepted
- Tank water level indicators must be provided
- Where there is an on-site detention (OSD) tank, the rainwater tank must be located adjacent to and overflow into the OSD tank
- Where downpipes discharge into an above ground rainwater tank, access and clear-outs shall be provided and extended near or at ground level
- Minimum clearance of 600mm around tank is required and 1000mm above top of tank

Rainwater Filtration/Treatment System

- Filtration system shall consist of automatic backwash filter, timer and pressure differential control, 100 micron screen and a stainless steel bag filter housing a 50 micron polyester filter bag
- The rainwater filtration/treatment system shall be located adjacent to the rainwater tank to allow adequate priming of the pumping equipment
- The rainwater filtration/treatment system shall be located in a dedicated room, or within an enclosure if located externally

Subsoil Drainage

- Subsoil drainage shall be factory slotted uPVC pipework
- Subsoil drains shall be surrounded with 150mm of blue metal

Ground Water

- For new buildings, hardstands and pathways, the ground shall immediately grade away from these areas

4 Technical Sections

4.6 Stormwater Drainage

4.6.4 Deliverables

General

Please refer to Section 2.3 Project Design Documents for project deliverables, and specific system deliverables as noted in this section.

- Justification/outline of process for selected rainwater reuse system, notably inclusion and sizing of pump and tanks if applicable
- TAFE NSW Hydraulic Design Standard departures
- Rainwater harvesting tank sizing calculation
- Where there is an on-site detention (OSD) tank, the rainwater tank must be located adjacent to and overflow into the OSD tank

4 Technical Sections

4.7 Fire Hydrants

4.7.1 Summary

The fire hydrant system will be designed in accordance with the provisions of AS 2419.1 and the requirements of local fire brigade.

Site Investigation

Undertake a site investigation to document site conditions and existing fire hydrant services to determine if suitable for reconnection for the proposed project.

Supply

Make a planning assessment to review the preferred point of supply from an existing water supply to accommodate the proposed project requirements.

Where existing pressure and /or flow is insufficient, upgrade of the existing infrastructure or new water connections/supplies may be required. The TAFE NSW project team is to be advised if major infrastructure upgrades is required to accommodate the proposed project requirements.

4.7.2 Design

Design Parameters

- Fire hydrants are to be designed and installed to AS 2419
- Fire hydrant valves shall comprise 65mm nominal diameter standard landing valves (all bronze components) with approved aluminium “Storz” quick couplings and suitable for connection by the local fire brigade
- Position fire hydrant valve centreline 750mm above finish floor level and allow to direct outlets to meet with the approval of the Authorities
- Allow for the handwheel of the valve to be 100mm clear or any obstruction

All physical pressure and flow tests are to be witnessed by the superintendent.

The designer shall obtain the Annual Fire Safety Statement (AFSS) from the project manager to determine the relevant standard to which the fire hydrant system is designed and installed to. The designer shall confirm with the BCA consultant and project team what the proposed new fire hydrant system will need to be designed to.

Materials

Fire hydrant pipework to be installed in the following materials:

- In-ground pipe and fittings to be red stripe polyethylene
- Above ground drainage pipe and fittings to be Galvanised mild steel, suitable for 1,700kPa hydrostatic test pressure as per AS2419.1 requirements

4 Technical Sections

4.7 Fire Hydrants

4.7.3 Components

Fire Hydrant Booster Assembly

- Fire hydrant brigade booster assembly shall be designed and installed to suit AS2419.1, which includes a required backflow prevention device (double detector check valve assembly) with water meter bypass

Fire Water Supply Tank

- Fire water supply tanks shall be externally bolted, stainless-steel panel tanks (316 for outdoor/marine applications and 304 for internal applications) complete with access ladders, lockable manhole covers, drain and visual water level indicators
- A minimum of 600mm clearance around the tank shall be provided
- A minimum of 1000mm clearance above the tank shall be provided

Test Drains

- A method of testing the fire systems shall be provided to allow monthly, 6-monthly and yearly fire tests to occur (at pump, and most disadvantaged hydrant)

External Fire Hydrants

- External fire hydrants must be provided with sluice valves installed in a valve pit complete with cast iron box and hinged cover permanently marked “SV” or “Water” to indicate water service

Fire Ring Mains

- New ring mains shall be sized at a minimum DN150 to consider future capacity

4.7.4 Deliverables

General

Please refer to Section 2.3 Project Design Documents for project deliverables, and specific system deliverables as noted in this section.

- Justification/outline of process for selected fire hydrant system, notably inclusion and sizing of pump and tanks if applicable
- TAFE NSW Hydraulic Design Standard departures
- Statement of available pressure and flow to be maintained throughout the project timeframe
- Fire hydrant pump and fire hydrant tank water supply calculations (if applicable)

4 Technical Sections

4.8 Fire Hose Reels

4.8.1 Summary

The fire hose reel system will be designed in accordance with the provisions of AS 2441 and the requirements of local fire brigade.

These will be located a maximum of four (4) metres from a fire exit in accordance with NCC requirements.

Fire hose reels will be located such that a 4m stream of water from the end of a nozzle of a thirty-six (36) metre fire hose reel will reach all parts of the particular floor area within the building.

Fire hose reels are not permitted to pass through a fire or smoke door.

4.8.2 Design

Design Parameters

- Fire Hose Reels are to designed and installed to AS 2441
- Provisions for Fire Hose Reels shall be in accordance to the BCA report

Materials

Fire hose reel pipework to be installed in the following materials:

- Reticulated above ground pipe and fittings to be copper type “B” with press-fit joints. Pipework and fittings shall be equal to Viega or Allmach

4.8.3 Components

Isolating valves

- Isolating valves and the like shall be in accordance with AS 3500 and AS 2441. Any valve that can isolate the water supply to a fire hose reel shall be locked open and tagged in accordance with AS 2441

4.8.4 Deliverables

General

Please refer to Section 2.3 Project Design Documents for project deliverables, and specific system deliverables as noted in this section.

- Justification/outline of process for selected potable water system, notably inclusion and sizing of pump and tanks if applicable
- TAFE NSW Hydraulic Design Standard departures

4 Technical Sections

4.9 Fire Sprinkler Systems

4.9.1 Summary

Fire sprinkler systems shall be in accordance with the building classification as defined in the NCC specific building class and code standards to be used shall be confirmed by the certifier on the project. Where a sprinkler system is required, protection shall be provided throughout the building including concealed spaces i.e. ceiling void spaces, etc. as per AS2118 standard. Sprinkler design and installation shall be in accordance with AS2118.1 and/or AS2118.4 standards where applicable.

For new multi storey buildings, consideration must be given to combined fire hydrant and sprinkler systems as per AS2118.6 where ordinary hazard sprinklers are proposed.

Site Investigation

Undertake a site investigation to document site conditions and existing fire sprinkler services to determine if suitable for reconnection for the proposed project.

Supply

Make a planning assessment to review the preferred point of supply from an existing water supply to accommodate the proposed project requirements.

Where existing pressure and /or flow is insufficient, upgrade of the existing infrastructure or new water connections/supplies may be required. The TAFE NSW project team is to be advised if major infrastructure upgrades is required to accommodate the proposed project requirements.

4.9.2 Design

Design Parameters

Fire Sprinkler Systems shall be installed in accordance to 2118.4

All physical pressure and flow tests are to be witnessed by the superintendent.

The designer shall obtain the Annual Fire Safety Statement (AFSS) from the project manager to determine the relevant standard to which the fire sprinkler system is designed and installed to. The designer shall confirm with the BCA consultant and project team what the proposed new fire sprinkler system will need to be designed to.

Materials

Fire hydrant pipework to be installed in the following materials:

- In-ground pipe and fittings to be red stripe polyethylene
- Above ground drainage pipe and fittings to be galvanised mild steel, suitable for 1,700kPa hydrostatic test pressure as per AS2118 requirements

4 Technical Sections

4.9 Fire Sprinkler Systems

4.9.3 Components

Fire Sprinkler Booster Assembly

- Fire sprinkler brigade booster assembly shall be designed and installed to suit AS2118, which includes a required backflow prevention device (double detector check valve assembly) with water meter bypass

Fire Water Supply Tank

- Fire water supply tanks shall be externally bolted, stainless-steel panel tanks (316 for outdoor/marine applications and 304 for internal applications) complete with access ladders, lockable manhole covers, drain and visual water level indicators
- A minimum of 600mm clearance around the tank shall be provided
- A minimum of 1000mm clearance above the tank shall be provided

Sprinkler Control Valves

- Sprinkler control valve installations shall be provided and strategically located in areas where accessible by the Fire Brigade authority. All system control valves and switches shall be supervised/monitored and shall be connected to the building Fire Indicating Panel (FIP) with interface provisions

Fire Ring Mains

- New ring mains shall be sized at a minimum DN150 to consider future capacity

Protection of Fire Sprinkler Heads

- Sprinkler head covers within workshop spaces where installed within 3.5m AFGL

4.9.4 Deliverables

General

Please refer to Section 2.3 Project Design Documents for project deliverables, and specific system deliverables as noted in this section.

- Justification/outline of process for selected fire sprinkler system, notably inclusion and sizing of pump and tanks if applicable
- TAFE NSW Hydraulic Design Standard departures
- Statement of available pressure and flow to be maintained throughout the project timeframe
- Fire sprinkler pump and fire hydrant tank water supply calculations (if applicable)

Work Health & Safety

5 Work Health & Safety

5.1 General Requirements

The ''Common Work Health & Safety Concerns'' table identifies common Work Health & Safety concerns arising from hydraulic services that have been identified from past TAFE NSW projects. Each project team must demonstrate that all safety concerns raised have been addressed as part of their involvement with any project to which this Design Standard applies. The safety concerns listed in the table must be included in project-specific Safety-in-Design Registers to ensure that project teams demonstrate how they have been addressed through all phases of any project.

Please note the information in the table is:

- For guidance only,
- Not exhaustive and does not take into account specific circumstances and should not be relied on in that way, and
- Does not alleviate the respective TAFE NSW team, designer, supplier or contractor from their own Work Health and Safety obligations and duties.

Legend	Level of Risk	Action Required
H	High	Implement cost effective risk control measures, and formalise procedures or management responsibility for reducing risk. Amend design to reduce risk, or seek alternative option. Only accept option if justifiable on other grounds.
M	Moderate	Incorporate cost effective risk control measures within the scope of long-term planning. Management responsibility must be specified. Check that risks cannot be further reduced by simple design changes.
L	Low	Manage by routine procedures. Check that risks cannot be further reduced by simple design changes.

5 Work Health & Safety

5.2 Common Work Health & Safety Concerns

Safety Issue Raised	Potential Control or Treatment measure	Reference to Design Standards/Statutory Requirements	Level of Risk	Phase: Project Delivery	Phase: Delivery	Phase: Construction, Supply, Installation	Phase: Operation and End use
Water leaks into rooms	Design of rooms to be water tight so that no leaks occur within room. No water services to be provided in switchboard residing in rooms, cupboard areas.	NCC/BCA	H		Y		
Tampering of water and gas supplies	Design of isolation valve to discourage/eliminate tampering (i.e. locked valves, located within ceilings)	AS/NZS3500.1	M		Y		
Scalding from hot water	Tempering hot water to ablution fixtures to an appropriate temperature	AS/NZS3500.4	H		Y		
Slips, trips and falls in wet areas	Allow for adequate drainage within wet area	NCC/BCA	H		Y		
Unburnt and unwanted natural gas entering space	Provide adequate ventilation within spaces with gas equipment. Allow for gas detection systems to be nominated for dedicate rooms with gas equipment	AS5601.1	H		Y		
Hot works and welding	Design to consider required tools for contractor use. Assess SWMS, correct PPE to be worn, hazard identification, shielding erected where required and sufficient training to be required	NCC/BCA	H		Y		
Falls from heights resulting in injury	Contractor to provide appropriate barriers and fall protection systems as required	NCC/BCA	H		Y		

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