THE UNIVERSITY OF SYDNEY

CIS Essential Fire Safety Measures Standard

The University of Sydney

Engineering & Sustainability Team

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1 PURPOSE

The CIS Essential Fire Safety Measures Standard sets out the University of Sydney's minimum requirements for the design, construction and maintenance of essential fire safety measures. It ensures new and refurbished systems are energy efficient, fit-for-purpose, made from durable good-quality materials, contain no or minimal environmentally harmful substances, and are cost efficient to operate and maintain.

Applicable requirements documented in Workplace Health and Safety legislation, Disability Discrimination legislation, State Environmental Planning legislation, Commonwealth and State legislation, National Construction Codes (NCC), the Building Code of Australia (BCA) and Australian and New Zealand Standards (AS/NZS) are the minimum and mandatory compliance requirements.

Where any ambiguity exists between this standard and the aforementioned mandatory requirements then:

a. the highest performance requirements must apply
b. applicable requirements must follow this order of precedence:
    i. Workplace Health and Safety legislation
    ii. Disability Discrimination legislation
    iii. State Environmental Planning and Assessment legislation
    iv. All other Commonwealth and State legislation
    v. NCC, BCA and PCA
    vi. AS/NZS
    vii. This standard and other University of Sydney standards

2 SCOPE

These standards describe the minimum requirements for the design, construction and maintenance of all essential fire safety measures throughout all buildings owned, operated and managed by the University of Sydney.

The standards apply to all planners, project managers, consultants, contractors, sub-contractors, tenants, managing agents and University staff involved in the design, construction and maintenance of existing, new and proposed University buildings and facilities.

All essential fire safety system products and services provided or specified by designers, consultants, staff and contractors must conform to this standard.

Where specific applications are not explicitly covered or ambiguity exists, the intent of the design standard must be satisfied. In such cases a return design brief must be provided for review and approval by the issuer of this standard or their appointed delegate who must have relevant technical competence in the subject matter Additional more stringent requirements to those listed in this standard may apply on a project-specific basis dependent upon risk management and insurance requirements.

The Standard provides:

a. A reference document to enable consistency with the design and engineering objectives

b. Details of the minimum performance requirements for Planning, Architectural Design and maintenance.
c. Support of the University Vision for the built environment and best practice.

The Standard addresses key objectives:

a. Quality design which responds, enhances and complements the environment
b. Appreciation of the heritage context and cultural history of the campuses
c. Value for money in all aspects of the project
d. The design of low maintenance buildings and environments
e. Longevity of construction approach to design
f. Standardization of key flashing and ancillary details
g. Flexible design, to future proof building usage for expansion or adaption to new uses
h. Safety in design

2.1 NEW BUILDINGS

As a minimum, the essential fire safety measures provided in University buildings must be designed and installed in accordance with the minimum legislative requirements incorporating all Statutory Regulations, Australian Standards, Local Council, Fire & Rescue NSW, Work Health & Safety (WHS) and WorkCover requirements.

Each building must be equipped with the appropriate fire suppression, detection, emergency warning and egress provisions, all designed and installed in accordance with the requirements of the *'Deemed-to-Satisfy Provisions'* of the NCC. Additional measures may also be required to meet specific building hazards and/or the requirements of University Insurers.

Where it is proposed that the *'Performance Requirements'* of the NCC will be adopted to develop an *'Alternative Solution'* in lieu of complying with the *'Deemed-to-Satisfy (DtS) Provisions'*, the consultant/contractor must seek approval from CIS for all proposed *'Alternative Solutions'* during the initial design development. The consultant/contractor must take a long term balanced view of capital costs, energy costs, maintenance costs and longevity when proposing any *'Alternative Solution'*, comparing the capital and operational costs of each proposed solution with the applicable DtS provisions.

Generally, *'Alternative Solutions'* will only adopt fixed active and passive measures to achieve the *'Performance Requirements'* of the NCC. Where management procedures are proposed to be included as part of an *'Alternative Solution'*, approval must be sought from CIS.

Where *'Alternative Solutions'* are proposed, an Accredited Certifier - Fire Safety Engineer, registered with the NSW Building Professionals Board, or approved equivalent, must be engaged to certify the proposed solution.

The consultant/contractor will consult with CIS, University Risk Management, University WHS Group and Project User Groups, to discuss any additional essential fire safety measures that must be included in the design, in order to suit the proposed occupancy, associated hazards, and the overall fire exposure risk. Additional measures will be determined via a risk hazard assessment process, incorporating details and issues relating to the fire safety within the building, including business continuity, consequence of loss and likelihood of loss.

2.2 EXISTING BUILDINGS

The requirements for the refurbishment of existing essential fire safety measures within existing buildings will often be the same as for new buildings. However, there are few existing buildings in the University that have been constructed under current regulations, due to the ever-changing nature of Building Regulations and Australian Standards.

Whilst every endeavor is made to comply with regulations during refurbishments and upgrades, it is unlikely that the full extent of the building regulations can always be met. Therefore, in many cases involving existing building refurbishment, '*Alternative Solutions*' and essential fire safety measures upgrade strategies must be developed in lieu of complying with the '*Deemed-to-Satisfy (DtS) Provisions*' of the NCC. Where '*Alternative Solutions*' are proposed to be adopted in existing buildings, the requirements listed above, must also apply. It is also noted that many University buildings have existing '*Alternative Solutions*'. Where refurbishment occurs within these buildings, the refurbishment works must be performed in accordance with the existing '*Alternative Solution*' or it must be reviewed, updated and re-certified to suit both the refurbishment works and the remainder of the building.

Within any building proposed for refurbishment, the Standard of Performance for all existing essential fire safety measures must be reviewed by the consultant/contractor for compliance with the current NCC and Australian Standard requirements. The details of this review together with a proposed essential fire safety measures upgrade strategy must be submitted to CIS for approval during the initial design development. As the University often chooses to perform voluntary upgrades of essential fire safety measures as part of building refurbishment projects, these details will assist in the determination of the extent of modification and upgrade to existing essential fire safety measures, required to be incorporated into the refurbishment works.

3 GLOSSARY OF TERMS

BCA	Building Code of Australia
CIS	Campus Infrastructure Services
CMS	Central Monitoring Station
DVC	Digital Voice Command
EP&AR	Environmental Planning & Assessment Regulation
EWIS	Emergency Warning Intercommunication System
FIP	Fire Indicator Panel
FMS	Fire Management System
FRL	Fire Resistance Level
MCP	Manual Call Points
MDF	Main Distribution Frame
MECP	Master Emergency Control Panel
MNS	Mass Notification System
NCC	National Construction Code
PCA	Plumbing Code of Australia
OWS	Occupant Warning System
PABX	Private Automated Branch Exchange
PC	Practical Completion
PUG	Project User Group, Project Control Group or Project Working Group
SSISEP	Sound System and Intercom System for Emergency Purposes
VESDA	Very Early Smoke Detection Apparatus
WIP	Warden Intercommunication Phones
WHS	Work Health & Safety

4 AUTHORITIES & RESPONSIBILITIES

This standard is issued by CIS. It is approved and signed-off by the Director, CIS. The CIS Engineering and Sustainability Team are responsible for maintaining the standards and keeping it up-to-date. The Standard must be reviewed biennially.

5 TECHNICAL REQUIREMENTS

5.1 GENERAL

Most University buildings are considered to be classified as Class 9b buildings, i.e., '*an assembly building, including a trade workshop,* laboratory, or *the like in a primary school or secondary school',* as defined by the National Construction Code (NCC). This Class 9b classification generally applies to all teaching spaces, computer rooms, teaching laboratories, workshops, and the like, but does not apply to other specialised areas of buildings such as student accommodation (and other premises containing areas for sleeping occupants), carparks, farm buildings, office areas, research laboratories and the like. Additionally, some buildings may contain areas that are required to be designed to suit EP&AR '*entertainment*' requirements.

The proposed essential fire safety measures to be installed within a building are determined by the NCC building classification, combined with type of construction and rise in storeys. These details, together with any special 'entertainment' requirements, must be determined by the consultant/contractor during initial design development and submitted for approval by CIS.

Many University buildings contain health and fire hazards far in excess of those normally found in typical Class 9b assembly buildings. Additionally, the University's duty of care and commitment to Work Health & Safety often requires a higher degree of life safety provision than that provided by the local building regulations and NCC. The NCC requirements for essential fire safety measures in Class 9b buildings may also be considered insufficient for the hazards contained in many University buildings.

The provision of automatic smoke detection, emergency warning systems and safe egress must be incorporated in all new construction projects and in the refurbishment of all existing buildings and services.

The University's minimum requirements for essential fire safety measures are stated below. These requirements may be in addition to, but not in substitution of, legislative requirements.

5.1.1 DESIGN APPROACH

The University expects consultants and designers to provide designs that meet the project briefs. The following are priorities that consultants and designers are required to be aware of and consider in their designs:

a. Take a long term balanced view of capital costs, energy costs, maintenance costs and longevity
b. As educational and research both progress at rapid rates, usage of buildings and areas within buildings can change a number of times within the life of a building, systems must be designed to be adaptable for such changes
c. Ensure that plant and equipment is designed with access and visual impact in mind

5.1.2 ENGINEERING PROCESS

The University expects consultants and designers to be fully qualified, experienced and capable of carrying out all engineering design, equipment selection and construction/installation quality checks.

In selecting equipment, the University expects consultants and designers to select products and system configurations of proven and reliable quality.

In the designing of all systems, the University expects consultants and designers to follow good industry practice.

5.1.3 EQUIPMENT SELECTION & SIZING

In selecting equipment, the University expects consultants and designers to select products of proven and reliable quality, with reputable support and after sales service.

Products which are of closed systems and proprietary in nature, thus locking the University into exclusive dependence of one manufacturer must be avoided and only used if there are no other options.

The provision of spare capacities for future must be considered for all projects. In making such considerations careful analysis of spare capacity against the application of diversity and balance must be considered.

5.2 DESIGN AND CONSTRUCT CONTRACTS

5.2.1 GENERAL

This section outlines the extent of the services to be provided by the contractor under a Design and Construct contract.

The contractor shall be fully responsible for the complete design of the essential fire safety measures installations, including the selection, sizes and quantity of equipment, and shall provide calculations and drawings and other documentation as necessary to demonstrate conformance with the design parameters, industry practice, CIS requirements, codes, regulations and standards. This includes all calculations required to confirm that existing infrastructure is sufficient to supply the proposed systems and equipment installed under the project.

The contractor shall allow to fully co-ordinate the documentation with the Architect, Structural Engineer and all other services consultants / contractors.

5.2.2 CALCULATIONS

As part of the contractor's design, it is expected that the following design calculations as a minimum are produced for review by CIS for approval prior to finalising design:

a. Equipment selections based on the overall capacities calculated
b. Water supply calculations inclusive of pumps, town main and tank supplies
c. Pipe sizing calculations
d. Electrical and cable sizing calculations

e. All other calculations necessary to illustrate equipment reticulation and components have been selected fully in accordance with the project requirements and this specification.

5.2.3 DRAWINGS AND DOCUMENTATION

The contractor shall provide design, construction and as-built drawings, which may be either design drawings produced by the contractor or shop drawings produced by equipment manufacturers.

The contractor is responsible for producing all design and as-built documentation, including, but not limited to:

a. Concept Design documentation (as required);
b. Detailed Design documentation, including:
    i. Layout drawings
    ii. Details
    iii. Schematics
    iv. Design certification
    v. Equipment details
    vi. Testing / commissioning procedures
c. Workshop drawings, including:
    i. Drawings for the purpose of system manufacture
d. As Built drawings, including:
    i. Detailed drawings demonstrating the as installed system
e. Operations and Maintenance manuals.
f. Training manuals

All design documentation shall be approved by CIS prior to any works progressing onsite.
Workshop, As-Built drawings and O&M manuals shall be submitted to for review prior to final sign off

5.2.4 TECHNICAL SUBMITTALS

Technical submittals shall be provided with the full technical and spatial requirements of each proposed plant item. The technical submissions shall include, where applicable, but not be limited to:

a. Certified shop drawings of each item complete with sectional weights and point loads.
b. Certified noise levels from each plant item.
c. Electrical requirements including starting current, running current, operational voltage, power consumption, recommended protection devices, wiring diagrams, connection and terminals details. Also detail of how cables are terminated to the plant item and earthing requirements shall be provided.
d. Pump Curves as applicable.
e. Recommended spares schedules and projected future availability (to ensure that redundant components are not used)
f. Requirements for specialist tools to maintain the plant item.
g. Maintenance zones and requirements including weights of any replaceable components.
h. Manufacturer's recommendations for installation including ventilation and thermal requirements.
i. Confirmation of product lifespan assuming maintained to manufacturers recommendations.
j. Where equipment model numbers / references are stated these are indicative only and the Contractor MUST ensure the selected plant fully complies with the standard

5.3 FIRE MANAGEMENT SYSTEM (FMS)

An FMS Network is installed at the University to monitor fire system status signals for all Automatic Fire Detection & Alarm Systems, Automatic Fire Sprinkler Systems and Fire Pumps installed across all University facilities. For the Camperdown/Darlington Campuses, the FMS also provides automatic fire brigade alarm callouts facilities via Alarm Signaling Equipment (ASE) installed at the FMS FIP.

During the initial design development stage for each project, the consultant/contractor must consult and obtain approval from CIS for the extent of modifications required to the FMS Network. These modifications must incorporate changes to the existing fire systems or installation of new FIP's, sprinkler systems and fire pumps into the project works.

Modification of the site communications network to accommodate new FMS Network signal connections must be included in the scope for all new buildings and refurbishment projects.

New FIP's, fire sprinkler systems, sprinkler control valves and fire pumps, must be connected to the FMS to provide high and low level interface signals required to provide control and monitoring of the fire equipment for alarm, fault and isolate conditions.

Due to the complex nature of the FMS Network, it is required that an approved University FMS contractor must perform all project-related alteration works associated with the installation and connection of devices connected to the FMS, including any required programming and modification to existing FMS equipment. These works form part of the overall project scope and must include all modifications to the following equipment:

a. Main Campus FMS FIP – Firesense AFP-2800
b. FMS Gate House Graphics Mimic Panels (located at 5 gate entries) - Onyxworks
c. FMS Graphics Computer Terminals (3 off) - Onyxworks

5.3.1 CAMPERDOWN/DARLINGTON CAMPUSES

All existing FIPs, fire sprinkler systems, sprinkler control valves and fire pumps installed throughout University buildings on these campuses must be connected to the main campus FMS FIP via the building PABX/MDF/Comms Room, to the University main PABX room, which is located in the Macleay Building (A12)..

The FMS FIP contains most of the Alarm Signaling Equipment (ASE) for the site, which are distributed across five (5) individual gate entries to the campuses. Unless fire systems for a building are accessed remotely from the five (5) individual gate entry points, there are generally no ASE's located within the buildings on this campus.

5.3.2 OTHER CAMPUSES

All building FIPs, fire sprinkler systems, sprinkler control valves and fire pumps installed throughout University Buildings on remote campuses must be connected to the main campus FMS Network via addressable IP network connections.

ASEs are generally installed at each individual building FIP and/or fire sprinkler system, with the exception of Camden and Cumberland Campuses, which both have a campus FIP arrangement.

5.3.3 HIGH LEVEL INTERFACES

High level interface connections to the FMS allow control and monitoring of all addressable devices connected to the building FIP via the Onyxworks FMS graphics computer terminals. High level interfaces are provided by the installation of a dedicated FMS IP network gateway within the building FIP to connect to the FMS network and Onyxworks FMS graphics computer terminals. The FMS network gateway card must be totally independent of the MNS network gateway card.

For buildings without individual ASE's, automatic fire brigade callout signals from buildings with high level interfaces are provided via copper telephone lines to the FMS FIP. Individual copper fire lines must be provided for both dry and wet fire brigade call facilities from each building.

All buildings installed with Notifier 2800 and Firesense AFP-2800 FIPs must be provided with a high level interface to the FMS.

All FMS graphics computer terminals must be uploaded with building floor plans indicating the floor layout and room number details together with icons indicating the device type and location of each addressable device connected to each high level interfaced FIP.

The existing building floor plans loaded onto FMS graphics computer terminals must be modified to accommodate any changes in floor layouts and addressable device layouts resulting from refurbishment projects occurring within buildings containing high level interface FIPs.

The contractor shall check, commission and demonstrate the operation of the FMS high level interface prior to Practical Completion of the works.

5.3.4 LOW LEVEL INTERFACES

Low level interface connections to the FMS allow monitoring signals only for specified inputs from the building via the Onyxworks FMS graphics computer terminals. Low level interfaces are provided by the installation of a MOXA I/O logic controller within the building connecting to the FMS network and Onyxworks FMS graphics computer terminals.

For buildings without individual ASE's, automatic fire brigade callout signals from buildings with low level interfaces are provided via copper telephone lines to the FMS FIP. Individual copper fire lines must be provided for both dry and wet fire brigade call facilities from each building.

All buildings installed with FIPs other than Notifier 2800 and Firesense AFP-2800, must be provided with a low level interface to the FMS.

Low level interface signals from building FIP's generally include:

a. FIP Alarm
b. FIP Isolate
c. FIP Zone Isolate
d. FIP Fault
e. FIP 240V Power Failure
f. FIP Door Open

As there are no control facilities provided for low level interface connections, building floor plans identifying the locations of all addressable devices are not loaded onto the FMS graphics computer terminals and there is generally no requirement for FMS graphics modifications to suit refurbishment projects occurring within buildings containing existing low level interfaces.

5.3.5 FIRE SYSTEM CONNECTIONS TO COMMUNICATIONS NETWORK

Connections between the building FIP's and sprinkler systems and the FMS and MNS are performed via the site communications network using a combination of copper phone lines, single mode optical fibre cabling and IP network connections.

Connections shall generally consist of:

a. Dry Fire Brigade Call - fire rated cable to building MDF with copper phone line connection to FMS FIP
b. Wet Fire Brigade Call – fire rated cable to building MDF with copper phone line connection to FMS FIP
c. FMS & MNS High Level Network Interfaces - Provide a triple data outlet to the FIP and the MECP location. One port is for the FIP's Ethernet connection, one port for the SSISEP Ethernet connection, and one port is spare. These horizontal cables must be rated as Low Smoke Zero Halogen with a red sheath. The sockets are to be numbered and labelled in the normal manner using red traffolyte labels and white text. Patch leads used to connect these sockets shall have red wraparound labels on both ends labelled "FIRE" and SSISEP" as applicable. The patch leads are to be normal colours for Ethernet connections and not red patch leads which signify a lead wired as an Ethernet crossover

Further information regarding data network connections and phone line connections to the FMS and MNS can be found in the Communications Cabling Standard Clauses 3.17 and 4.17.

5.4 MASS NOTIFICATION SYSTEM (MNS)

A MNS Network is installed at the University to enable PA announcements to be distributed from a remote location throughout buildings across all campuses.

The system comprises a graphics computer terminal and PA microphone located at the Security Services CMS located at the Services Building (G12). The computer terminal is connected to Digital Voice Command (DVC) modules installed within building EWIS and OWS panels, via the site IP communications network. The MNS network gateway card installed at each EWIS and OWS panel must be totally independent of the FMS network gateway card installed in the building FIP.

To eliminate the potential for constant hiss from the EWIS/OWS speakers caused by the background music (BGM) input function being permanently activated, the MNS input to each EWIS and OWS panel must be programmed to activate the BGM function of the panel, only when the MNS is being manually operated.

During the initial design development stage for each project, the consultant/contractor must consult and obtain approval from CIS, for the extent of modifications required to the MNS Network. All new EWIS and OWS panels installed on any Campus must be connected to the MNS Network to provide remote PA facilities and monitoring of the EWIS/OWS panel status.

Modification of the site communications network to accommodate new MNS Network signal connections will be included in the scope of all new buildings and refurbishment projects.

Due to the complex nature of the MNS Network, it is required that an approved University MNS contractor must perform all project-related alteration works associated with the installation and connection of devices connected to the MNS, including any required programming and modification to

existing MNS equipment. These works form part of the overall project scope and include all modifications to the following equipment:

a. Digital Voice Command (DVC) modules – Notifier DVC
b. MNS Graphics Computer Terminals (one-off) – Onyxworks

5.5 Access Panels, Doors & Hoppers to Fire Resisting Shafts

All fire rated access panels, doors and hoppers must be:

a. Equal to the FRL of the shaft in which they are installed in.
b. Provided with identification labeling in accordance with the requirements of AS4072.1 Appendix B and AS1851-2005.
c. Detailed on the building asset register.
d. Included in a consolidated Passive Fire and Smoke Containment System report, delivered under the scope of the project works. The report must provide comprehensive details of all items listed under Section 17 of AS1851-2005, including:
    i. consolidated as-built fire compartmentation drawings for each area and level of the building affected by the project works, documenting the exact location of all existing and new fire walls, floors and ceilings, together with the location of all existing and new passive fire and smoke containment measures
    ii. corresponding photos of each individual passive fire and smoke containment measure
    iii. certification of each individual passive fire and smoke containment measure

5.6 Automatic Fail-Safe Devices

5.6.1 GENERAL

Automatic fail-safe devices include magnetic door holders and fire trips to security door interfaces (electric strikes, electric mortise locks, drop bolts, magnetic locks, etc.), which are required to activate when a fire/smoke condition is sensed via the building fire sprinkler or fire detection system. These devices must be normally energized to enable them to return to the fail-safe position when power to the device is lost.

5.6.2 MAGNETIC DOOR HOLDERS

The consultant team must fully liaise with CIS and the PUG to determine requirements and locations of fire and/or smoke rated doors required to be normally held open by magnetic door holders. Magnetic door holders must be mounted at the top of fire doors and not at the base. Each magnet must be fitted with a local release button so where more than one door panel is fitted to a single opening, one switch must release all magnetic door holders. Both parts of the magnet must be rigidly secured.

Magnetic door holders must be powered from the FIP and installed on a separate control loop to security door interfaces and air conditioning fire trip cabling, with individual isolation facilities for each loop located at the FIP.

5.6.3 FIRE TRIP TO SECURITY DOOR INTERFACES

The consultant team must fully liaise with CIS, Security Services and the PUG to determine the locations of security door interfaces. For all required egress doors that can be locked by the electronic security system, fire trip interfaces must be installed to automatically unlock the door in the event of any fire alarm system or sprinkler system activation.

Unless the electronic security system controller, cabling and associated equipment are designated as a fail-safe device, fire trip cabling must run from the FIP/sprinkler system pressure switch and connect directly to the door interface. Further technical information and requirements regarding security door interfaces may be found in the Security Standards.

Fire trips to security door interfaces must be installed on a separate control loop to magnetic door holders and air conditioning fire trip cabling, with individual isolation facilities for each loop located at the FIP.

All doors provided with a fire trip to a security door interface must also be provided with a green Break Glass Unit labeled 'Door Release' and fixed to the wall adjacent to the door handle. This University requirement is to ensure egress through the door is accessible in the event of all types of emergencies.

A4 signage must also be mounted on the door at eye level. The signage must be green with white lettering, indicating:

'EMERGENCY EXIT ONLY,
THIS EXIT DOOR AUTOMATICALLY UNLOCKS IN THE EVENT OF A FIRE,
FOR OTHER EMERGENCIES ACTIVATE ADJACENT BREAK GLASS UNIT'

Include '*DOOR ALARMED*' if applicable.

All egress doors provided with security screamers must be arranged so that the security screamer device is deactivated on a fire trip signal.

The details of all fire trips to security interfaces devices will be included on the building's essential fire safety measure asset register and the associated drawings.

5.7 AUTOMATIC FIRE DETECTION AND ALARM SYSTEMS

5.7.1 GENERAL

The University currently has a variety of existing fire detection and alarm systems and FIPs installed throughout its buildings, including older type single wire series circuit systems (Reichel type) and more traditional conventional and addressable fire systems. There are also a number of buildings in the University that contain a mixture of old and new fire detection systems. This generally occurs where a portion of a building has been refurbished and the fire detection system is upgraded within the refurbished area only. To determine the fire detection and alarm system strategy for the building, the consultant/contractor must fully liaise with CIS and the relevant authorities during the initial design development stage for each project.

All University buildings, with the exception of NCC classified Class 10 structures, must be provided with fire detection and alarm systems or a suitable smoke alarm system, even if not specifically required by the NCC. As a minimum, all buildings with total floor areas greater than 1000m^2 must be provided with a complete fire detection and alarm system connected to automatic fire brigade call facilities in full compliance with AS1670.1, with additional control and monitoring provided at the FMS and MNS. For buildings with total floor areas less than 1000m^2, a local smoke alarm system must be installed with smoke alarms spaced to AS1670.1 requirements.

Where existing fire detection and alarm systems do not meet the requirements of the current NCC and applicable Australian Standards, a new FIP must be installed in the building to serve as the main FIP, with the original FIP serving as a sub-panel. The new FIP must be installed with sufficient spare capacity

to accept the gradual transfer of existing circuits from the original panel, in order to eventually serve the entire building.

When carrying out refurbishment work in buildings that require an upgrade from original single-wire series detector circuits and/or conventional detector circuits to addressable systems, rewiring and transfer must include the entire affected circuit and not just the part of the circuit that is relevant to the refurbishment area.

When upgrading or extending part of an existing fire detection system, the current essential services maintenance contractor must inspect the system at Practical Completion to confirm that the system is fully operational and satisfies all relevant requirements. The cost of this inspection will be included as a Project cost.

5.7.2 FIRE INDICATOR PANEL (FIP)

Fire Indicator Panels must comply with the following details:

a. New FIPs must be fully addressable type, suitable for high level interface connection to the University FMS Network (Notifier 2800 or Firesense AFP-2800, or approved equivalent). The type of panel proposed to be installed will be subject to approval by CIS.
b. FIP cabinets and associated hardware - loop cards, relay cards, input/output (I/O) cards, network cards, gateway cards, I/O controllers, etc - must be sized to adequately serve the entire building or area which they serve, with a minimum of 20% spare capacity on all equipment and cabling.
c. New FIPs installed in existing buildings must be provided with sufficient zone display cards to accommodate the transfer of all existing detectors and circuits serving the entire building.
d. FIPs must be located at the most accessible building entrance designated for the Fire & Rescue NSW (i.e. the entrance accessible to a fire appliance).
e. The FIP must be placed in a position that allows for both audible and visual fault monitoring by the building occupants. Under no circumstances are FIPs to be located in storerooms or offices or other '*out of the way*' places.
f. Separate isolating facilities for each group of detectors and all equipment interfaces must be provided at the FIP for EWIS/OWS, magnetic door holders, security interface devices, air conditioning trips, sprinkler system interfaces and main fire bell/strobe.
g. Generally, red manual call points (MCP) connected directly to the FIP will not be excepted, with the exception of the one red MCP required to be provided at the FIP.
h. Where existing systems are refurbished, red MCPs installed throughout the refurbishment area must be removed from existing FIPs to be replaced with white Emergency Call Points (ECP) and connected to the EWIS/OWS.
i. Individual LED indicator lamps must be provided for each of the following signals generated from interfaced equipment connected to the FIP:
    i. Detector zone alarm
    ii. Fire sprinkler alarm
    iii. Fire pump (sprinkler and hydrant) status indication; run, fault, low fuel level (for diesel types)
    iv. Fire sprinkler flow switch alarms (one indicator per flow switch)
    v. Fire sprinkler and hydrant system valve monitor switches (one indicator per location); open, closed
    vi. Fire sprinkler pre-action systems; low air pressure alarm

vii. VESDA status indication; airflow fault, alert alarm, action alarm, fire 1 alarm, fire 2 alarm

j. Where existing FIPs require modification of existing programs and/or software to incorporate changes as a result of refurbishment works, these modification works must be carried out by an approved University fire services contractor. The cost of these works must be fully included in the tender sum for the Project.

k. All installed addressable devices must be programmed to appear on the FIP LCD display, indicating the type of device and its location. The naming convention for programming the location of the device must indicate the level, room and room name, eg,'*L2, Room 201, Men's Toilet*'.

l. To eliminate the possibility of false alarms, FIP's must be capable of providing alarm verification facilities. Approval from CIS must be sought prior to incorporating alarm verification in any area.

m. Building sub-FIPs must not be installed without prior approval from CIS.

n. A3 size framed and covered block plan(s) must be installed adjacent to the FIP. This must show the extent of alarm zones and all addressable devices and loop numbering for each item of equipment and each level of the building controlled by the FIP.

o. Where existing fire detection and alarm systems are refurbished, any existing block plans must be altered to suit the works performed as part of the refurbishment. A system interface diagram/matrix must also be included as part of the block plan information, in accordance with the requirements of AS1851.

p. Adequate space for the storage of AS1851 test logbooks must be provided within the FIP cabinet or alternatively a separate logbook cabinet must be provided.

5.7.3 DETECTORS

Fire detectors must comply with the following details:

a. All new fire detection and alarm systems must be equipped with fully addressable detectors, complete with adjustable sensitivity. New detectors proposed to be connected to existing systems must be fully compatible with the existing FIP equipment listing requirements.

b. Detectors must be suitably selected for each location in accordance with AS1670 Appendix A - Guidance for the Selection of Detectors. Where smoke detectors are indicated as the suggested detection device, photoelectric smoke detectors must be installed.

c. Where detectors are prone to false alarms, multi-criteria detectors with adjustable sensitivity must be installed.

d. Detector dust caps must be provided for all new detectors installed as part of a project.

e. For smoke detectors installed in student accommodation and other sleeping areas, the provision of addressable multi-criteria detectors with addressable sounder bases is preferred. The photo-electric smoke component of the detector is programmed to activate the local sounder only and auto resets once the smoke is cleared. The thermal component of the detector is programmed to activate fire brigade call facilities and EWIS operation throughout the building, in conjunction with all other fire mode functions. Note that this arrangement may require an alternative Fire Engineered Report to achieve compliance with regulations.

f. Where detectors installed as part of a project have been incorrectly selected or located and are found to have caused multiple alarm activations during the DLP, the contractor must replace and rectify the detectors at their expense.

g. All detectors installed within a building must have indicating bases or heads providing the same indication throughout for both polling and alarm conditions.
h. Where detectors are located in concealed spaces (such as ceiling spaces, cupboards, sole occupancy units, air handling systems and the like), remote indicators must be provided. Remote indicators must be provided for both conventional and fully addressable type detectors.
i. All detectors must be fully accessible for maintenance. Accessibility to concealed spaces will be achieved via ceiling access panels or accessible walkways. Where accessibility to detectors is difficult, the use of VESDA must be considered.
j. Photoelectric smoke detectors must be provided in all electrical distribution board cupboards, telecommunications cupboards, electrical switch rooms and lift motor rooms.
k. For paths of travel to exits, photoelectric smoke detectors must be installed. Where it is deemed inappropriate to install these detectors due to the possibility of unwanted alarms, multi-sensor CO and heat detectors must be considered.
l. Probe type thermal detectors connected to both the building FIP and the fume cupboard controller must be provided within all fume cupboard exhaust flues. Remote indicators must be provided in these cases.
m. Beam type detectors may be selected for large open areas, provided adequate access is provided to maintain the detector.
n. Care must be taken to ensure that heaters, air conditioning registers, ceiling fans and light fittings are not located within the minimum required distance from smoke and thermal detectors.
o. All addressable devices must be clearly labeled with the addressable device number as listed on the panel. For detectors, labeling can be mounted on the detector head, the base or the remote indicator. Labels must be permanent with an adequate text size clearly visible from the floor level immediately under the device.
p. Detectors within construction areas must be adequately protected from contamination during the construction works. This may be achieved by the provision of dust caps on all detectors or the removal of the detector heads from the construction site and stored in a dust free environment.

a. Aspirated smoke detection system must be VESDA or CIS approved equivalent.
b. The use of VESDA must be considered for use in areas of high sensitivity, high value and high risk. Additionally VESDA must be installed in areas where accessibility to detectors is difficult. Areas proposed for the installation of VESDA must be submitted to CIS for approval. Examples of these types of areas are:
    i. Clean rooms;
    ii. Electron Microscope rooms;
    iii. Laboratories containing high value equipment, eg, MRIs, TEMs, Mass Spectrometers;
    iv. Essential computer network and communication facilities;
    v. Museums containing valuable assets;
    vi. Heritage areas;
    vii. Archive areas;
    viii. Atrium areas;
    ix. Animal houses; and
    x. Flammable Liquid stores

c. VESDA systems must operate independently of other detection/suppression systems, however they must be connected to the building FIP and to the FMS to provide indication of all alarm levels in order to allow early response by Security Patrol.
d. All VESDA alert and action alarms must provide an alarm on the FMS for Security to investigate but must not activate automatic fire brigade call facilities. The Fire 1 or the Fire 2 alarm must be configured to activate automatic fire brigade call facilities.
e. Xtralis - the manufacturer of VESDA - must be consulted as to the optimum design for the particular installation. Only VESDA accredited installers are permitted to install a VESDA system.
f. If the VESDA controller is to be located remote of the area being protected, a mimic panel providing aural and visual indication of alert, action, Fire 1 and Fire 2 alarm and system faults must be located in or adjacent to the protected area.
g. All VESDA installations must be provided with remote display modules located at the VESDA controller, to provide visual representation of smoke levels and alarm and fault conditions.

5.7.4 OCCUPANT WARNING SYSTEMS (OWS)

Occupant warning systems must comply with the following details:

a. Where buildings are not provided with EWIS/SSISEP, an OWS must form part of the fire detection and alarm system.
b. New OWS must consist of an amplified sound system producing the evacuation signal in accordance with the requirements of ISO 8201.
c. Existing sounder or bell type OWS must be upgraded to amplified sound system type OWS during building refurbishment projects in order to achieve the evacuation signal tone and sound pressure level requirements of AS1670.1. New sounder or bell type OWS must not be installed.
d. All new OWS equipment installed in existing buildings must be adequately sized to provide sufficient sound levels to accommodate speaker installation throughout the entire building. An additional 30% spare capacity on amplifier capacity must also be provided to accommodate future additional speakers.
e. New OWS must be provided with a microphone and appropriate key switching at the FIP to allow PA functions.
f. Sound pressure levels must be provided in accordance with the requirements of AS1670.1.
g. Occupant warning speakers must be provided in accordance with the requirements for EWIS/SSISEP.
h. Commissioning details indicating measured sound pressure levels must be provided on the as-built drawings and within the O&M manual for all new and refurbishment works.
i. All OWS installed must be connected to the MNS.

5.7.5 CABLING

Fire detection and occupant warning system cabling must comply with the following details:

a. All cabling must be fixed to structural elements of the building. Adhesive type fixings are not accepted.

b. Cabling must be fixed independently of all other services and building elements such as suspended ceiling supports. Cabling must not be installed laying on ceilings.
c. Cabling must be adequately segregated from other electrical and data cabling. This includes segregation of the fire detection cabling from the EWIS/SSISEP cabling.
d. Cabling must generally be installed concealed in most locations. Where concealed cabling cannot be achieved, cabling must be installed in surface mounted conduit painted to match the adjacent surfaces. The location of all exposed conduits runs must be approved by CIS prior to installation.
e. Non-fire rated cabling installed that activate fire trip functions must be fail safe (ie, loss of power or a cut cable will activate the fire trip function).
f. For further details of cabling refer to the Electrical Standards.

5.8 AUTOMATIC FIRE SPRINKLER SYSTEMS

5.8.1 GENERAL

Consideration must be given by the Consultant/Contractor for the use of sprinklers in all University buildings. This consideration must examine the overall benefits provided by sprinkler systems, such as life safety, property protection and business continuity, to minimise the risk of the loss to University facilities and operations caused by extensive fire damage.

Automatic fire sprinkler systems must be installed in the following building and occupancy types:

a. Student Accommodation;
b. Heritage Buildings;
c. Laboratories;
d. Specialist areas containing high value equipment, eg, Electron Microscopes, MRIs, TEMs, Mass Spectrometers
e. Museums;
f. Atrium areas;
g. Flammable Liquid stores

Where water damage caused by accidental operation or leaks from the sprinkler systems may cause extensive damage to property and equipment installed in dedicated rooms of the building, the installation of a dry pipe pre-action sprinkler system will need to be considered.

All automatic sprinkler systems must be connected to the FMS, with the following signals provided:

a. sprinkler alarm
b. sprinkler isolated
c. sprinkler pump running
d. sprinkler pump fault
e. sprinkler pump low fuel level
f. sprinkler stop valve closed
g. sprinkler flow switch

The sprinkler alarm signal must be connected to the FMS via a dedicated copper phone line.

Where an FIP is installed within the building, these signals must also be connected to the FIP and provided with individual LED indicators.

The system must be designed to allow omission of weekly testing of the sprinkler system and associated sprinkler pumps, in accordance with the requirements of AS1851. Additionally, all on-site

documentation and equipment required by AS2118.1 and AS1851 must be revised and/or provided to suit all system refurbishments and new works. This includes, but is not limited to, the provision of block plans, fire system interface diagram/matrix, pressure gauge schedules, water supply information, spare sprinklers and spanners.

The sprinkler control valves must be located in a position that is accessible to Fire and Rescue NSW response appliances. Clear directions to the sprinkler control valve location must be posted adjacent to the FIP. A location plate indicating the position of the sprinkler control valves must be installed on the outside of an external wall.

5.8.2 WATER SUPPLIES

Automatic fire sprinkler system water supplies must comply with the following details:

a. When designing and installing new fire sprinkler systems, or upgrading existing systems, the consultant/contractor must confirm whether the existing water supply pressure/flow details satisfy the requirements of the system.
b. The building hydrant demand must be available in addition to the building sprinkler demand to ensure that both systems can operate simultaneously from the water supply provided to the building.
c. All fire services test water must recycle back into the fire system storage tanks or alternatively to water retention tanks, to enable reuse of the test water.
d. Test drains and sumps must be provided to enable water flow testing.
e. Fire water supply tanks must be either of concrete construction or stainless steel panel type, complete with access ladders and lockable manhole covers to allow internal tank inspection and cleaning. Tanks must be complete with internal dividing walls and associated supply and drain connections to allow a minimum of 50%of the required storage capacity to be available during tank cleaning and maintenance operations. Visual tank water level indicators and high and low level alarms connected back to the FIP must be installed. Panel tanks must be installed on raised supporting beams allowing access to visually inspect the underside of the base of the tank. A minimum clear distance of 500mm around the walls, base and roof of the panel tank must be provided to allowance maintenance and inspection. Tanks with internal bladders will not be accepted.

5.8.3 HAZARD CLASSIFICATIONS

Automatic fire sprinkler system hazard classification must comply with the following details:

a. For all new sprinkler system installations and refurbishments, the minimum level of protection for University buildings must be specified as Ordinary Hazard Group 1, as defined in AS2118.1. Light hazard sprinkler systems will not be accepted in University buildings.
b. Generally, hazard classifications must be specified in accordance with AS2118.1, except for the above listed minimum requirement and the following specific areas within University buildings, where the minimum hazard classifications must be:
    i. Ordinary Hazard Group 1 - offices, lecture rooms, lecture theatres, student accommodation
    ii. Ordinary Hazard Group 3 - libraries, laboratories, museums

5.8.4 PIPEWORK AND EQUIPMENT

Automatic fire sprinkler pipework and equipment must comply with the following details:

a. Underground pipework and pipework installed external to the building must suit the requirements listed in the CIS Hydraulic Services Standard, CIS Trenching and Excavation Standard and the CIS Permit to Dig Form.
b. Internal pipework must be reticulated neatly throughout the building. Pipework must be run parallel and plumb with adjacent pipework and other building services and elements.
c. Pipework must be securely and independently fixed to structural elements of the building and must allow for movement in both the structure and the adjacent equipment.
d. Pipework must be concealed where possible. Where pipework is installed exposed, it must be painted with one primer coat and two finishing coats of an approved colour to suit Architectural requirements.
e. Stainless steel braided flexible pipe droppers are preferred over fixed pipework for final connections to sprinkler heads fixed in suspended ceilings. Flexible pipe droppers must be adequately supported to the ceiling using an approved fixing system.
f. Pipework must generally be medium steel pipe or galvanized pipe to suit AS1074 Onesteel Fireplus Medium, or approved equivalent.
g. Joints and fittings on pipework of 50mm diameter or less must be screw fixed. Joints and fittings on pipework of 65mm diameter or greater must be roll grooved or flanged.
h. All fire sprinkler pumps and pump controllers must be equal to those manufactured and supplied by Prime Pumps or KSB Ajax Pumps, or approved equivalent.
i. Sprinkler heads installed in false ceilings must be provided with a two piece semi recessed escutcheon plate.
j. Sprinkler heads installed in communications rooms must be installed in the upright position and provided with robust sprinkler guards/cages.
k. Sprinkler systems must be provided with a brigade booster connection designed and installed to suit AS2419.1.
l. Sprinkler systems must be provided with backflow prevention devices as per the requirements listed in the CIS Hydraulic Standards.

5.9 EMERGENCY LIFTS

Emergency lifts must be installed to suit the requirements of the NCC.

Technical information and requirements regarding emergency lifts may be found in the CIS Vertical Transportation Standards.

5.10 EMERGENCY LIGHTING

Emergency lighting must be installed to suit the requirements of the NCC.

Technical information and requirements regarding emergency lighting is included in the CIS Lighting Standard.

5.11 EMERGENCY WARNING AND INTERCOMMUNICATION SYSTEM (EWIS)

5.11.1 GENERAL

EWIS, or Sound Systems and Intercom Systems for Emergency Purposes (SSISEP), must be designed and installed in all University buildings having a rise in stories of 3 or more, and in University assembly buildings that contain lecture theatres, seminar rooms, libraries, museums, student computer facilities, teaching laboratories/workshops, and the like, with a total building floor area greater than 1000m2.

In University buildings where the above clause does not require EWIS to be designed and installed, an Occupant Warning System is required to be designed and installed, as indicated in the Automatic Fire Detection and Alarm System section of this document.

EWIS must respond immediately to activation of the FIP, fire sprinkler installation, or a manual call point. To supplement the audible warning system, visual warning devices must be provided at strategic locations (generally in corridors and/or public spaces) on all levels, and in areas with high ambient noise levels.

In sound sensitive areas such as animal houses, consideration must be given to the provision of visual warning devices only in lieu of installing the audible warning system. However, advice is to be sought from CIS and the animal house staff before the proposed alarm type is selected.

5.11.2 MASTER EMERGENCY CONTROL PANEL (MECP)

Master emergency control panels must comply with the following details:

a. The MECP must be housed in the same cabinet as the FIP. In existing buildings where this may not be possible due to available space, the MECP will generally be located in an accessible location adjacent to the building FIP.
b. The MECP fascia layout and operational characteristics must be equal or equivalent to Inertia 2000 and/or Vigilant QE90 type EWIS panels. The type of panel proposed to be installed will be subject to approval by CIS.
c. Where the MECP is proposed to be designed and installed flush into wall spaces, ventilation space for heat dissipation from the EWIS cabinet must be included, as EWIS amplifiers generate considerable heat.
d. MECPs must be installed with separate evacuation zones provided for each level and a minimum spare capacity for an additional two (2) evacuation zones.
e. Each evacuation zone will be provided with a dedicated amplifier. All amplifiers must be provided with 30% spare capacity to allow for additional future speakers to be installed within each zone.
f. An A3 block plan must be installed adjacent to the MECP, showing each level of the building and the evacuation zones and position of all WIPs installed.
g. All MECP's must be provided with DVC equipment and a network card to allow connection of the panel to the MNS.
h. To eliminate the potential for constant hiss from the EWIS/OWS speakers caused by the background music (BGM) input function being permanently activated, the MNS input to each EWIS and OWS panel must be programmed to activate the BGM function of the panel, only when the MNS is being manually operated.
i. An output from the MECP to the FIP must be provided to allow fire trips to AV and security door screamers to be activated when the MECP is in alert, alarm or PA mode.

5.11.3 EMERGENCY WARNING SYSTEM OPERATION

Unless otherwise directed, all EWIS will be arranged for the following automatic sequence of operations:

a. No delay from receipt of fire system activation to operation of ALERT signal throughout entire building.
b. ALERT signal must sound for 60 seconds throughout the entire building then automatically change to EVAC signal throughout the entire building.
c. No cascading, ie. signals must be provided throughout all areas of the building simultaneously.
d. Standard voice recorded messages must be provided with the EVAC signal.
e. ALERT and EVAC signal types must meet the requirements of AS1670.4.
f. Commissioning details indicating measured sound pressure levels and speech intelligibility must be provided for all areas and rooms within the building. These details will be provided on the as-built drawings and within the O&M manual, for all new and refurbishment works.
g. Individual inputs from the FIP and/or sprinkler system flow switches must be provided to the MECP for each evacuation zone, in order to enable the building fire warden team to easily identify, via LED operation on the MECP, the evacuation zone in alarm.
h. Similarly, activation of any MCPs must also provide indication of the specific evacuation zone activated.

5.11.4 EMERGENCY CALL POINTS (ECP) AND WARDEN INTERCOMMUNICATION PHONES (WIP)

ECPs and WIPs must comply with the following details:

a. Provided within each evacuation zone.
b. Where fire hose reel cupboards are located in the vicinity of fire egress stairs, WIPs will be provided within each fire hose reel cupboard and ECPs will be installed in visible positions immediately adjacent to each fire hose reel cupboard
c. All ECPs connected to the EWIS must be white, and must activate the emergency sound system without automatically calling the fire brigade
d. Each WIP must be provided with labeling that corresponds to the associated labeling on the MECP.

5.11.5 CABLING

EWIS cabling must comply with the following details:

a. All cabling must be fixed to structural elements of the building. Adhesive type fixings are not accepted.
b. Cabling must be fixed independently of all other services and building elements such as suspended ceiling supports. Cabling must not be installed laying on ceilings.
c. Cabling must be adequately segregated from other electrical and data cabling. This includes segregation of the fire detection cabling from the EWIS cabling.
d. Cabling must generally be installed concealed in most locations. Where concealed cabling cannot be achieved, cabling must be installed in surface mounted conduit painted to match the adjacent surfaces. The location of all exposed conduits runs must be approved by CIS prior to installation.
e. For further details of cabling refer to the CIS Electrical Standard.

5.12 EMERGENCY EVACUATION DIAGRAMS

Emergency evacuation diagrams are installed throughout all levels of all University buildings. The diagrams provide information regarding the basic emergency evacuation requirements for each level of the building. Additionally, the diagrams also provide a means of way-finding for building occupants, students and visitors, and are therefore required to include room numbers for all spaces on each level.

For new buildings, new emergency evacuation diagrams must be designed and installed as part of the project scope of works, in accordance with the standard University format, and the requirements of AS3745-2010.

Some existing emergency evacuation diagrams were originally designed and installed to suit the requirements of AS3745-2002. These Australian Standards have subsequently been superseded by AS3745-2010, which require additional information to be included on each emergency evacuation diagram. As such, existing diagrams must be updated to suit the CIS standard evacuation diagram template and the current requirements, whenever a project refurbishment occurs within any space. The upgrade of the diagrams must be included in the consultant/contractors scope of work for each project.

For existing buildings undergoing refurbishment, the consultant/contractor must request from CIS, the AutoCad files of the existing emergency evacuation diagrams to update with the revised level layouts, fire equipment locations, and evacuation paths for each level of the refurbishment works. This will require all plans located on each level of the refurbishment project to be upgraded as part of the project works. To meet the requirements of AS3745-2010, this may include the addition of standardised symbols identifying the location of all WIPs, MCPs, ECPs, OWS Panels, FIPs, Hydrants, Hose reels, Extinguishers and Fire Blankets on the level, and realigning the floor plan and assembly area plan to ensure they are correctly orientated to suit the location of the installed diagram.

Locations of emergency evacuation diagrams must be submitted for approval to CIS and the building fire warden team prior to installation, but must generally be located on each level in the vicinity of each fire stair, lift landing and in public areas adjacent to lecture theatres, seminar rooms, teaching laboratories and all teaching and learning spaces. This is to ensure occupants and visitors have access to view the plans. Additionally, an emergency evacuation diagram must be installed adjacent to the FIP/MECP.

Detailed specifications indicating the requirements for the picture frames and mounting details relating to the installation of the emergency evacuation diagrams can be obtained from the CIS Signage Standard.

All emergency evacuation diagrams must be included on the building asset register and the associated as built drawings.

5.13 EXIT SIGNS

Exit lighting must be installed to suit the requirements of the NCC.

Technical information and requirements regarding exit lighting is included in the CIS Lighting Standard.

5.14 Fire Dampers

All fire dampers installed must be:

a. Provided with access panels to enable inspection, testing and resetting of the damper
b. Detailed on the building asset register.
c. Included in a consolidated Passive Fire and Smoke Containment System report for the project works. The report will provide comprehensive details of all items listed under Section 17 of AS1851-2005, including:
    i. consolidated as-built fire compartmentation drawings for each area and level of the building affected by the project works, documenting the exact location of all existing and new fire walls, floors and ceilings, together with the location of all existing and new passive fire and smoke containment measures
    ii. corresponding photos of each individual passive fire and smoke containment measure
    iii. certification of each individual passive fire and smoke containment measure

Further technical information and requirements regarding fire dampers may be found in the CIS Mechanical Services Standards.

5.15 Fire/Egress Doors

A number of existing fire doors located within the University are old and may contain an asbestos core. Any doors thought to contain asbestos must be inspected prior to works commencing by performing a hazardous materials inspection of the proposed site. This inspection will be performed by the project consultant/contractor.

If any doors located in a proposed refurbishment area are confirmed to contain asbestos, the door must be removed in line with WorkCover asbestos removal requirements and be replaced with a new door to suit the current requirements. All asbestos removal and disposal must be carried out by a suitably licensed asbestos contractor in accordance with the relevant State and Federal WHS Acts and Regulations, and in accordance with the University and CIS OHS Management System.

All doors/fire doors located in egress paths within a proposed refurbishment area of an existing building must be upgraded as part of the project refurbishment works to comply with current NCC and Australian Standard requirements. This includes:

a. Statutory signage consistent with the CIS Signage Standards must be provided in accordance with requirements of the NCC. Note that signage must be fixed to fire door sets with devices that will not penetrate the skin of the door;
b. New door hardware, including door closers, lever handles and latches and locks must be compliant with the requirements of the NCC and the Environmental Planning and Assessment Regulation. Further technical information and requirements regarding door hardware may be found in the CIS Security Standards;
c. A compliant door swing, in the direction of egress, is required in accordance with the requirements of the NCC;
d. The hinges for fire/egress doors must be screwed to the door frame and not welded;
e. All fire doors and associated frames must be tagged with a test certification label;

f. If magnetic door holders are required for installation, they must be installed at the top of the door in a position that allows easy access to the release button;
g. Where the opening of a fire/egress door may cause injury to persons on the other side, consideration must be given for the door to be installed complete with an approved and tested viewing panel
h. Any alterations to existing fire door sets must be provided with full certification from the fire door manufacturer and installer, indicating that the alterations are consistent with the tested prototype, which has been submitted to the standard fire test procedures. Additionally, new certification tags must be installed on both the door leaf and door frame.
i. All information must be detailed on the building asset register.
j. All information must be included in a consolidated Passive Fire and Smoke Containment System report for the project works. The report will provide comprehensive details of all items listed under Section 17 of AS1851-2005, including:
    i. consolidated as-built fire compartmentation drawings for each area and level of the building affected by the project works, documenting the exact location of all existing and new fire walls, floors and ceilings, together with the location of all existing and new passive fire and smoke containment measures;
    ii. corresponding photos of each individual passive fire and smoke containment measure;
    iii. certification of each individual passive fire and smoke containment measure.

5.16 Fire Hose Reel Systems

Water supplies for existing fire hose reel systems vary throughout the University, due to the differing ages of the systems and the original standard of performance design and installation of each of the systems. When designing and installing new fire hose reels or upgrading existing systems, the consultant/contractor must test and confirm the existing water supply pressure/flow details to determine compliance with the current NCC and Australian Standard requirements.

Water supplies for fire hose reel systems must be taken from the metered potable cold water supply and will be piped independently to ensure shutdown of the domestic water supply system does not affect the operation of the fire hose reel system and vice versa. The fire hose reel system pipe work must consist of Type B copper tube and fittings.

Where fire hose reels are installed within buildings and in areas that are not susceptible to be misused for washdown or cleaning purposes, a non-metered water supply to the fire hose reel system from the fire hydrant system will be permitted, subject to approval from the water supply authority. Galvanised steel fire hose reel pipework is acceptable in these types of installations.

Where fire hose reel booster pumps are installed to satisfy the pressure and flow requirements for fire hose reel system, the pumpset must be provided in accordance with the requirements of AS2941. The fire hose reel pump will supply only the fire hose reel system and must not be installed to supply the potable cold water supply system and vice versa.

All fire hose reels must be provided with 36m hose length and 19mm diameter hose with brass nozzles attached. All installed fire hose reels must have the instructions for operation in graphics rather than written instructions.

For existing building refurbishments, the location and coverage of the existing fire hose reels must be reviewed and upgraded to meet the current NCC and Australian Standard requirements in order to provide compliance with any changes to the new floor layout.

Where fire hose reels are located in enclosures or cupboards, signage consistent with the CIS Signage Standards must be provided in accordance with requirements of the Australian Standards.

Fire hose reels must only be installed for use in fire situation. The installation of fire hose reels for use in non-fire situations will not be accepted.

Fire hose reel pipe work must be marked using adhesive pipe markers with water flow direction arrows.

5.17 FIRE HYDRANT SYSTEMS

5.17.1 GENERAL

In cases where the existing fire hydrant system of a refurbished building is not installed to the current regulations and would require substantial upgrading to achieve compliance, the consultant/contractor must consult with CIS, and if appropriate Fire & Rescue NSW, to determine the extent of the proposed alterations to the system.

Wherever possible, fire hydrant coverage for all University buildings is preferred to be achieved by hydrants located external to the building. External fire hydrants will be provided with painted dual hydrant landing valves; the valve assembly and the stem painted signal red. External fire hydrants generally form part of the University water supply network and are therefore considered as "feed" fire hydrants that must not be connected to a building fire brigade booster assembly. Appropriate labeling must be provided on the stem of all external hydrants connected to a building fire brigade booster assembly for the purpose of indicating the "attack" fire hydrant and the booster assembly to which the hydrant is connected.

Fire brigade booster assemblies must be located in a position where a fire appliance has adequate access. Block plans located at each fire brigade booster assembly must be upgraded to suit changes to the system due to building refurbishment works. Signage must be provided at each fire brigade booster connection in order to easily identify the building/area served by the booster.

Where fire hydrants are located in enclosures or cupboards, signage consistent with the CIS Signage Standards must be provided in accordance with requirements of the Australian Standards.

Hydrant booster pumps must be connected to the building FIP and the FMS to allow monitoring and alarms to be provided for pump run and pump fault (including electrical mains failure and low fuel level status). The monitoring of these conditions must also satisfy the requirements to allow the omission of weekly pump testing, as per AS1851-2005.

5.17.2 WATER SUPPLIES

Fire hydrant water supplies must comply with the following details:

a. Water supplies for existing fire hydrant systems vary throughout the University, due to the differing ages of the systems and the original standard of performance design and installation of each of the systems. When designing and installing new fire hydrants or upgrading existing systems, the consultant/contractor must test and confirm the existing water supply pressure/flow details to determine compliance with the current NCC and Australian Standard requirements.

b. The building hydrant demand must be available in addition to the building sprinkler demand to ensure that both systems can operate simultaneously from the water supply provided to the building
c. All fire services test water must recycle back into the fire system storage tanks or alternatively to water retention tanks, to enable reuse of the test water.
d. Fire water supply tanks must be either of concrete construction or stainless steel panel type, complete with access ladders and lockable manhole covers to allow internal tank inspection and cleaning. Tanks must be complete with internal dividing walls and associated supply and drain connections to allow a minimum of 50%of the required storage capacity to be available during tank cleaning and maintenance operations. Visual tank water level indicators and high and low level alarms connected back to the FIP must be installed. Panel tanks must be installed on raised support beams allowing sufficient access to visually inspect the underside of the base of the tank. A minimum clear distance of 500mm around the walls, base and roof of the panel tank must be provided to allowance maintenance and inspection. Tanks with internal bladders will not be accepted.
e. Means for performing system flow testing at the booster pump (or the booster connection where no pumps are installed) must be provided. This will include a pressure gauge schedule, which indicates the flow required at the test location in order to satisfy the requirements at the most remote hydrant(s). This includes adequate drainage and any other documentation and equipment required to satisfactorily maintain the fire hydrant system and pump in accordance with AS1851-2005.

5.17.3 PIPEWORK AND EQUIPMENT

Fire hydrant pipework and equipment must comply with the following details:

a. Fire hydrant system pipework must be DICL where installed underground.
b. For further information regarding the installation of underground pipework, refer to the CIS Hydraulic Services Standard, CIS Trenching and Excavation Standard and the CIS Permit to Dig Form.
c. Above-ground fire hydrant pipework must be galvanized medium weight steel pipe, using roll grooved fittings.
d. All internal exposed fire hydrant pipe work must be painted and marked using adhesive pipe markers with water flow direction arrows.
e. All fire hydrant pumps and pump controllers must be equal to those manufactured and supplied by Prime Pumps or KSB Ajax Pumps, or approved equivalent.
f. Hydrant systems must be provided with backflow prevention devices as per the requirements listed in the CIS Hydraulic Standards.
g. All fire hydrants valves and boosters must be provided with forged aluminium Storz hose couplings complete with chain linked cap, to suit Fire & Rescue NSW requirements.

5.18 FIRE SEALS PROTECTING OPENINGS IN FIRE RESISTING COMPONENTS

All fire seals protecting openings in fire resisting components of each building must be:

a. Designed and installed to the requirements of Specification C3.15 of the BCA
b. Provided with identification labeling in accordance with the requirements of AS4072.1 Appendix B and AS1851-2005
c. Detailed on the building asset register.
d. Included in a consolidated Passive Fire and Smoke Containment System report for the project works. The report must provide comprehensive details of all items listed under Section 17 of AS1851-2005, including:
    i. consolidated as-built fire compartmentation drawings for each area and level of the building affected by the project works, documenting the exact location of all existing and new fire walls, floors and ceilings, together with the location of all existing and new passive fire and smoke containment measures
    ii. corresponding photos of each individual passive fire and smoke containment measure
    iii. certification of each individual passive fire and smoke containment measure

5.19 Fire Shutters

All fire shutters installed must be:

a. Designed and installed to the requirements of Specification C3.4 of the BCA to achieve the required FRL
b. Provided with identification labeling in accordance with the requirements of AS1902.2
c. Held open with a magnet connected to the building fire detection/fire sprinkler system, which allows the fire shutter to automatically close in fire mode. Adequate access to the magnet must be provided
d. Provided with fully accessible equipment to provide easy resetting of the fire shutter to its normal position after operation has occurred
e. Provided with an audible warning device, flashing warning light and signage to enable operation in full accordance with the requirements for sliding fire doors as per Clause C3.6 of the BCA.
f. Detailed on the building asset register
g. Included in a consolidated Passive Fire and Smoke Containment System report for the project works. The report must provide comprehensive details of all items listed under Section 17 of AS1851-2005, including:
    i. consolidated as-built fire compartmentation drawings for each area and level of the building affected by the project works, documenting the exact location of all existing and new fire walls, floors and ceilings, together with the location of all existing and new passive fire and smoke containment measures
    ii. corresponding photos of each individual passive fire and smoke containment measure
    iii. certification of each individual passive fire and smoke containment measure

5.20 Gaseous Fire Suppression Systems

Generally, the University does not recommend the installation of gaseous fire suppression systems, except in cases where every other avenue of fire protection has been scrutinized and/or rejected for a valid reason. Carbon dioxide systems must not be considered. Prior to any proposal for a gaseous fire suppression system to be installed, an extensive risk assessment, cost benefit analysis and life cycle costing report must be provided by the consultant/contractor for CIS approval.

5.21 LIGHTWEIGHT FIRE RATED CONSTRUCTION

All lightweight fire rated construction will be:

a. Designed and installed to the requirements of Specification C1.8 of the BCA to achieve the required FRL
b. Provided with identification labelling in accordance with the requirements of AS4072.1 Appendix B and AS1851-2005
c. Detailed on the building asset register
d. Included in a consolidated Passive Fire and Smoke Containment System report for the project works. The report must provide comprehensive details of all items listed under Section 17 of AS1851-2005, including:
    i. consolidated as-built fire compartmentation drawings for each area and level of the building affected by the project works, documenting the exact location of all existing and new fire walls, floors and ceilings, together with the location of all existing and new passive fire and smoke containment measures
    ii. corresponding photos of each individual passive fire and smoke containment measure
    iii. certification of each individual passive fire and smoke containment measure

5.22 MECHANICAL AIR HANDLING SYSTEM SHUTDOWN

For all University buildings less than 25m in effective height, all mechanical air handling systems, with the exception of non-ducted individual room A/C units, fume cupboards and approved special purpose systems, must be provided with a fire trip signal to shutdown the air handling system on activation of the building fire detection and/or fire sprinkler system. Once the fire detection and/or fire sprinkler alarm has been reset, the mechanical air handling system must also be automatically reset to the correct operating status.

Approved special purpose systems includes systems serving operating theatres, clean rooms and rooms housing high value equipment, which may be damaged when the ventilation system is shutdown.

Fire trip cabling and equipment which allows shutdown of mechanical air handling systems must be grouped onto one common isolation control switch located at the FIP. This isolation facility must be totally separated from the individual isolation control switches required for fire trips connected to magnetic door holders and fire trips to security door interfaces. Fire trips to mechanical air handling systems must be normally energised.

The consultant/contractor must provide a fire systems interface matrix that lists all existing and new mechanical air handling system shutdown installed in the area of the project.

Details of all fire trip signals and connections provided to shutdown of mechanical air handling systems will be included on the building asset register and associated drawings.

Further technical information and requirements regarding shutdown of mechanical air handling systems may be found in the CIS Mechanical Standards.

5.23 PORTABLE FIRE EXTINGUISHERS & FIRE BLANKETS

Fire extinguishers must be installed in all University buildings. Fire extinguisher types and locations must be selected to comply with the coverage and spacing requirements of AS2444, AS1940 and AS2243.8. These Australian Standard requirements exceed those of the NCC.

Generally, dry chemical AB(E) fire extinguishers will be installed due to the suitability with a variety of different class fires. Where a clean fire extinguishing agent is required to protect against electrical fire hazards (Class E), such as lift motor rooms, main electrical switch rooms, main computer server rooms and communications rooms, carbon dioxide extinguishers must be installed.

Water extinguishers must be installed in all buildings that are not protected with a fire hose reel system. Water extinguishers are not required to be installed in buildings containing a fire hose reel system.

Where possible, fire extinguishers must be located within fire hose reel cupboards. All extinguishers must be mounted no greater than 900mm above the floor. Where extinguishers are located in enclosures or cupboards, signage must be consistent with the CIS Signage Standards and provided in accordance with requirements of the Australian Standards.

Where refurbishment projects alter or add a risk, the existing fire extinguishers must be replaced or supplemented to cover the new circumstances created. This requirement is to extend to passageways and corridors and to the extinguisher serving the refurbished area.

Prior to project works commencing, the consultant/contractor must perform a dilapidation report of the project site, listing the numbers and types of existing fire extinguishers. These extinguishers must remain in the project site under the control of the contractor throughout the duration of the project works and depending upon suitable condition, appearance and a requirement to install each individual extinguisher, will be either reinstalled, returned to the University or destroyed at completion of the project refurbishment. Existing fire extinguishers that are more than 20 years old must be replaced with new and not reinstalled as part of the project works.

Fire blankets must be installed for use on small fires involving chemicals, cooking oils and fats. These will be located in all wet labs and kitchen areas.

In addition to the above listed requirements, the following portable fire equipment must be installed inside all wet labs, adjacent to the main entry/egress door to the space:

a. 1 off 3.5kg CO2 extinguisher, minimum 5B(E) rating
b. 1 off 1200x1200 fire blanket
c. For larger and higher risk labs, additional extinguishers may be required to be installed within the space. The recommended extinguishers in these circumstances are a 4.5kg AB(E) type dry powder extinguishers installed adjacent to the above listed fire equipment.

5.24 PRESSURISING SYSTEMS

The consultant/contractor must provide a fire systems interface matrix that lists all existing and new required pressuring systems installed in the area of the project.

Details of all required fire safety measures relating to pressuring systems will be included on the building asset register and the associated drawings.

Further technical information and requirements regarding pressurizing systems can be found in the CIS Mechanical Standards.

5.25 Required Power Operated Exit Doors

Required power operated exit doors include automatic sliding doors and powered operated door openers/closers which are required to activate when a fire/smoke condition is sensed via the building fire sprinkler or fire detection system. The consultant/contractor must ensure all power operated exit doors installed in required paths of egress automatically open in the event of fire alarm activation.

These devices will be normally energised to enable the devices to return to the fail-safe position when power to the device is lost. To ensure that power operated exit doors are able to be classified as fail-safe devices, fire trip cabling must run from the FIP/sprinkler system pressure switch and connect directly to the door interface and not via any electronic security system controllers, unless the electronic security system controller, cabling and associated equipment are designated as a fail-safe device.

Fire trip cabling and equipment allowing required power operated exit doors and security door interfaces to function will be grouped onto one common isolation control switch located at the FIP. This isolation facility must be totally separated from the individual isolation control switches required for fire trips connected to magnetic door holders and also to shutdown mechanical air handling systems.

The consultant/contractor must provide a fire systems interface matrix that lists all existing and new power operated exit doors installed in the area of the project.

All power operated exit doors provided with a fire trip must also be provided with a push button "door release" fixed to the wall adjacent to the door. This requirement is to ensure egress through the door is available in the event of all types of emergencies.

The details of all fire trips to power operated exit doors must be included on the building asset register and the associated drawings.

5.26 Smoke & Heat Vents

The consultant/contractor must provide a fire systems interface matrix that lists all existing and new required smoke and heat vents installed in the area of the project.

Details of all required fire safety measures relating to smoke and heat vents must be included on the building asset register and the associated drawings.

Further technical information and requirements regarding smoke and heat vents may be found in the CIS Mechanical Standards.

5.27 Smoke & Heat Alarm Systems

Where a University building is not protected or not proposed to be protected with an Automatic Fire Detection and Alarm System or a Fire Sprinkler System, smoke and heat alarms must be installed (except buildings designated as NCC Class 10 structures). Smoke alarms must be installed to suit the spacing requirements of AS1670.1, the Environmental Planning & Assessment Regulation 2000, the NCC and AS3786.

Where smoke and heat alarms are installed, they must be interconnected throughout the building, have LED indicators, have a single test/silencing/hush facility and be 240V mains powered connected to their own dedicated power circuit.

Where smoke alarms are installed in residential and shared accommodation buildings, the smoke alarm must be a photoelectric type and where required, will be provided with an approved relay output facility to activate lighting to assist evacuation in accordance with the requirements of the NCC Volume 2 Clause 3.7.2.5.

The University preferred brand of smoke and heat alarms is Brooks, or approved equivalent.

5.28 Smoke Dampers

All smoke dampers installed will be:

a. Provided with access panels to enable inspection, testing and resetting of the damper
b. Detailed on the building asset register.
c. Included in a consolidated Passive Fire and Smoke Containment System report for the project works. The report must provide comprehensive details of all items listed under Section 17 of AS1851-2005, including:
    i. consolidated as-built fire compartmentation drawings for each area and level of the building affected by the project works, documenting the exact location of all existing and new fire walls, floors and ceilings, together with the location of all existing and new passive fire and smoke containment measures
    ii. corresponding photos of each individual passive fire and smoke containment measure
    iii. certification of each individual passive fire and smoke containment measure

Further technical information and requirements regarding smoke dampers may be found in the CIS Mechanical Services Standards.

5.29 Smoke Doors

Smoke doors must be constructed so that smoke will not pass from one side of the doorway to another, in accordance with the requirements of BCA Specification C3.4. This includes doorways located in smoke walls and also doors suitably sealed against smoke spreading from enclosures located in exits and paths of travel which contain electrical and communication distribution boards/equipment.

All smoke doors must:

a. Be provided with statutory signage in accordance with the BCA Clause D2.23. All signage must be consistent with the CIS Signage Standard.
b. Swing in the direction of egress, or in both directions
c. Fitted with smoke seals capable of resisting smoke to the required temperature/time requirements of AS6905- 2007
d. If magnetic door holders are required to be installed, they will be installed at the top of the door in a position that allows easy access to the release button.
e. Where the opening of a smoke door may cause injury to persons on the other side, consideration must be given for the door to be installed complete with an approved and tested viewing panel
f. Any alterations to existing smoke door sets must be provided with full certification from the door manufacturer indicating that the alterations are consistent with the tested prototype

that has been submitted to the standard fire test procedures. Additionally, new certification tags must be installed on both the door leaf and door frame.

g. Detailed on the building asset register
h. Included in a consolidated Passive Fire and Smoke Containment System report for the project works. The report must provide comprehensive details of all items listed under Section 17 of AS1851-2005, including:
    i. consolidated as-built fire compartmentation drawings for each area and level of the building affected by the project works, documenting the exact location of all existing and new fire walls, floors and ceilings, together with the location of all existing and new passive fire and smoke containment measures
    ii. corresponding photos of each individual passive fire and smoke containment measure certification of each individual passive fire and smoke containment measure

5.30 Standby Power Systems

Standby power systems are generally installed to meet the NCC requirements for Atrium Construction and for aisle/step lighting in theatres.

Where standby power systems are installed for aisle and step lighting requirements, a central UPS will be installed. The UPS must be located in a secured area that allows maintenance by authorised personnel. The UPS must be hard-wired and secured in a lockable cabinet that provides adequate ventilation. Appropriate signage must be provided to the cabinet housing the UPS.

Further technical information and requirements regarding standby power systems may be found in the CIS Electrical Standards.

5.31 Wall Wetting Sprinkler & Drencher Systems

Wall wetting sprinkler and drencher systems must be installed in accordance with the NCC to provide protection over windows, openings or walls of non-fire resistant construction. External wall wetting sprinklers will be provided to protect against fire exposure to/from adjacent buildings and internal wall wetting sprinklers must be provided to protect required paths of egress. Where wall wetting sprinklers are installed to protect windows, the windows must be permanently fixed in the closed position.

Water supplies for existing wall wetting sprinkler and drencher systems vary throughout the University, due to the differing ages of the systems and the original standard of performance for each of the systems. Examples of system water supplies include connections to building fire sprinkler systems, individual systems complete with dedicated sprinkler valve sets and pumps, systems connected to fire hydrant/fire hose reel system pipework and systems connected to domestic water supplies.

When designing and installing new wall wetting sprinklers, or upgrading existing systems, the consultant/contractor must test and confirm the existing water supply pressure/flow details to determine compliance with the current NCC and Australian Standard requirements.

Dedicated sprinkler valve sets must be installed for wall wetting sprinkler and drencher systems with more than 12 sprinkler heads. These systems must be connected to operate automatic fire brigade call facilities, building evacuation systems and other interfaced systems in accordance with a standard fire sprinkler system. These systems must also be connected to the FMS to provide control and monitoring similar to a standard fire sprinkler system.

5.32 WARNING & OPERATIONAL SIGNS

Warning and operational signs include:

a. Fire safety notices indicating "Offence Relating to Fire Exits" as per the Environmental Planning & Assessment Regulation
b. Fire/smoke/egress door signage as per NCC Clause D2.23
c. Signage warning against the use of lifts in fire as per NCC Clause E3.3.

All signage must be consistent with the CIS Signage Standard.

Fire stairs and exits that require the installation of fire safety notices indicating "Offence Relating to Fire Exits" must have the notice displayed in a conspicuous position adjacent to the doorway providing access to the exit, but not within the exit.

Signage warning against the use of lifts in fire must be displayed adjacent to every lift call button throughout the building.

5.33 EQUIPMENT LABELLING AND IDENTIFICATION

5.33.1 BELOW GROUND SERVICES

All underground services to have marking tape of correct distances above pipework complying with relevant Australian Standards for that service. Where the service is non-metallic, provide a tape incorporating locating wire.

5.33.2 ABOVE GROUND SERVICES

All pipework and cabling must be labelled with adhesive markers indicating pipe contents or system type and directional arrows indicating flow. Markers must be installed at a minimum of every five metres.

Labelling must not be restricted only to close proximity of access panel openings.

5.33.3 ASSET LABELLING AND BAR CODING

Equipment must be provided with asset labels and bar codes as per CIS Asset Identification and Labelling Standard.

5.34 PIPEWORK AND CABLING INSTALLATIONS

5.34.1 BELOW GROUND SERVICES

All pipework and cabling installed below ground must be fully surveyed and documented in accordance with the details required for Quality Level A, as per AS5488-2013 – Classification of Subsurface Utility Information (SUI).

The CIS Standard – Permit to Dig Form (CIS-ENG-F003) must be submitted and approved by CIS prior to installing or repairing any pipework or cabling located below ground.

For further details and requirements of all pipe and cabling installations below ground, please refer to the CIS Excavation Standard, CIS Hydraulic Services Standard and CIS Electrical Services Standard.

5.34.2 ABOVE GROUND SERVICES

All pipework and cabling installations, including the materials, supports, jointing, etc, must satisfy the relevant Australian Standard, CIS Hydraulic Services Standard and CIS Electrical Services Standard.

5.34.3 CORE HOLES AND SLEEVES

Details of all proposed core holes in floors, walls, beams and columns must be checked and approved by a structural engineer prior to coring the hole.

All pipework and cabling passing through a core hole or masonry/concrete wall or floor must be provided with a 0.6 mm thickness sheet copper sleeve having a grooved and seamed joint. Sleeves must be cylindrical having a diameter to provide a 25mm gap all around the services passing through the sleeve. Alternatively, copper tubing may be used as the sleeve if a 25mm gap around the service can be achieved. Each service passing through the sleeve must be positioned centrally in the sleeve to ensure the annular space between the service and the sleeve is equal and round.

Fire rating of all pipe and cabling penetrations must be installed to comply with all statutory requirements and the requirements of this standard.

5.34.4 CORROSION PROTECTION AND FINISHES

All surfaces exposed or susceptible to corrosion will be suitably painted, including external surfaces of all machinery, apparatus, equipment, fittings, tanks, vessels and services including supports, hangers and brackets.

Ferrous metal exposed to the atmosphere or in humid conditions is to be hot dip galvanised having a minimum coating thickness 0.1mm. Hot dip galvanising must be carried out after all welding, cutting, drilling and swarf removal has been completed. The university will not accept cold galvanising process.

Surfaces that must not be painted include:

a. All fibreglass and plastic surfaces.
b. Chrome plated and stainless steel surfaces.
c. Bearing surfaces, slides, adjusting screws and any surface that is required to be unpainted for the correct operation or adjustment of the equipment.
d. Flexible duct connections to plant, rubber or canvas hoses, flexible rubber mountings and any other non-metallic flexible connections.
e. Piping where installed in ceilings, trenches, underfloor, and similar concealed spaces must not be painted throughout their entire length but must be labelled with identification bands. However, steel piping installed in damp conditions in any of the above must be hot dip galvanised.
f. Bare copper tanks.
g. Motor and equipment nameplates.

6 COMMISSIONING

Comprehensive pre-commissioning, commissioning and quality monitoring must be specified by the consultant/designer.

A project specific commissioning plan is to be developed and provided to the University for review and approval.

Detailed testing and commissioning records must be provided for each system and each component as appropriate. All such records must be witnessed and verified by the project consultant/head contractor.

Project hand over inspection and testing plans (ITPs) must be developed by the consultant/contractor to allow the system to be handed over to the University.

7 SAFETY IN DESIGN

The contractor must consider risk during the design. A design safety report must be submitted to the relevant CIS Project Manager for every design project. Contractors must confirm, so far as it is reasonable practicable (SFAIRP), that the structure is without risks to health and safety.

Design risks must be considered for the asset lifecycle covering construction, operational and maintenance, refurbishments and decommissioning.

The design safety report must include the following:

a. Description of design element;
b. Description of potential risks and hazards associated with the design element;
c. A low/medium/high risk assessment considering likelihood and consequence;
d. Proposed measures to eliminate risks where practicable;
e. Control measures to mitigate and manage design risks;
f. Nominating responsibilities for managing the design risks.

This may be provided as a design risk register where appropriate and must include results of any calculations, testing and analysis etc.

8 DOCUMENTATION & RECORDS

8.1 DESIGN DOCUMENTATION

Prior to commencing construction of new or refurbishment projects, the consultant/contractor must fully investigate and document the requirements for each essential fire safety system required to be installed, altered or modified as part of the project works.

This must include:

a. Review of the current Annual Fire Safety Statement (AFSS) for the building to determine the proposed Fire Upgrade Strategy;
b. Provision of a BCA Compliance Report;
c. Provision of Fire Engineered Alternative Solution Report (where applicable);
d. Return Brief defining the systems proposed and any deviations from this standard;

e. Calculations to be provided on the sizing of the pipe work. Future allowances are to be included in these calculations\sizing;
f. Calculations & selections on the proposed equipment;
g. Budget calculations;
h. Provision of Design Certification of each essential fire safety measure;
i. Requests for all variations to this Standard submitted using the **CIS Request for Dispensation Form (CIS-ENG-F001);**
j. Complete the Design & Construct checklist using the **CIS Design & Construct Essential Fire Safety Measures Checklist Form (CIS-ENG-F009).**

This documentation must be provided by the consultant/contractor in both electronic and hard copy formats and approved by the University.

8.2 COMPLETION DOCUMENTS

At the completion of all projects, the following documentation must be provided for each essential fire safety measures installed or altered as part of the project works:

a. O&M manual(s)
b. As-built drawings (including schematics and block plans)
c. Final Fire Safety Certification (indicating BCA clauses & Australian Standards year/amendment)
d. Asset schedules and labelling (as per the Asset Identification and Labelling Standard)
e. Commissioning test results
f. Product manufacturer specific information
g. Copies of FIP, MECP, FMS, MNS, computerised emergency and exit lighting system programs and graphics computer software modifications
h. Licensed versions of FIP, MECP, FMS, MNS, computerised emergency and exit lighting system graphics computer software required to program panels and monitoring systems
i. Details of all user names and passwords required to access all equipment and software
j. Warranty schedules for all major items of equipment, including but not limited to tanks, pumps, FIP's, MECP's, etc.
k. Maintenance requirements for all items of equipment
l. Building User Guide
m. Installers Statutory certificates
n. Certification of compliance to the design standard by completing and submitting the **CIS Project Design Certification Form (CIS-PROJ-F001)**

This documentation must be provided by the contractor in both electronic and hard copy formats and approved by the University prior to Practical Completion being granted.

Similar completion documentation must be provided by the Fire Safety Engineer, in the form of a Fire Safety Strategy Handover Report, confirming full details of certification, commissioning and specific ongoing maintenance and operational management issues required for all approved Alternative Solutions.

9 OPERATIONS

9.1 MATERIALS AND EQUIPMENT SELECTION

Only new materials, equipment and components will be installed and these must be of good quality, fit for purpose and selected to minimise life-cycle costs and maximise efficiency. All products must be supported locally and internationally by factory trained service networks. All spare parts must be available ex-stock factory for a period of 10 years from purchase date. Equipment and materials that are obsolete, discontinued, about to be discontinued or superseded, must not be installed. Selected equipment must have the ability to be backwards compatible.

Uniformity of the type of materials must be consistent throughout all individual installations and must match, or be fully compatible, with the existing equipment.

All fire protection equipment must be designed and manufactured to the relevant Australian Standard and be listed in the ActivFire Register of Fire Protection Equipment, or approved equivalent.

Details of all major items of fire equipment proposed to be installed during new or refurbishment projects must be submitted to CIS for approval prior to installation. This will include, but is not limited to, pipe material selection, FIPs, MECPs, fire pumps, fire water storage tanks, etc.

Identification of a proprietary item of equipment will not necessarily imply exclusive preference for the item identified, but indicates a deemed-to-comply item.

9.2 SERVICE ACCESS REQUIREMENTS

The following servicing and access requirements must be provided:

a. Position all equipment and arrange access provisions at equipment, to optimise future maintenance and repairs.
b. Service access doors and panels must be hinged and lockable with a University plantroom bi-lock key. Lift off panels with screw fixings are not acceptable
c. The University will not accept major plant within ceiling spaces and plant in tight spaces. Plant that is located in a ceiling space must have free and easy access. This includes ability to service system without reaching around or over columns, beams, cable trays, pipe work, lights and duct work
d. All motors are to be provided with isolators within 3 meters distance from motor. Isolators must be labelled with details of the source of electrical supply (DB/CB).
e. A plus 20% additional dimension access allowance is to be provided for above the manufacturers access requirements
f. Major plant located above 3m height will have permanent stair/ladder access provisions with permanent workable platform
g. Trip hazards to be identified and painted in yellow
h. Electrical hazards must be identified and labelled appropriately
i. Confined spaces to be noted and appropriate signage applied
j. Fixed switchable lights are to be provided in all areas where essential fire safety measures are installed
k. Access to plant and equipment must comply with all WHS regulations

9.3 REDUNDANT EQUIPMENT

All redundant essential fire safety systems and equipment and associated services (power, water, drainage, etc) must be removed as part of the project. Building surfaces and finishes must be made good wherever redundant services are removed. Where a service is unable to be removed appropriate tags and labelling shall be installed to indicate the service is redundant.

9.4 INTERRUPTION TO ESSENTIAL FIRE SAFETY MEASURES

Where any new, refurbishment or maintenance works require interruption or isolation of essential fire safety measures to prevent false alarms from occurring or to allow work to be performed on the system, contractors must gain approval from CIS prior to the works occurring.

An application for "Fire System Interruption" form must be submitted to CIS for approval at least 72 hours prior to any proposed interruption.

When refurbishment works occur within occupied buildings, fire safety measures in occupied areas must not be interrupted or isolated for periods longer than eight (8) hours. Wherever possible, the existing fire safety measures installed in project areas will be disabled throughout the construction period. Where the project works require isolation of fire safety measures serving occupied areas of the building outside of the refurbishment area, the installation contractor is required to isolate and de-isolate the system on a daily basis to minimise system downtime and ensure that the building has adequate fire safety measures available.

To prevent fire detector contamination caused by construction and maintenance activities, detector dust caps must be temporarily installed on all detectors in the vicinity of all dusty works. Where dust caps are temporarily installed, the contractor must adopt a system to check and notify the University for both the installation and removal of the dust caps.

Prior to refurbishment works commencing within buildings proposed to remain occupied during the course of the refurbishment works, the contractor must consult with CIS the proposed strategy and methodology relating to interruption of essential fire safety measures within the building for the duration of the project works. The contractor must also provide appropriate safe work method statements (SWMS).

All costs associated with the interruption and isolation of essential fire safety measures required for new and refurbishment projects will be included by the contractor in the overall tendered amount for the project works.

Where construction works cause false alarms, all applicable false alarms fees and maintenance contractors attendance to the false alarms, must be paid for by the project.

9.5 MAINTENANCE AND TESTING

For essential fire safety measures installed as part of a refurbishment project of an existing building, regular statutory maintenance and testing must be carried out by the University essential services maintenance contractor during the Defects Liability Period (DLP). The installation contractor must provide a comprehensive handover and the required completion documentation at Practical Completion.

All defects arising from regular statutory maintenance and testing performed during the DLP will be documented and passed onto the installation contractor for rectification. The installation contractor must be responsible for all defect rectification works identified during the DLP.

For new buildings, the installation contractor must provide statutory maintenance and testing of all essential fire safety measures listed on the Final Fire Safety Certificate for the building, throughout the DLP. Prior to the completion of the DLP, the installation contractor will perform all annual maintenance procedures in the presence of the University essential services maintenance contractor and provide documentation confirming the provision of all statutory maintenance has been performed during the DLP. In these instances, the installation contractor must also provide certification in the form of an Annual Fire Safety Statement prior to completion of the DLP.

Any details which will affect the future maintenance and performance of the new or upgraded equipment must be supplied by the installation contractor at Practical Completion.

Prior to completion of the DLP, a final inspection of the installed systems will be carried out by the: installation contractor, appropriate CIS staff, and University essential services maintenance contractor, in order to reconcile the performance of the equipment during DLP to produce a final list of project defects. All project defects identified must be rectified by the installation contractor prior to finalisation of the DLP.

10 AUTHORISATION OF VARIATIONS

Project managers, consultants, contractors, commissioning agents and facilities maintenance personnel must ensure compliance with these requirements is achieved.
Variations to this standard must only be considered where:

a. the University Standard's requirement cannot physically or technically be achieved.
b. the alternative solution delivers demonstrated and proven superior performance for the same capital and life cycle cost or better.

Consultants and contractors must identify and justify requirements of the standard that do not apply to the project or which need to be varied. Formal requests for all variations to this Standard must be submitted using the **CIS Standards - Request for Dispensation Form (CIS-ENG-F001)**. The issuer of this standard or their delegated authority must review and consider requirements of stakeholders from clients, projects and facilities management before deciding whether to approve variations. Their formal sign-off is required for acceptance of any non-compliances and departures from this standard's requirements.

11 QUALITY CONTROL

11.1 DESIGN STANDARD COMPLIANCE

Compliance with requirements of this standard must be checked throughout the design, construction and commissioning phases of projects by CIS' services consultant. Any issues or deviations from this standard must be reviewed and approved in writing by the issuer of this standard.

Competent CIS consultants and representatives must check compliance with this standard during design reviews and formal site inspections. Any non-conformances with requirements of this standard must be documented and provided to the CIS Project Manager for issue to contractors and their consultants.

Project Managers must maintain a formal register of non-conformances and manage close out of outstanding non-conformances. Contractors and their consultants issued with non-conformances must take appropriate corrective actions. The CIS Project Manager must ensure:

a. proposed corrective actions are implemented
b. close out of non-conformances in relation to this standard is formally approved and signed off by the author of the standard or their delegate

11.2 Design Standard Certification

Contractors and consultants must certify compliance to the design standard by completing and submitting the **CIS Project Design Certification Form (CIS-PROJ-F001)** to the CIS Project Manager at each of the following project phases:

a. Design and Documentation
b. Tender
c. Construction

Notwithstanding CIS' internal quality control processes, contractors and their consultants must implement their own robust quality assurance and control procedures to ensure compliance with requirements of this standard.

11.3 Construction Compliance

Consultants and contractors are expected to include check sheets for each system component detailing each item that needs to be checked, tested and verified during the installation process. Such check sheets must be completed and verified by the project consultant/contractors, including the identification of any defects and the closing out of such defects.

11.4 Acceptance

The University will only accept projects as complete when all of the above have been carried out, submitted and verified.

12 REFERENCES

Design and documentation utilising these standards is to incorporate the requirements of the following current standards and requirements as a minimum:

a. National Construction Code
b. Environmental Planning & Assessment Regulation
c. Work Health & Safety Act
d. All CIS Standards
e. AS1074 Steel tubes and tubular for ordinary service
f. AS 1221 Fire Hose Reels
g. AS1530.1 Methods for fire tests on building materials, components and structures – Combustibility test for materials

h. AS1530.2 Methods for fire tests on building materials, components and structures – Test for flammability of materials
i. AS1530.3 Methods for fire tests on building materials, components and structures – Simultaneous determination of ignitability, flame propagation, heat release and smoke release
j. AS1530.4 Methods for fire tests on building materials, components and structures – Fire resistance test of elements of building construction
k. AS 1668.1 The use of mechanical ventilation and air conditioning in building - Fire and smoke control
l. AS 1670.1 Fire detection, warning, control and intercom systems – System Design, installation and commissioning – Part 1: Fire
m. AS 1670.4 Fire detection, warning, control and intercom systems – System Design, installation and commissioning – Part 4: Sound Systems and Intercom Systems for Emergency Purposes
n. AS 1851 Maintenance of fire protection systems and equipment
o. AS 1905.1 Fire resistant door sets
p. AS 1905.2 Fire resistant roller shutters
q. AS 1940 The storage and handling of flammable and combustible liquids
r. AS 2118.1 Automatic fire sprinkler systems - General systems
s. AS 2118.6 Automatic fire sprinkler systems – Combined sprinkler and hydrant
t. AS 2243 Safety in laboratories - Planning and operational aspects
u. AS 2243.8 Safety in laboratories – fume cupboards
v. AS 2293.1 Emergency evacuation lighting for buildings – System design, installation and operation
w. AS2304 Water storage tanks for fire protection systems
x. AS 2419.1 Fire Hydrant installations – System design, installation and commissioning
y. AS 2441 Installation of fire hose reels
z. AS 2444 Portable fire extinguishers and fire blankets – Selection and location.
aa. AS 2941 Fixed fire protection installations - Pumpset systems
bb. AS 3000 Electrical installations
cc. AS 3013 Electrical installations- classification of the fire and mechanical performance of wiring system elements
dd. AS 3500 - National plumbing and drainage code
ee. AS 3786 Smoke alarms.
ff. AS 4072 Components for the protection of openings in fire-resistant separating elements - Service penetrations and control joints
gg. AS4428.1 Fire detection, warning, control and intercom systems – Control and indicating equipment - Fire
hh. AS 5007 Powered doors for pedestrian access and egress
ii. AS 6905 Smoke doors
jj. AS/ACIF S009 Installation requirements for customer cabling – Wiring rules
kk. National Code of Practice for the Safe Removal of Asbestos (NOHSC:2002 - 1988)

The above standards are not an exhaustive list of the relevant requirements. The consultant/contractor must incorporate all relevant standards and Authorities requirements into project specific design, documentation and installation.

Consideration must be given by the consultant/contractor to the original standard of performance relevant to the construction date of the individual essential fire safety measures.

13 NOTES

N/A

14 DOCUMENT AMENDMENT HISTORY

Revision	Amendment	Commencing
001	First Issue	16 August 2013
002	• Clause 2 Scope (amended) • Clause 5.2 D&C Contracts (new clause inserted) • Clause 5.3.5 Fire System Connections to Communication Network (new clause inserted) • Clauses 5.7.3 (d), (e) & (m) Detectors (new clauses inserted) • Clause 5.7.6 (e) Cabling (new clause inserted) • Clause 5.8.1 Modified to indicate building and occupancy types requiring fire sprinkler system installations • Clauses 5.10 & 5.13 Emergency & Exit Light System – details removed from this standard as these systems are now included in CIS Lighting Standard. • Clauses 5.11.2 (h) & (i) MECP (new clauses inserted) • Clause 5.33 Equipment Labelling & Identification (new clause inserted) • Clause 6 Commissioning (amended) • Clause 7 Safety in Design (new clause inserted) • Other minor amendments to wording throughout document	18 September 2015

15 ATTACHMENTS

ATTACHMENT 1 DESIGN AND CONSTRUCT CHECKLIST FOR CONSULTANTS (CIS-ENG-F009)

ATTACHMENT 1 DESIGN AND CONSTRUCT CHECKLIST FOR CONSULTANTS (CIS-ENG-F009)

This spreadsheet is available in Excel via the Forms section of the UoS Website.

Design and Construct List

The following is a list of fire documents which CIS require the building service consultant and contractors to provide as part of their package.
This is a guide for the consultant/contractor to ensure they meet minimum design components in all projects.
These documents will be reviewed by the relevant CIS Services Engineer or their delegate during the design phases.
This list does not alleviate the building services consultant's responsibility to design to the online CIS Design standards.

Design Input - Provided by all Fire Services Consultants on all Projects		Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6		
Item Required	Detail of the Design Item to be Completed	Project Planning and Assessment	Approved Project Initiation	Design and Documentation	Tender	Construction	Post Construction and DLP	Compliance Achieved	Building Services Consultant Comments
Application for connection to hydraulic services infrastructure for new or increased water supply requirements.	Application to be made to either Sydney Water or University of Sydney (determined by ownership). Application must be approved prior to design being finalised.		x					Yes / No or N/A	
Specifications (Where applicable)	Complete a fire specification for the project. Include schedules for all major items of equipment including FIP, EWIS, pumps, tanks and material types.			x				Yes / No or N/A	
Plan Layout Drawings	Design drawings in Autocad (and Revit 3D model where applicable) format including plans, schematics and single line diagrams.			x		x		Yes / No or N/A	
Room Spatial Allowances with Fire Equipment	Confirm all equipment proposed will fit within the room/riser/ceiling spaces with sufficient access for maintainance and egress.			x		x		Yes / No or N/A	
FMS & MNS Connections	Proposed connections, interfacing, system programming, graphic upgrades and network communications between building systems and FMS/MNS to be submitted for approval.			x		x		Yes / No or N/A	
Water Supply Pressure/Flow Calculations	Provide details of existing water supply pressure/flow requirements via Sydney Water enquiry or by testing the actual supply characteristics and providing results. Water supply graphs (town main + pumped) to be provided to indicate hydrant and fire systems combined water supply design requirements .			x		x		Yes / No or N/A	
Equipment sizing	Calculations & selections to be provided for all proposed equipment including pumps, tanks, FIP's, MECP's. Future allowances are to be included in these calculations/sizing.			x		x			
Supply of statutory design certifications and certification of compliance to the University standards and other relevant standards.	Complete the design certificate in line with the relevant standards and requirements including NCC, Austrailian Standards, Fire Engineering Report, CIS Standards			x	x	x		Yes / No or N/A	
Safety in Design Documentation	Provide a Safety in Design document for review and approval by the Services Engineeer.			x	x	x	x	Yes / No or N/A	
Interface Matrix & Block Plans	Interface matrix and block plans proposed to be installed to be submitted for approval prior to installation					x		Yes / No or N/A	
Evacuation Diagrams	Evacuation diagrams proposed to be installed to be submitted for approval prior to installation					x		Yes / No or N/A	
Asset List	Proposed final asset list to be submitted for approval					x		Yes / No or N/A	
Inspection, testing and maintenance	Confirm all inspection, testing and preventive maintenance to be perfomed during DLP together with proposed dates when the tasks will be performed						x	Yes / No or N/A	