FPA
NEW ZEALAND

Code of Practice
for the Integration of Building Fire Safety Systems with other Services

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Fire Protection Association New Zealand
www.fpanz.org

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- Association of Building Compliance
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Foreword

Building fire safety systems are regularly interfaced with other building services to address the life safety needs of building occupants in the event of fire. In 2020, the Fire Protection Association New Zealand gathered a voluntary group of organisations and industries to develop this document, which addresses the issues arising through various stages of design, construction, and building use involving such integration of building systems.

Failures with significant adverse consequences have been recorded, and the group strongly believed in the importance of ensuring that interfaces between building systems are correctly designed, installed, proven to work, and remain working correctly throughout the building's lifetime.

This project revived a scoping project previously convened by Standards New Zealand in 2009 which, although agreed as a necessary document, did not progress further at that time. It is hoped that, in the future, this work might contribute to or evolve into a New Zealand Standard.

The group has aimed to outline expectations at each stage from building design through to building use. By clarifying and expanding on requirements from such documents as the MBIE *Compliance Schedule Handbook* and various standards it is hoped that this Code of Practice will assist all parties involved to design, install, commission, certify, approve, test, and maintain integrated systems in ways that ensure correct operation and ultimately the safety of building occupants in the event of fire.

About FPANZ

Established in February 1975, the Fire Protection Association New Zealand (FPANZ) is the primary organization which represents the fire protection industry in New Zealand. As a not-for-profit, its mission is:

'To provide a professional forum and be the unified voice of the fire protection industry by drawing on our expertise and collective knowledge to reduce the impact of fire in New Zealand.'

FPANZ's membership base includes those involved in fire alarms, sprinklers, hand-operated firefighting equipment, passive fire protection, system design, installation and maintenance, inspection and certification, evacuation schemes, fire equipment manufacturing and distribution, insurance, fire engineering, Fire and Emergency New Zealand, and Territorial Authorities.

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This Code of Practice was developed in good faith to cover a subject for which there is incomplete standardisation in New Zealand. Every effort has been made to ensure that the information in this document is, at the date of issue, as comprehensive and accurate as possible. The interpretation and use of this document are the responsibility of the reader. The Fire Protection Association New Zealand accepts no liability whatsoever for any direct or incidental damages that may arise out of or in connection with any use, application, or interpretation of this document.

Document History

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It is the intention of FPANZ that this document will be reviewed periodically.
Any reviews and feedback for future revisions can be submitted to info@fpanz.org for consideration

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1. Introduction

This Code of Practice is intended as a guide for specifiers, designers, installers, approvers, certifiers, service providers, and owners of fire protection systems and buildings in New Zealand.

There are currently no specific New Zealand Codes or Standards that detail how to integrate multiple systems to ensure that any building systems reliant on the operation of another system are commissioned, tested, and maintained in concert. A variety of informal practices are used within industry, but these do not necessarily reflect good practice, nor do they assure the intended outcomes.

The purpose of this Code of Practice is to provide guidance for the specification, design, installation, commissioning, certification, documentation, maintenance, and routine testing of integrated fire safety systems installed to protect human life and property. The intention is to ensure that the active interconnections and interfaces between the various systems in a building are considered together as a whole, rather than independently of each other. A crucial component of this is the documentation necessary to convey what systems are integrated, the functional purpose of the interconnections, and the regular testing requirements for such systems interfaces.

This Code of Practice supplements other available documents such as NZS 4512, NZS 4541, and the MBIE *Compliance Schedule Handbook*, which identify the need for such interfaces but do not provide detailed guidance as to how they should be implemented, documented, or tested.

2. Scope & Limitations (applications)

2.1 Scope

This document contains general information to assist in the specification, design, installation, commissioning, certification, documentation, testing, and maintenance of integrated building systems. The focus is on life safety and Compliance Schedule Specified Systems, and how particular building systems need to be integrated to achieve the correct operation required in a 'Fire' or 'danger' state.

The MBIE Compliance Schedule Handbook identifies several Specified Systems expected to be tested periodically where they are connected to the building's emergency warning system. The extent of such integration and ongoing interface testing, however, needs to be established and appropriately documented as part of the building's design.

Examples of systems that might typically require some form of integration include, but are not limited to:

- Automatic systems for fire suppression (for example, sprinkler systems)
- Automatic or manual emergency warning systems for fire or other dangers
- Electromagnetic or automatic doors or windows (for example, ones that close on fire alarm activation)
- Emergency lighting systems
- Escape route pressurisation systems
- Lifts, escalators, travellators, cable cars, or other systems for moving people or goods within buildings
- Mechanical ventilation or air conditioning systems
- Audio loops, or other assistive listening systems
- Smoke control systems
- Emergency power systems for, or signs relating to, a system or feature
- Systems for communicating spoken information intended to facilitate evacuation
- Signs for communicating information intended to facilitate evacuation

NOTE: the above (partial) list is taken directly from the list of specified systems in Schedule 1 of the *Building (Specified Systems, Change the Use and Earthquake-prone Buildings) Regulations 2005*.

There may also be benefits or requirements to integrate other building services or plant and equipment with the fire alarm system in order to achieve the correct state of operation in the 'Fire' or 'danger' state, even if life-safety is not their main purpose.

Irrespective of the reason for installation, good practice is to ensure that all integrated systems are commissioned and tested as outlined in this document. These systems can include but are not limited to:

- Building Systems that may be required to start, stop, or remain operating on demand
  - Plant, pumps and equipment, storm water detention, etc.
  - Utilities (gas, steam, etc.)
  - Building equipment (conveyors, robots, cranes, cooking appliances, etc.)
  - Refrigeration systems
  - Electrical systems including photovoltaic systems
  - Emergency generators
- Security systems (access control and notifications)
- Communication systems (public address systems, audio loop systems, TV, etc.)
- Other fire prevention and active life safety systems (hypoxic, etc.)
- External systems (FENZ monitoring, security systems, mobile phones, websites, etc.)

2.2 Scope exclusions

This Code of Practice does not apply to stand-alone systems that operate in isolation and do not require or provide a signal or interface with any other system.

This Code of Practice is not a comprehensive systems design document but is recommended for use as a guideline to ensure the comprehensive integration of systems.

The commissioning procedures included in this document are intended to test the physical end-to-end *operation* of the integrated systems. It excludes any assessment of the adequacy of individual systems, which are expected to be designed, tested, and maintained in accordance with their own specifications, Codes, and Standards as applicable.

2.3 Application to Existing Buildings

This Code of Practice is applicable to both new builds and existing buildings.

Where systems within existing buildings are already subject to appropriate maintenance and testing procedures, it is not the intention of this document to replace or supersede such existing practices. Nevertheless, industry regularly identifies existing buildings where the interfaces between the systems within them are not being adequately tested, and queries relating to the interfacing of systems are common.

For existing buildings, where the integration of systems is unclear, this document may help to identify new or additional requirements to supplement existing maintenance practices. See section 13.1.

3. Definitions

(Form) 12A	Forms for building maintenance management - Form 12A: Certificate of compliance with inspection, maintenance and reporting procedures. This is a prescribed form, issued by an Independently Qualified Person (IQP), to be attached to the Building Warrant of Fitness in accordance with the *Building (Forms) Regulations 2004*, to verify that the inspection, maintenance, and reporting procedures on a compliance schedule for a specified system have been carried out during the previous 12 months.
Accredited Inspection Body	An organisation that has been independently accredited by an internationally recognised accreditation body to AS/NZS ISO/IEC 17020 (Type A) as competent to inspect the relevant system (e.g. fire sprinkler or fire detection and alarm systems).
Authority Having Jurisdiction (AHJ)	The organization, office, or individual responsible for approving equipment, installations, or procedures. This may, depending on circumstances, be a Building Consent Authority or a Territorial Authority.
Building Consent Authority (BCA)	Has the same meaning as the New Zealand Building Act. A Building Consent Authority performs the following statutory functions: ❯ issues building consents (except consents subject to a waiver or modification) ❯ inspects building work for which it has granted a building consent ❯ issues notices to fix ❯ issues code compliance certificates ❯ issues compliance schedules. The local Territorial Authority will generally fill this role.
Building Warrant of Fitness (BWoF)	A building owner's annual statement confirming that the specified systems in the compliance schedule for their building have been maintained and checked for the previous 12 months, in accordance with the building's compliance schedule.
C/AS2 **C/VM2**	Acceptable Solution for buildings other than risk group SH for New Zealand Building Code Clauses C1-C6 Protection from fire. Verification method: Framework for fire safety design for New Zealand Building Code Clauses C1-C6 Protection from Fire.
Commissioning	An integrated, systematic process to ensure, through documented verification, that all building systems perform interactively in accordance with the design intent and operational requirements of the building consent. See section 10.
Commissioning records	Documentation to verify that system(s) have been commissioned correctly. They provide a record for operations and maintenance, and create a benchmark for future testing, maintenance, and re-commissioning.
Competent person	A person who is able to demonstrate that they have acquired, through suitable qualifications, training and/or experience, the knowledge and skills necessary to be able to design, install, test, and maintain the required system(s) according to the equipment suppliers' specific requirements and instructions, and good industry practice. Such a person is expected to work only within their area of knowledge and expertise.

Compliance Schedule	A document that contains specific information about, and procedures for, specified systems within a building as required under section 100 of the Building Act. Under section 103 of the Building Act, a compliance schedule must: a) state and describe each of the specified systems covered by the compliance schedule, including a statement of the type and (if known) make of each specified system, and b) state the performance standards for the specified systems, and c) describe the inspection, maintenance, and reporting procedures to be followed by independently qualified persons or other persons in respect of the specified systems to ensure that those systems are capable of, and are, performing to the performance standards.
External interference	Disruption of a control signal, either intentional or unintentional, which prevents or causes unwanted signalling between systems.
External systems	Systems external to the building requiring fire system status input for either control, monitoring, or information purposes.
Fail-safe (Locks)	Electromechanically operated locks which require power to be connected to keep them in the locked state (by contrast, Fail-secure locks remain locked until power is connected to release the lock).
Fire Brigade	The expected first emergency responder to a fire alarm. NOTE: At the time of publication this would typically be Fire and Emergency New Zealand (FENZ), previously known as the New Zealand Fire Service.
Fire Report	A report (typically prepared by a Fire Engineer) that documents the Fire Safety design and building fire safety features that is approved as part of the Building Consent documentation. This document may also be known by other names including, but not limited to: Fire Safety Report, Fire Engineering Strategy.
Independent Inspection Body	See Accredited Inspection Body.
Independently Qualified Person (IQP)	An IQP is a person who is accepted by a Territorial Authority as being qualified to carry out or supervise all, or some of, the inspection, maintenance, and reporting procedures required for a specified system stated on a compliance schedule. An IQP can certify that those procedures have been fully complied with.
Interface	The connection between building systems to achieve a necessary control signal or message. It may include relays and/or a high-level interface. See also Relay.
Integrated Building System	Building systems which need to be interconnected (via an interface) to achieve the correct operation required in the 'Fire' or 'danger' state. See section 10.4.
Integrated Testing	100% end-to-end testing of Integrated Building Systems to ensure that every 'cause' results in the required 'effect' as detailed in the approved Fire Matrix. See 13.1.
Integrated Testing Agent	A person or body appointed by the owner, who plans, schedules, documents, coordinates, and implements the testing of the integrated systems. This person/body may be the owner, a tenant, a commissioning/testing company, a fire protection contractor, an independent inspection body, or other competent person.

Listed	*Equipment, materials, or services included in a list published by an organization that is acceptable to the Authority Having Jurisdiction, and whose listing states that either the equipment, material, or service meets appropriate designated standards, or has been tested and found suitable for a specified purpose.* *Examples of listing organisations that may be relevant for the installation of fire systems include, but are not limited to: CSIRO ActivFire, Underwriter's Laboratories (UL), FM Global Approvals, Loss Prevention Certification Board (LPCB), Verband der Schadenverhutung (VdS), Fire Protection Association New Zealand (FPANZ) Fire Alarm Equipment Register.*
Fire Matrix	Integrated building systems table showing the intended cause and effect functionality of various fire protection related systems both within and external to a building. See Appendix C and Appendix D for examples
(Building) Owner	The building owner as defined by the Building Act. For the purposes of this document the term 'owner' also includes their delegated representative, agent, or the person who has control of the premises (such as landlord, tenant, property/ building manager).
Person	Has the same meaning as the New Zealand Building Act.
(Fire Alarm) Relay	Typically, a normally open / normally closed contact point that signals between a fire detection and alarm system and another system. For the purposes of this document a 'relay' also includes high-level interface (for example Modbus) which, while not a physical relay, performs the equivalent interface/signal function. NOTE: In safety situations, relays should be operated 'power on' normally and fail to the safe mode when power is interrupted.
Secure data	Data communication protocol used between systems that employs a recognised cyber-security format.
Serious deficiency / Significant defect	Deficiency of a system or interface that would lead to a significant probability of system failure or adverse impact on life safety. For integrated systems this will typically mean a failure of the 'cause' to initiate the required 'effect' in the Fire Matrix. This would prohibit the issue of a certificate or a 12A. If it is not a life safety issue, then it would not typically be considered serious or significant.
Soft latching	A means of maintaining a door in the closed state but still allowing free access and egress.
Territorial Authority (TA)	A council named in Part 2 of Schedule 2 of the Local Government Act 2002. As specified in the Building Act, Territorial Authorities issue: ❯ project information memoranda ❯ building consents where the consent is subject to a waiver or modification of the Building Code ❯ certificates of acceptance ❯ certificates for public use ❯ compliance schedules (and amends compliance schedules).

4. List of Abbreviations

12A	Form 12A
ABC	Association of Building Compliance
AHJ	Authority Having Jurisdiction
AHU	Air Handling Unit
BCA	Building Consent Authority
BMS	Building Management System
BWoF	Building Warrant of Fitness
CCC	Code Compliance Certificate (Form 12A)
FAR	Fire Alarm Relay
FENZ	Fire and Emergency New Zealand (previously known as the NZ Fire Service)
FFO	Fire Fighting Operations
FPANZ	Fire Protection Association New Zealand Inc.
HVAC	Heating, Ventilation, Air Conditioning
IQP	Independently Qualified Person
MBIE	Ministry of Business, Innovation & Employment
MCP	Manual call point
NZBC	New Zealand Building Code
NZSA	New Zealand Security Association
O&M	Operation and Maintenance (manual)
PA	Public Address
PS3	Producer Statement – Construction
PS4	Producer Statement – Construction Review
SS	Specified System
SVR	Sprinkler Valve Room
TA	Territorial Authority

5. Regulatory and Certification Considerations

Buildings that contain certain safety and essential systems, known as 'Specified Systems', require a 'Compliance Schedule'. The *Building (Specified Systems, Change the Use and Earthquake-prone Buildings) Regulations 2005* considers the following to be Specified Systems:

SS1	Automatic systems for fire suppression (for example, sprinkler systems).
SS2	Automatic or manual emergency warning systems for fire or other dangers (other than a warning system for fire that is entirely within a household unit and serves only that unit).
SS3	Electromagnetic or automatic doors or windows (for example, ones that close on fire alarm activation).
SS4	Emergency lighting systems.
SS5	Escape route pressurisation systems.
SS6	Riser mains for use by fire services.
SS7	Automatic backflow preventers connected to a potable water supply.
SS8	Lifts, escalators, travellators, or other systems for moving people or goods within buildings.
SS9	Mechanical ventilation or air conditioning systems.
SS10	Building maintenance units providing access to exterior and interior walls of buildings.
SS11	Laboratory fume cupboards.
SS12	Audio loops or other assistive listening systems.
SS13	Smoke control systems.
SS14	Emergency power systems for, or signs relating to, a system or feature specified in any of [Specified Systems] 1-13.
SS15	Any or all of the following systems and features, so long as they form part of a building's means of escape from fire, and so long as those means also contain any or all of the systems or features specified in [Specified Systems] 1 to 6, 9, and 13: a. Systems for communicating spoken information intended to facilitate evacuation; and b. Final exits (as defined by clause A2 of the NZ Building Code); and c. Fire separations (as so defined); and d. Signs for communicating information intended to facilitate evacuation; and e. Smoke separations (as so defined).

When a building is completed in accordance with the building consent, if it contains one or more Specified Systems, the building owner is issued with a Compliance Schedule at the same time as their code compliance certificate. This Compliance Schedule lists the building's Specified Systems, the performance standards, and the inspection, maintenance and reporting procedures needed to keep them in good working order.

All of these systems require ongoing inspection and maintenance to ensure they continue to function as designed. Many of them may also require integration with one or more other systems, but typically are interconnected with (or via) the fire detection and alarm system – Specified System 2 (SS2).

A Compliance Schedule includes:

- a detailed description of each Specified System
- performance standards for each system
- the inspection and maintenance procedures required to ensure the Specified Systems continue to function as intended, including necessary interfaces

The building owner is responsible for ensuring that all the inspection, maintenance, and reporting procedures for the Specified Systems stated in the Compliance Schedule for their building is carried out, and that those systems are performing, and are expected to continue to perform, to the performance standards.

The Compliance Schedule needs to contain information describing how the systems are interfaced and details of any requirements for integration testing.

Every year the building owner needs to supply the relevant Territorial Authority with a BWoF. The BWoF must state that the owner has fully complied with the inspection, maintenance, and reporting procedures of the Compliance Schedule for the previous year.

5.1 Standards / Codes of Practice for Integrated Building Systems

Some international standards specify requirements for systems integration (see also Appendix A). The following may be useful references:

- AS 1851 - Routine service of fire protection systems and equipment
- NFPA 3 - Standard for Commissioning of Fire Protection and Life Safety Systems
- NFPA 4 - Standard for Integrated Fire Protection and Life Safety System Testing
- CIBSE Commissioning Code M - Commissioning management.

5.2 New Zealand Standard for Fire Detection and Alarm Systems in Buildings (NZS 4512)

The fire detection and alarm system is a key component of the overall integrated building systems and is responsible for the detection of fire, occupant warning, notification to the Fire Brigade and other parties (where required), and providing interfaces with associated plant and equipment.

The applicable Standard for such systems is NZS 4512. Several of this Standard's requirements are relevant to the design and installation of an integrated building systems. The key considerations are outlined below.

NZS 4512 (clause 203.1 in the 2010 edition, clause 2.3.2 in the 2021 edition) stipulates that the fire alarm control panel can initiate but not power other fire-related functions, for example the actuation of ventilating systems, emergency lighting, lift control, door closure, or other building services.

NZS 4512 (clause 203.5 in the 2010 edition, clause 2.3.6 in the 2021 edition) specifies that the fire alarm system must not be used to monitor the function or failure of ancillary services not directly related to fire safety.

The same clause permits indicators and manual controls for fire safety related ancillary services to be located on the fire alarm system indicating unit's Fire Brigade index.

Operation of the external 'Silence Alarms' switch on the fire alarm system control unit (clause 205.4 in the 2010 edition, clause 2.5.4 in the 2021 edition) will silence the alerting devices provided they have been triggered by the fire detection and alarm system itself. In systems designed to the 2010 or later versions of the Standard, restoration of this switch will partially re-arm the system (apart from the activated zones and devices).

Where any other system (e.g. fire sprinkler system, gas suppression system) is interfaced to the main building fire alarm system to activate the building's alerting devices, the other system must have a labelled 'Silence Alarms' switch, operable by a 'Bulgin 6083/C' patterned key fitted to the outside of its control unit, as specified in NZS 4512 (clause 205.5 in the 2010 edition, clause 2.5.5 in the 2021 edition). This interconnection is required to be supervised by the fire alarm system (clause 218.9 in the 2010 edition, clause 4.6.13 in the 2021 edition).

While not specified in NZS 4512, where the fire detection and alarm system overrides or interconnects with any other building system (for example: lift, escalator, security, smoke control) it is good practice to provide a non-latching 'Services Restore' switch, operable by a 'Bulgin 6083/C' patterned key fitted to the outside of the fire alarm system's control unit, to allow the responding Fire Brigade to reinstate the building's integrated services prior to the arrival of an alarm service technician to fully restore the fire alarm system after an activation.

Commissioning and annual testing is required for all ancillary services interfaces connected to the fire detection and alarm system (clauses 503, 504.1(d), and 603.10 in the 2010 edition, clauses 5.3, 5.4.1(d), and 6.3.11 in the 2021 edition).

In NZS 4512:2010, a note to 603.10 acknowledges the deficiency addressed by this Code of Practice. It is stated that this test may only check the relay. In NZS 4512:2021 this requirement has been significantly strengthened:

- Clause 5.4.3 requires end-to-end operational testing to be conducted on all interfaced services for correct functioning for commissioning tests.
- Clause 5.5.2.2(m) requires independent inspection of end-to-end operational testing to be conducted upon commissioning of all interfaced services for correct functioning.
- Clause 6.3.11 requires annual testing of the interface between services.

NZS 4512:2021 is also clearer in its documentation requirements and in clause 8.2 requires commissioning records to detail interfaces with other systems.

5.3 Other Standards

NZS 4541, NZS 4515, AS/NZS 1668.1, and others may require signals from a fire alarm system, or provision of signals to a fire alarm system, to actuate emergency functions. The cause and the means of such interfacing may be detailed in the standard.

See Appendix B for items to consider and references to relevant standards.

6. Competency / Training

All persons who are involved with design, installation, commissioning, inspection, testing, maintenance, and operation of integrated life safety systems need to be adequately trained and competent in the functions they are expected to perform.

A competent person is expected to:

- Be trained for the specified functions, and
- Be licensed where required by jurisdictional regulators for the specified function, and
- Hold relevant qualifications.

Qualifications for systems might typically include:

- Fire: NZS 4541 and NZS 4512 recognised NZQA level 4 qualifications for sprinkler and fire alarm installation and certification.
- Security: NZQA level 3 and Certificate of Approval / licensed by Private Security Personnel Licensing Authority.
- Lift: Lift commissioner with electrical registration. Lift Inspector with relevant IQP status.
- Electrical: Registered electrician.
- Hydraulics: Registered plumber.
- Mechanical Building Services (HVAC): NZ Building Code compliance documents C/AS1, C/AS2, and C/VM1 reference AS/NZS 1668.1:1998 and G4/AS1 references AS 1668.2:2002. Any person involved in the design, installation, commissioning and testing of fire system integrated HVAC systems should be trained and competent in the application of this and other relevant standards.

Qualifications and training should include those appropriate to persons with:

- Chartered Engineer status from a recognised agency,
- Specific third-party system training, preferably to an NZQA Unit Standard,
- A competency standard approved by a “third party inspector” – see 11.2, or
- Persons who have undertaken relevant and specific recent industry training.

Persons with the stated level(s) of qualification should be involved in the processes outlined above for their respective fire systems and equipment.

Persons with the equivalent levels of qualifications for the other life safety systems or equipment in the installation should be involved in the processes outlined above for their respective systems and equipment.

In the absence of any applicable national qualifications, persons involved should seek training from their system or equipment supplier.

7. Process

The process for the integration of building systems should be included and form part of the building's overall commissioning schedule. A commissioning plan should be developed to outline the scope and define the responsibilities of the commissioning process as well as the activities, schedules, and documentation required. See figure 1 for a general process overview.

To achieve the optimum commissioning process, it is necessary to give consideration of what building systems will be present and what integration will be needed as soon as practicable within the project lifecycle, and well before the design is completed and building consent approval is sought. Designing in the ability to commission systems properly from the outset can provide huge benefits, especially in relation to time, cost, and performance.

A commissioning plan should be started early and populated with detail as it becomes available. This approach calls on project designers to plan, reality-check as they go along, prepare fully for handover, and follow through after occupation to fine-tune and resolve issues as they emerge.

The Building Services Research and Information Association Guide BG 8/2009 suggests a Model Commissioning Plan which includes:

- Provide general information about the project.
- Identify the commissioning team members during each stage of the commissioning process.
- Define the roles and responsibilities for each commissioning team member.
- Identify the systems to be commissioned.
- Create a schedule of commissioning activities for each stage of the commissioning process.
- Establish documentation requirements associated with the commissioning process.
- Establish communication and reporting procedures for the commissioning process.

Depending on the complexity of the building, and the number of systems involved, the commissioning process may benefit from the appointment of a dedicated commissioning manager to coordinate and facilitate the various activities necessarily involved to properly integrate the various systems.

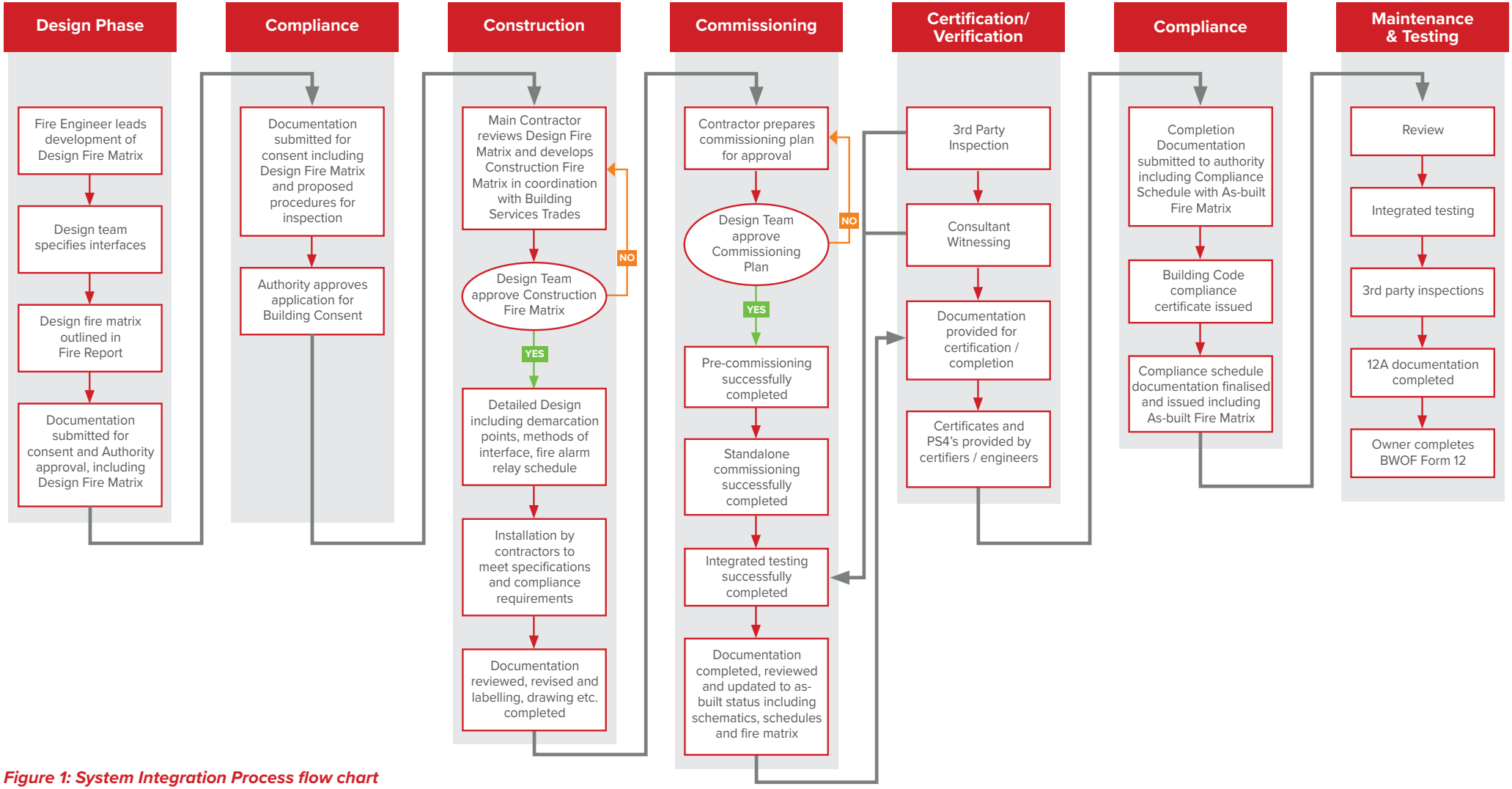

Figure 1: System Integration Process flow chart

8. Design

8.1 Design criteria for Integrated Building Systems

This Code of Practice relies on the development of an Integrated Building Systems Fire Matrix. It is expected that this Fire Matrix forms part of the Fire Report and/or other consented documentation and thereby becomes integral to the commissioning process.

The building services design engineers (consultants and/or installation contractors) need to specify the required functionality of all integrated systems under various emergency alarm scenarios or emergency conditions as required by the building design and relevant standards, owner, and other project requirements. The Fire Engineer is expected to lead this process and develop the Design Fire Matrix with input from the building services design engineers.

Items for a designer to consider when developing a Fire Matrix are detailed in Appendix B. This is not an exhaustive list of systems, and their functions and matrices will vary between buildings, but it is intended to assist the designer in consideration of what might be required.

The complexity of a Fire Matrix will depend on the systems and function of a building. At building consent stage, it is expected that the Fire Matrix will be sufficiently detailed to describe how each system is required to function to support the intended overall design. The Fire Matrix may then be expanded upon and increased to include each individual discipline's needs and requirements to support the construction, commissioning, and testing processes. Examples are provided in Appendix C and Appendix D.

The safety of testers when accessing and testing interfaces should be considered in the Safety in Design process.

8.2 Specifications

Where a building is to contain multiple systems, it may be necessary for the fire alarm system to be interfaced to these other services and systems, to shut down or change modes of operation on detection of smoke, fire, or activation of a suppression system (for example mechanical services may be shut down or started up).

Such interfaces should be direct from the fire alarm control panel to the affected services, and not 'cascaded' via an intermediary panel or system (such as a BMS), which might be isolated for work elsewhere within the building, thereby resulting in the unexpected and unnotified impairment of the integrated building systems' functionality.

It is strongly recommended that only analogue addressable fire alarm systems are specified for installations requiring anything but the simplest fire alarm interfacing to other building systems. Analogue addressable systems are typically much more capable of system and logic programming, control functionality, flexibility, data logging, time stamping, signal supervision, and positive identification of inputs/outputs and activations. They also typically have superior self-monitoring capability.

8.3 Documentation

It is important to establish what the testing and reporting procedures for each Specified System will be, and that these are documented within the Building Consent application.

The NZBC *Compliance Schedule Handbook* provides some examples of systems that may be interfaced and indicates the extent of testing required. For example, for an emergency lighting system that is connected to the building's fire alarm system the Handbook indicates that as part of the annual testing requirements: *"Where the system is connected to the building's emergency warning system, testing of the interface between the two systems should be carried out annually."*

The Fire Matrix and specifications detailing the integrated systems functionality should be submitted in the Building Consent application documentation, including the Compliance Schedule checklist.

- Examples of Fire Matrices are provided in Appendix C and Appendix D.
- Examples of Compliance Schedule checklists are provided in Appendix F.

These documents will then form the basis of the testing requirements and will need to be referenced in the building's Compliance Schedule and Operation and Maintenance manuals.

9. Construction

9.1 Confirmation of Design Criteria

A process should be put in place so that the construction team reviews and confirms the proposed integrated systems with the designer(s) to ensure that the interfaces operate as needed. This also helps the installer to understand and ensure any issues are raised early in the project. By way of example, this process might be:

a) Upon award of the contract, the main contractor is responsible for compiling a fully detailed Construction Fire Matrix in accordance with the design documentation. At this point they should identify any ambiguities or inconsistences in the design documentation and request review and resolution by the design team.

b) The Fire Engineer and the Building Services engineers should review the Construction Fire Matrix to confirm that the contractor has correctly and accurately captured the fire alarm system functionality and fire interfaces in accordance with the design documents.

c) The main contractor should then get final approval of the Construction Fire Matrix incorporating any review comments from the design team. This document will be used to commission the completed fire alarm system and interfaces between integrated systems.

9.2 Detailed engineering

The Building Services contractors need to complete a detailed engineering design of their individual building services, as necessary to achieve the approved Construction Fire Matrix's specified functionality.

This will include:

- agreeing demarcation points,
- methods of interface (relay, high level, etc.),
- responsibility for termination,
- features necessary to enable testing (isolate/restore switches, etc.), and
- development of documentation.

As the cabling in fire detection and alarm systems is continually supervised for faults, good installation practice is to install the fire alarm system's output relays to the different building services as close as practicable to the interfaces, or demarcation points, to those building systems to minimise the risk of an unidentified and unreported connection failure.

It is considered good practice for the fire alarm contractor to provide labelled junction boxes/housings containing the interface equipment (e.g. relays) and for the other building service contractor to connect and terminate their system's interface to that.

Consideration needs to be given by the contractors to the type of interface required (relays, high level interfaces, etc.) and the most suitable method of achieving the required outcomes.

When designing interfaces it is also critical that consideration be given to how the interface is to be periodically tested, and also to how the rest of the systems are to be tested if the interface cannot normally be operated as part of the routine testing. Any interface isolation or by-pass arrangements need to be supervised to ensure that the interface cannot inadvertently be left in an impaired state.

9.3 Installation

Installation should proceed in accordance with the construction documentation which details interface information such as:

- Coordinated equipment (e.g. junction box) locations between service contractors.
- Agreed demarcation and termination lines/responsibilities.
- Cabling and equipment type/size.
- Labelling/signage details.

Clear instructions and means of resetting any interfaced services should be provided so that services can be readily restored once it is safe to do so.

Contractors should coordinate to ensure interfaces are provided as specified and in accordance with applicable Standards and compliance requirements.

Consideration should be given to the following:

- Locating interface points as close as possible to the system being interfaced to in the field to minimise the length of unsupervised cable (fire alarm cable is supervised).
- Using Junction boxes to house interface equipment and located for ready access by all services. Preferably accessed from floor level without ladders. If located behind ceiling tiles, provide signage to indicate location.
- Labelling junction boxes, and relays within, clearly as to purpose.
- Failing safe. Using normally-energised contacts may be appropriate - where fire alarm system fails or is damaged (for example, in a fire) the interfaced system may start / operate.
- Checking the relevant standards to see if fire rated cabling is required for the interface.
- Providing a test facility/button.
- Providing visual indications of relay status.
- Checking that relay contacts are appropriately rated for the voltages and currents being switched.
- Delaying actions to allow timely operation (e.g. Smoke extract to start after air inlet opening).

9.4 Documentation

To facilitate construction and commissioning, the following documentation is expected to be produced (depending on the complexity of the systems and interfaces):

- Relay/interface schedule. See Appendix D.4 for an example
- Schematic drawings
- Labelling
- Plan drawings
- Program writing and listings.

10. Commissioning Requirements

10.1 Commissioning Planning

In planning for commissioning, the Building Services contractors or other nominated parties (for example Commissioning Engineers) need to propose integrated fire testing requirements.

These would typically include the following:

- allocation of responsibilities,
- attendance requirements,
- prerequisite tasks,
- testing sequence,
- testing durations,
- witnessing and demonstration requirements, and
- consideration of disruption/impact on affected parties.

The Fire Engineer and Building Services Engineers should review and approve these arrangements.

10.2 Pre-commissioning

Each Building Services contractor should confirm installation completeness and readiness for the commencement of commissioning once their system has all programming completed, all relays/interfaces installed with connections terminated, and systems 'powered' and operational.

10.3 Stand-alone Commissioning

Prior to integrated commissioning, each Building Services contractor should conduct stand-alone system commissioning to verify correct system operation under all the fire scenarios identified in the approved Construction Fire Matrix.

For the fire contractor this typically means testing from the required input devices (manual call point, smoke detector, etc.) confirming that all required relays/interfaces actually operate. For the other contractors, this typically means testing that the input to their system (for example lift override to fire mode) initiates the specified function(s).

10.4 Integrated Testing

Once individual system Pre-commissioning and Commissioning is complete, systems must be tested as complete integrated systems. This requires the operation of 100% of interfaces with end-to-end testing to ensure that every 'cause' results in the required 'effect' as detailed in the approved Construction Fire Matrix and relay schedule.

Integrated testing may be undertaken by the contractor's competent person and witnessed by the main contractor. It may be beneficial to appoint an Integrated Testing Agent to coordinate all parties and keep records.

It is recommended that, in all but the simplest of situations, integrated systems testing should involve a suitably qualified and experienced third party such as an Accredited Inspection Body, or a specialised commissioning company acting as an independent witness or tester.

10.5 Documentation

Written records of commissioning tests should be completed and supplied to the building owner to establish a benchmark for the future testing and maintenance of their building's systems.

Construction documentation (Fire Matrix, schematics, relay schedules, plan drawings, etc.) need to be reviewed and updated with any changes and developments made during the construction and commissioning process to produce accurate 'as-built' documentation.

A laminated or framed copy of the as-built Fire Matrix should be installed in permanent manner at the fire alarm control panel. This will preferably be on the wall adjacent to the panel, or alternatively inside the panel door. A copy of the other documentation is also required by NZS 4512 (clause 505 in the 2010 edition, section 8 in the 2021 edition) - this might be placed in a document pouch and permanently affixed adjacent to the fire alarm control panel.

- A Relay Schedule example is shown in Appendix C.4.
- Examples of commissioning checklists are given in Appendix E.

It is strongly recommended that a register of commissioning issues is maintained to assist with any future trouble shooting. An example is given in Appendix E.

11. Certification/Verification

11.1 Consultant Witnessing

If required, the Fire Engineer, or other party will witness the Integrated Testing performed by the installing contractors to verify that the actual performance is in accordance with the Fire Matrix and the objectives of the fire design. This may be necessary so that a PS4 Producer Statement for Construction Review (Observation) can be provided if required by the BCA.

The extent of witnessing required, and who can witness, will depend both on the complexity of the integration and a risk analysis of the likelihood, and consequences to life safety, of failure. This risk analysis should consider the dependence of life safety on the system integration as well as the level of confidence in the construction and commissioning processes for the project.

11.2 Third-party inspections

Fire protection systems require an independent 'third-party' inspection and certification by an Accredited Inspection Body which is arranged by the installing contractor. Insurers may also conduct their own inspections.

In accordance with NZS 4512:2021 clause 5.5.2.1 the Accredited Inspection Body is required to verify the correct installation of the fire protection systems as detailed in the relevant Standards and Fire Report(s) to enable formal certification. This includes checking/witnessing all integrated system tests as per NZS 4512:2021 clauses 5.5.2.2 (m) and 5.4.3. As an alternative to checking/witnessing the tests the Accredited Inspection Body can review independent testing reports.

A certificate of completion for a fire alarm or sprinkler system needs to note the presence of any other integrated systems. In such cases, it would be expected that the inspector or certifier either witnesses the integrated testing, or receives (and retains) a comprehensive record of successful integrated testing against the Fire Matrix performed by the likes of a commissioning engineer. A Fire Matrix may form part of the inspection certificate.

An inspection body formally accredited for fire alarm or sprinkler system certification would typically be considered suitable for inspections of interfaces between integrated building systems, even if not specifically accredited for that task. The inspector should, however, be accredited for the type of building involved.

11.3 Documentation

Information/documentation that needs to be available for certification typically includes:

- As-built Fire Matrix
- As-built Schematics (including relay/interface schedules)
- Applicable Drawings
- Programming details

- Test results
- Flow chart showing how all the systems work together
- Commissioning and Testing Records (for examples see Appendix D)
- Certificates of Completion/Compliance for the fire protection systems
- PS3 Producer Statements for installation, as required by the BCA.

This documentation would typically form part of the building's Operation & Maintenance (O&M) manual which is provided by the main contractor to the owner detailing the operation and maintenance requirements of the integrated systems.

Over the life of a building the O&M manual will need to be updated to reflect any changes to the building and systems, as well as including details of any maintenance that has taken place.

a) On successful completion of commissioning the contractors need to provide the documentation to the Design team and the main contractor to include within the O&M manual.

b) The Fire Engineer may be requested by the BCA, insurer, or building owner, to provide confirmation of their satisfaction that the systems have been installed and integrated as stated in the Building Consent. This may be a PS4, Producer Statement - Construction Review, if requested by the Building Consent Authority.

12. Compliance

All buildings, other than single residential buildings, require a Compliance Schedule and an annual warrant of fitness if they contain Specified Systems.

Building owners must ensure continued operation of Specified Systems, meet inspection requirements, and sign an annual building warrant of fitness. This includes continued effective operation of those features and systems, including correct operation of interfaces.

12.1 Consent

The Building Act 2004 Subsection 45.1(g) requires:
An application for a building consent must be accompanied by either one of the following:

- *if a compliance schedule is required as a result of the building work, a list of all specified systems for the building; or*
- *if an amendment to an existing compliance schedule is required as a result of the building work, a list of all specified systems that are being: -*
  - *altered in the course of the building work*
  - *added to the building in the course of the building work*
  - *removed from the building in the course of the building work.*

The Building Act 2004 Subsections 51.1(c) and (d) require:
A building consent or an amendment to a building consent, must state:

- *the specified systems that are covered by the compliance schedule, and*
- *the performance standards for the specified systems that are required by the Building Code.*

A Compliance Schedule should be regarded as a living document that holds relevant information relating to the building and specified systems. Section 103 of the Building Act states:
(1) A compliance schedule must—

(a) state and describe each of the specified systems covered by the compliance schedule, including a statement of the type and (if known) make of each specified system; and

(b) state the performance standards for the specified systems; and

(c) describe the inspection, maintenance, and reporting procedures to be followed by independently qualified persons or other persons in respect of the specified systems to ensure that those systems are capable of, and are, performing to the performance standards.

Applications for a building consent need to contain Compliance Schedule information. A Compliance Schedule:

- details the specified systems in the building in relation to the proposed building work (new, altered, existing, or removed specified systems)

- states the performance standards of each new, or altered specified system
- also states the inspection and maintenance standards (this part should only be thought of as a high-level overview, where more detail is provided by the applicant in their plans and specifications).

A Compliance Schedule is not just a list of Specified Systems in a building. A Compliance Schedule document should be prepared to enable an IQP to be able to pick up the document and by reading the content understand the Specified Systems, locate them within the building, understand the performance level they need to operate at and, most importantly, how to inspect and maintain the system to ensure continued performance – including interfaces between building systems. It is recommended that drawing(s) are provided on project completion showing the general location of all Specified Systems contained within the building. This ensures that a correct and accurate record exists and also assists the IQP to determine whether all features have been properly inspected and maintained.

A Compliance Schedule is issued at the same time as the Code Compliance Certificate, along with a compliance schedule statement. The Compliance Schedule is issued by the BCA, when it is satisfied that all Specified Systems are operational.

See Appendix F for an example of a Compliance Schedule application document.

12.2 Development of Compliance Schedule

The MBIE *Compliance Schedule Handbook* provides guidance on developing a Compliance Schedule for the Specified Systems in a building, including guidance on their associated inspection, maintenance, and reporting procedures which will necessarily include the integrated testing requirements.

Typically, as a minimum for Specified Systems that are connected, an annual test is required to be undertaken to confirm the interfaces between integrated building systems are working as required.

Some BCAs will require the Compliance Schedule to be included as part of the building consent application.

A Fire Matrix should form part of Compliance Schedule documentation to clearly show how building systems are integrated.

A BCA will review submitted documentation and issue a Compliance Schedule which should include a Fire Matrix.

12.3 Documentation records

When the Compliance Schedule is issued, a compliance schedule statement is also issued. The compliance schedule statement must be kept and displayed in a visible location such as the lobby or reception area of the building. The BCA/TA must agree to the location of the statement. The compliance schedule statement states the Specified System(s) on the Compliance Schedule and where the Compliance Schedule is kept.

The compliance schedule statement is valid for the first year and must be replaced by a Building Warrant of Fitness (BWoF) on, or before, the anniversary date of the issue of the Compliance Schedule.

A BWoF is a certificate issued by the building owner confirming that all of the Specified Systems contained within the building have been inspected and maintained and are performing in accordance with the Compliance Schedule. A BWoF verifies that the inspection, maintenance, and reporting procedures for all the Specified Systems within a building have been carried out in accordance with the Compliance Schedule for the previous 12 months.

The building owner issues a BWoF on a Form 12 prescribed by the Building (Forms) Regulations 2004. A BWoF certificate is issued for a 12-month period, which coincides with the date that the Compliance Schedule was issued.

The BWoF is required to:

- state that the requirements of the Compliance Schedule have been satisfied (which would include end-to-end interface testing)
- be signed by the building owner
- state where the Compliance Schedule and any associated certificates or reports (Form 12A) will be located.

The building owner must attach copies of all Form 12A certificates together with any recommendations and forward these to the BCA. Form 12A is the certificate issued by the Independently Qualified Person (IQP) verifying that the inspection, maintenance, and reporting procedures set out on the Compliance Schedule have been undertaken (it is expected that these procedures include the end-to-end interface testing.) The IQP must attach to this form any other supporting documentation confirming compliance, such as certificates of compliance, certificates of completion, Fire Matrix testing records, and producer statements for construction and construction review. It is recommended that drawing(s) are provided on project completion showing the general location of all of the Specified Systems contained in the building. This ensures that a correct and accurate record exists for all systems and assists IQPs to determine whether all features have been properly inspected, maintained, and reported on.

An example of Auckland Council's guidance on the building owner's responsibilities relating to building warrants of fitness can be found at **https://www.aucklandcouncil.govt.nz/building-and-consents/commercial-building-systems/Pages/building-warrant-of-fitness.aspx**.

13. Maintenance & testing requirements

Specified Systems are required to be maintained in accordance with the Compliance Schedule to ensure that a Form 12A can be issued by the maintaining IQP and a BWoF issued on or before the building's annual anniversary.

A building Owner is responsible for ensuring that the building's Specified Systems are tested and maintained to ensure that the systems will function in an integrated manner as intended for life safety, and in accordance with the Compliance Schedule.

The process of witnessing the integrated systems testing should be documented, where any are Specified Systems, and that process should form a part of the Compliance Schedule.

It is envisaged that the same suite of tests that proved the correct functioning of integrated building systems interfaces during commissioning would be repeated during the life of a building.

13.1 Requirements Review

As fire alarm systems are Specified Systems, their maintenance requirements are required to be written into the building's Compliance Schedule in order that these requirements are properly documented and form part of the Building Warrant of Fitness (BWoF) for the building in which the system is installed. Although it is ultimately the building owner's obligation to ensure that maintenance requirements are written into the building's Compliance Schedule, the designer/installer has a duty of care to assist the building owner to achieve this.

In order to determine the testing and maintenance requirements of a system the BWoF and Compliance Schedule need to be reviewed.

It is expected that this will contain the information detailed in the sections above, including the As-built Fire Matrix, and testing and maintenance instructions.

In the event of there being an existing Compliance Schedule which does not contain sufficient detail to ensure the proper maintenance of any installed integrated building system, it is recommended that the IQP/owner draft a suitable Compliance Schedule which takes into account the requirements of the manufacturer's listed system and the installation. Where the installation Standard is not known, it is recommended that the manufacturer's requirements and/or AS 1851 are followed. In consultation with the building owner, the redrafted Compliance Schedule should be lodged with the BCA as part of a Form 11 application to amend the building's Compliance Schedule to include the maintenance requirements of the integrated building systems.

13.2 Integrated Testing

The fire alarm is required to be tested at least annually and this testing needs to include the interfaces to all other systems that are integrated with it. Tests should ensure that the

fire alarm system and integrated systems continue to operate as intended at the time of commissioning and are likely to do so through the full life-cycle of the building.

Note that a Compliance Schedule may require more frequent testing for some systems such as quarterly for smoke control systems.

The fire alarm, when activated, may automatically cause fire doors to be released, stairwell pressurisation systems to operate, goods handling equipment such as conveyors to stop operating, etc. For completeness, the testing must be a complete end-to-end test from detection and signal transportation, through relays to the controller for the integrated system, and finally to the correct operation of the integrated system.

The integrated testing should adhere to the Fire Matrix for the building. See Appendix B for examples of building functions that could be included in the Fire Matrix and examples of Fire Matrix templates.

The building owner (or the integrated testing agent, on their behalf) should coordinate testing of the interfaced fire alarm system as well as any other integrated systems. The systems to be tested should be clearly identified using the Fire Matrix.

All parties involved in coordinating, undertaking, and documenting the integrated testing, including the building owner, integrated testing agent, and relevant integrated system contractors should be able to demonstrate the necessary experience and knowledge to undertake their respective part of the work (see section 6). All testing work should be undertaken to an appropriate standard which proves that the integrated systems operate as intended.

Integrated testing will necessitate the coordinated attendance of technicians responsible for the various integrated systems including, but not limited to, the fire alarm system, automatic sprinklers systems, heating, ventilation and air-conditioning systems, the electrical system, and building management systems. To reduce inconvenience and to facilitate the efficient testing of the fire alarm system and other integrated systems advanced notice should be supplied to building occupants of the test date, the reason for the test, and detail what will happen on the day.

Supporting documentation to evidence that integrated testing has taken place is the responsibility of the building owner. The Testing agent(s) should confirm the correct functioning of Integrated Building systems with Integrated testing.

The engagement of an Integrated Testing Agent to coordinate all Building Services testing agents should be considered.

An example of Integrated testing form can be found in Appendix D.

13.3 Third-party inspections

It is recommended that all but the simplest of integrated testing be witnessed by a third party.

Complex systems should involve a suitably qualified and experienced third party such as an Accredited Inspection Body, or a commissioning engineer.

Where annual test surveys are required to be conducted by an Accredited Inspection Body, the survey is to confirm the correct function of the systems. The Accredited Inspection Body is expected to test, witness, or receive (and retain) written results of the successful Integrated Testing in the Fire Matrix as the correct functioning of the fire systems relies on the integrated systems.

13.4 Documentation

Records of testing and maintenance, successful or otherwise, need to be retained.

The IQP's need to provide a Certificate of compliance with inspection, maintenance, and reporting procedures – commonly known as a "Form 12A" – so that the Owner may apply for the BWoF.

In order for an IQP of any integrated system to provide a Form 12A, successful Integrated Testing needs to have been carried out to confirm correct function for life safety and in accordance with the Compliance Schedule. The MBIE Compliance Schedule Handbook provides guidance on developing a Compliance Schedule for the Specified Systems in a building, including guidance on the associated inspection, maintenance and reporting procedures which will necessarily include the integrated testing requirements.

An IQP is expected to physically witness the integrated testing if they are to sign the Form 12A.

An example of a Form 12A can be found in Appendix G. It is recommended that the Fire Matrix is attached to the Form 12A.

If there is a significant defect present, this would prohibit the issue of a Form 12A. If it is not a life safety issue, then it may not be considered a significant defect. The relevant standard(s), such as NZS 4512 and NZS 4541, may provide further guidance on the categorisation of deficiencies and whether a Form 12A may be issued.

Once the owner receives the 12A forms stating all Compliance Schedule requirements have been complied with, including end-to-end interface testing, and stating all systems function as intended, they may complete Form 12A for the Building Warrant of Fitness.

14. Implementation and Review

IMPLEMENTATION

A final draft of this Code of Practice was distributed for review to the following organisations and industries:

- Fire Protection Association
- Society of Fire Protection Engineers, New Zealand Chapter
- The Institution of Fire Engineers, New Zealand Branch
- Fire Equipment Manufacturers Association
- Fire and Emergency New Zealand
- Ministry of Business, Innovation and Employment
- Insurance Council of New Zealand
- IRHACE - The Institute of Refrigeration Heating & Air Conditioning Engineers of New Zealand
- NZ Security Association
- Association of Building Compliance
- Chartered Institution of Building Services Engineers
- Construction Industry Council
- The New Zealand Institute of Building
- Master Plumbers, Gasfitters and Drainlayers NZ Inc
- Building Officials Institute of New Zealand
- The New Zealand Building Subcontractors' Federation
- Climate Control Companies Association New Zealand
- Association of Hydraulic Services Consultants of Australia and New Zealand
- System Commissioning industry
- Territorial Authorities
- Lift industry
- Electrical industry
- Facilities management industry

The document is available from the Fire Protection Association of New Zealand (FPANZ) website **https://www.fpanz.org/docs/codes-of-practice**.

REVIEW, INTERPRETATION AND UPDATE PROCESS

An individual or organisation may write to the FPANZ Chief Executive, requesting an amendment to, or an interpretation of, this Code of Practice.

Appendix A:
Documents Referenced in this Code of Practice

A.1 *New Zealand Standards*

- NZS 4332:1997 *Non-domestic passenger and goods lifts ("Lift Code")*
- NZS 4510:2008 *Fire hydrant systems for buildings*
- NZS 4512:2010 *Fire detection and alarm systems in buildings*
- NZS 4512:2021 *Fire detection and alarm systems in buildings*
- NZS 4515:2009 *Fire sprinkler systems for life safety in sleeping occupancies (up to 2000 square metres)*
- NZS 4541:2020 *Automatic fire sprinkler systems*

A.2 *Joint Australian/New Zealand Standards*

- AS/NZS 5149.3:2016 *Refrigerating systems and heat pumps - Safety and environmental requirements. Part 3: Installation site*
- AS/NZS 5601.1:2013 *Gas installations. Part 1: General installations*
- AS/NZS ISO/IEC 17020:2013 *Conformity assessment — Requirements for the operation of various types of bodies performing inspection*

A.3 *Australian Standards*

- AS 1668.1:2015 *The use of ventilation and air conditioning in buildings. Part 1: Fire and smoke control in buildings, + Amendment 1:2018*
  NOTE: The NZ Building code Acceptable Solutions and Verification Methods currently cite the superseded AS/NZS joint 1998 edition of this standard.
- AS 1668.2:2012 *The use of ventilation and air conditioning in buildings, Part 2: Mechanical ventilation in buildings*
  NOTE: The NZ Building code Acceptable Solutions and Verification Methods currently cite the superseded 2002 edition of this standard.
- AS 1851:2012 *Routine service of fire protection systems and equipment*
- AS 4214:2018 *Gaseous fire extinguishing systems*
- AS 4428.16:2020 *Fire detection, warning, control and intercom systems – Control and indicating equipment. Part 16: Emergency warning control and indicating equipment*

A.4 *Other International Standards*

- BSI PAS 95:2011 *Hypoxic air fire prevention systems. Specification*
- EN 16750:2017 *Fixed firefighting systems — Oxygen reduction systems — Design, installation, planning and maintenance*

- NFPA 3:2021 *Standard for Commissioning of Fire Protection and Life Safety Systems*
- NFPA 4:2021 *Standard for Integrated Fire Protection and Life Safety System Testing*
- Austrian Standards:
  - ÖNORM F 3073: 2021 *Maintenance of fire prevention systems using an oxygen reduced atmosphere*
  - ÖNORM F 3007: 2009 *Oxygen reduction systems*
  - ÖNORM F 3008: 2010 *Oxygen reduction system - Control panels*

A.5 *New Zealand Legislation and Associated Documents*

- Building Act 2004
- Building Regulations 1992 (New Zealand Building Code)
- Building (Forms) Regulations 2004
- Building (Specified Systems, Change the Use and Earthquake-prone Buildings) Regulations 2005
- Local Government Act 2002
- New Zealand Building Code (Building Regulations 1992)
- Ministry of Business, Innovation & Employment – *Exemplar Compliance Schedule* **https://www.building.govt.nz/assets/Uploads/building-officials/guides/exemplar-compliance-schedule.pdf**
- Ministry of Business, Innovation & Employment – NZBC Acceptable Solutions and Verification Methods
- Ministry of Business, Innovation & Employment – *Compliance Schedule Handbook* (somewhat out of date and currently under review by MBIE) **https://www.building.govt.nz/building-code-compliance/building-code-and-handbooks/compliance-schedule-handbook/**

A.6 *Other Documents*

- Association of Building Compliance – *Code of Practice for Electromechanical Locking Devices on Egress Doors*. **https://www.abciqp.org.nz/membership/resource-library/codes-of-practice/33**
- Association of Building Compliance – *Compliance Schedule Reference Guide* **https://www.abciqp.org.nz/resourcelib/325619c0107ab95b9.32428533/ABC-Compliance-Schedule-Reference-Guide-November-2021.pdf**
- Auckland Council – AC1806 *Compliance schedules and building WOFs guidance document* **https://www.aucklandcouncil.govt.nz/building-and-consents/commercial-building-systems/Pages/building-warrant-of-fitness.aspx**
- BSRIA (Building Services Research and Information Association) UK – Guide BG 8/2009 – *Model Commissioning Plan*

- CIBSE (Chartered Institute of Building Services Engineers) UK – *Commissioning Code M - Commissioning management (2003)*
- Fire and Emergency New Zealand F5-08GD DRAFT – *Designers' Guide – Firefighting operations in Lifts.* **https://www.fireandemergency.nz/business-and-landlords/designers-guide-to-firefighting-operations/**
- FPANZ COP 01 – Code of Practice for Gaseous Suppression Systems (Rev 1:2016) https://**www.fpanz.org/docs/codes-of-practice**
- FPANZ COP 02 – Code of Practice for Water Mist Fire Protection Systems (Rev 1:2017) **https://www.fpanz.org/docs/codes-of-practice**
- NZ Security Association – *Code of Practice Security Systems: Electronic and Physical* **https://security.org.nz/wp-content/uploads/2018/08/COP-SSEP-FINAL.pdf**

Appendix B:
Fire Matrix considerations

B.1 *General*

In developing a cause-and-effect Fire Matrix it is important to understand both the proposed systems and how they are intended to operate to support the fire design/strategy for the building (and vice versa).

The sections below provide examples of common systems with functions and actions that should be routinely considered within the cause-and-effect Fire Matrix.

Other systems within the building may also require integration to operate, change mode, or shut down. Examples include hazardous processes or systems using hazardous substances that require shut down or altered ongoing operation when a fire is detected.

Consideration should also be given to zoned control in larger buildings. Staged/Phased evacuation of large complexes means that a fire in one area might not require immediate action in another area.

B.2 *Fire suppression and control systems – typical integration considerations*

B.2.1 SPRINKLER SYSTEM

ITEM	REFERENCE
a) Sprinkler system operation to generate building fire alarm	NZS 4541 clause 4.7.3 NZS 4515 clause 3.8 NZBC AS F7/AS1 clause 1.2.8
b) Fire Brigade to receive an alarm	NZS 4541 clause 4.7.2.2 NZS 4515 clause 3.9 Fire report
c) Shutdown of conveyor systems	NZS 4541 clauses 2.5.3.3, 5.10.5.5, and 9.4.1.23.3
d) Shutdown of hazardous processes	NZS 4541 clause 2.13
e) Shutdown of air handling plant for Extra High Hazard	NZS 4541 clauses 9.3.8 and 9.4.1.14
f) Zone/floor flow switches to be indicated on fire alarm panel	NZS 4541 clause 2.11.1
g) The sprinkler system design may require the shutdown of building systems and equipment (fryers, robots, cranes, etc.)	NZS 4541 clause 2.13 Sprinkler specification / Certifier
h) Zone/floor flow switches may need to perform functions such as evacuating particular areas, connecting with nurse call systems, etc.	Fire report / Evacuation philosophy
i) The owner may require notification of alarm, defect, pump running, pump room access, etc.	Owner brief

B.2.2 OTHER FIRE SUPPRESSION SYSTEMS

Gas suppression, water mist, foam, wet chemical, etc.)

ITEM	REFERENCE
a) Fresh air supply shut down / damper close. Which stage of alarm generates this shut down?	AS 4214 clauses 6.4.3.1 and 7.4
b) Gas supply shut down. Which stage of alarm generates this shut down?	AS 4214 clauses 6.4.3.1 and 7.4
c) Air handling units may need to be shut down. Which stage of alarm generates this shut down?	Air handling specification / owner brief
d) Notification to Owner / Occupant / Security / Fire Brigade / Fire Protection service provider / other	Fire report / owner brief
e) Building evacuation may be desired. Indication of activation on fire alarm system index?	Owner / Fire report / Evacuation philosophy / NZS 4512:2010 App C NZS 4512:2021 App D
f) The owner may require notification of alarm, defect, pump room access, etc.	Owner brief

B.3 *Fire detection and Emergency warning systems, visual alerting systems – typical interaction considerations*

ITEM	REFERENCE
a) Global evacuation tones / messages	NZS 4512:2010 clause 218.6 / NZS 4512:2021 clause 2.18.8 Fire report / Evacuation philosophy
b) Staged or zonal evacuation tones / messages	NZS 4512:2010 clause 218.6 / NZS 4512:2021 clause 2.18.8 Owner brief / Fire report / Evacuation philosophy
c) Visual alerting devices – high noise areas	NZS 4512:2010 clause 406.4 / NZS 4512:2021 clause 4.6.4
d) Visual alerting devices – managed care facilities	NZS 4512:2010 clause 406.5 / NZS 4512:2021 clause 4.6.5 Owner brief
e) Visual alerting devices – global, staged, or zonal evacuation	Fire report / Owner brief
f) Emergency Warning System (EWS) and Emergency Warning and Intercommunication System (EWIS) for staged or zonal evacuation (with or without supplementary visual indication)	Fire report / AS 4428.16 clause 18.18.2
g) Supplementary sensory alerting devices – for the visually impaired	Fire report / Owner brief
h) Supplementary audio or visual devices – e.g. occupant Bluetooth hearing aid system, visual display unit	Fire report / Owner brief

i) Notification to parties possibly including Fire Brigade, owner, specific staff members, security, fire protection service provider, etc.	Owner brief / Occupant brief / Fire report / specification
j) Sector indicating panels	FENZ / NZS 4512:2010 clause A4 / NZS 4512:2021 clause A4
k) Sprinkler Flow switch indication	NZS 4541 clause 2.11.1
l) Pump running indication	NZS 4541 clause 6.7.1.10 NZS 4515 clause 6.5.1.9 NZS 4510 clause 5.4.1
m) Indication of integrated system status and associated emergency control switches (e.g. fan controls)	Fire report AS 1668.1:2015 clause 4.11.3 & Table 4.1

B.4 *Mechanical/HVAC systems and Smoke Control Systems (Mechanical/ Passive) – typical integration considerations*

B.4.1 MECHANICAL PLANT

Establish the intent and likely functionality of mechanical systems and consider the impacts on smoke spread, sprinkler operation, etc.

ITEM	REFERENCE
a) Fan shutdown / smoke damper closure – Initiating fire mode input from the fire alarm system. Possible manual controls and indicators either hardwired or conveyed via fire alarm system data loops. Consider whether shutdown is appropriate.	AS 1668.1:2015 Section 7
b) Fire Report to specify what, if any, mechanical Air Handling Systems are to operate under fire conditions, and how.	Fire report
c) Smoke Extract System/Hot Layer smoke control system – manual/automatic controls and indicators of mechanical systems either hardwired or conveyed via fire alarm system data loops to initiate fire/extract mode following input from the fire alarm system. This may include control and indication of extract fans, supply air fans, make-up air dampers, etc.	AS 1668.1:2015 Section 9
d) Smoke Purge System –manual/automatic controls and indicators of mechanical systems are either hardwired or conveyed via fire alarm system data loops to initiate fire/purge mode following input from the fire alarm system. This may include control and indication of supply air fans, doors/ dampers, extract fans.	AS 1668.1:2015 Section 11
e) Zone Pressurisation to prevent smoke spread – manual/automatic controls and indicators either hardwired or conveyed via fire alarm system data loops. Fire detection zone location to be specifically identified and communicated from fire detection and alarm system. Control logic possibly provided by fire alarm system. This may include control and indication of AHUs, fans, dampers, etc.	AS 1668.1:2015 Section 8

f) Stairwell/safe path Pressurisation – manual/automatic controls and indicators either hardwired or conveyed via fire alarm system data loops to initiate fire mode. Control logic possibly provided by fire alarm system. Smoke detection in stairwell may override stairwell pressurisation system. Automatic hold-open devices to release stairwell doors when the stairwell pressurisation initiated. This may include control and indication of supply air fans, doors, dampers, extract fans.	AS 1668.1:2015 Section 10
g) Lift Shaft Pressurisation – Initiating building smoke detection input from the fire alarm system to the start Lift Pressurisation Fan (LPF). Smoke detection in the lift motor room, lift shaft, or LPF inlet to stop LPF. Control logic and indicators possibly provided by fire alarm system. This may include control and indication of supply air fans, doors/dampers, lifts, extract fans.	AS 1668.1:2015 Section 10
h) Car park air supply and extract to operate on fire detection – interface with fire alarm system.	AS 1668.1:2015 Clause 5
i) Jet fans shutdown (or start-up) on fire detection – interface with fire alarm system.	AS 1668.1:2015 Clause 5.5.

B.4.2 AIR HANDLING SMOKE DETECTION

ITEM	REFERENCE
a) Shutdown of AHU on detection of smoke in ductwork via non-latching in-duct smoke detection. Possibly powered/supervised by fire alarm system.	AS 1668.1:2015 Clause 5.5.4
b) Optional duct smoke detection connection to, or indication at the fire alarm panel. Optional remote alarm or building evacuation.	Fire report
c) Fire Fan Controls (see B.4.3) to allow duct smoke detection shutdown to be overridden to allow the AHU to run even when the duct smoke detector is in alarm. Possible control logic and indicators provided by fire alarm system.	AS 1668.1:2015 Clause 5.5.3

B.4.3 FAN CONTROLS

ITEM	REFERENCE
a) Fire Fan Control Panel (FFCP) to be provided where mechanical air handling plant, smoke fans, stairwell pressurisation fans and lift pressurisation are required to operate in a fire condition. FFCP to provide plant mode indication and firefighter override functionality.	AS 1668.1:2015 Clause 4.11
b) Fan controls (not fire) to be provided for firefighters where required.	AS 1668.1:2015 Clause 5.5.3
c) FFCP integrated with the fire alarm system or provided separately by the mechanical services trade and interfaced with the fire alarm system via addressable relay logic. FFCP typically located adjacent the main fire alarm indicating unit (requires brigade approval of location and layout, as for the fire alarm).	AS 1668.1:2015 Clause 4.11
d) Separate mechanical reset – A separate reset switch is required for the FFCP to allow the mechanical plant to remain in fire mode after the fire alarm system and detection circuits are reset.	AS 1668.1:2015 Table 4.1

B.4.4 ACTUATED ROOF VENTS AND WINDOWS FOR SMOKE CONTROL

ITEM	REFERENCE
a) Roof vents / windows to close or open on alarm signal from fire alarm system or temperature sensor?	Fire report
b) Make up air dampers to open or close on alarm signal from fire alarm system?	Fire report

B.5 *Monitoring, BMS – typical integration considerations*

ITEM	REFERENCE
a) BMS may monitor the fire alarm relay outputs to the mechanical switchboards and communicate an alarm via remote monitoring system (independent of the fire alarm monitoring system). Mechanical plant control required for smoke control, including shutdown, usually hardwired (i.e. does not rely on the BMS to initiate and control plant in fire mode).	Fire report Mechanical specifications AS 1668.1:2015 clause C4.11.3

B.6 *Refrigeration systems – typical integration considerations*

ITEM	REFERENCE
a) Shutdown air flow for sprinkler system requirements.	NZS 4541 clauses 9.3.8 and 9.4.1.14
b) Shutdown ammonia/flammable refrigerant systems for fire engineering requirements due to air flow or safety.	Fire report
c) Specific requirements for machinery rooms/flammable refrigerants.	AS/NZS 5149.3 clauses 5 and 6
d) Evacuation requirements for refrigerant leak, consider special tones, coloured strobes, specific procedures, etc.	Evacuation philosophy

B.7 *Electrical Systems – typical integration considerations*

B.7.1 ACTIVE SIGNAGE/EMERGENCY EXITS

ITEM	REFERENCE
a) EXIT or DO NOT EXIT signage to direct occupants to a safe exit path away from specific fire or other unsafe conditions. Interface with fire detection system to provide fire location information.	Fire Report / Owner brief / Electrical specification / Evacuation philosophy
b) Signage for fire suppression systems (e.g. gaseous suppression, water mist) where the building fire panel doubles as the suppression control panel (note – recommended installation practice is to use separate suppression control panels).	FPANZ Code of Practice for Gaseous Suppression Systems clauses 7.5.1 and 9.5 FPANZ Code of Practice for Water Mist Fire Protection Systems, clauses 7.5.1 and 9.4

B.7.2 POWER SUPPLIES/LIGHTING

ITEM	REFERENCE
a) Smart lighting – turn lighting to 100% on fire alarm	Electrical specification
b) Emergency lighting – turn on on fire alarm	Electrical specification
c) Uninterrupted Power supply (UPS) management	Electrical specification
d) Generator Diesel tank supply management	Electrical specification
e) Solar system configuration and power down control	Electrical specification

B.7.3 SECURITY SYSTEMS (ACCESS CONTROL AND NOTIFICATIONS)

Persons undertaking the testing of an interfaced access control system need to have knowledge of the baseline design data for the premises. Buildings have varying access control solutions.

ITEM	REFERENCE
a) Electrically operated locks specifically required to release under fire alarm conditions to operate in fail-safe mode to allow unrestricted entry and exit during emergency situations.	Security specification / Fire report / Evacuation philosophy NZSA Code of Practice Security Systems: Electronic and Physical
b) Where differential air pressures occur, particularly zone pressurised areas, soft latching may be required to prevent free door movement.	
c) The connection between the fire alarm control unit and the security controller to operate in a fail-safe manner.	
d) Data communication between the fire alarm control unit and the security controller to be monitored against external interference.	
e) A secure data format is used for sending data from the fire alarm control unit to the security management system.	

B.7.4 COMMUNICATION SYSTEMS (PUBLIC ADDRESS (PA), TV, AUDIO LOOP SYSTEMS)

ITEM	REFERENCE
a) Shutdown audio on PA, TV systems, etc., on fire alarm.	Fire report Electrical specification
b) Broadcast fire alarm across PA, TV, Audio Loop systems.	Fire report Electrical specification

NOTE: There may be dual purpose systems that are used for both PA and fire alarm alerting.

B.8 *Building Systems (Plant, Pumps & Equipment storm water detention, etc.) – typical integration considerations*

In principle, any building service or building/production plant/equipment which:

- Provides fuel to a fire (i.e. anything that allows distribution of gaseous, liquid, or solid fuel through the building which could contribute to a fire),
- Provides oxygen to the fire – for example, non-HVAC fan systems,
- Allows fire, heat, or smoke to spread through the building, or
- Makes fire detection or sprinkler systems less effective by drawing smoke or heat away from detector or sprinkler heads,

needs to be either shut down when fire is detected or placed in a state which does not increase the risk to life safety or fire spread.

The above arise on the basis that shut down or shutoff can be performed safely and do not create additional risks greater than the original risk of fuelling the fire, or aiding the spread of fire, heat, or smoke.

ITEM	REFERENCE
a) Building services Gaseous, liquid, or solid fuel transport systems – fuel supply to be shut off upon detection of a fire, associated equipment to be shut down safely. e.g. boilers, HVAC heating units, natural gas, and LPG supplies.	FENZ Fire report Services specification
b) Hydraulic systems e.g. hydraulic pumps and power packs – to be shut down or made inoperable if continued or sudden operation could result in fire spread.	Services specification
c) Electrical systems – isolation of direct current electrical supply e.g. from photovoltaic (solar) cells, battery banks, UPS systems, etc. Detection of a fire (signal from fire alarm system) should safely isolate the DC power from the building electrical infrastructure. Consider which systems must remain on.	Electrical specification
d) Storm water retention systems – where valves are installed in storm water systems to prevent pollution entering the municipal storm water systems – e.g. yard or building where dangerous goods are stored. Where such valves operate automatically, they should close upon detection of a leak or fire (signal from fire alarm system).	Hydraulics/Civil specification
e) Ventilation/extraction systems shut down e.g. Kitchen extract duct and fan systems, stand-alone or linked roof or wall vent fan systems, forced air systems which create a draft.	Mechanical services specification

B.9 *Automated Systems, Building equipment (conveyors, robots, cranes, cookers, etc.) – typical integration considerations*

In principle, any system or equipment which enables product (and fire) to move through/to/from a building needs to be either shut down when a fire is detected or placed in a state/location which does not increase the risk to life safety or fire spread.

This is on the basis that shutdown or shutoff can be performed safely and does not create additional risks greater than the original risk of moving or fuelling the fire.

ITEM	REFERENCE
a) Automated goods handling systems – that transport goods through a building or portion of a building - consider shut down upon detection of fire, heat, or smoke, smoke (signal from fire alarm system), or 'Return to home' or other designated location. • Conveyors - in floor, on floor, or overhead • Garment handling systems that transport hanging garments • Other goods transportation systems (e.g. pneumatic or vacuum tube type systems) • Autonomous vehicles or robots – forklifts, stock pickers • Industrial robots – pick and place, palletising • Dumb waiters • Cranes • Automatic storage and retrieval systems – vertical lift modules, horizontal carousels, unit load stackers (palletised goods) • Car stackers – multi car parking systems.	NZS 4541 clauses 2.13, 8.3.6, 9.4.1.15, and 9.4.1.23.3 Fire report Mechanical/Plant specification Owner brief
b) Systems that if unattended would create a fire risk or contribute to a fire to shut down upon detection of fire alarm, for example: • Commercial cooking systems • Deep fat fryers • Range hoods • Ovens • Salamander broilers.	Fire report Evacuation philosophy Hydraulics specification NZS 5601.1 clause 6.5.1 AS 1668.1:2015 section 6 Owner brief
c) Dust and particle extraction systems – e.g. cyclones in timber mills, yards, woodwork factories, etc., to shut down upon detection of fire, heat, or smoke.	NZS 4541 clauses 2.13 and 9.4.1.15 AS 1668.1:2015 section 5 Fire report Owner brief

B.10 *Lifts/Escalators – typical integration considerations*

ITEM	REFERENCE
a) Fire alarm recall – any fire alarm returns the lift to the 'home' floor, typically ground level. If fire alarm originated on this level, then stop at a nominated alternative floor.	Fire report
b) Escalator/travelator controlled stop on notification of fire from detection system.	Fire report

NOTE: NZS 4332 (lift code) is silent on any interface from the building fire alarm system to the lift control equipment. Such an interface may be specified by a fire report to perform specific actions such as returning lifts to a nominated floor, or to operate differently during a fire event.

NOTE: firefighter lift controls and heat sensor for recall are not considered to be integrated systems and are not covered by this Code of Practice. The heat sensor might physically be the same as a fire alarm heat detector, but it is connected to and is an integral part of the lift system.

B.11 *Fire prevention systems, Hypoxic – typical configuration and integration considerations*

ITEM	REFERENCE
a) Hypoxic (fire prevention) system operating at 15% O_2 by volume. Typically fed by a vacuum pressure swing adsorption (VPSA) unit with N+1 redundancy and duty and standby cycle. Oxygen sensors located throughout area.	BSI PAS 95 clauses 4.3 and 4.5 EN 16750 clauses 5.7.3 and 8 ÖNORM F 3073 ÖNORM F 3007 ÖNORM F 3008
b) First alarm level - If the oxygen percentage rises above an identified level (e.g. 14.9% to 15.1%) an initial alarm shows on the screen of the oxygen monitoring system and initiates local alerting of staff.	
c) Second alarm level - If the oxygen percentage rises further (e.g. above 15.2%), an alarm is transmitted to an external response agency (e.g. via the fire alarm system). Oxygen level alarm displayed on the fire alarm indicating unit.	

B.12 *Utilities, Gas, Water, Solar, etc. – typical integration considerations*

ITEM	REFERENCE
a) Gas supply shutdown may be required when fire is detected, or a fire extinguishing system operates.	AS/NZS 5601.1 clause 6.5.1 / Services specification / Fire report / System manufacturer's documents
b) Gas appliance shutdown required if supply air is shut off by a fire damper.	AS/NZS 5601.1 clause 6.5.2
c) Where a gas shut-off does occur on fire alarm, measures are required to prevent release of unignited gas upon gas supply restoration.	AS/NZS 5601.1 clause 6.5.3
d) Solar system energy storage systems action on fire to be specified.	Fire report Electrical specification
e) Pressure sustaining valves to maintain fire-fighting water.	NZS 4541 clause 4.4.6.3 FENZ Fire report

B.13 *Integrated Passive Systems (e.g. fire and smoke doors/curtains) – typical integration considerations*

ITEM	REFERENCE
a) Any fire alarm or specific detection to actuate passive systems.	Fire report

B.14 *External systems/parties*

ITEM	REFERENCE
a) Fire and Emergency New Zealand	Fire report, Owner brief
b) Offsite owner notifications/ messages via phone, pager, website, computer	Owner brief
c) Security monitoring company	Owner brief
d) Building manager notifications/ messages via phone, pager, website, computer	Owner brief
e) Neighbouring building notifications/ messages via phone, pager, website, computer	Owner brief

B.14 *Miscellaneous integration considerations*

ITEM	REFERENCE
a) Nurse call notifications/messages	Electrical specification
b) On-site owner notifications/ messages	Owner brief
a) Other staff mobilisation/ paging system	Owner brief

Appendix C:
Design Document Examples

C.1 *Design Fire Matrix Example 1*

For a simple building the matrix need not be complicated. Below is an example.

The content is an example only and may not suit the system, application, or use of a building - adaptation will be required.

DESIGN FIRE MATRIX

		EFFECT				
		FENZ notification	Fire contractor notification	Building wide alarm	Building HVAC fans/dampers	Doors / gates
CAUSE	Manual call point (MCP) operation	Fire	Fire	Fire	off	release
	Smoke/Heat detector operation	Fire	Fire	Fire	off	release
	Fire alarm defect	Defect	Defect	-	-	-
	Fire alarm isolate	Isolate	Isolate	-	-	-
	Power failure	-	-	-	-	release

C.2 *Design Fire Matrix Example 2*

For a medium complexity building there will be more systems needing integration and so the matrix will need to be more involved. Below is an example for an apartment with car parking.

The content is an example only and may not suit the system, application, or use of a building - adaptation will be required.

DESIGN FIRE MATRIX	EFFECT													
CAUSE	FENZ notification	Fire contractor notification	Building wide alarm	Local alert - fire cell of origin only	Building HVAC fans/dampers	Car park supply air	Jet fans	Corridor Electrical lighting to 100%	Doors / gates	Lift	Security monitoring company	Owner	Utilities (Gas)	Fire Door hold open devices
Sprinkler operation	Fire	Fire	Fire	-	off	on	off	on	release	recall	Fire	Fire	off	-
Sprinkler supervised valve operation	Fire	valve op	-	-	off	on	off	on	-	recall	valve op	valve op	off	-
Sprinkler defect	Defect	Defect	-	-	-	-	-	-	-	-	Defect	Defect	-	-
Sprinkler isolate	Isolate	Isolate	-	-	-	-	-	-	-	-	Isolate	Isolate	-	-
Manual call point (MCP) operation	Fire	Fire	Fire	-	off	on	off	on	release	recall	Fire	Fire	off	-
Smoke/Heat detector operation	Fire	Fire	Fire	-	off	on	off	on	release	recall	Fire	Fire	off	-
Apartment X smoke detector operation	-	Alert X	-	Alert X	-	-	-	-	-	-	Alert X	Alert X	-	-
Fire Door adjacent smoke detectors	Fire	Fire	Fire	-	off	on	off	on	release	recall	Fire	Fire	off	close
Fire alarm defect	Defect	Defect	-	-	-	-	-	-	-	-	Defect	Defect	-	-
Fire alarm isolate	Isolate	Isolate	-	-	-	-	-	-	-	-	Isolate	Isolate	-	-
Supply Air duct detector operation	-	-	-	-	-	off	-	-	-	-	alert	alert	-	-
Fan control override switch on	-	-	-	-	-	on	on	-	-	-	alert	alert	-	-
Fan control override switch off	-	-	-	-	-	off	off	-	-	-	alert	alert	-	-
Power failure	-	-	-	-	-	-	-	-	release	-	alert	alert	off	close

C.3 *Design Fire Matrix Example 3*

For a staged/managed evacuation building there will be more systems needing integration and so the matrix will need to be even more involved. Below is an example for a care home.

The content is an example only and may not suit the system, application, or use of a building - adaptation will be required.

DESIGN FIRE MATRIX

		EFFECT																			
		Fire Alarm									Mechanical			Electrical				Misc.			
		FENZ notification	Fire contractor notification	Alarm - Building wide	Alarm - Local alert in fire cell of origin only	Alarm - Zone of origin notification	Alarm - Adjacent zone notification	Escalation timer[3]	Remote Display Unit	Fire alarm LED indicators Flow and level/zone	HVAC - Building fans/ dampers	HVAC - Zone of origin fans/dampers	HVAC - adjacent zone fans/dampers[4]	Electrical lighting	Doors / gates[5]	Security monitoring company	Integrated Passive systems (fire doors) in zone of origin	Utilities (Gas) in zone of origin	Equipment (fryers, oven) in zone of origin	Nurse call	Owner
CAUSE	Sprinkler operation[1]	Fire	Fire	Fire	-	-	-	-	Fire	on	off	-	-	on	release	Fire	-	off	off	Fire	Fire
	Sprinkler supervised valve operation	Fire	valve op	Fire	-	-	-	-	-	on	off	-	-	on		valve op	-	off	off	valve op	valve op
	Sprinkler defect	Defect	Defect	-	-	-	-	-	-	on	-	-	-	-		Defect	-	-	-	Defect	Defect
	Sprinkler isolate	Isolate	Isolate	-	-	-	-	-	-	on	-	-	-	-		Isolate	-	-	-	-	Isolate
	Zone MCP operation	Fire X	Fire X	-	-	Fire X	Alert	-	Fire X	on	-	off	-	on	release	Fire X	-	off	off	Fire X	Fire X
	All out evacuation switch at SVR (White manual call point) operation	Fire	Fire	Fire	-	-	-	-	Fire	on	off	-	-	on	release	Fire	-	off	off	Fire	Fire
	Zone heat/smoke detector operation	-	Alert X	-	-	Alert	-	Start	Alert X	on	-	off	on	on	release	Alert X	-	off	off	Alert X	Alert X
	Detectors adjacent fire door operation	-	Alert X	-	-	Alert	-	Start	Alert X	on	-	off	on	on	release	Alert X	close	off	off	Alert X	Alert X
	Escalation time reached	Fire X	Fire	-	-	Fire X	Alert	-	Fire X	on	-	off	on	on	release	Fire X	-	off	off	Fire X	Fire X
	Local Remote Display Unit reset[2]	-	Reset[6]	-	-	Reset[6]	-	Stop	Reset[6]	Reset[6]	-	Reset[6]	Reset[6]	Reset[6]	Reset[6]	Reset[6]	Reset[6]	Reset[6]	Reset[6]	Reset[6]	Reset[6]
	Fire alarm defect	Defect	Defect	-	-	-	-	-	-	on	-	-	-	-		Defect	-	-	-	-	Defect
	Fire alarm isolate	Isolate	Isolate	-	-	-	-	-	-	on	-	-	-	-		Isolate	-	-	-	-	Isolate

NOTES:
'Fire' means evacuation tone and message
'Alert' means alert tone and staff action message
X = zone / device detail
1 Sprinklers may be zoned, but are not in this example
2 Where staff need the ability to reset an alert alarm - typically care, detention, and special facilities such as air traffic control
3 Upon smoke detection, owner may request a timer starts. After set run time, the alarm escalates from 'alert' to 'fire' in the zone of origin and 'alert' in the adjacent zone
4 Assuming HVAC on helps prevent smoke entering adjacent zone
5 In this example doors are not located in secure areas (e.g. dementia care)
6 The alarm will only reset if the detector has reset itself

C.4 *Design Fire Matrix Example 4*

For a complex building there will be many systems needing integration and so the matrix can get even more complicated. Below is an example.

The content is an example only and may not suit the system, application, or use of a building - adaptation will be required.

DESIGN FIRE MATRIX

CAUSE	EFFECT																															
	Fire Alarm						Mechanical										Electrical								Misc.							
	FENZ notification	Fire contractor notification	Alarm - Building wide	Alarm - Zone X notification	Alarm - Zone Y notification	Fire alarm LED indicators Flow and level/zone	HVAC - Building fans/ dampers	HVAC - Zone X fans/ dampers	HVAC - Zone Y fans/ dampers	Fire fans, make up air...	Smoke purge system	Pressurisation system - Stairwell	Pressurisation system - Lift shaft	Fans - Car park supply air	Fans - Jet fans, etc.	BMS	Active signage	Electrical lighting	UPS control	Emergency generator Diesel supply	Doors / gates	Security monitoring company	Communication system (PA, TV, Audio)	Integrated Passive systems (curtains, doors, dampers...)	Refrigeration system	Utilities (Gas, Water, Solar...)	Systems (burners, pumps, boilers, UPS...)	Automated Equipment (conveyor, crane...)	Equipment (fryers, oven, ...)	Hazardous process	Lift	Fire prevention systems	Owner
Sprinkler Level/Zone X flow switch operation	Fire	Fire X	-	Fire	Alert	on	-	off	-	on	on	on	on	on	off	Fire X	on	on	off	off	release	Fire X	Fire X	-	off	off	off	stop	off	off	recall	-	Fire X
Sprinkler Level/Zone Y flow switch operation	Fire	Fire Y	-	Alert	Fire	on	-	-	off	on	on	on	on	-	-	Fire Y	on	on	-	-	release	Fire Y	Fire Y	-	off	off	off	stop	off	off	recall	-	Fire Y
Sprinkler Pump running	Fire	pump on	-	-	-	on	-	-	-	-	-	-	-	-	-	pump on	-	-	-	-	-	pump on	-	-	-	-	-	-	-	-	-	-	pump on
Sprinkler supervised valve operation	Fire	valve op	-	-	-	on	-	-	-	-	-	-	-	-	-	valve op	-	-	-	-	-	valve op	-	-	-	-	-	-	-	-	-	-	valve op
Sprinkler defect	Defect	Defect	-	-	-	on	-	-	-	-	-	-	-	-	-	Defect	-	-	-	-	-	Defect	-	-	-	-	-	-	-	-	-	-	Defect
Sprinkler isolate	Isolate	Isolate	-	-	-	on	-	-	-	-	-	-	-	-	-	Isolate	-	-	-	-	-	Isolate	-	-	-	-	-	-	-	-	-	-	Isolate
Level/Zone X manual call point operation	Fire X	Fire X	-	Fire	Alert	on	-	off	-	on	on	on	on	on	off	Fire X	on	on	off	off	release	Fire X	Fire X	-	off	off	off	stop	off	off	recall	on	Fire X
Level/Zone Y manual call point operation	Fire Y	Fire Y	-	Alert	Fire	on	-	-	off	on	on	on	on	-	-	Fire Y	on	on	-	-	release	Fire Y	Fire Y		off	off	off	stop	off	off	recall	on	Fire Y
All out evacuation switch at SVR	Fire	Fire	Fire	-	-		off	off	off	on	on	on	on	on	off	Fire	on	on	off	off	release	Fire	Fire	-	off	off	off	stop	off	off	recall	on	Fire
(White manual call point) operation	Fire X	Fire X	-	Fire	Alert	on	-	off	-	on	on	on	on	on	off	Fire X	on	on	off	off	release	Fire X	Fire	-	off	off	off	stop	off	off	recall	on	Fire X
Level/Zone X detector operation	Fire Y	Fire Y	-	Alert	Fire	on	-	-	off	on	on	-	-	-	-	Fire Y	on	on	-	-	release	Fire Y	Fire	-	off	off	off	stop	off	off	recall	on	Fire Y
Level/Zone Y detector operation	Fire Y	Fire Y	-	Alert	Fire	on	-	-	off	on	on	-	-	-	-	Fire Y	on	on	-	-	release	Fire Y	Fire	close	off	off	off	stop	off	off	recall	on	Fire Y
Detectors adjacent Zone Y fire door operation	Defect	Defect	-	-	-	on	-	-	-	-	-	-	-	-	-	Defect	-	-	-	-	-	Defect	-		-	-	-	-	-	-	-	-	Defect
Fire alarm defect	Isolate	Isolate	-	-	-	on	-	-	-	-	-	-	-	-	-	Isolate	-	-	-	-	-	Isolate	-	-	-	-	-	-	-	-	-	-	Isolate
Fire alarm isolate	-	Alert	-	-	-	on	-	-	-	-	-	-	-	-	-	Alert	on	-	-	-	-	Alert	-	-	-	-	-	-	-	-	-	-	Alert
Gas suppression detection stage 1	Fire	Fire	-	Alert	-	on	-	off	-	-	-	-	-	-	-	Fire	on	-	-	-	-	Fire	-	-	-	-	-	-	-	-	-	-	Fire
Gas suppression detection stage 2	Fire	Fire	-	Alert	-	on	-	off	-	-	-	-	-	-	-	Fire	on	-	-	-	-	Fire	-	-	-	-	-	-	-	-	-	-	Fire
Gas suppression discharge pressure switch	Defect	Defect	-	-	-	on	-	-	-	-	-	-	-	-	-	Defect	on	-	-	-	-	Defect	-		-	-	-	-	-	-	-	-	Defect
Gas suppression defect	Isolate	Isolate	-	-	-	on	-	-	-	-	-	-	-	-	-	Isolate	on	-	-	-	-	Isolate	-		-	-	-	-	-	-	-	-	Isolate
Gas suppression isolate	Isolate	Isolate	-	-	-	on	-	-	-	-	-	-	-	-	-	Isolate	on	-	-	-	-	Isolate	-		-	-	-	-	-	-	-	-	Isolate
Air handling duct detector operation	-	-	-	-	-	-	-	-	-	off	off	off	off	off	-	Alert	-	-	-	-	-	Alert	-	close	-	-	-	-	-	-	-	on	Alert
Fan control switch on	-	-	-	-	-	-	-	-	-	on	on	on	on	on	on	Alert	-	-	-	-	-	Alert	-	-	-	-	-	-	-	-	-	on	Alert
Fan control switch off	-	-	-	-	-	-	-	-	-	off	off	off	off	off	off	Alert	-	-	-	-		Alert	-	-	-	-	-	-	-	-	-	on	Alert
Fire prevention system defect/isolate	-	Alert	-	-	-	on	-	-	-	-	-	-	-	-	-	Alert	on	-	-	-	-	Alert	Alert	-	-	-	-	-	-	-	-	Alert	Alert
Ammonia warning	-	Warning	Warning	-	-	on	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Warning	Warning	-	-	-	-	-	-	-	-	-	Alert
Power failure	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Alert	-	-	-	-	release	Alert	-	-	-	-	-	-	-	-	-	-	Alert
Firefighters' Service lift key switch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	control	-	-

Appendix D:
Construction Document Examples

D.1 *Construction Fire Matrix Example 1*

For a small simple building, the matrix need not be complicated. Below is an example of the simple design matrix expanded with construction information.

The content is an example only and may not suit the system, application, or use of a building - adaptation will be required.

CONSTRUCTION FIRE MATRIX

		EFFECT				
		FENZ notification via monitor co 'ABC'	Fire contractor notification via monitor co 'ABC'	Building wide alarm	Building HVAC fan (SF-R01) / damper (FD-01) via 1 x relay	Door (MD-01) via relay
CAUSE	Manual call point (MCP) operation	Fire	Fire	Fire	off	release
	Smoke/Heat detector operation	Fire	Fire	Fire	off	release
	Fire alarm defect	Defect	Defect	-	-	-
	Fire alarm isolate	Isolate	Isolate	-	-	-
	Power failure	-	-	-	-	release

D.2 *Construction Fire Matrix Example 2*

For a medium complexity building there will be more systems needing integration and so the matrix will need to be more involved. Below is an example for an apartment with car parking expanded with construction information.

The content is an example only and may not suit the system, application, or use of a building - adaptation will be required.

CONSTRUCTION FIRE MATRIX		EFFECT													
		FENZ notification via monitor company 'ABC'	Fire contractor notification via monitor company 'ABC'	Building wide alarm	Local alert - fire cell of origin only	Building HVAC fan (SF-R01) / damper (FD-01) via 1 x relay	Car park supply air (SF-R02) via relay	Jet fans (JF-01, JF-02) via 2 x relay	Corridor Electrical lighting to 100% via local relay	Doors (MD-01) / gates (site entry) via relay	Lift 01 via 2 x relay[4]	Security company text via monitor company 'ABC'	Owner text via high level interface to BMS	Utilities - Gas solenoid G-01 via relay. Manual reset	Fire Door 103 hold open device via relay
CAUSE	Sprinkler operation	Fire	Fire	Fire	-	off	on	off	on	release	recall	Fire	Fire	off	-
	Sprinkler supervised valve operation	Fire	valve op	Fire	-	off	on	off	on	-	recall	valve op	valve op	off	-
	Sprinkler defect/isolate	Defect	Defect	-	-	-	-	-	-	-	-	Defect	Defect	-	-
	Manual call point (MCP) operation	Fire	Fire	Fire	-	off	on	off	on	release	recall	Fire	Fire	off	-
	Smoke/Heat detector operation	Fire	Fire	Fire	-	off	on	off	on	release	recall	Fire	Fire	off	-
	Apartment smoke detector operation[1]	-	Alert X	-	Alert X					-	-	Alert X	Alert X		-
	Fire door smoke detectors (D119, D120)	Fire	Fire	Fire	-	off	on	off	on	release	recall	Fire	Fire	off	close
	Fire alarm defect/isolate	Defect	Defect	-	-	-	-	-	-	-	-	Defect	Defect	-	
	Supply Air duct detector operation (D101)[2]	-	-	-	-	-	off	-	-	-	-	alert	alert	-	-
	Fan control override switch 1 - Carpark supply on[3]	-	-	-	-	-	on	-	-	-	-	alert	alert	-	-
	Fan control override switch 1 - Carpark supply off[3]	-	-	-	-	-	off	-	-	-	-	alert	alert	-	-
	Fan control override switch 2 - Jet fans on[3]	-	-	-	-	-	-	on	-	-	-	alert	alert	-	-
	Fan control override switch 2 - Jet fans off[3]	-	-	-	-	-	-	off	-	-	-	alert	alert	-	-
	Power failure	-	-	-	-	-	-	-	-	release	-	alert	alert	off	close

NOTES:
1 X = apartment / device detail
2 Duct detector alarm is non latching, it will automatically reset to allow supply air fan to restart
3 Fan control switch overrides any automatic operation
4 Lift recall - to level 1 unless level 1 is origin of alarm, then level 2. Requires 2 relays - fire level 1, fire remainder building
5 Reset button required to keep the HVAC equipment in fire mode if the FAP is reset (AS 1668 requirement).

D.3 *Construction Fire Matrix Example 3*

For a staged/managed evacuation building there will be more systems needing integration and so the matrix will need to be more involved. Below is an example for a care home expanded with construction information.

The content is an example only and may not suit the system, application, or use of a building - adaptation will be required.

CONSTRUCTION FIRE MATRIX

CAUSE	EFFECT																							
	Fire Alarm									Mechanical						Electrical					Misc.			
	FENZ notification via monitor company 'ABC'	Fire contractor notification via monitor company 'ABC'	Alarm - Building wide	Alarm - Zone A	Alarm - Zone B	Alarm - Zone C	Escalation timer3	Remote Display Unit	Fire alarm LED indicators Flow and level/zone	Building HVAC fans (SF-R01/R02/R03) / damper (FD-01/02) via 1 x relay	HVAC -Zone A fan (SF- R01) via 1 relay	HVAC -Zone A -B damper (FD-01) via 1 relay	HVAC -Zone B fan (SF- R02) via 1 relay	HVAC -Zone B-C damper (FD-01/02) via 1 relay	HVAC -Zone C fan (SF- R03) via 1 relay	Corridor Electrical lighting to 100% via local relay	Doors (MD-01) / gates (site entry) via relay	Security monitoring company text via monitor company 'ABC'	'Fire Door A-B hold open device via relay	Fire Door B-C hold open device via relay Utilities -	Gas solenoid G-01 for Zone C via relay. Manual reset	Fryer, oven zone C	Nurse call via high level interface	Ownertext via monitor company 'ABC'
Sprinkler operation[1]	Fire	Fire X	Fire	Fire	Fire	Fire	-	Fire	on	off	off	close	off	close	off	on	release	Fire	-	-	off	off	Fire X	Fire X
Sprinkler supervised valve operation	Fire	valve op	Fire	Fire	Fire	Fire	-	-	on	off	off	close	off	close	off	on		Fire	-	-	off	off	-	valve op
Sprinkler defect	Defect	Defect	-	-	-	-	-	-	on	-	-	-	-	-	-	-		Defect	-	-	-	-	-	Defect
Sprinkler isolate	Isolate	Isolate	-	-	-	-	-	-	on	-	-	-	-	-	-	-		Isolate	-	-	-	-	-	Isolate
Zone A MCP operation	Fire	Fire A	-	Fire	Alert	-	-	Fire AX	on	-	off	close	on	-	-	on	release	Fire	-	-	-	-	Fire AX	Fire A
Zone B MCP operation	Fire	Fire B	-	Alert	Fire	Alert	-	Fire BX	on	-	on	close	off	close	on	on	release	Fire	-	-	-	-	Fire BX	Fire B
Zone C MCP operation	Fire	Fire C	-	-	Alert	Fire	-	Fire CX	on	-	-	-	on	close	off	on	release	Fire	-	-	off	off	Fire CX	Fire C
All out evacuation switch at SVR (White manual call point) operation	Fire	Fire X	Fire	Fire	Fire	Fire	-	Fire	on	off	-	-	-	-	-	on	release	Fire	-	-	off	off	Fire X	Fire X
Zone A heat/smoke detector operation	-	Alert A	-	Alert	-	-	Start	Alert AX	on	-	off	close	on	-	on	on	release	Alert	-	-	-	-	Alert AX	Alert AX
Zone B heat/smoke detector operation	-	Alert B	-	-	Alert	-	-	Alert BX	on	-	off	close	off	close	on	on	release	Alert	-	-	-	-	Alert BX	Alert BX
Zone C heat/smoke detector operation	-	Alert C	-	-	-	Alert	-	Alert CX	on	-	off	-	on	close	on	on	release	Alert	-	-	off	off	Alert CX	Alert CX
Detectors adjacent fire door A-B operation	-	Alert X	-	Alert	Alert		-	Alert X	on	-	-	close	-	-	on	on	release	Alert	close		-	-	Alert X	Alert X
Detectors adjacent fire door B-C operation	-	Alert X	-	-	Alert	Alert	-	Alert X	on	-	-	-	-	close	on	on	release	Alert		close	-	-	Alert X	Alert X
Escalation time reached (Zone A)	Fire	Fire	-	Fire	Alert	-	-	Fire A	on	-	off	-	on	-	on	on	release	Fire	-	-	-	-	Fire X	Fire X
Local Remote Display Unit reset[2]	-	Reset[6]	-	-	-	Reset[6]	Stop	Reset[6]	Reset[6]	-	Reset[6]	Reset[6]	Reset[6]	Reset[6]	Reset[6]	Reset[6]	Reset[6]	Reset[6]	Reset[6]	Reset[6]	no	Reset[6]	Reset[6]	Reset[6]
Fire alarm defect	Defect	Defect	-	-	-	-	-	-	on	-	-	-	-	-	-	-	-	Defect	-	-	-	-	-	Defect
Fire alarm isolate	Isolate	Isolate	-	-	-	-	-	-	on	-	-	-	-	-	-	-	-	Isolate	-	-	-	-	-	Isolate

NOTES:
'Fire' means evacuation tone and message, 'Alert' means alert tone and staff action message
X = zone / device detail
In this example Zone A is adjacent to B, B adjacent to A & C, C adjacent to B
1 Sprinklers may be zoned, but are not in this example
2 Where staff need the ability to reset an alert alarm - typically care, detention and special facilities such as air traffic control
3 Upon smoke detection, owner may request a timer starts. After set run time, the alarm escalates from 'alert' to 'fire' in the zone of origin and 'alert' in the adjacent zone
6 The alarm will only reset if the detector has reset itself
Terminology / operational naming to be confirmed by owner

D.4 *Fire Alarm Relay (FAR) schedule example*

FAR REFERENCE	LOCATION	TRADE INTERFACE	DESCRIPTION
FAR-1	Level 5 Plant room	Mechanical	Mechanical supply air shutdown (SF-01) damper close (FD-01)
FAR-2	Basement plant room	Mechanical	Car park supply air on (SF-R02)
FAR-3	Basement plant room	Mechanical	Jet fans shutdown (JF-01 & JF-02)
FAR-4	Basement switch room	Electrical	Corridor Electrical lighting to 100%
FAR-5	Ground level Equipment cupboard	Security	Access Control: Door MD01 release, site gates release
FAR-6	Level 5 Lift Controller 1	Lift	Automatic lift recall to ground level
FAR-7	Level 5 Lift Controller 1	Lift	Automatic lift recall to level 1
FAR-8	Basement plant room	Hydraulic	Gas solenoid G-01 shutdown, manual reset
FAR-9	Level 1 services cupboard	Builder	Fire door 103 hold open device release
HL-1	Basement plant room	Mechanical	Owner notification through high level link to BMS

Instructions:

1. *Fire Alarm Contractor to identify all Fire Alarm Relays (FAR) required to achieve Approved Integrated Fire Matrix functionality.*
2. *FAR locations to be agreed with interfacing trades e.g. adjacent to a Mechanical Distribution Board, or a security controller.*
3. *Fire Contractor to program FAR according to Fire Matrix requirements and test functionality independently of interface trade.*
4. *Interface trade to install and terminate cabling between FAR and interface equipment and test independently of Fire Alarm trade.*
5. *Combined or end-to-end testing to be conducted e.g. activation of a MCP to verify mechanical fan shutdown, or release of specific access-controlled doors.*

Appendix E: Commissioning & Testing Records examples

E.1 *Fire Alarm Relay (FAR) checklist example*

				FIRE ALARM CONTRACTOR				INTERFACING CONTRACTOR			INTEGRATED TESTING	
FAR REFERENCE	LOCATION	TRADE INTERFACE	DESCRIPTION	FAR ADDRESS	FAR INSTALLED	FAR PROGRAMMED	FAR SUCCESSFUL TEST	INSTALLED	TERMINATED	SUCCESSFUL TEST	END-TO-END SUCCESSFUL TEST	COMMENTS
FAR-1	Level 5 Plant room	Mechanical	Mechanical supply air shutdown (SF-01) damper close (FD-01)	xx-xx-xxx	✓	✓	✓	✓	✓	✓	✓	Witness by ABC Main Contractor hh-DD-MM-YYYY
FAR-2	Basement plant room	Mechanical	Car park supply air on (SF-R02)	xx-xx-xxx	✓	✓	✓	✓	✓	✓	✓	Witness by XYZ Fire Engineer, hh-DD-MM-YYYY
FAR-3	Basement plant room	Mechanical	Jet fans shutdown (JF-01 & JF-02)	xx-xx-xxx	✓	✓	✓	✓	✓	✓	✓	Witness by XYZ Fire Engineer, hh-DD-MM-YYYY
FAR-4	Basement switch room	Electrical	Corridor Electrical lighting to 100%	xx-xx-xxx	✓	✓	✓	✓	✓	✓	✓	Witness by ABC Main Contractor hh-DD-MM-YYYY
FAR-5	Ground level Equipment cupboard	Security	Access Control: Door MD01 release, site gates release	xx-xx-xxx	✓	✓	✓	✓	✓	✓	✓	Witness by XYZ Fire Engineer, hh-DD-MM-YYYY
FAR-6	Level 5 Lift Controller 1	Lift	Automatic lift recall to ground level	xx-xx-xxx	✓	✓	✓	✓	✓	✓	✓	Witness by XYZ Fire Engineer, hh-DD-MM-YYYY
FAR-7	Level 5 Lift Controller 1	Lift	Automatic lift recall to level 1	xx-xx-xxx	✓	✓	✓	✓	✓	✓	✓	Witness by XYZ Fire Engineer, hh-DD-MM-YYYY
FAR-8	Basement plant room	Hydraulic	Gas solenoid G-01 shutdown, manual reset	xx-xx-xxx	✓	✓	✓	✓	✓	✓	✓	Witness by ABC Main Contractor hh-DD-MM-YYYY
FAR-9	Level 1 services cupboard	Builder	Fire door 103 hold open device release	xx-xx-xxx	✓	✓	✓	✓	✓	✓	✓	Witness by XYZ Fire Engineer, hh-DD-MM-YYYY
HL-1	Basement plant room	Mechanical	Owner notification through BMS	xx-xx-xxx	✓	✓	✓	✓	✓	✓	✓	Witness by ABC Main Contractor hh-DD-MM-YYYY

Instructions:

1. *Fire Alarm Contractor to identify all Fire Alarm Relays (FAR) required to achieve Approved Integrated Fire Matrix functionality.*
2. *FAR locations to be agreed with interfacing trades e.g. adjacent a Mechanical Distribution Board, or a security controller.*
3. *Fire Contractor to program FAR according to Fire Matrix requirements and test functionality independently of interface trade.*
4. *Interface trade to install and terminate cabling between FAR and interface equipment and test independently of Fire Alarm trade.*
5. *Combined or end-to-end testing to be conducted e.g. activation of a MCP to verify mechanical fan shutdown, or release of specific access-controlled doors.*

All interfaces have been successfully tested in accordance with the Fire Matrix

Project _____

Signed/Name _____

Company _____

Date _____

E.2 *Integrated Systems Testing checklist example*

The content is an example only and may not suit the system, application, or use of a building - adaptation will be required.

Where buildings are zoned or equipment is to operate independently, more detailed cause and effects will need to be entered.

Project _____

Address _____

Signed/Name _____

Company _____

Notes to include which items have been tested:

SYSTEM INPUT	SYSTEM OUTPUT	ACTION	NOTES	TEST RESULTS	DATE	INITIALS
1. Sprinkler operation (FBA signals fire)	a) FENZ notification	Fire				
	b) Fire contractor notification	Fire				
	c) Building wide alarm	Fire				
	d) Building HVAC fans/dampers	Off				
	e) Car park supply air	On				
	f) Jet fans	Off				
	g) Corridor Electrical lighting to 100%	On				
	h) Doors / gates	Release				
	i) Lift	Recall				
	j) Security monitoring co	Fire				
	k) Owner	Fire				
	l) Utilities (Gas)	Off				
2. Sprinkler supervised valve operation	a) FENZ notification	Fire				
	b) Fire contractor notification	Fire				
	c) Building wide alarm	Fire				
	d) Building HVAC fans/dampers	Off				
	e) Car park supply air	On				
	f) Jet fans	Off				
	g) Corridor Electrical lighting to 100%	On				
	h) Doors / gates	Release				
	i) Lift	Recall				
	j) Security monitoring co	Fire				
	k) Owner	Fire				
	l) Utilities (Gas)	Off				

Integrated Systems Testing checklist example cont.

SYSTEM INPUT	SYSTEM OUTPUT	ACTION	NOTES	TEST RESULTS	DATE	INITIALS
3. Sprinkler deficit/ isolate	a) Fire contractor notification	Defect				
	b) Security monitoring co	Defect				
	c) Owner	Defect				
4. Manual call point (MCP) operation	a) FENZ notification	Fire				
	b) Fire contractor notification	Fire				
	c) Building wide alarm	Fire				
	d) Building HVAC fans/dampers	Off				
	e) Car park supply air	On				
	f) Jet fans	Off				
	g) Corridor Electrical lighting to 100%	On				
	h) Doors / gates	Release				
	i) Lift	Recall				
	j) Security monitoring co	Fire				
	k) Owner	Fire				
	l) Utilities (Gas)	Off				
5. Smoke/ Heat detector operation	a) FENZ notification	Fire				
	b) Fire contractor notification	Fire				
	c) Building wide alarm	Fire				
	d) Building HVAC fans/dampers	Off				
	e) Car park supply air	On				
	f) Jet fans	Off				
	g) Corridor Electrical lighting to 100%	On				
	h) Doors / gates	Release				
	i) Lift	Recall				
	j) Security monitoring co	Fire				
	k) Owner	Fire				
	l) Utilities (Gas)	Off				
6. Apartment smoke detector operation	a) Fire contractor notification	Alert				
	b) Local alert - fire cell of origin only	Alert				
	c) Security monitoring co	Alert				
	d) Owner	Alert				
7. Adjacent smoke detector	a) Integrated Passive systems (Door hold open devices)	Close				

Integrated Systems Testing checklist example cont.

SYSTEM INPUT	SYSTEM OUTPUT	ACTION	NOTES	TEST RESULTS	DATE	INITIALS
8. Air handling duct detector operation	a) Car park supply air	Off				
	b) Security monitoring co	Alert				
	c) Owner	Alert				
9. Fan control switch on	a) Car park supply air	On				
	b) Jet fans	On				
10. Fan control switch off	a) Car park supply air	Off				
	b) Jet fans	Off				
11. Power failure	a) Doors / gates	Release				
	b) Security monitoring co	Alert				
	c) Owner	Alert				
	d) Utilities (Gas)	Off				
	e) Integrated Passive systems (Door hold open devices)	Close				

E.3 *Commissioning Issues Register*

Instructions: Commissioning defects to be recorded in the defect register to ensure they are rectified by the responsible party, checked, and re-tested.

NO.	DATE OBSERVED	INTERFACE	DESCRIPTION	REASON/ CORRECTIVE ACTION	RESPONSIBLE	DATE RECTIFIED	CHECKED	STATUS	COMMENTS
1.	12/06/2019	Lifts	Lift failed to return to ground floor on fire signal	Wiring between the fire alarm relay and lift controller was found to be incorrectly terminated at lift controller. Lift Contractor to rectify and re-test.	Lift Contractor	13/06/2019	✓	Closed	
2.	13/06/2019	Mechanical	AHU-2-3 continued to run when the duct smoke detector was activated.	Faulty duct smoke detector to be replaced	Mechanical Contractor		✓	Open	Awaiting delivery of replacement detector.
3.	13/06/2019	Security	Egress door D-110.1 remained locked on activation of the fire alarm.	Fire Alarm incorrectly programmed	Fire Contractor	13/06/2019	✓	Closed	

Appendix F: Recommended Compliance Schedule building consent documentation

Below is an example of a basic Compliance Schedule template commonly in use. A Territorial Authority may require a more in-depth Compliance Schedule.

The Association of Building Compliance has produced a 'Compliance Schedule Reference Guide', which includes references to interfaces and matrices (**https://www.abciqp.org.nz/resourcelib/325619c0107ab95b9.32428533/ABC-Compliance-Schedule-Reference-Guide-November-2021.pdf**).

The Ministry of Business, Innovation & Employment has also produced an 'Exemplar Compliance Schedule' document which includes references to interfaces (**https://www.building.govt.nz/assets/Uploads/building-officials/guides/exemplar-compliance-schedule.pdf**). A matrix needs to be added to complete the documentation.

3. SPECIFIED SYSTEM/S
The following Specified System/s is/are contained in the building.

SPECIFIED SYSTEM		INSPECTION, MAINTENANCE & REPORTING STANDARDS (please list standard if not referenced. Always maintain to latest standard, not standard of installation)	SYSTEM NOTIFICATION (tick as applicable)		
1	**Automatic systems for fire suppression**				
1.1	A water sprinkler system Performance standard:	☐ NZS 4541 ☐ NZS 4515 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
1.2	☐ Gas flood system in ☐ Foam system in ☐ Deluge system in ☐ Other fire extinguishing system (Specify what the other fire extinguishing system is) ..... system in ..... Performance standard:	☐ FPANZ Water mist CoP ☐ FPANZ Gas suppression CoP ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐

SPECIFIED SYSTEM		INSPECTION, MAINTENANCE & REPORTING STANDARDS (please list standard if not referenced. Always maintain to latest standard, not standard of installation)	SYSTEM NOTIFICATION (tick as applicable)		
2.	**Automatic or manual emergency warning systems for fire or other dangers?**				
2.1	☐ Manual warning systems (Type 2 alarm) ☐ Automatic fire alarm system with heat detectors and manual call points (Type 3 alarm) ☐ Automatic fire alarm system with smoke detectors and manual call points (Type 4 alarm) ☐ Automatic fire alarm system with modified smoke detection and manual call points (Type 5 alarm) ☐ ..... Performance standard:	☐ NZS 4512 ☐ AS 1851 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
2.2	Automatic gas leak detection systems for the detection and measurement of combustible gases Performance standard:	☐ NZS 5263 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
3.	**Electromagnetic or automatic doors or windows**				
3.1	Automatic doors e.g. sliding or revolving doors Are doors interfaced with emergency warning system? ☐ Yes ☐ No Performance standard:	☐ NZS 4239 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
3.2	Access controlled doors (swipe card, keypad, sensor-delayed egress, etc.) Are doors interfaced with emergency warning system? ☐ Yes ☐ No Performance standard:	☐ NZS 4239 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
3.3	Interfaced fire or smoke door or windows (electromagnetic door holders) Performance standard:	☐ AS 4178 ☐ NZS 4232.2 ☐ NZS 4520 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
4.	**Emergency lighting systems** Performance standard:	☐ AS/NZS 2293.2 ☐ NZS 6104 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐

SPECIFIED SYSTEM		INSPECTION, MAINTENANCE & REPORTING STANDARDS (please list standard if not referenced. Always maintain to latest standard, not standard of installation)	SYSTEM NOTIFICATION (tick as applicable)		
5.	**Escape route pressurisation systems** **Interfaced with fire alarm?** ☐ Yes ☐ No Performance standard:	☐ AS 1851.6 ☐ AS 1668.1 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
6.	**Riser mains for use by fire services** Performance standard:	☐ NZS 4510 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
7.	**Automatic backflow preventers connected to a potable water supply** Performance standard:	☐ AS/NZS 2845.1 ☐ AS 2845.3 ☐	☐	☐	☐
8.	**Lifts, escalators, travelators, or other systems for moving people or goods within a building**				
8.1	Passenger carrying lifts Interfaced with fire alarm? ☐ Yes ☐ No Performance standard:	☐ NZS 4332 ☐ NZS 4334 ☐ FPANZ Integrated Systems CoP ☐ EN 81 ☐	☐	☐	☐
8.2	Goods or service lifts Interfaced with fire alarm? ☐ Yes ☐ No Performance standard:	☐ NZS 4332 ☐ FPANZ Integrated Systems CoP ☐ EN 81 ☐	☐	☐	☐
8.3	Escalators and moving walks Is system Interfaced with emergency warning system? ☐ Yes ☐ No Performance standard:	☐ EN 115 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
9.	**Mechanical ventilation or air-conditioning systems** Cooling tower installed ☐ Yes ☐ No Spray booth ☐ Yes ☐ No Kitchen hood ☐ Yes ☐ No Interfaced with fire alarm? ☐ Yes ☐ No Performance standard:	☐ AS/NZS 3666.2 ☐ AS/NZS 4114 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐

SPECIFIED SYSTEM		INSPECTION, MAINTENANCE & REPORTING STANDARDS (please list standard if not referenced. Always maintain to latest standard, not standard of installation)	SYSTEM NOTIFICATION (tick as applicable)		
10.	**Building maintenance units or other devices providing access to the exterior of a building** Performance standard:	☐ BS 6037.1 ☐ AS/NZS 1891.4 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
11.	**Laboratory fume cupboards** Performance standard:	☐ AS/NZS 2243.8 ☐ NZS 7203 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
12.	**Audio loops or other assistive listening systems**				
12.1	Audio loop Interfaced with fire alarm? ☐ Yes ☐ No Performance standard:	☐ AS 60118.4 ☐ NZS 4121 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
12.2	FM radio frequency systems and infrared beam transmission Interfaced with fire alarm? ☐ Yes ☐ No Performance standard:	☐ AS 60118.4 ☐ NZS 4121 ☐	☐	☐	☐
13.	**Smoke control systems**				
13.1	Mechanical smoke control systems Location .... System description Interfaced with fire alarm? ☐ Yes ☐ No Performance standard:	☐ AS 1668.1 ☐ AS 1851 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
13.2	Natural smoke control systems Location .... System description Interfaced with fire alarm? ☐ Yes ☐ No Performance standard:	☐ AS 1668.1 ☐ AS 1851 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
13.3	Smoke curtains Location .... System description Interfaced with fire alarm? ☐ Yes ☐ No Performance standard:	☐ AS 1668.1 ☐ AS 1851 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐

SPECIFIED SYSTEM		INSPECTION, MAINTENANCE & REPORTING STANDARDS (please list standard if not referenced. Always maintain to latest standard, not standard of installation)	SYSTEM NOTIFICATION (tick as applicable)		
14.	**Emergency power systems for, or signs relating to, a system or feature in any of the Specified Systems 1 - 13**				
14.1	Emergency power systems installed for the purpose of supplying power to any of the Specified Systems 1 - 13 Performance standard:	☐ NZS 6104 ☐	☐	☐	☐
14.2	Signs for all systems Performance standard:	☐ NZS 4121 ☐	☐	☐	☐
15.	**Any or all of the following systems and features, so long as they form part of a building's means of escape from fire, and so long as those means also contain any or all of the systems or features specified in clauses 1 to 6, 9 and 13:**				
15.1	System for communicating spoken information intended to facilitate evacuation Performance standard:	☐ NZS 4512 ☐ AS 1851 ☐ FPANZ Integrated Systems CoP	☐	☐	☐
15.2	Final exits Performance standard:	☐ AS/NZS 2293.2 ☐ NZS 4121 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
15.3	Fire separation Performance standard:	☐ NZS 4520 ☐ NZS 4232 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
15.4	Signs for communicating information intended to facilitate evacuation; and such signs as required by the NZBC (all systems); and S.120 of the Act Exit signs ☐ Yes ☐ No Direction signs ☐ Yes ☐ No No Exit signs ☐ Yes ☐ No Other ☐ Yes ☐ No Performance standard:	☐ NZS 4121 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
15.5	Smoke separation Location .... System description ..... Performance standard	☐ AS 1668.1 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐
16.	**Cable cars** Performance standard:	☐ NZS 5270 ☐ FPANZ Integrated Systems CoP ☐	☐	☐	☐

Appendix G: Form 12A

Certificate of compliance with inspection, maintenance, and reporting procedures Section 108(3)(c), Building Act 2004

THE BUILDING		THE OWNER	
Street address of building:	[insert details]	Name of owner:	[insert details]
Legal description of land where building is located:	[insert details]	*Contact person:	[insert details]
Building name:	[insert details]	Mailing address:	[insert details]
Location of building within site/block number:	[insert details]	Street address:	[insert details]
Level/unit number:	[insert details]	†Registered office:	[insert details]

COMPLIANCE

The inspection, maintenance, and reporting procedures of the Compliance Schedule, (including the testing of Integrated Building System interfaces in accordance with the FPANZ Integrated Building Systems Code of Practice), have been fully complied with during the 12 months prior to the date stated below in relation to the following Specified Systems:

PRESENT	SS	IS	SPECIFIED SYSTEM
☐	1	☐	Automatic systems for fire suppression (for example, sprinkler systems).
☐	2	☐	Automatic or manual emergency warning systems for fire or other dangers (other than a warning system for fire that is entirely within a household unit and serves only that unit).
☐	3	☐	Electromagnetic or automatic doors or windows (for example, ones that close on fire alarm activation).
☐	4	☐	Emergency lighting systems.
☐	5	☐	Escape route pressurisation systems.
☐	6	☐	Riser mains for use by fire services.
☐	7	☐	Automatic backflow preventers connected to a potable water supply.
☐	8	☐	Lifts, escalators, travelators, or other systems for moving people or goods within buildings.
☐	9	☐	Mechanical ventilation or air conditioning systems.
☐	10	☐	Building maintenance units providing access to exterior and interior walls of buildings.
☐	11	☐	Laboratory fume cupboards.
☐	12	☐	Audio loops or other assistive listening systems.
☐	13	☐	Smoke control systems.
☐	14	☐	Emergency power systems for, or signs relating to, a system or feature specified in any of clauses 1-13.
☐	15	☐	Any or all of the following systems and features, so long as they form part of a building's means of escape from fire, and so long as those means also contain any or all of the systems or features specified in clauses 1 to 6, 9, and 13:
☐	15a	☐	a. Systems for communicating spoken information intended to facilitate evacuation; and
☐	15b	☐	b. Final exits (as defined by clause A2 of the building code); and
☐	15c	☐	c. Fire separations (as so defined); and
☐	15d	☐	d. Signs for communicating information intended to facilitate evacuation; and
☐	15e	☐	e. Smoke separations (as so defined).

SS = Specified System number, IS = Integrated System with interface to another system

[Full name of independent qualified person]

Date: [insert date]

Signature of independent qualified person

*Delete if the owner is an individual.
†Delete if inapplicable.

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FPA NEW ZEALAND

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