



Introduction

Alarm system devices

A fire alarm system consists of one or more devices and/or control mechanisms intended to alert a building's occupants of a fire. Where there are interconnected devices with a central control function, it may be capable of providing fire crews with information concerning the activation of the detectors. Knowledge of the detectors' locations and type together with the times of activation may allow firefighters to identify the origin of fire and potential spread and consequence of fire. Provision of adequate information is likely to assist fire crews to move to the fire area and to conduct firefighting operation efficiently and safely.

Depending upon the type of system, fire alarms may monitor alarm-initiating devices such as manual call points, automatic detectors and water flow indicator. In systems involving automatic detection, if an alarm signal is received, the controller (essentially, a central computer) processes it and, if the signal is verified, activates the signalling devices (e.g. alarm sounders or beacons) and may initiate a signal to an alarm receiving centre (ARC). If a visual display is provided on the control box and/or subsidiary indicating panels (mimic panels), information is displayed and, if a printer output is present, output to hard copy.

The central control may also activate other devices such as fire curtains and fire ventilation systems as well as deactivating magnetic hold-open devices.

Detection systems have devices that automatically sense fire or its by-products. Detection systems are often integrated into fire alarm systems, and this section covers both.

Alarm system types

As indicated above, fire alarm systems may vary widely in complexity. NZS 4512:2010 Fire detection and alarm systems in buildings: Appendix B lists the types of alarm systems currently recognized under the standard.

Disregarding the Type 1 (single point detection) system – although Type 1 detectors can be interlinked, a basic manual alarm system would consist of a simple control panel, an initiating panel (may be part of the control panel), activating devices (manual call points) and notification devices (alarm sounders). The connecting wiring must also be considered to be part of the system.

The other end of the spectrum may be complicated systems including multiple arrays of detectors with varying detection criteria, selective voice evacuation systems with integrated phone communication systems and that operate a range of ventilation and suppression systems based on the location of the activation.

System requirements

The Acceptable Solutions for the NZ Building Code (NZBC) specifies the requirements for fire alarms systems for each risk group. NZS 4512:2010 sets the requirements for design, installation, and maintenance. Location of the fire alarm panel and the index diagram shall be approved by Fire and Emergency New Zealand (Paragraph 403.1.1).

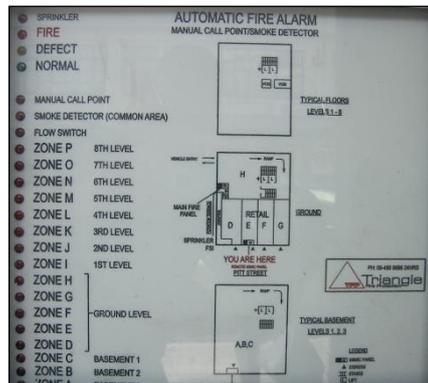


Figure 1: Fire alarm panel and index diagram

Scope

This guide describes how fire crews may use the information provided by fire alarm systems and offers guidance to designers to achieve compliance with Clause C5.7 of the NZ Building Code and to facilitate operational efficiency. Lift controls, often interconnected with the fire alarm system, are outlined in guide: F5-08 GD Firefighting Operations in lifts.

The default position for a location for a fire alarm panel would be preferred to be adjacent to the front entrance as this is generally the address point to a building or site. This is the location Which responding crews will attend first and it would be expected that fire safety systems would be located there. If this is not the location, then at least a mimic panel should be provided with clear instructions as to where the panel is located. As with NZS 4512:20140, the position should always be approved by Fire and Emergency which should be contacted prior to installation and not when the job is complete.

Definitions

Attendance point

A single point of emergency response attendance per building, as referenced in clause 6.2.1 of the C/ASx documents, and to comply with Clause C5.3 of the New Zealand Building Code, NZBC. This will give access to:

- indications of fire location
- controls for fire safety systems
- inlets for fire sprinkler or hydrant systems.

Note: An attendance point where facilities are provided to meet the provisions of NZBC C5-7 giving firefighters clear information, will be the initial tasking and safety briefing point for crews before deploying to any other access point.

Address point

This point is part of the data set administered by Land Information New Zealand, (LINZ). It is the address, (point)where the Building is commonly known to be located. The address point can be either singular, or a range of individual points as described on the LINZ data set.

Fire service vehicular access

C/AS Part 6: Firefighting Clause 6.1.1 describes this. Additionally, for the health and safety of our personnel, this access:

- must not involve a canopy, or other part of a structure to drive or park under
- must be located outside a horizontal collapse zone requirement of 1.5 times height of the tilt slab
- must be within 135 m of a firefighting water supply.

If the access meets these requirements then it is deemed usable, and the 75 m hose run may be measured from this hard-standing.

**Firefighter
access point**

NZ Building Code clause C6.3 applies. Additionally, for access points which are not linked to the requirements for an Attendance point described above, it will be advantageous to the building owner for the Provisions requirements of NZBC Clause C5.7 to apply. See the note in the attendance point definition. Failure to provide these may mean that briefings for safety and tasking may delay arrival at the additional access points.

Zones and sectors

**Location and
alarm type**

An index panel displays information about the location and type of alarm. The initial indication and any changes on the panel may assist attending fire crews with determining their initial firefighting actions and help track the spread of smoke or heat. A building may have several indicating panels if there is more than a single entrance. There may be also be different index panels if they are required by different responders (e.g. attending fire crews, security personnel and building management staff). This Chapter focuses solely on panel locations and features intended for use by attending fire crews. In accordance with NZS 4512:2010, designers should always seek approval from Fire and Emergency in respect of the index panel's design and the relevant location(s).

The location of an index panel is critical to its usefulness. As indicated above, in any system that has more than one detection zone, the activation of detection devices will provide an indication of the fire's progression through a space. This requires the panel to be monitored throughout firefighting operations to promote the safe deployment of firefighters.

Generally, the best location is close to the initial attendance point; this is likely to be at the main entrance of a building. In larger buildings (that have more than one access route e.g., because escape stairways open onto different elevations of the building) or on larger sites that would require fire appliances to move away from the initial attendance point, it may be beneficial to have mimic panels at strategic locations. For buildings such as tall, high-rise buildings (THRBs) with Fire Control Centre, the index panel will usually be located within this space. However, depending on the room's location and accessibility, it may advantageous to locate an additional index panel at the main entrance.

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Master index panel

Each building should have its own index panel even if a single fire alarm system serves several buildings. Firefighting operations are likely to be delayed if the appropriate information is not available at the relevant attendance point. In large complexes, an additional master index panel could assist attending fire crews in locating the building where an alarm originates. As with index panels, the location of this master panel should be discussed and agreed with Fire and Emergency.

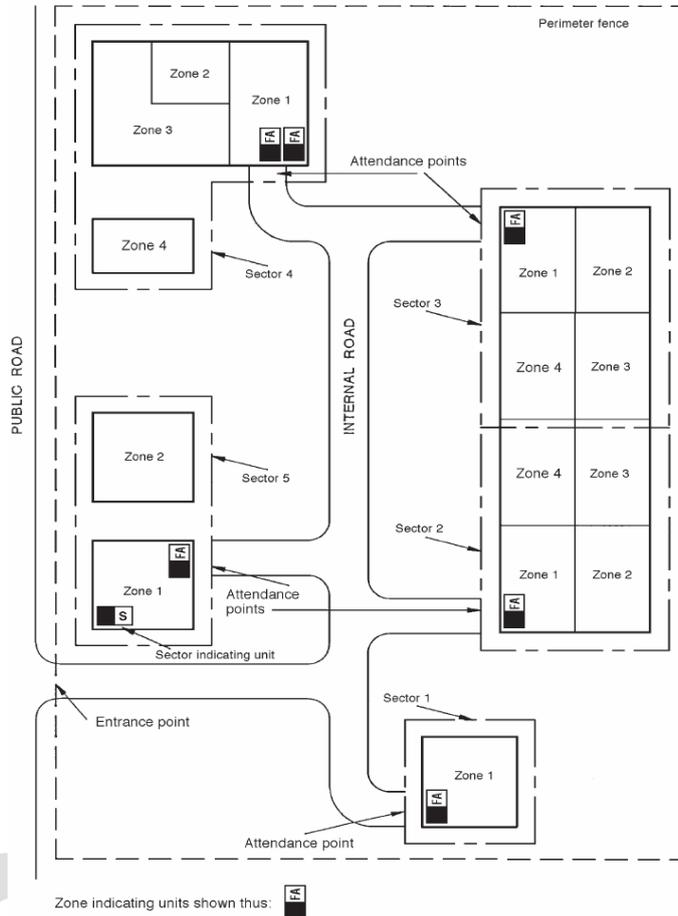


Figure 2: Master index panel

Index panels

Index panels display alarm information in different ways. Some have lights or LEDs that are labelled.

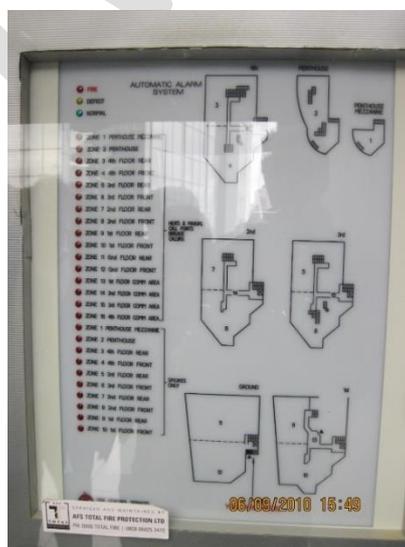


Figure 3: Alarm index panel with lights

Alphanumeric index panels have a readout-type display that should be programmed to show very specific information describing the alarm activation, detection criterion and location.



Figure 4: Alphanumeric index panel

Control panel

The control panel may also serve the function of the index panel. In such cases, its location and features should meet all index panel requirements. The index panel may hold hard copies of building plans and diagrams. If provided, these will be rapidly available to firefighters. A notice on the panel's housing should indicate that it contains building plans or diagrams.

All index panels should contain an indication of the:

- floor where the signal originated
- zone on that floor
- device that has activated and any subsidiary devices that have been activated because of the alarm signal.

Zone descriptors, whether labels next to lamps or alphanumeric displays, should provide information relevant to the fire crews' needs. Designers should assume that users will not be familiar with the building.

Descriptors should be intuitive, easily understood and current. The information should include the building's layout, tenants and names and references of other spaces. Changes in the spaces within the building should be represented on the index panel.

If a sprinkler system is present, it is important that the zone indication show the area covered by the system. Flow switches or pressure switches and their controls should be indicated so that fire crews can, if necessary, take control of the relevant parts of the system.

Alarm devices should indicate a situation requiring emergency action and normally activate evacuation signals. e.g.:

- manual call point
- sprinkler flow
- smoke detector
- heat detector
- specific extinguishing system e.g., for kitchen cooking equipment
- clean agent system
- carbon dioxide system
- any special features (e.g., hypoxic systems, water mist etc.).

Further information on the location of smoke and heat detectors should be further identified on the index panel by mounting location:

- area (ceiling)
- underfloor
- duct
- air plenum
- lift lobby
- lift motor room
- lift shaft
- stairs.

Status indicators give information about whether the main fire alarm power is on, or they report on the condition of devices external to the alarm system. These may include, for example:

- main system power on
- main system fault
- fire pump running
- fire pump fault
- generator running
- generator fault
- stair doors unlocked
- smoke control system in operation.

Fire alarm panel co-location for multiple buildings

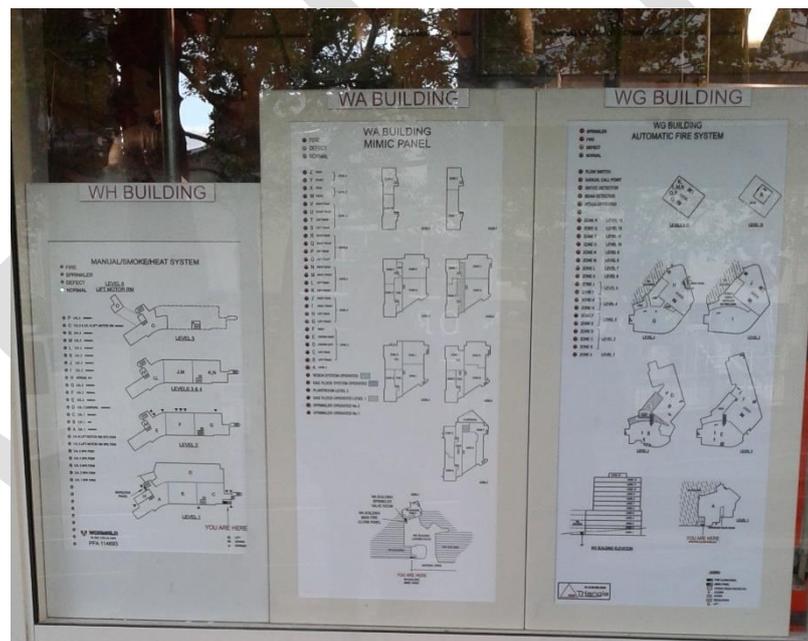


Figure 5: Fire alarm panel co-location for multiple buildings

The design of the diagram is important – the diagram should allow firefighters to rapidly obtain the information required. The orientation of the diagram to the layout of the building will assist firefighters to visually process the information it contains. The furthest point of the building beyond the index panel’s location should be at the top of the diagram.

Designers should begin with the building’s outline in creating diagrams. Zones would be identified by the boundary lines between them. Likewise, for alarms designated by room, suite, or tenant, these locations should be shown. A ‘You Are Here’ indicator shows the viewer where they are in respect to the building.

Where alarm zones and sprinkler zones overlap, it should be indicated on the index panel with separate indicator LED lamps for each. If there is a single sprinkler zone on

a floor and multiple alarm zones, lamp or LED index panels should report only the floor and device type. An alarm from another device type will light the appropriate zone lamp. If there are multiple sprinkler zones per floor, and sprinkler and alarm zone boundaries are not coordinated, separate diagrams can show each.

Access to alarm panels

Standard operating procedures of Fire and Emergency NZ do not require personnel to access the internal workings of a fire alarm panel. While the ability is there to interrogate the panel as to location, zone or silence and reset the panel, crews will not access the internal workings of the panel. Therefore, for this reason the most common key used in this scenario is a Bulgin key which allows the panel to be reset or the associated fire safety features to be turned off or reset also. This does not require access to the panel itself. It is recommended that a panel which is as informative as possible is installed to allow early access to the fire location which may help mitigate the damage caused by fire.

Zoning and indication considerations

Considerations

When deciding the location of zoning indicator panels, consider the following:

- Provide separate panel at each building for each building served.
- Location for rapid fire service access near the main entrance or in the fire control centre.
- Include basic information, i.e. floor, zone, device type (alarm or fault).
- Zone boundaries correspond with the internal layout of the building.
- Indicate area covered by sprinkler systems.
- Include status indicators for power and external devices.
- Include control switches for other fire protection features.

Consistent designations of floor indications used in the building helps to avoid confusion. For example, it is imperative that floor designations on the signs mounted in stairways, lifts, and lift lobbies, be consistent with the index panel so the firefighters can be directed and report to the correct floor.

In addition to information about floors, zones and devices, many features of the building could be shown on the diagram. These include fire protection systems and building components that attending fire crews needs to be aware of. However, when adding these features, it is not always prudent to use acronyms such as PE as some attending crews may not know what this means and will only create confusion and delays. In this case PE stands for photoelectric which relates to solar panels on a building roof, but attending crews didn't know anything about it or understand what it meant.

Designers should remember that modifications to the building or its layout may require changes to the index drawing. An index panel with inaccurate information could be worse than no index panel at all.

Index panel considerations

Considerations

When deciding the location of index panels, consider the following:

- Located adjacent to main entry to building.
- Is it visible from vehicular access point, if obscured a strobe light is required to indicate location.
- Tinted glass will obscure.
- Information readable at 1700 mm above ground level.
- Controls should be within 750 – 1850 mm above ground level.
- Co-located by fire sprinkler inlet or other fire safety features (if serving same building/firecell).
- Building attendance point/address should match the address point as the address point is where our appliance will respond to.
- Types of detection (heat/smoke).

- Location of building entry/access points.
- Location of stairs.
- 'You are here' indicator.
- Fire alarm control panel location (if located inside) and other repeater/mimic panels.
- Levels/floors to match building with high levels at top.
- Plan orientated correctly with building.
- Location of sprinkler valve house and sprinkler inlet if remote from panel.
- Normal/Fire/Defect lights.
- Private Fire Alarm (PFA) number (a monitored alarm response).
- Clearly labeled zones.
- Trial evacuation.

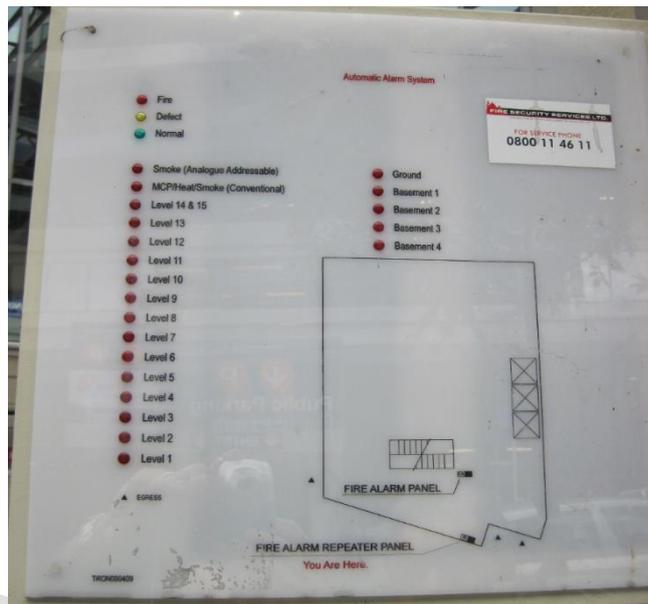


Figure 6: Fire alarm index panel

Accepted index panel symbols

Symbol	Usage	Colour
	Building outline (bold)	Black
	Internal walls with no through access May also be zone demarcation	Black
	Zone demarcation with access available between zones	Black
	Projection line to a plan view of a hidden area e.g. mezzanine, basement	Black
	Area of special fire protection or ancillary system coverage	Amber
	Access way between levels – stairs, escalators, travellators, ramps	Black
	Lift	Black
YOU ARE HERE	Reader orientation title (upper case)	Red
	Directional arrow indicating a location	Black

	Building access point Placed outside building outline and oriented appropriately	Black
	Main indicating unit (fire alarm panel)	Black
	Sector indicating unit	Black
	Repeater zone index (mimic panel)	Black
Symbol	Usage	Colour
FSI	Fire sprinkler inlet	Red
CV	Sprinkler control valves (if not co-located with FSI) (CV location can also be written adjacent to 'sprinkler operated' light-emitting diode (LED))	Red

Fire and Emergency alarm connections

Vital that Fire and Emergency responds to the correct location

The NZ Building Code requires fire alarm systems from certain buildings to automatically alert Fire and Emergency. Often a monitoring company will receive the alarm signal and then retransmit it to Fire and Emergency.

It is crucial that the address reported to Fire and Emergency matches the address where the alarm originated as the initial response will be to that address point. If a building has multiple addresses, the one with the fire alarm index panel or fire systems centre should be reported. If a building or site includes separate buildings in sectors the signal should be coordinated with the correct index panel location.

Larger buildings with multiple sections or multiple entrances can be confusing. If possible, remote fire department notification should include information on the section, wing, or entrance where units should report, so firefighters may investigate an alarm originating from the corresponding area. In addition, strobe lights at building entrances (corresponding to the activated alarm location) will assist attending fire crews and reduce the response time.

Fire and Emergency notification

Notifications

Notifications to Fire and Emergency should report the:

- correct location/address
- correct entrance with the alarm index panel or fire systems centre
- section or wing of the building, if available
- device type, if possible.

Voice alarm systems

Voice evacuation message

Emergency warning and intercommunication systems (EWIS) automatically send a voice evacuation message to speakers in selected areas of high-rises or large buildings, hospitals and other buildings where total evacuation is impractical. A typical high-rise arrangement would provide for the following areas to automatically receive a pre-recorded evacuation signal on the floor where the alarm originates and the floors above and below it. The evacuation signal controls the zone-by-zone staged/phased evacuation from a pre-programmed scheme.

The Building Fire Warden or arriving firefighters can evacuate additional areas by manually activating one, multiple, or all floors with the manual select switches in the fire systems centre. They also can override the pre-recorded message and broadcast live voice announcements to any or all evacuation zones with a microphone at the fire systems centre. Adjacent to each manual select switch, visual indicators show which evacuation zones are activated at any given time.



Defining evacuation zones

Arrangement of evacuation zones depends upon the design of the building and any evacuation plan in place. Each floor is typically one evacuation zone. Areas that are not separated by fire separations may not be divided into multiple evacuation zones. However, if a floor is divided by fire separations to enable occupants to take refuge on either side, multiple evacuation zones can be provided. Operators at the fire systems centre will only be able to give different instructions to those on either side of the barriers if the zone boundaries coincide with the fire rated separations.

Floors that are physically open to one another should be arranged as a single evacuation zone. This avoids the confusion possible when occupants in portions of the space hear an evacuation signal, but cannot clearly decipher it. A common example of this situation is a series of parking garage levels connected by open ramps. The group of interconnected levels should be designed as a single evacuation zone on the 'floor, floor above and floor below' automatic evacuation scenario.

Atria and other large open spaces spanning multiple floors also deserve special attention in buildings with selective evacuation. The response depends upon the egress arrangement and the building's evacuation plan. The entire atrium should comprise one evacuation zone. It may be desirable to activate only the atrium zone upon receipt of an alarm signal from within the atrium, and not from alarm signals in other areas.

Consideration should also be given to signals in areas adjacent to the atrium, so as not to cause occupant confusion. These signals or messages should clearly and concisely identify the evacuation plan for those spaces adjacent to any atrium.

Under NZS 4512:2010, EWIS systems are required to comply with AS 2220.1-1989 Part 1, or where appropriate, and as agreed with all stakeholders, an alternative recognised national or international standard on a case by case basis.

Voice alarm systems considerations

Evacuation zone boundaries

When defining evacuation zones, consider the following:

- Arrange evacuation zone boundaries along fire or smoke separations.
- Coordinate the evacuation zones with the building evacuation plan.
- Place areas or floors open to one another in a single zone.
- Arrange each bank of lifts into a manual select zone.
- Arrange each stairway into a separate zone (manual-select type if no initiating devices within stairway).
- Arrange each atrium on a separate zone and consider message legibility when arranging activation of adjacent areas.

Fire control centre

Dedicated room The Acceptable Solutions for the NZ Building Code require high-rise buildings to have a dedicated room or other location containing fire alarm and related fire protection control equipment. These are called 'Fire Control Centres'.

Other standards refer to the Fire Control Centre as 'Central Control Station', 'Emergency Command Center' and 'Fire Control Room'.

Purpose The purpose of the Fire Control Centre (FCC) is to provide an area from which firefighting operations and other emergency procedures can be controlled. The centres are not to be used for any purpose other than the control of firefighting activities and measures concerning occupant safety or security.

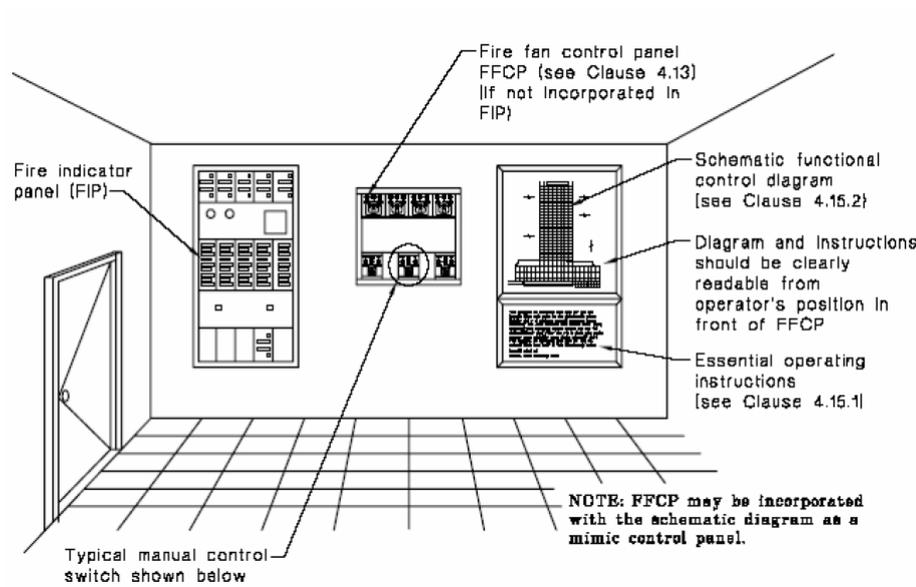


Figure 11: Schematic example of a fire control centre

For further information on fire control centres, see design guide: F5-09 Firefighting operations fire control centre.