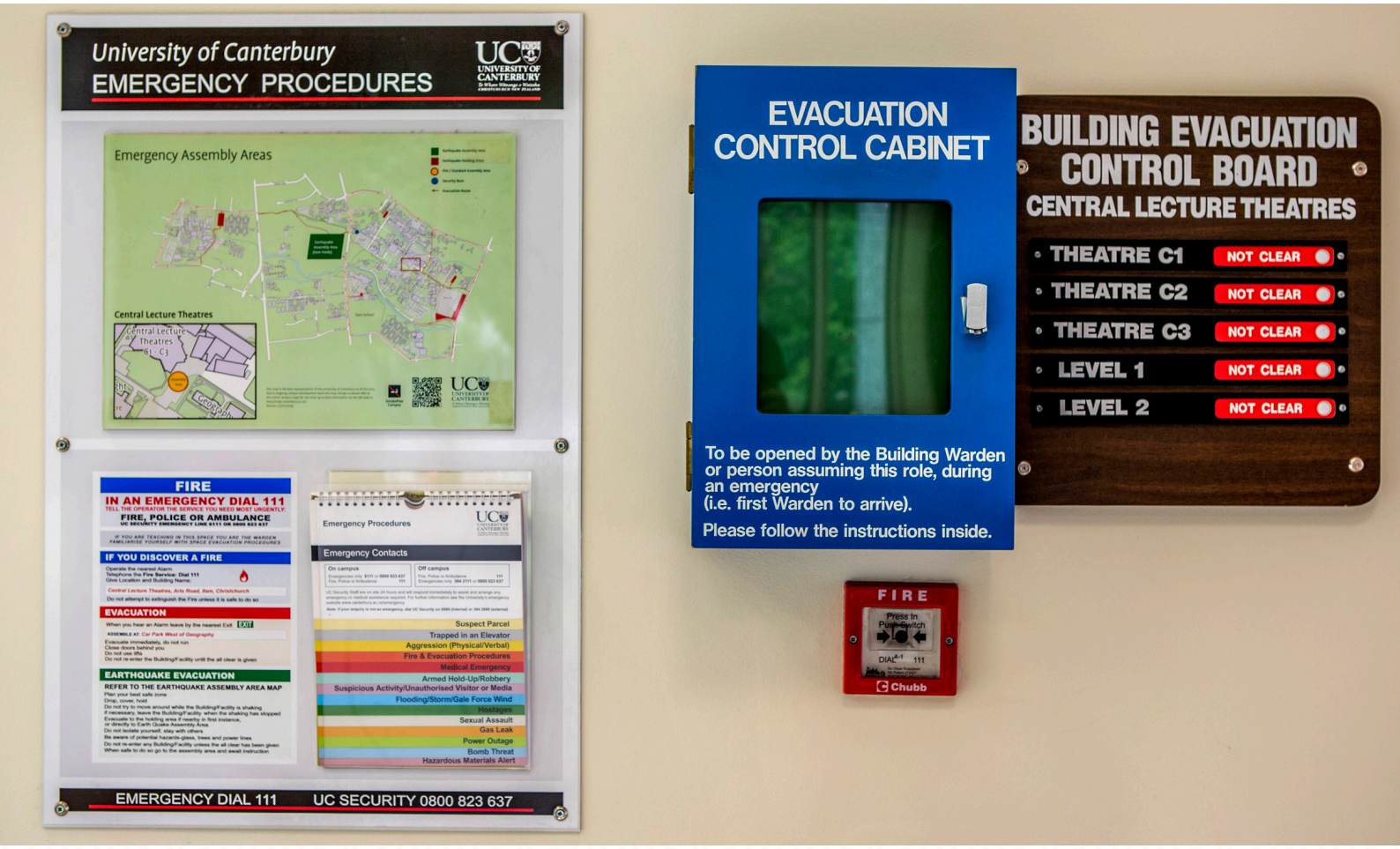
Design Guidelines
September 2019: Issue 4

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Section 10 Fire and Life Safety.



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Standards in the Design Guidelines Suite

Design Standard Guidelines Index:

Document Control

Revision History

Revision Number	Description	Section Owner	Date
Issue 1	Original Draft	-	-
Issue 2	Internal Review	-	-
Issue 3	First public circulation	-	October 2016
Issue 4	Updated Issue	*Rob Oudshoorn*	*September 2019*

Current Document Acceptance

Update Authored	Approved	Date
Pat Keogh	*Rob Oudshoorn*	*September 2019*

Key Updates from Previous Issue

Revision Item	Details
10.2.5 Fire Protection Systems & Equipment	*Mandatory requirements added*
10.2.6 Sprinkler valve access control	*New Clause*
10.3.2 Fire System 230V Isolators	*New Clause*
10.4.4 HSSD Smoke Detection Systems	*New Clause*
10.5.5 Interfaces with Other Trades	*New Clause*

Contents

10.1 General

10.1.1 Purpose

This section sets out the University's minimum requirements for the design, quality of materials and standard of construction of fire protection systems. Requirements detailed by this document will apply to both new building construction projects and upgrade or refurbishment activities.

The provision of fire services shall conform to the requirements of current standards and statutory requirements. Additional, more stringent requirements may be called up on a project specific basis.

This section of the Design Standard Guidelines is intended to be read and implemented in design in conjunction with **Section 01 – General** and any project specific brief and agreements.

10.1.2 Fire Design Brief Clarifications

At the beginning of the project, the Fire Consultant shall; through review the briefing documentation, queries to the University of Canterbury Project Manager (UCPM), or workshop with key stakeholders - ensure that the following is understood and clearly communicated

- **Building Risk Group Definition** – this definition is required per firecell. Particular reference should be made to areas accommodating members of the public, sleeping areas and spaces with high or hazardous storage.
- **Total Building Occupancy** – the fire engineer determines the populations as per the NZBC occupant density tables. There may be areas within the building that are expected to have populations that are greater or less than those of the NZBC.

  These include queuing areas for Class Change, Lab Crush Zones, Multi-functional teaching spaces and Lecture Theatre maximum. Agreement on occupancy profiles need to occur.
- **Evacuation Strategy** – Determine any requirement for in-place protection or staged evacuation, evacuation of interconnected or adjacent buildings, or areas of the building that are vulnerable should an “All Out” evacuation be initiated (e.g. PC labs, Research labs, sensitive environments, high security areas).
- **High Hazard Areas** – define zones within the building that will likely include significant hazards (e.g. chemical storage, fuels, radiation).
- **Security Provisions** – establish how the requirement for fail-safe means of escape interrelates with the University security provisions for the building.
- **Business Continuity** – set the expectation for maintained business continuity.
- **Property Protection** – set the expectations for areas requiring enhanced fire safety for the purpose of property protection.

10.2 Design Concepts

10.2.1 Compliance Methods for New Buildings

The University is accepting of both NZ Building Code Acceptable Solution and Alternative Solution (i.e. C/VM2 Verification Method) design for new buildings.

At Preliminary or Concept Design phase of the project, the University require a comparison document outlining the benefits for considering either approach in order to agree the compliance method.

This should be presented in the form of concept design sketches and a summary bullet point Fire Strategy report.

10.2.1.1 Acceptable Solutions

Acceptable Solutions C/AS1 – C/AS7 can be used to demonstrate compliance with the NZ Building Code for 'Protection from Fire'.

For larger projects the University may choose to involve an external peer reviewer.

The requirement for a peer reviewer is to be discussed with the UCPM during Concept Design stage in the context of the project so the associated benefits or disadvantages can be evaluated.

10.2.1.2 Alternative Solutions

The preferred approach for Alternative Solutions is the NZ Building Code Verification Method C/VM2.

Consideration to adopting a "first principles" alternative solution may become a future option through MBIE Guidance, and should be an option if possible.

Where an Alternative Solution is proposed on a project it is the responsibility of the fire consultant to initiate consultation with the stakeholders including the Building Consent Authority and NZ Fire Service Engineering Unit, to agree the preferred approach in principle prior to completion of Concept Design Stage.

This is to de-risk the project pursuing a compliance methodology which may result in an extended Building Consent review period.

All Alternative Solutions are to be independently Peer Reviewed by a consultant selected by the University.

10.2.2 Assessment and Compliance of Existing Buildings

MBIE have published requirements for review of existing buildings for Means of Escape from Fire in accordance with Section 112 of the Building Act.

The Requirements are based on a scoring sheet which ranks the fire risk vulnerability of the building using criteria such as occupant type and recent completed Building Consents.

If it exists, The University will provide any previous assessment of the Risk Score as part of the project briefing documentation.

The fire engineer is to verify the Risk Score in the context of the building information provided and proceed with the 'As Near As is Reasonably Practicable' (ANARP) analysis on this basis.

The fire consultant shall agree ANARP upgrade principles with the University prior to consultation with the Building Consent Authority at an early stage to agree the Risk Score and interpretation of the ANARP principles.

10.2.2.1 Passive Fire Upgrades

The fire consultant shall undertake a gap assessment of the current state of passive fire elements and recommend an upgrade approach that takes into account

- The Risk Score for the project, as assessed by the MBIE guidelines for Means of Escape from Fire
- Other fire safety improvements being considered, i.e. the scope of works of the project
- "Duty of care" safety considerations
- A benefit-sacrifice analysis, from both a financial and functional perspective

The above considerations shall be summarised and reported to the UCPM in order to determine a reasonable approach.

10.2.2.2 Adjoining Areas

The consultant shall ensure that the design and associated documents highlights relevant operational issues to be considered in the execution of the contract works e.g.: maintenance of electrical, communications, fire and security services to those adjoining areas in the building excluded from the contract works areas.

The extent to which adjoining areas are surveyed shall be informed by the Risk Score assessment for the building and agreed in advance with the UCPM.

10.2.2.3 Common areas of upgrade include:

- **Fire *and* Smoke Stop Doors** – the preference to replace older style fire and smoke stop doors with certified doorsets where project budget permits. The fire engineer is to undertake a survey of the doors and provide recommendation on the status of the door maintenance. This includes the door integrity, current certification status, sealants, closers, signage and hardware.
- **Seismic Restraint** – Seismic restraint of fire services where modified are to meet all current code requirements.
- **Fire Stopping** – Mechanically fixed or adhered fire stopping products are preferred, and any use of friction-fitted fire stopping is to be agreed prior to installation.
- **Surface Finishes** – Existing surface finishes are to be maintained ANARP to C/ASx, unless deemed hazardous (e.g. non-compliant exposed foamed plastics) subject to BCA approval.
- **Services tunnels** – Reinstate fire stopping between basement levels and the services tunnels to a minimum of 60 minutes fire separation.
- **Sprinkler System** – Retrofitting of a sprinkler system into an existing non-sprinkled building is to be considered if the complete building is undergoing alterations, or there are convincing reasons under the MBIE ANARP review process.

10.2.3 Evacuation Management Procedures

The preference is for "all out" simultaneous evacuation with due regard to the University's security protocols.

It is acknowledged that there are a number of existing interconnected buildings with internal and external walkways and bridges on campus. As part of the Concept Design Stage, the fire consultant is to review any existing evacuation management strategy for the building and consult with the UCPM to determine preferences for evacuation.

For Halls of Residence, where possible a Type 5 smoke detection system in accordance with NZS4512 is to be provided to allow local hush of false alarm activated.

10.2.4 Business Continuity and Property Protection

Due regard is to be paid to the University of Canterbury business continuity and property protection needs.

At the concept design stage, the fire engineer is to establish with the University their Business Continuity and Property Protection requirements for the project and incorporate options into the design. Note that this may be in the form of an options report for pricing purposes, with consideration of the following:

- Isolation of the risk through the introduction of additional fire separations e.g. 60 minute fire rating to rubbish rooms, MSB Rooms, HASNO spaces, and special laboratories, 90 minute fire ratings to high-hazard plant areas.
- Early detection – e.g. use of aspirating detection systems with high sensitivity for computer areas.
- Suppression systems acknowledging the risk – e.g. gas suppression within server rooms; no sprinkler heads within fume extract hoods, sprinklers over transformers
- Following principles of Standards that are over and above the minimum requirements of the Code – e.g. AS/NZS Laboratory Standards.
- Due reference to HASNO Regulations where required
- Fire Separations – ensure appropriate signage and/or as-built records are provided to identify fire rated element including the associated fire rating. This may include stencilling of fire rating on concealed fire rated wall elements, and inclusion of fire collars in openings through fire separations where future cabling may be required to pass through, with due regard to manufacturers performance constraints for the fire rated devices.
- HVAC interface – the NZBC requires wholesale shutdown of distributed HVAC systems. There areas of the university, such as PC2 and above labs, where maintaining pressurisation systems for containment is required hence a shutdown to the HVAC systems is detrimental to the University's needs.

10.2.5 Fire Protection Systems and Equipment

University of Canterbury requires a fire sprinkler system to be designed and installed in all new buildings. *All areas of the building are to be covered by the sprinkler system – sub-division of spaces to avoid sprinkler protection is not permitted (NZS4541 2013 Clause 208.1 and 208.2 shall not be applied unless approved by the University at time of design.)*

All refurbishments on existing buildings shall consider the feasibility of retrofitting a fire sprinkler system. This shall be provided to the University as part of a cost-benefit analysis of the upgrade.

All fire sprinklers are to be connected to the University campus fire ring main. New connections are to include isolate valves with the capability for being monitored for the purpose of isolating the building from the wider network if necessary for maintenance purposes.

Fire extinguishers are preferred in lieu of fire hose reels for compliance with the Standard NZS 4503 for most University buildings (except special risk). The preferred form of hand held firefighting equipment is to be clarified during the Concept Design stakeholder consultation period.

Although the Fire Protection contractor is expected to typically remain responsible for the certification of the fire protection systems, the design phase requirements should include:

- *Hydraulic calculations to allow preliminary sizing and coordination of major sprinkler routes and horizontal distribution pipework*
- *Design and coordination of the location of ceiling or wall mounted minor equipment (sprinkler heads, detectors etc)*

10.2.6 Sprinkler Valve Room Access Control

All Fire Sprinkler valve rooms shall be fitted with an electric mortice lock. Where the building is fitted with access control the lock and access control reader shall be part of the access control system. Where no access control is fitted the lock shall be powered from its own power supply. In all cases the locks shall be fail safe, released by activation of the fire systems and fitted with key override keyed to the University's sprinkler valve room key.

10.2.7 Existing Alarm Network

All alarm systems shall be connected to the NZ Fire Service monitoring system and any connection to data / phone racks shall be in fire rated data cable.

10.2.8 Pre-application or Technical Meeting

A Building Consent Authority (BCA) Pre-Application or Technical Meeting is required for all University projects prior to submission for Building Consent, except if the lesser scale of the project does not warrant a specific meeting, as approved by the UCPM. The BCA meeting is to be arranged once the above project parameters are established and the fire safety design strategy advanced.

10.2.9 Additional Deliverables

A copy of the building consent fire strategy report for the project is to be provided to the University in digital form.

A copy of the for construction issue of the fire protection systems performance specification is to be provided to the University in digital form

10.3 Materials & Equipment

Selection of materials and equipment for fire design and protection shall be informed by the information below and the approved products and suppliers listed in Appendix A of **Section 01 - General.**

10.3.1 Alarm Systems and Units

Direct Brigade Alarm (DBA) units shall be of Pertronic™ or Vital™ manufacture.

All alarm systems shall be analogue addressable type of either Ampac™ or Pertronic™ manufacture.

Aspirating systems are preferable to beam detection. Monitoring points are to be located in an area that is easily accessible without the use of a ladder.

Gaseous suppression systems are to be used for key server areas an IT racks at the direction of the University.

10.3.2 Fire System 230V Isolators

All fire equipment using 230V power shall be fitted with a 230V isolation switch which allows the power supply to be removed from the system without further isolation.

If these switches are mounted external to the cabinet and in a public area they must be lockable in both positions.

All fire system 230V isolators shall be labelled with the supply DB name and circuit breaker designation.

10.3.3 Detectors

Smoke detectors shall be analogue addressable type selected to suit their location and either Apollo™ or System Sensor™ manufacture to connect to the relevant panel. .

10.3.4 Evacuation

Each evacuation system shall be connected to a Talk A Phone™ interface module to allow the University Wide Area Broadcast system to operate over the Evacuation speakers of the alarm system. *Amplifiers shall be 50 watt of Ampac or Pertronic manufacture.*

A compatibility of sound is to be maintained campus wide.

10.3.5 Manual Call Points

Manual Call Points shall be of resettable type

10.3.6 Pipework and Components

Fire service pipework installed below ground shall be Polyethylene (PE) type and be sized to allow for any losses between materials e.g. steel to plastic – both have different flow rates.

Fire services installed above ground or in services ducts shall be approved medium grade galvanised steel pipe with roll groove joints and fittings. Lightweight steel pipe is not permitted. Isolation between dissimilar metals shall be provided.

Pressure gauges shall be installed at the supply point and at highest point on the fire hydrant riser.

At ground level external accessed inlets shall be provided.

Exposed fire service pipe-work, cabinets, valve box covers, etc. shall be painted “Dulux Wildfire Red”.

Fire sprinkler heads installed on suspended ceilings shall be installed using the Victaulic Vicflex System including the proprietry bracket.

Hydraulic fire services shall include for all fittings, piping, branches, valves, hydrants, hose reels, sprinklers, etc. including provision of booster pump equipment as necessary to complete the installation.

10.3.7 Magnetic Door Hold (MDH) Open Devices

the University considers both floor mounted or wall mounted MDH devices suitable depending on the type best suited to the specific location

10.4 Installation Requirements

10.4.1 Fire Protections for Penetrations

Fire protection installed in penetrations shall be easily removable without causing damage to material passing through the penetration, and must not in any way restrict future use of the penetration.

The University require an independent fire stopping contractor for installing passive fire systems and products. The contractor is to provide a schedule of work, documenting location of penetrations and products used for sealant to the required fire rating.

Fire stopping at slab level is preferred.

Additional conduit, with appropriate fire collars is to be installed for future allowance to retrofit data and cabling.

Or Firestop Sleeves which allow for the addition of extra cables at a later date shall be installed. (Hilti CSF-SL)

10.4.2 Shut Down Protocols

All shut down protocols for active sprinkler and alarm systems are to be in accordance with the standards defined in NZS4541 and NZS4512

10.4.3 Operations and Maintenance Manuals

In addition to the requirements outlined in Section 07 - Documentation Standards, flow rate design data is to be detailed in the Operations and Maintenance Manuals.

10.4.4 HSSD Smoke Detection Systems

HSSD Smoke Detection Systems shall have the tail end pipework (after the sampling point and furthest from the detection unit) extended to an easily accessible location no more than 2 metres above floor level. The end of this pipe shall have a removal plug to allow for reverse cleaning of the pipework.

10.4.5 Interfaces with Other Trades

It shall be the Fire Protection Contractors responsibility for resolving the interfaces between their scope and other trades, for example all onward connections from Fire Alarm Panels.

Compliance Checklist

Project Name:	Date:
Submitting Consultant:	Design Stage:

Section 10 – Fire and Life Safety Compliance Checklist		Complies	Does Not Comply	Not Applicable	Comments:
1.0	**Section 01 - General**				
#	All Clauses	☐	☐	☐	
10.1	**General**				
10.1.1	Purpose	☐	☐	☐	
10.1.2	Fire Design Brief Clarifications	☐	☐	☐	
10.2	**Design Concepts**				
10.2.1	Compliance Methods for New **Buildings**	☐	☐	☐	
10.2.2	Assessment and Compliance of Existing Buildings	☐	☐	☐	
10.2.3	Evacuation Management Procedures	☐	☐	☐	
10.2.4	Business Continuity and Property Protection	☐	☐	☐	
10.2.5	Fire Protection Systems and Equipment	☐	☐	☐	
10.2.7	Sprinkler Valve Room Access Control	☐	☐	☐	
10.2.8	Existing Alarm Network	☐	☐	☐	
10.2.9	Pre-application or Technical Meeting	☐	☐	☐	
10.2.9	Additional Deliverables	☐	☐	☐	
10.3	**Materials & Equipment**				
10.3.1	Alarm Systems and Units	☐	☐	☐	
10.3.3	Fire System 230V Isolators	☐	☐	☐	
10.3.4	Detectors	☐	☐	☐	
10.3.5	Evacuation	☐	☐	☐	
10.3.6	Manual Call Points	☐	☐	☐	
10.3.7	Pipework and Components	☐	☐	☐	
10.3.7	Magnetic Door Hold (MDH) Open Devices	☐	☐	☐	
10.4	**Installation Requirements**				
10.4.1	Fire Protections for Penetrations	☐	☐	☐	
10.4.2	Shut Down Protocols	☐	☐	☐	
10.4.3	Operations and Maintenance Manuals	☐	☐	☐	
10.4.4	HSSD Smoke Detection Systems	☐	☐	☐	
10.4.5	Interfaces with Other Trades	☐	☐	☐	

Compliance Checklist

Date:	☐ Acceptable
University Reviewer:	☐ Acceptable subject to comments
Signed:	☐ Resubmission required