VIGILANT *MX1*-Au Fire detection and alarm system Engineer's Specification

A Fire detection and alarm system Employing Advanced Analogue Addressable Detection Technology.

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** Optional: Include, modify or delete as required.*

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0. ADVICE TO ENGINEERS ON SYSTEM CONSTRUCTION

0.1 *GENERAL INFORMATION*

This specification describes a highly programmable analogue addressable fire detection and alarm system (*FDAS*) that provides a cost effective and reliable means of detecting fires, displaying zones and associated addressable devices in alarm, initiating an occupant warning system or sound system and intercom system for emergency purposes (*s.s.i.s.e.p.* also known as *EWIS*), and signalling a monitoring service provider with an alarm signal to initiate a fire dispatch centre (Fire Brigade) call out, as well as signalling faults and *disabled* conditions (also known as *isolate*). It also provides both simple and complex ancillary control functions to mitigate the effects of fire. This system uses various fault tolerant communications facilities to minimise the effects of faults when monitoring inputs and controlling outputs.

System inputs (detectors, *MCPs*, flow switches etc.) and system outputs (visual warning devices, audible warning devices, interfaces to smoke management systems, etc.) are mainly wired as addressable devices on the addressable communications loops. Some primary inputs and outputs, such as the connection to alarm signalling equipment (*ASE*), are connected directly to the control and indicating equipment (*c.i.e.* also known as the *FIP*).

The *FDAS* described in this specification is mainly analogue addressable, but also may support collective (conventional) detector circuits using addressable zone modules.

Three-port short circuit isolator modules allow existing collective system wiring terminating at the c.i.e. to be reused as wiring for a star-wired addressable system.

The VIGILANT *MX1* c.i.e. is a non-proprietary open market panel which has many features which make it highly suitable for both new installations as well as for existing systems that are to be progressively upgraded from collective detection to analogue addressable detection.

An analogue addressable fire detection system makes use of detectors that incorporate fire sensors (smoke, carbon monoxide, flame and/or heat) to return analogue values corresponding to the quantities of the fire by-products present in the immediate environment. Software algorithms are then employed to determine whether the values returned represent a valid fire condition that should be reported as an alarm. Although the fire detectors are wired on a common electrical circuit (*transmission path*), the addressable capabilities of the system enable analogue values from each sensor to be separately returned and evaluated and the status of each sensor to be individually displayed at the c.i.e.

The VIGILANT *MX1* c.i.e. has a highly flexible mechanical design utilising a 15U, 19” rack construction allowing various options to be fitted to the cabinet. Other cabinets are available with sizes ranging up to 40U for use where more space is required. A compact 8U version is also available.

The 4 line alphanumeric liquid crystal display (LCD) of an *MX1* c.i.e. can provide full display facilities of fire alarm conditions and well as many other system conditions and tests through a user-friendly menu structure. The LCD may be programmed to display a unique alarm text message for each zone (up to 999 zones), or it can be expanded if required, to display an additional unique text alarm message for each addressable device.

The LCD may be supplemented with additional individual light emitting diode (LED) indicators for zone alarm, fault and disabled (previously known as isolated) using one red visual indicator and one yellow visual indicator. The indicators are expandable in groups of sixteen (16) zones to a maximum of one hundred and ninety two (192) zone visual indications in the 15U panel. It is recommended that for large systems the LCD is used for fire detection zones with the visual indicators used for specific purposes such as sprinkler flow switches. For smaller systems all zones may be indicated with the visual indicators.

** Optional: Include, modify or delete as required.*

The flexibility of this system and the range of options require the specification for each project to be selected to suit the application. For this reason optional specification clauses are tagged with an asterisk* throughout this specification and can be deleted or inserted as required.

Appendix A is to be provided by the Engineer and should list each Air Conditioning System to be controlled and its type, i.e., Supply, Return, and Smoke Spill.

0.2 *STANDARDS*

The following standards are referred to in this Specification:

AS 1603	Automatic Fire Detection and Alarm Systems AS 1603.1 Part 1: Heat detectors AS 1603.2 Part 2: Point-type Smoke detectors AS 1603.5 Part 5: Manual call points AS 1603.14 Part 14: Point-type carbon Monoxide (CO) fire detectors
AS 1668	The use of ventilation and air-conditioning in buildings. AS 1668.1 Part 1: Fire and smoke control in multi-compartment buildings
AS 1670	Fire detection, warning control and intercom systems - System design, installation and commissioning AS 1670.1 Part 1: Fire AS 1670.4 Part 4: Sound systems and intercom systems for emergency purposes
AS 1851	Maintenance of fire protection systems and equipment.
AS 3000	SAA Wiring Rules
AS 3013	Electrical installations- Wiring systems for specific applications
AS 4428	Fire detection, warning, control and intercom systems - Control and indicating equipment AS 4428.1 Part 1: Fire AS 4428.3 2010 Part 3: Fire Brigade Panel AS 4428.5 Part 5: Power supply units AS 4428.6 Part 6: Alarm signalling equipment AS 4428.10 Part 10: Alarm investigation facility
AS/NZS CISPR22	Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment
AS 7240	Fire detection and alarm systems AS 7240.2 Part 2 Control and indicating equipment AS 7240.4 Part 4 Power supply equipment AS 7240.5 Part 5 Point-type heat detectors AS 7240.6 Part 6 Carbon monoxide fire detectors using electro-chemical cells AS 7240.7 Part 7 Point-type smoke detectors using scattered light, transmitted light or ionization AS 7240.8 Part 8 Carbon monoxide fire detectors using an electro-chemical cell in combination with a heat sensor. AS 7240.11 Part 11 Manual call points
EN 54	Fire Detection and Alarm Systems EN 54 -10 Part 10 Flame detectors EN 54 -11 Part 11 Manual call points

** Optional: include, modify or delete as required.*

ISO 8201	Acoustics – Audible emergency evacuation signal
SITE COPY	Keep on the site a copy of AS 1670.1

GENERAL REQUIREMENTS

0.3 *SCOPE - FIRE DETECTION*

A fire detection and alarm system shall be installed throughout (ADD NAME OF PREMISES)*. The fire detection and alarm system shall be software programmable, device addressable, analogue sensing, using multiplex communication techniques with extra low voltage field wiring and modular construction in full compliance with all applicable Australian codes and standards.

The contractor shall provide, install, test and commission the fire detection and alarm system as specified herein and as shown on the tender drawings. The system shall include all required hardware, interconnecting wiring and site-specific data to accomplish the requirements of this specification and the tender drawings, whether itemised or not.

All equipment shall be new and shall be the products of a single company engaged in the manufacture and sale of analogue addressable fire detection systems.

0.4 *MATERIALS & SERVICES*

The system shall include, but not be limited to, the following elements:

- Control and indicating equipment as a main c.i.e.
- Control and indicating equipment as one or more sub-indicator panels in accordance with the schedule of equipment*
- Power supplies, batteries and battery chargers
- Collective (conventional) circuit interface modules*
- Equipment enclosures
- Control relays with enclosures*
- Firmware and hardware as required to provide a complete functioning system
- Site specific data as required to provide a complete functioning system.
- Analogue addressable multi-sensor photoelectric smoke and heat sensors
- Analogue addressable heat and smoke detectors, input and output modules
- Analogue addressable carbon monoxide fire detectors with photo and heat detectors*
- Sole occupant unit or apartment alarm acknowledgement facility (AAM)
- Addressable flame detectors*
- Intrinsically safe analogue addressable detectors and modules*
- Collective (conventional) heat, smoke and carbon monoxide/heat fire detectors*
- Other devices as required for compliance with this specification
- Occupant Warning System* OR Interface to the sound system and intercom system for emergency purposes*
- Mimic panels, printers and central control terminal where shown on drawings*

** Optional: Include, modify or delete as required.*

- Fire Fan Control Panel*
- Wiring
- Installation, testing, commissioning and completion of installer's statement as per AS 1670.1.

0.5 *CERTIFICATION OF CONFORMITY (APPROVALS)*

All fire detection and alarm system equipment shall be independently tested and certified to conform to the relevant standards listed in AS 1670.1.

All equipment shall be listed by the ActivFire Scheme or appropriate listing body where a relevant standard applies and/or otherwise shall be shown to be fit for purpose and compatible.

All equipment and detection devices shall comply with CISPR22 for radio frequency emission and have a valid C-Tick or RCM label.

The c.i.e. (FIP) shall comply with AS 7240.2, and all mimics, repeater panels and alarm signalling equipment shall comply with relevant parts of AS 7240 and/or AS 4428.

The c.i.e. shall have an integrated fire brigade panel complying with AS 4428.3 2010, with the option also available of a separately-mounted fire brigade panel, also complying with AS 4428.3 2010.

Power supplies/charger shall comply with AS 4428.5 as specified in AS 4428.1 or AS 7240.4.

All smoke detectors shall comply with AS 1603.2 or AS 7240.7.

All combined carbon monoxide, photoelectric and heat detectors shall comply with, AS 7240.6 for the CO function AS 7240.5 for the heat detector function and AS 7240.7 for the photoelectric function.

All heat detectors shall comply with AS 1603.1 or AS 7240.5.

All flame detectors shall comply with EN 54-10.

All fire alarm manual call points shall comply with AS 1603.5 or EN 54-11 Type A or AS 7240.11 Type A, and shall be coloured red.

Audible and visual (strobes) occupant warning shall produce the ISO 8201 T3 temporal pattern.

Detectors and devices for hazardous areas shall have IECEx certificates of conformity.

The tenderer shall provide copies of approvals for the equipment offered.

> Note: "comply" means to be certified to conform to all the requirements in the relevant standard.

0.6 *INSTALLER'S QUALIFICATIONS*

The installation of the system is to be carried out by trained personnel.

A technician trained by the manufacturer of the system shall approve all design drawings and be on hand to supervise the total installation. The technician shall supervise site-specific data documentation, adjustment, preliminary testing and final testing of the system and shall provide training and instruction on system operation and basic maintenance to the owner's personnel.

All equipment furnished shall be new and state of the art products of a manufacturer engaged in the manufacturing and installation of fire detection equipment. Experience of over ten years in this field is expected.

** Optional: include, modify or delete as required.*

The manufacturer shall supply a reference list of installed systems in Australia using the same or equivalent equipment to be supplied for this project.

The manufacturer or an authorised distributor shall confirm that within reasonable distance of the project site there is an established agency which stocks a full complement of spare parts and offers 24 hour service on all equipment to be furnished.

0.7 *APPROVAL TO USE EQUIPMENT*

When requested, the contractor shall supply for the engineer's approval, all relevant electrical specifications for all components of the fire detection system. -

> Note: Data describing more than one type of item shall be clearly marked to indicate the type the contractor intends to provide for a given application. All submittal material shall be complete. Partial submittal will not be accepted.

0.8 *INSTALLER'S STATEMENT*

REQUIREMENT: Before practical completion provide a copy of the commissioning test report and the completed installer's statement in the form set out in the current revision of AS 1670.1.

0.9 *DRAWINGS & DIMENSIONS*

DIAGRAMMATIC LAYOUTS: Drawings showing fire detector layouts are diagrammatic only. Before commencing work, determine the exact positions of the detectors in conjunction with the Engineer, having regard to building features, other services, and the requirements of regulatory authorities to ensure required separation and spacing can be achieved.

0.10 *FIRE MONITORING SERVICE CONNECTION**

REQUIREMENT: Connect the main c.i.e. to a monitoring service provider with a direct data link to a fire dispatch centre. The alarm signalling equipment used for this connection shall comply with AS 4428.6.*

The contractor shall pay all fees associated with the initial connection to the monitoring service provider. The principal shall pay the monitoring costs as they occur.

** Optional: Include, modify or delete as required.*

1. SYSTEM DESCRIPTION

1.1 *GENERAL*

The requirements of “Conditions of the Contract” apply to this work. This specification intends to describe an “on premises” fire detection and alarm system that is to be device addressable, analogue detecting, and modular. Intelligent (knowledge based, such as fuzzy logic) smoke detection algorithms shall be available to select to suit application conditions.

All reference to model numbers and other pertinent information herein is intended to establish minimum standards of performance, quality of construction, and equal in operation to the VIGILANT *MX1* non-proprietary fire detection and alarm system. It is not the intent of these specifications to eliminate competitive equipment. Any equipment proposed as equal to that specified herein shall conform to the requirements herein.

Systems which do not meet the performance criteria of this specification will not be accepted.

The system as described shall be installed, tested and delivered to the owner in non-defective condition. The system shall include all required hardware, interconnecting wiring and software to meet the requirements of this specification and to meet the requirements of the contract drawings, whether itemised or not. The site-specific data configuration of the system, and its operation and annunciation of alarms shall be as described in this specification and as shown on the drawings.

Analogue addressable smoke detectors, multi-sensor combined smoke and heat detectors, combined carbon monoxide and heat fire detectors, and analogue addressable hazardous area detectors, manual call points and sprinkler flow switch inputs shall be supported by the system. In addition the system must be capable of performing the functions of an alarm acknowledgement facility (AAM), addressable devices for supervisory functions such as the monitoring of sprinkler valve tamper circuits and fire pumps, and control and interface with air conditioning systems shall be provided.

Comprehensive programming facilities shall be provided to enable output control logic functions to be performed and resulting outputs activated at any required location within the system.

1.2 *SYSTEM COMMUNICATIONS*

Detectors and other input and output devices shall be located within the protected premises at selected points. Communication between the devices and the c.i.e. (FIP) shall be by means of up to eight fault-tolerant, data communications loops complying with the following criteria:

Support a combination of up to 250 addressable detectors and devices per loop;

Provide up to 1A of loop power;

Provide short circuit isolation at every addressable detector so a single short circuit does not prevent operation of more than 1 detector

Provide short circuit isolation of addressable field modules so a single short circuit shall not prevent operation of more than 40 addressable modules

A single open circuit shall not prevent the operation of any device;

Any fault shall be reported at the c.i.e.

** Optional: include, modify or delete as required.*

1.3 *ELECTRICAL ISOLATION*

The fire detection and alarm system shall be connected to other systems using suitable electrical isolation such that there is no electrical connection between the fire detection and alarm system and the other systems, and such that any other system that is not already electrically connected to the fire detection and alarm system will not become connected. Examples of other systems are: s.s.i.s.e.p., mechanical ventilation systems and building management control systems. Exceptions are systems that are permitted to share the same power supply equipment in the relevant standards.

1.4 *DEVICE WIRING*

Analogue addressable devices shall generally be wired using two-wire loops. Where this is not practical, star connections and T-off spurs may be used provided the requirements of section 1.2 are met, with the exception that it is permissible where star connections and T-off spurs are used, that a single open or short circuit on a spur may prevent operation of up to 40 devices on the same spur, provided the fault tolerance requirements of the relevant standards are met. Circuits required to be installed in this manner shall be detailed in the response to this specification.

All occupant warning system circuits (if used) shall be supervised for open and short circuits and these fault conditions shall be clearly indicated at the c.i.e.

If the occupant warning is provided by an s.s.i.s.e.p., the faults that are required to be supervised shall be indicated at least as a common s.s.i.s.e.p. fault at the c.i.e.

Where a separate 24 V d.c. supply is required for sounder bases, this supply shall be supervised for open and short circuit fault. Failure of a supply circuit shall indicate as a fault at the c.i.e. with identification of the supply affected.

Collective (conventional) devices (if used) shall be wired to addressable zone modules by means of two-wire circuits with end-of-line supervision.

Control devices (if used) shall be connected to analogue loop addressable output modules, or to ancillary outputs at the c.i.e. as appropriate. All required fire related output circuits shall be supervised for open and short circuits.

Where an addressable module requires a separate 24 V d.c. supply, the failure of this supply shall not result in more than 40 devices being affected, regardless of the number of addressable modules employed, unless they are fitted within the c.i.e. enclosure. A failure of this supply shall be indicated as a fault at the c.i.e. giving the nature of the fault and the address of the module affected.

Where 24 V d.c. supplies are connected to wiring that is external to the c.i.e. that wiring shall have overload protection to prevent a short circuit from affecting any other part of the system.

1.5 *POWER SUPPLY EQUIPMENT*

Power supply equipment complying with the relevant standards shall power all the equipment detailed in this specification. Where a number of power supplies are used, a separate common fault indication for each power supply shall be the minimum indication provided to indicate faults detected by the required power supply fault monitoring.

Power supply equipment used for occupant warning systems (if used) shall meet the same standby requirement as the c.i.e. and be capable of supplying the full alarm load without dependence on the backup batteries.

The battery charging voltage shall be temperature compensated within the limits specified by the battery manufacturer.

** Optional: Include, modify or delete as required.*

The power supply equipment shall be suitable for connection to the Australian standard mains voltage which is 230 V a.c. +/- 15% at 50 Hz unless otherwise specified.

The c.i.e. shall have an internal general purpose mains power outlet that allows the power supply to be removed for service and replaced without the need for a licensed electrician to remove mains power. There shall also be an additional outlet to allow one item of mains-powered test equipment such as a portable PC to be connected to the mains supply without the need to remove the power supply connection.

1.6 *BATTERIES*

Batteries shall be provided to operate the complete fire detection and occupant warning system during a mains failure. The capacity of the batteries shall be determined in accordance with AS 1670.1.

1.7 *INPUT CONFIGURATION*

Each addressable input device shall be able to be configured to suit different applications as required for the project.

The following input configurations shall be available as a minimum:

- Normal
- Alarm Verification Facility (AVF as described by AS 4428.1 or AS 7240.2, 7.12.1 Type A dependency)
- Supply air out of alarm delay 60 s
- Delay into alarm up to 60 s (for flow switch monitoring)
- Latching or non-latching operation.

Note: Alarm verification shall not cause a delay for inputs set for manual call point operation.

The primary functional unit of the c.i.e. is the zone (fire fighter search area), the status of which is dependent on the status of the input devices that are mapped to the zone by the site programmable configuration. The type of operation that will result from the activation of input devices within a zone shall be selectable during the programming process from a list of zone profiles that provide complex zone functionality to suit different applications. Zone profiles shall include the following types:

- Fire dispatch centre calling
- Non-fire dispatch centre calling
- Alarm investigation facility (AIF as described in AS 4428.10)
- Alarm acknowledgment facility (AAF as described in AS 7240.2)
- Residential mode (Used with combined smoke and heat detectors – local alarm only on smoke detection; general alarm on heat detection.)
- Flow switch zone with remote solenoid test
- Sprinkler alarm valve zone
- Valve tamper alarm zone
- Status zone (for safety system hardware monitoring as required)
- Non-display Status zone.

Additional custom zone profiles shall be able to be configured.

** Optional: include, modify or delete as required.*

In addition to addressable fire detectors, manual call points and hard contact inputs; pseudo points shall be able to be mapped to zones to allow special application cause and effect logic to control zone status.

It shall be possible to configure certain critical inputs, zones and outputs so that they cannot be disabled.

1.8 *SYSTEM ZONING*

The system shall be divided into zones as indicated on the drawings. An alphanumeric LCD (and individual visual indicators)* on the c.i.e. shall provide indication of the status of each zone.

The system shall be capable of expansion up to 2,000 addressable devices, wired on up to 8 analogue addressable loops, but shall have basic input and output capabilities beyond this provided by input and output devices with several inputs and/ or outputs addressable as sub-points.

The system shall be capable of expansion up to 999 zones for future expansion of the site.

The programming facilities of the system shall enable a zone to include any number of detection devices ranging from 1 to 40 (as restricted by AS 1670.1).

1.9 *SYSTEM OPERATION*

The operation of the system in response to the activation of input devices assigned to a zone shall be in accordance with the drawings, cause and effect diagrams and the general specification below.

Activation of any fire alarm initiating device shall cause the following actions and indications.

- Indicate a fire alarm condition at the c.i.e. (and at any remote indicator panels that are installed).*
- Display fire alarm information on an alphanumeric display (generally an LCD), including the zone number of the operated zone, the zone text description, the device identifier and device text description where specified on the drawings or schedule of detectors and/ or devices. In addition the type of device shall be shown, e.g. smoke, heat, flow switch etc.

  The LCD shall be able to simultaneously display two zones in alarm, with the first zone in alarm remaining on the top lines of the display. Where more than two alarms exist, they shall be able to be scrolled into view by operation of a key designated “Next” on the operator keypad.

  The operator shall be able to retrieve more detailed information about the alarm displayed which shall include time and date of the alarm occurrence and pre-programmed action text.
- Indicate the alarm on the relevant zone alarm LED where zones or groups of zones (such as floors levels) are specified to have individual LED zone indicators.
- Operate the c.i.e. audible alarm indicators (sounder/buzzer) and the external fire alarm red strobe (if this is an upgrade project specify whether or not the existing bell shall remain or be removed)*.

  The c.i.e. sounder/buzzer shall be able to be silenced by operating the dedicated key within the fire brigade panel interface on the front panel.

  The external alarm shall operate until the occupant warning system (alarm devices) is silenced.
- Log the alarm condition to the c.i.e. internal history file (and to the printer if fitted)*.

** Optional: Include, modify or delete as required.*

- Close all smoke doors and smoke dampers, if applicable, to prevent the spread of smoke.
- Operate air handling units and smoke removal fans as shown on the drawings.
- Operate air conditioning systems to AS 1670.1 or AS 1668.1 requirements as nominated on the drawings or the separate specification for AS 1668.1 smoke management.
- (Cause the building occupant warning system to operate as detailed in 6.2)* or (Communicate the zones in alarm to the sound system for emergency purposes (EWIS) as detailed in 6.3.)*
- (Transmit the alarm condition to the fire monitoring service provider if connected.)*

Activation of any supervisory circuit, supervised valve closure (valve tamper), air pressure abnormal, low temperature, and fire pump fault shown in the drawings shall cause the following actions and indications.

- (Indicate the supervisory condition at the c.i.e.)*
- (Activate the c.i.e. sounder until it is manually silenced (as for a fire alarm).*
- Log the activation to the c.i.e. internal history file (and to the printer if fitted)*.
- (Transmit the active condition to the fire monitoring service provider.)*

The occurrence of a fault condition (e.g. open or shorted actuating circuit, supervised output, c.i.e. faults, open or shorted remote display communications wiring) shall cause the following actions and indications.

- Indicate the fault condition at the c.i.e.
- Activate the c.i.e. sounder until it is manually silenced.
- Indicate on the LCD that a fault is present and display a fault action message on the LCD to advise the system operator of the action to take to deal with the fault condition (ref. 2.3).
- Indicate the fault condition on the relevant zone fault LED where zones or groups of zones (such as floors levels) are specified to have individual LED zone indicators.
- Log the fault condition to the c.i.e. internal history file (and to the printer if fitted)*.
- (Transmit the fault condition to the fire monitoring service provider.)*

(If any alarm zone is disabled (isolated), then a disabled indication shall be displayed at the c.i.e. (and a disabled (isolate) condition transmitted to the fire monitoring service provider)*.

(Where indicated on the drawings, multi-sensor detectors shall be configured such that each sensor (or sub-point) can be separately disabled either automatically or manually. When a sub-point is disabled this condition shall be indicated at the c.i.e. as a disabled condition.)*

The occurrence of a condition that effectively totally disables the system (system power supply failure, and system processor failure) shall activate an output, which may be used to transmit this condition to the fire monitoring service provider or otherwise connected to meet local requirements.

Where the c.i.e. is shown on the drawings to be located in an area not normally occupied, an external c.i.e. sounder shall be provided in a normally occupied area.

Where an external c.i.e. sounder is required and a c.i.e. sounder silence switch is provided. the switch shall silence fault conditions only, not alarm conditions.

** Optional: include, modify or delete as required.*

2. C.I.E. (Fire indicator panel)

2.1 *GENERAL*

The c.i.e. shall be (surface mounted)* (recessed mounted)* in the position indicated on the drawings. It shall be modular in construction and shall include, but not be limited to, the hardware, software and firmware needed to fulfil the major system requirements that are described below.

The c.i.e. shall be VIGILANT *MX1* type or equivalent.

2.2 *C.I.E. ENCLOSURE*

The enclosure shall be of 19 inch rack format, steel cabinet with a hinged protective door incorporating a viewing window. The door shall have cylinder type Lockwood 003 key operable lock.

The 28U or 40U enclosures shall be factory finished in baked epoxy powder coat Dulux Cream Ripple or equivalent.

The 8U or 15U enclosures shall be factory finished in baked epoxy powder coat Titania or equivalent.

A manual call point shall be mounted on the front of, or adjacent to, the cabinet. The wiring to this call point shall be supervised and shall be assigned to the same zone as the location of the c.i.e. with its device text description identifying it as the c.i.e. manual call point.

Where the ASE is mounted within the enclosure, a dedicated mounting bracket shall be provided such that the ASE indicators can be viewed through the window of the protective door.

2.3 *CONTROLS & INDICATIONS*

An operating panel shall be located behind the indicator viewing window, and shall incorporate a 4-line by 40-character LCD alphanumeric display, (with individual zone indicators for ALARM, FAULT/DISABLED)* and controls for silencing the c.i.e. audible alarm indicator (buzzer/ sounder), silencing alarm devices (occupant warning system), reset and disable. The panel shall be certified to comply with the AS 4428.3 2010 requirements for Fire Brigade Panels.

With no abnormal conditions present on the system, the alphanumeric display shall show the name of the system and the current date and time.

An alarm condition shall cause the information specified in Section 1.9 to be clearly indicated on the alphanumeric display.

A fault condition shall cause a fault action message to be displayed on the LCD to advise the operator of the action to take to deal with the fault condition.

When abnormal conditions exist, the alphanumeric display shall clearly show the nature of the conditions present, and shall provide the means to readily recall the conditions to the display. Other controls and indicators, clearly delineated from those for fire fighter use, shall be provided for other c.i.e. operating functions (e.g. recall and test).

An event history log shall be maintained in the c.i.e. memory. This data shall be able to be recalled on the alphanumeric display on the c.i.e. and on a plug-in terminal and shall contain a time stamped log of not less than the previous 900 events in the system. This log shall be stored within the c.i.e. in non-volatile memory to allow events to be retrieved after complete removal of all power.

** Optional: Include, modify or delete as required.*

2.4 *(DISCRETE VISUAL ZONE INDICATORS)**

In addition to the LCD on the c.i.e., LED visual indicators shall be located on the c.i.e. to show:

Operation of detectors within each fire zone
(Operation of each sprinkler system pressure switch)*
(Operation of each sprinkler system flow switch)*
(Indication of sprinkler pump run and ancillary indicators)*
(Indication of all ancillary device isolations, including door holders, air-conditioning trips and evacuation system outputs)*.

The visual indicators shall provide three (3) levels of indication: steady red visual indicator to indicate Alarm, a flashing yellow visual indicator to indicate Fault, and a steady yellow visual indicator to indicate a Disabled condition.

Individual zone visual indicators shall have an adjacent and associated printed text description. The text label be easily inserted and updated on site and shall allow for up to 30 characters or spaces. The text shall be printed in different colours and different coloured backgrounds to clearly designate the zone type, e.g. general alarm zone, non-brigade calling zones, sprinkler flow switch zones. The colours shall be agreed with the Engineer prior to commissioning.

2.5 *TEST AND DIAGNOSTIC FACILITIES*

Automatic system test facilities shall be incorporated within the c.i.e. to continually test microprocessor operation and memory. In addition, the automatic zone test facilities shall test zone and addressable device inputs at regular intervals, with a means provided in the system programmable parameters to inhibit automatic testing on specific dates. The automatic system test, whilst testing all zones and functions, shall mask the test results so that they will not indicate on the c.i.e., activate signals to the fire monitoring service provider or operate any ancillary equipment such as air-conditioning shut-down and magnetic door holders. Failure of an automatic test shall indicate as a fault condition on the c.i.e, and be logged to the c.i.e. history file.

Manually activated test facilities shall also be provided by the c.i.e. operating panel to test the alarm operation of individual alarm zones, the operation of analogue addressable detectors and other points. The test shall simulate smoke entry into the detector chamber of an analogue addressable smoke detector thereby testing the alarm path from the input of the electronic circuitry within each detector.

Further manual test facilities shall also be provided to test the c.i.e. LCD display and LED indicators, and to display the CRC of the system databases and firmware.

(Testing of flow switches, where fitted, shall cause the operation of a solenoid valve. Failure of the flow switch to operate within 120 seconds shall cause a test fail signal.)*

The c.i.e. shall also provide facilities to activate an automatically-resetting one-person walk test mode, which shall be able to be applied to a single zone or several zones at the same time. When this test is applied, the system shall remain fully functional in all other areas.

The c.i.e. shall provide management and diagnostic tools for analogue addressable devices to simplify system maintenance and servicing. The tools shall include commands to locate the position of a wiring fault on an analogue loop (e.g. short circuit or open circuit), and commands to identify all addressable devices on the addressable detector loop, regardless of whether they are programmed into the c.i.e. or not. The tools shall also enable addressable device faults to be identified, including missing, duplicate, foreign or incorrect device types. The tools shall be activated from the c.i.e. LCD display and keypad without the use of supplementary equipment such as a laptop computer.

** Optional: include, modify or delete as required.*

2.6 *INPUT/OUTPUT CAPABILITIES*

The c.i.e. shall provide a two-wire termination to allow quick and easy connection to an ASE for signalling to main-centre monitoring service providers. In addition, a minimum of three relay contact outputs shall be provided to provide an alternative means of connection to a monitoring service. The function of these relay outputs shall be as follows:

- Alarm relay; 1 set of electrically isolated changeover contacts
- Fault relay (normally energised); 1 set of electrically isolated changeover contacts
- Disabled (Isolate) relay; 1 set of electrically isolated changeover contacts.

In addition, three programmable outputs shall be available at the c.i.e. to serve the following functions:

- External Alarm (ref. 6.1)
- Occupant Warning System (ref. 6.2)
- Ancillary Output for air conditioning shutdown and door holder release.

Supervised serial communications capabilities shall be provided for the operation of remote displays and connection to building management systems. Separate communications facilities shall also be provided for the connection of:

- An on-site programming terminal, laptop computer or optional modem for remote monitoring and/or operation of the c.i.e.
- An optional event printer.

2.7 *REAL TIME CLOCK*

The c.i.e. shall maintain an internal real time clock and calendar which shall be used to time-stamp history events and printer events (if printer fitted). The clock shall maintain time accuracy within ±15 seconds per month, and the time and date shall be able to be adjusted manually from the front panel of the c.i.e. The clock shall automatically make adjustments for local daylight saving (if any).

Where a system contains one or more remote LCD displays, the c.i.e. shall provide facilities to regularly and automatically synchronise the time and date so that the time indicated by each device in the system does not vary by more than 1 minute.

2.8 *SYSTEM PROCESSOR*

The c.i.e. shall contain the system microprocessor and associated electronics to provide system operation to this specification. The system processor shall be supervised by watchdog circuitry furnishing automatic restart after loss of activity, and providing an external relay output signal should processor control not be regained. No manual input shall be required to restart the system processor on power up in the event of a complete power down condition. It shall return to an on-line state as an operating system performing all programmed functions upon power restoration. Non-volatile memory shall be provided for storage of the site specific data, cause and effect logic and operating system as well as the zone and point disable status and the information stored in the history log.

2.9 *FIRE DETECTION AND ALARM SYSTEM POWER SUPPLIES*

Power for the fire detection and alarm system and fire alarm battery charger shall be determined in accordance with AS 1670.1. The power supply shall have sufficient current rating to supply the specified system load (including a 50W occupant warning system)* and maintain the fire detection and alarm system battery in a fully charged condition, meeting the recharge requirements of AS 1670.1.

** Optional: Include, modify or delete as required.*

The power supply requirements shall be met by use of the integral power supply, which shall have a minimum current rating of 5 Amps with any additional power requirements supplied by supplementary power supplies, which shall be available with current ratings up to 10 Amps.

The battery charger function of the power supply shall be automatic in design, adjusting the charge rate to the condition of the batteries in a manner that is suitable for the battery type used. The terminal voltage shall be temperature compensated in accordance with the battery manufacturer's published data.

Sealed electrolyte batteries shall be provided for the fire detection and alarm system, and where possible, these shall be housed within the c.i.e. cabinet. The battery capacity shall be calculated to meet the requirements of AS 1670.1 including the factor specified in that standard for deterioration and aging during the battery life cycle. Battery calculations shall be submitted to justify the battery size chosen.

Automatic battery test facilities shall be included to verify the battery connection and capacity.

2.10 *SITE-SPECIFIC DATA PROGRAMMING*

A comprehensive Microsoft Windows™ compatible programming software package, operating on an industry-standard personal computer shall be used for customisation of site specific data to suit the installation, including cause and effect logic.

The programming software shall be registered and licensed to users that have been trained in its use to ensure that the fire alarm system programming is carried out correctly, and that updates to the programming software can be received.

The following general system facilities shall be able to be programmed:

- System name,
- Text description for each zone,
- Text description for each alarm initiating device (e.g. addressable detectors or points),
- Fault action message,
- Time and dates for automatic test exclusion,
- (Day / Night mode start and stop times for each day of the week with exclusion dates for various holidays)*,
- Daylight saving start and finish dates if dates have changed since those pre-programmed at the time of release of the software package,
- Programming, diagnostics and access level password.

A minimum of three levels of access to the c.i.e. and system programming facilities shall be provided allowing separate access for general c.i.e. operation, system interrogation via a diagnostics terminal, and system programming. All access levels except general c.i.e. operation shall be protected by individually programmable passwords (ref. section 2.11). Access levels shall be as defined AS 7240.2.

Site specific data shall include field programmable output control (cause and effect) logic, allowing the system to control a wide variety of output functions based on zone status, input point status, system conditions, state of up to 1000 dummy variables, up to 1000 timers, using Boolean operators such as NOT, AND, OR, XOR with conditional jumps. The output control logic and input/output facilities shall be capable of supporting air conditioning zone pressurisation fire control logic without the need for separately programmed PLCs or computers.

** Optional: include, modify or delete as required.*

The site specific data file shall be able to be loaded into the c.i.e. with or without field wiring connected. The data shall be easily updated during commissioning on site and as required for subsequent modifications and additions.

The programming software shall provide the facility to connect to a pre-wired, non-programmed system and import the address and device type of all connected analogue addressable devices to enable pre-wired systems to be rapidly programmed.

All physical memory integrated circuits shall be permanently soldered to the c.i.e. circuit board. The use of sockets or PROMs that require a PROM burner is not acceptable.

The c.i.e. processor shall have dual database storage to allow the system to remain operational while a new configuration is downloaded. On successful commissioning both databases shall contain copies of exactly the same configuration. If a memory failure should occur in one database, the c.i.e. shall automatically switch over to run from the duplicate data base, to reduce down time and provide a higher degree of reliability.

The programming software shall incorporate facilities to retrieve the system configuration including cause and effect logic complete with original programming comments from c.i.e. memory if required in cases where the original site specific data file has been lost or corrupted (for example).

2.11 *USER PASSWORDS AND PASSCODES*

The site specific data programming shall allow a site specific user name and password to be set such that only those with knowledge of this can upload and download database changes.

The password shall be made available to the building owner after the defects liability period, in cases where the owner chooses to engage another fire contractor.

Up to 9 additional user names and pass codes shall be provided for technicians to carry out the following:

- Make time and date changes and recall data from the history log remotely
- Perform in depth diagnostic functions remotely
- Access functions assigned to access level 3 via the c.i.e. technical menus.

The c.i.e. shall support a secure temporary password facility permitting site specific data to be retrieved from the c.i.e. in cases where the relevant archived site specific data file and the c.i.e. password have both been lost. A single-use temporary access password (TAP) shall be available from the c.i.e. manufacturer or its representative upon the presentation of an application that is authorised by the building owner or authorised service organisation and is accompanied by a legitimate login recovery code provided by the c.i.e.

2.12 *(ALARM ACKNOWLEDGEMENT FACILITY)**

To enable nuisance alarms in the sole occupancy units to be acknowledged and cleared without transmitting an alarm to the fire monitoring service provider, an alarm acknowledge module (AAM) shall be fitted in each unit in the position shown on the drawings. The function of this module shall be to warn the occupants that an analogue addressable smoke detector within the unit has activated and provide the facilities for operation in accordance with the AAF function described in AS 7240.2.

Each AAM shall provide two time delays independently programmable from the c.i.e. The acknowledge delay shall provide a time not exceeding (60)* seconds for the occupants to acknowledge the detector activation and to silence the local alarm sounder by pressing the Acknowledge push button on the AAM. If this delay should expire without the pushbutton being operated, then an alarm shall be transmitted to the fire monitoring service provider.

** Optional: Include, modify or delete as required.*

If the alarm is acknowledged in time, the smoke clearance delay shall provide a time not exceeding (180)* seconds to allow smoke to clear and the activated detector to restore to normal. If this delay should expire without the detector restoring to normal, an alarm shall be transmitted to the fire monitoring service provider.

The AAM controls shall be wall-mounted on a miniature control panel within each unit. Maximum dimensions of the AAM control panel shall be 118 mm high, 74 mm wide and 50 mm deep.

A single c.i.e. shall support up to 250 AAM sole occupancy units.

2.13 *(ALARM INVESTIGATION FACILITY)**

An Alarm Investigation Facility (AIF), with operation as described in AS 4428.10, shall be provided on specified zones. AIF shall initiate a programmable acknowledge delay of up to 30 seconds between the annunciation of an alarm, and the activation of the alarm devices (occupant warning system) and the signal to fire monitoring service provider.

Following acknowledgment within the acknowledge delay, a programmable investigation delay of up to 300 seconds as agreed with fire authorities, shall provide time to investigate the alarm. If it proves to be a nuisance alarm the alarm shall be able to be reset at the c.i.e. or at a remote reset station as specified on the drawings. If it is a real alarm and the investigation time expires, or another zone enters alarm state or a manual call point is operated, the occupant warning system and the signal to the monitoring service provider shall activate. The c.i.e. shall inhibit the use of alarm disablement during the investigation delay.

The c.i.e. front panel shall include an “attended / unattended” change over facility or alternatively the change over facility may be provided as part of the remote reset station. In the unattended mode the AIF acknowledgment delay shall be bypassed.

2.14 *(RESIDENTIAL MODE LOCAL ALARM)**

Residential apartments specifically shown in this specification shall be protected by a combination of smoke and heat detectors. This requirement may be met by the installation of multi-sensor detectors, providing both heat and smoke detector elements within a common detector enclosure. On detection of smoke, local audible alarms shall provide warning within the affected residential apartment only. On detection of heat, the building occupant warning system and the signal to fire monitoring service provider shall be activated.

Fire detection in common areas, path of travel to exits, and alarms initiated by manual call point operation shall not be subject to the residential mode.

2.15 *(PRINTER)**

Install a printer adjacent to the c.i.e., in the position shown on the drawings. The printer shall produce a printed record of time, date, event type and location of each event occurring on the system. The printer shall be a type supplied and approved for use with the system by the fire detection and alarm system manufacturer. The printer shall be capable of operation under mains fail conditions for the (same length of time as the c.i.e. can operate under mains fail conditions)* [or specify the time].

2.16 *(NETWORKING)**

Due to the size and complexity of the installation and limited space within the Fire Control Room, the system shall be made up of a number of sub fire control panels (SIPS) or data gathering panels (DGPs). These panels shall be located as shown on the drawings and shall communicate with each other and the main fire indicator panel via a communications network.

** Optional: include, modify or delete as required.*

The network shall be compatible with network mimic panels, Fire Fan Control panels (FCPs) and network colour graphics system. A Bridge to the Modbus RTU protocol shall be available to allow connection of information from the network to a BMS. Up to 250 SIPs or DGPS shall be connectable to each network with up to 64 panels per network ring.

The fire control panels and network communication hardware shall be ActivFire listed. The network communications shall be sent via internet protocol (for single mode or multimode fibre cable or direct dedicated Ethernet connections) or I-HUBs (wired in a ring)* for copper connections to ensure maximum speed and minimum communication response times.

Each networked SIP or DGP shall be capable of operating its own pre-programmed functions in the event of failure of any of the other fire indicator panels and/or the network.

The networked panels shall provide the following capabilities as programmable options:

- Annunciation of local alarm conditions on the LCD and FF of remote indicator panels,
- Use of the Master Alarm Status of remote indicator panels to control Master Alarm relays of the local panel,
- Network-wide control of Zone Reset, Isolate and Test functions,
- Network-wide operation of warning systems, external bells and panel sounders,
- Operation of local output control logic functions based on both remote and local panel status.

Diagnostic functions shall be provided at each networked fire indicator panel to enable network communications to be examined, analysed and tested.

2.17 *(REMOTE ACCESS)**

A modem or internet bridge shall be provided at the c.i.e. and shall be connected to the panel programming port. The facility shall provide dial-in or direct on line, password protected access to the fire detection and alarm system diagnostics and programming commands and also provide remote front panel-operation and remote reading of the LCD messages on a remote computer.

2.18 *AS 1851 SERVICE REPORT*

The c.i.e. shall monitor the condition of analogue addressable smoke and carbon monoxide detectors. To satisfy the 5 year sensitivity test specified in AS 1851-2005 or later, it shall be possible to upload a service report from the c.i.e. to a computer for printing. The report shall include the sensitivity setting and the contamination (percent dirty) of all smoke detectors.

2.19 *(REMOTE FAULT SOUNDER SILENCE)**

A remote fault sounder silencing switch shall be provided for the attendant and located as indicated on the drawings. The fault sound silencing shall allow the attendant to silence a fault condition detected by the c.i.e. without the need to open the c.i.e. protective door with the 003 key.

2.20 *AUTOMATIC DETECTOR READDRESSING*

While a purpose-built tool may be used to initially set the loop address of analogue detectors and devices prior to commissioning (refer Section 5.3.4), such a tool shall not be necessary for service replacement of detectors. The c.i.e. shall incorporate facilities to enable multiple detectors to be automatically set to the correct address when replaced during normal servicing, with built-in checks to ensure that the new device that is inserted is the correct

** Optional: Include, modify or delete as required.*

device type.

3. REMOTE FIRE BRIGADE PANEL

In addition to the AS 4428.3 2010-compliant control panel, the system shall support the connection of a remote Fire Brigade Panel to AS 4428.3 2010. The remote unit shall be compact in size, powered from the main control panel, (and shall be flush/ surface mounted in the position shown on the drawings)*. It shall incorporate all of the control and indication fire brigade facilities provided on the main panel, and shall operate separately, but in identical fashion to the fire brigade controls at the main panel.

4. MIMIC PANELS

4.1 *(REMOTE LCD DISPLAY)**

Remote alphanumeric LCD displays incorporating the following features shall be furnished and installed where shown on the drawings.

(The display enclosure shall be low profile, measuring no more than 180 mm in height, 455 mm in width and protruding from the mounting wall no more that 60 mm.)* (The display enclosure shall be flush mounting with built-in surround to cover wall penetrations.)*

Each display shall include an “Acknowledge” control to silence audible alarm/ fault indication (buzzer / c.i.e. alarm sounder) and tag any displayed alarm event as having been viewed by the operator, a “Reset” control to reset zones in alarm if permitted by on-site programming of the c.i.e., and a scroll facility to view all alarms, one at a time. The display shall also provide the facility to scroll through the display event history to provide information on current and historical zone and point alarm/ fault conditions.

Each display shall incorporate on-site programmable facilities to enable the display to annunciate all alarms in the system, or alarms from selected zones only. Each remote display shall be programmed to display the zones noted on the drawings. The programming facilities shall provide for various levels of operation of the display on a zone-by-zone basis, ranging from reset of all zones, to automatic display with no operator intervention except scrolling.

Power for the display shall be wired from the c.i.e. and the display shall be equipped with all necessary equipment to communicate with the c.i.e.

The wiring between the remote display and the c.i.e. shall be supervised such that loss of communication with the c.i.e. shall indicate a system fault condition at the c.i.e. and at the remote display. Loss of power to the remote display shall indicate as a fault condition at the c.i.e.

4.2 *(REMOTE MIMIC)**

Graphic-style remote mimic panels incorporating the following features shall be furnished and installed where shown on the drawings.

An engraved, screened or anodised graphic layout of the annunciated area noted on the drawings shall be clearly shown on the panel. The Engineer shall approve the graphic layout, method of printing and its colour and the location of the visual indicators before fabrication.

All necessary equipment shall be included in the mimic in order to communicate with the main fire indicator. The wiring between the mimic and the c.i.e. shall be supervised such that loss of communication with the c.i.e. shall indicate a system fault condition at the c.i.e. and at

** Optional: include, modify or delete as required.*

the remote mimic. (Loss of power to the remote mimic shall also indicate as a fault condition at the c.i.e.)*

(The mimic shall incorporate power supply and batteries. The power supply shall comply with the requirements of AS 1670.1)*

5. ANALOGUE ADDRESSABLE DEVICES

5.1 *GENERAL*

Analogue addressable fire detectors shall be furnished and installed where indicated on the specification drawings. The drawings shall also designate the type of detector to be utilised in each position. In order to speed service and minimise disruption to the occupants during service visits, all addressable detectors shall be two-part devices with a separate base and plug-in detector head. Detectors shall be of a low profile design, protruding no more than 60 mm from the installation surface when installed in the base (except where sounder bases are specified)*. All detector heads shall be capable of being locked to the base to prevent tampering or unauthorized removal.

The detectors shall operate as sensors of fire related phenomena and the level of this phenomena measured by the sensor shall be communicated to the c.i.e. as analogue information.

Self-contained fire detectors that make the alarm decision locally and transmit status only shall not be acceptable. The status of each detector shall be determined by field-upgradable c.i.e. firmware, and shall include specific algorithms to provide improved detection reliability and enhanced environmental performance (ref. 5.3.2). Self test facilities or sensing element monitoring shall be incorporated into each detector so that they can be remotely tested or verified.

The sensing chambers within the detectors shall be protected against the ingress of dust and insects to critical parts of the detector assembly. All detector heads shall be enclosed at the back to prevent ingress of air producing a stack effect and to protect against ingress of water.

Each detector shall incorporate an integral alarm indicator, which shall be turned on when the c.i.e. determines that the analogue values returned from the detector represent an alarm condition. The indicator shall be positioned so that the indication is visible over a wide angle from below a ceiling-mounted device. The indication shall be able to be extended to a remote position by suitable wiring to the detector base. When the indicator is not displaying an alarm condition, the indicator shall be off.

A technician-activated diagnostic function at the c.i.e. shall be provided to enable the detector indicator to flash to indicate the operation of communications between the detector and the c.i.e. and assist in determining the location of a detector with a specific address.

5.2 *CONNECTION OF ANALOGUE ADDRESSABLE DEVICES*

Analogue addressable devices shall communicate with the c.i.e. over a two-wire circuit configured as an “addressable loop”. Each addressable loop shall be capable of supporting up to 250 addressable devices (detectors or input/ output devices), with each loop capable of supplying up to 1A of loop current to power the devices. The loops shall be installed with a minimum of 10% spare capacity to allow for future extensions. Alternatively the detector wiring may be connected as separate detection lines, each isolated so that a short circuit on one line will not affect the operation of any other line as permitted by section 1.4. Each line shall support a maximum of 40 detectors (as limited by AS 1670.1). A software package, as provided by the system supplier, shall be used to verify that each loop, and the total system

** Optional: Include, modify or delete as required.*

design complies with the design criteria of the system manufacturer and the relevant system design requirements AS 1670.1.

5.3 *ANALOGUE ADDRESSABLE DETECTORS*

5.3.1 Detector types

Analogue addressable multi-sensor detectors shall normally incorporate dual internal sensors, consisting of either a photoelectric (scattered light) sensor and a heat sensor, or a carbon monoxide fire sensor and a heat sensor. The best detection mode for a wide variety of situations shall be able to be selected in the site specific data without having to physically change the detector.

Detection modes shall be selectable on a device-by-device basis and shall include smoke/ carbon monoxide detection only, heat enhanced smoke/ carbon monoxide detection only, smoke/ carbon monoxide plus heat detection, heat enhanced smoke/ carbon monoxide plus heat detection or heat detection only.

The supplier of smoke detectors shall have facilities in Australia for sensitivity and calibration checking and refurbishment as appropriate. IS THIS STILL TRUE?

Although the CO Photo and heat multi-sensor may be programmable to CO only, this shall not be used in this project. CO detection shall always be used in combination with Photo and or heat detection to detect a broad spectrum of fires.

Carbon monoxide detectors shall have 10 year service life in a normal environment. However in accordance with AS 1851 they shall undergo a sensitivity calibration check after 5 years of in service. Tenders shall provide details of the procedure for having the calibration check carried out by the required Australian-based facilities and the approximate associated cost.

Although detectors incorporating dual internal sensors shall generally be installed, detectors incorporating a heat or photoelectric smoke sensor only may be installed as shown on the drawing, subject to approval, where dual sensor devices can be shown to offer no overall advantage.

Generally where ionisation smoke detectors have been used in the past to more rapidly detect flaming fires, in this project combined photoelectric smoke and heat detectors shall be required.

Each heat detector shall be programmable to be able to function as combined rate of rise and fixed temperature or fixed temperature only, and shall be certified to comply with the relevant standards by CSIRO or appropriate approval authority as A2R, BS, CR, CS. The type proposed to be used in each location shall be specified by the tenderer.

(The analogue addressable loop shall support a multi-point aspirated very high sensitivity smoke detector that can monitor up to 250m^2.)*

(The analogue addressable loop shall support both single and triple waveband flame detectors.)*

Analogue addressable detector types provided shall be the same as, or equivalent to those listed below:

Photoelectric, Carbon monoxide and heat multisensor	850PC
Photoelectric and heat multisensor	850PH
Heat only	850H
Photoelectric only	850P
Single waveband flame detector	801F
Triple waveband flame detector	FV411F

** Optional: include, modify or delete as required.*

IECEx certified intrinsically safe analogue addressable detectors; similar to those listed above shall be available for installation in hazardous areas.

5.3.2 Detection Algorithms

Detection algorithms shall be incorporated into the system firmware to determine the Normal, Pre-alarm, Alarm, Fault and Dirty conditions for each analogue detector and to compensate for ambient conditions which may affect detector operation.

The algorithms shall be certified by CSIRO or other appropriate approval authority to meet the requirements of the relevant standard and shall evaluate the smoke, carbon monoxide and heat values received and perform the following functions:

For photoelectric smoke detection at least two types of algorithms shall be selectable:

- One algorithm shall include short term transient rejection and retardation of a rapid rate of rise in obscuration, characteristic of deceptive phenomena while introducing no delay to normal rate of smoke rise characteristic of real fires.
- Another algorithm shall be based on a fuzzy-logic “expert system” decision process designed to differentiate between the smoke and temperature patterns of real fires and those of typical causes of nuisance alarms. Three sensitivity settings shall be provided. These shall reflect the probability of the input stimuli representing a genuine fire, based on computation by the expert system, rather than simplistic detection of the smoke and/or heat levels present. An optional pre-alarm shall provide early warning of a potential alarm.

The Fire Contractor shall select the algorithm to be used for each detector according to the fire risk and environmental requirements of the location as approved by the Engineer, Fire Service or other approval authority having jurisdiction.

Where combined photoelectric smoke and heat detectors are specified for specific risks it shall be possible to select a heat enhancement mode whereby the smoke response is enhanced in the presence of a rate of rise in temperature to provide a faster response to flaming fires.

5.3.3 Detector Sensitivity

All standard detectors shall be Listed by ActivFire or appropriate approval authority to certify compliance with the relevant standards as applicable and referenced in AS 1670.1, and shall be set at their certified compliant sensitivity taking into account the environmental conditions at the location and the performance required (Ref. AS 1670.1 Appendix B).

The sensitivity settings of analogue addressable detectors shall be viewable at the panel in the measuring units appropriate to the phenomena measured by the detector and the detection algorithm used, e.g. precent obscuration per metre for photoelectric detectors, parts per million (ppm) for CO detectors and degrees Celsius for the fixed temperature setting of heat detectors. The photoelectric detectors shall have an Extended Service Life feature to ensure the alarm threshold required of the detector is maintained as the device ages. When the Extended Service Life feature can no longer maintain the alarm threshold required the detector shall flag a fault at the CIE.

5.3.4 Detector Addressing

Detectors shall use the addresses indicated on the drawings supplied. Address assignments for each standard detector shall be able to be programmed either on-line via the addressable loop, set via an infrared link to the programming tool or pre-programmed off-line using an auto address sequencing programming tool. Detector addresses shall not change from that

** Optional: Include, modify or delete as required.*

specified on the drawings even if additional addressable devices are added. Additional addressable devices shall be able to be added between installed devices without any changes being necessary to the addresses of previously installed devices. To prevent detector heads being inserted into the wrong base, all detector bases shall display the detector address. The address flag shall be clearly visible from floor level whether the detector is fitted or not.

5.3.5 Detector Colours

It shall be possible to change the detector colour by removing the clip on cover and base and replacing it with a coloured cover and base. The coloured covers shall not be painted but must be injection moulded as part of the manufacturing process so the detector cover or base will not chip or scratch. The covers and bases shall be available in any pantone colour to match the interior décor as required.

5.3.6 Detector Data Storage

A portable handheld device shall be capable of interrogating each detector via an infrared link or when a detector is plugged in and displaying the following minimum information:

- Current temperature, smoke level or carbon monoxide level according to detector type
- Detector type, serial number, and date of manufacture
- Detector current status (temperature, smoke level, dirtiness).
- Detector address.

The handheld device shall also allow the following tests to be carried out as a minimum:

- Instruct the detector to go into alarm condition
- Test remote indicator output
- Test detector sounder/relay base control output
- Test the detector integral indicator.
  Verify/change the detector's address
- Set the detector to blink on poll (or not)
- Verify *MX* loop voltage (useful fault-finding diagnostic feature).

5.4 *ANALOGUE ADDRESSABLE DETECTOR BASES*

A range of analogue addressable detector bases shall be available to support addressable loop continuity for detectors with inbuilt isolators, remote indicators, relay contact outputs, and integral sounders in addition to the plug-in detector. Detector bases shall be designed to ensure loop integrity is maintained if a detector head is removed. Each detector base shall not occupy any address on the analogue addressable loop; however bases for audio visual devices that may be remotely controlled to produce different signals may occupy an address.

Relay bases shall be installed as necessary to provide control output contacts for external equipment.

(Sounder bases shall be installed within the sole occupancy units to provide local audible warning complying with the ISO 8201 T3 temporal pattern. The sounder bases shall be loop-powered, and the addressable loop shall be capable of supporting up to 250 of these devices. The volume of the audible signal from each device shall be adjustable at each base.)*

** Optional: include, modify or delete as required.*

5.5 *SHORT CIRCUIT ISOLATOR DEVICES*

Short circuit isolators shall be built into each photoelectric, heat or combined photoelectric/heat detector to ensure no single short will affect more than 1 detector. Short circuit isolator devices shall be built into the addressable modules or be available as a separate device to ensure no single short will affect more than 40 modules. The short circuit isolators shall not occupy an address on the addressable loop.

The loop termination facilities at the control panel shall incorporate built-in short circuit isolators to limit the short circuit current sourced from the control panel such that separate short circuit isolators shall be unnecessary.

5.6 *ANALOGUE ADDRESSABLE MANUAL CALL POINTS*

Analogue addressable manual call points shall be furnished and installed where indicated on the drawings. The manual call points shall incorporate in built short circuit isolators, be analogue addressable, compatible with other devices on the same analogue addressable loop, and shall meet the requirements of AS 1603.5, EN 54 part 11 or AS/ISO 7240.11 of a type A direct operation type.

A visual indicator on the front face of the manual call point shall provide positive indication of operation and shall also be able to be used to confirm communication with the c.i.e. as for the integral indicator on the analogue detectors (ref. 5.1).

An IECEx certified intrinsically safe analogue addressable manual call point shall be available for installation in hazardous areas.

5.7 *(COLLECTIVE (CONVENTIONAL) DETECTOR INTERFACE MODULE)**

Collective detector interface modules shall be wired to the addressable loop where designated on the drawings. Each detector interface module shall be capable of monitoring two independent collective circuits and signal to the c.i.e. the status of the (existing)* collective detectors located in the area. Each module shall be capable of monitoring alarm, open-circuit fault, short-circuit fault and power supply fault status of a circuit interconnecting at least 20 detectors and shall provide integral red visual indication when in the alarm state.

The detector interface module shall derive its operating power from the addressable loop, or optionally be able to be powered from a supervised 24 V d.c. power supply wired to meet the requirements of AS 1670.1. An open or short circuit of the 24 V d.c. supply shall not disable the operation of more than 40 detectors.

5.8 *(ADDRESSABLE RELAY OUTPUT MODULES)**

Addressable relay output module(s) shall be installed as necessary to provide control output contacts for external equipment. A single addressable relay output module and a Quad relay module shall be available to suit the site application. Each module shall provide a voltage free changeover relay contact operated by command via the addressable loop from the c.i.e. The contacts shall be rated at a minimum of 1 Amp at 30 V d.c for single relays or 2A Amp at 30 V d.c for the quad modules. Each relay module shall provide a LED indication that the relay has operated. The quad module contacts shall alert users to “output stuck” conditions. Each module shall only take up 1 address on the loop with sub addresses used to control each relay on the quad module as required.

Both relay modules shall derive their operating power from the addressable loop.

** Optional: Include, modify or delete as required.*

5.9 *(ADDRESSABLE SUPERVISED OUTPUT MODULES)**

Addressable relay output module(s) shall be provided where necessary to provide supervision of output wiring to remote devices to meet the requirements of this specification. A single and quad monitored output module shall be available, each output rated at 2A and capable of driving a remote beacon or a warning system circuit. The outputs shall be powered from a supervised 24 V d.c. power supply, wired to meet the requirements of AS 1670.1. Each module shall only take up 1 address on the loop with sub addresses used to control each output on the quad module as required.

The modules shall be capable of supervising the wiring to the load for open or short-circuit faults and the power supply for failure. It shall transmit the resulting fault signal back to the c.i.e.

The modules shall provide an LED visual indication that the output has been actuated.

5.10 *(ADDRESSABLE CONTACT MONITORING MODULE)**

Addressable contact monitoring module(s) shall be provided where designated on the drawings to provide monitoring of the status of switched input signals. The module shall be capable of monitoring either normally open or normally closed contacts, and shall derive its power directly from the addressable loop.

5.11 *(ADDRESSABLE MULTI INPUT OUTPUT MODULES)*

Addressable multi input / output modules shall be provided where necessary to interface multiple circuits at one location. A single input single output, three input two output and quad input / output addressable modules shall be available to suit site applications. Each module shall provide supervised inputs which can monitor normally open or normally closed contacts and voltage free changeover relay outputs operated by command via the addressable loop from the c.i.e. The output contacts shall be rated at a minimum of 2A Amp at 30 V d.c. The quad module contacts shall also alert users to “output stuck” conditions. Each module shall only take up 1 address on the loop with sub addresses used to reference each input or control each output relay.

Both input / output modules shall derive their operating power from the addressable loop.

5.12 *(LED BEACON)**

Addressable LED flashing beacons shall be installed for residential alert in nominated areas where designated on the drawings. The beacons shall derive their power directly from the addressable loop.

6. ANCILLARY DEVICES

6.1 *(EXTERNAL ALARM DEVICE)*

If the fire detection and alarm system is connected to a monitoring service provider, the contractor shall install an external red Fire Alarm strobe near the designated entry point to the location of the c.i.e. in accordance with AS 1670.1.

6.2 *(OCCUPANT WARNING SYSTEM)**

The contractor shall provide an occupant warning system in accordance with the option below or a combination of the options as indicated on the drawings.

[USE TEXT BELOW FOR OCCUPANT WARNING SYSTEM OPTION 1]

** Optional: include, modify or delete as required.*

The contractor shall supply, install and wire an occupant warning system to meet the requirements AS 1670.1 using a tone generator and amplifier capable of producing the ISO 8201 T3 temporal pattern. Speakers shall be installed in the positions shown on the drawings. The wiring to the speakers shall operate at industry standard 100 volt line levels and shall be supervised for open and short circuit fault conditions. A fault condition on the speaker wiring shall cause the c.i.e. to register a fault condition.

The verbal evacuate message shall be interspersed in the 1.5 second gap of the T3 pattern.

The power output of the tone generator system shall be able to be readily increased by adding further tone generator modules to accommodate future expansion in system size.

(The occupant warning system shall provide emergency public address throughout the building by means of a paging microphone installed within or near the c.i.e. The emergency public address system shall be activated when the “push to talk” switch on the paging microphone is activated and shall broadcast speech from the microphone throughout the building, while the switch remains activated. Release of the “push to talk” switch shall cause the occupant warning system to revert to its previous state.)*

[USE TEXT BELOW FOR OCCUPANT WARNING SYSTEM OPTION 2]

The contractor shall supply, install and wire an occupant warning system to meet the requirements of AS 1670.1 using sounder detector bases capable of producing the ISO 8201 T3 temporal pattern in the designated areas shown on the drawings.

The total number of loop powered sounders on this project shall be up to (250)* [specify quantity if less], per addressable loop.

Where zoned activation of the sounder bases is specified, the whole addressable loop shall be protected to WS52W of AS 3103.

6.3 *(EWIS INTERFACE)**

The contractor shall provide an interface for the connection of the fire detection and alarm system to a sound system and intercom system for emergency purposes (or EWIS) in accordance with AS 1670.4 and the separate specification [insert specification number]. The interface shall be supervised for any fault that will affect the signalling of zoned alarms to the EWIS. The interface shall also receive at least one common fault signal from the EWIS.

6.4 *(MAGNETIC DOOR HOLD-OPEN DEVICES)**

The contractor shall supply and install all necessary power supplies, ancillary control circuits, magnetic hold-open devices and release switches to automatically release all fire doors as marked on the drawings.

Flush and surface door holder mounts shall be available and flush units shall be installed where the wall construction permits. The door holder magnet shall include a release switch built into the face plate of the unit.

6.5 *(FLOW SWITCHES)**

The contractor shall connect the fire detection and alarm system to sprinkler flow switches and flow switch test valves where shown on the drawings. The sprinkler flow switch circuits shall be supervised and all flow switches shall be able to be individually identified at the c.i.e. (using addressable device input units if necessary).

(Each sprinkler flow switch shall have an associated control relay output from the fire detection and alarm system. The control relay output shall be connected to an electrically operated, 24 volt flow switch test valve adjacent to each flow switch to facilitate remote flow switch testing. The 24 volt supply for operating the flow switch test valve shall not be taken

** Optional: Include, modify or delete as required.*

from the analogue addressable loop or line, but shall be wired separately from the c.i.e. or from a separate, monitored supply.)*

6.6 *(SPRINKLER ANTI-TAMPER SWITCHES)**

The contractor shall connect the fire detection and alarm system to approved sprinkler anti-tamper switches which shall be able to be individually identified at the c.i.e. The anti-tamper switches shall be supplied by the sprinkler contractor, and shall be located where shown on the drawings.

6.7 *(BMCS INTERFACE)**

The contractor shall provide a high level data interface linking the fire detection and alarm system with the building management and control system in compliance with AS 1670.1. The data transferred to the BMCS shall indicate the status (alarm, fault, and disabled) of every zone of the fire detection and alarm system. The interface shall use the industry standard MODBUS RTU protocol.

6.8 *(TELEPAGER INTERFACE)**

The contractor shall provide a communications interface to enable the fire detection and alarm system to send event messages to text-message (SMS) capable mobile phones or to alphanumeric pagers. It shall support up to 60 agents (mobile/cell phone or pager numbers) and shall be site programmable to route event messages to any agent depending on the event source (e.g. zone, point, system), event type (e.g. pre-alarm, alarm, fault, isolate) and zone range. The actual message routing shall be decided in conjunction with the Engineer before final commissioning. The protocol to the alphanumeric paging system shall be PET/TAP.

** Optional: include, modify or delete as required.*

7. (AS1668 AND ANCIALLARY CONTROLS)*

7.1 *SYSTEM DESCRIPTION*

The contractor shall provide automatic smoke detectors and control / indicating device circuits to achieve AS1668 fire and smoke or ancillary control and indication

The system shall interface to all air handling units or ancillary systems as specified in Appendix A at the end of this specification.

7.2 *INTERFACE WIRING/SUPERVISION*

Cabling for the fire fan controls shall be installed by the Fire Contractor and integrated into the fire alarm communications network. The fire fan control cabling shall be fire resistant and mechanically protected to AS 3013 classification WS51W and upgraded according to the hazard.

Loss of any conductor within the system, including all interface wiring between panel output terminals and Mechanical Services Board (MSB) terminals shall cause a fault signal to be generated for each fan affected.

It shall be the responsibility of the Fire Contractor to run cables from the MSB terminals to the input/output terminals of the fire detection and alarm system.

7.3 *(FIRE FAN CONTROL PANEL (FFCP))**

(The Fire Fan Control Panel shall be constructed to comply with 2.2 and with the requirements for fire and smoke ventilation and air-conditioning control panels that are applicable to this contract.)*

The fire fan manual controls shall comply with AS4428.7-1999 and be fitted to the FFCP via 19” rack 3U modules, up to 12 control/display boards shall be fitted per 3U module with a total capacity of 126 per CIE CPU. The FFCP shall be designed to ensure AS1670.1:2004 Section 3.9.1, control and indication mounting height requirements are met. Each control / display board shall comprise of 3 x push button contorts (e.g. on, auto, off) with LED indications and 4 x status indications (run, stop, fault, alarm). The function of each control and indication shall be clearly labelled and the operation shall be as follows: [specify functions]. A common FFIP Fire Mode indicator and controls for Lamp Test and Fire Mode Reset shall be provided.)*

(The control / display modules shall be capable of being duplicated and operated from multiple locations to provide site redundancy or backup)*.

The control / display modules shall be capable of being networked to remote DGPs or SIPs to enable connecting to the mechanical service boards or other systems via network cabling as opposed to wiring each individual connection back into the main FFCP.

7.4 *(MIMIC DIAGRAM)**

Position the controls and indicators appropriate for each Air Handling Plant on a photo-anodised facia to form a mimic diagram of the air conditioning system. This diagram should be coloured in accordance with (New South Wales)* Fire Brigade requirements for Tactical Fire Plans to show air flow paths for all air conditioning systems involved with Fire Fan Controls. The mimic facia shall comply with standard practice for Fire Fan Control Panel layout.

** Optional: Include, modify or delete as required.*

7.5 *AIR FLOW SWITCHES*

Air Flow switches shall be installed downstream of each Controlled Fan to indicate fan status. Air flow switches shall be installed by the Fire Services Contractor and wired back to the Motor Control Centre in cable fire rated to classification WS51W of AS 3013. Air Flow Switches shall be ("JOHNSON" Controls, Type P32 Series or equivalent)* or [specify details of air flow switches].

7.6 *ANCILLARY CONTORLS*

The ancillary controls shall fitted to the CIE via 19" rack 3U modules, up to 12 control/display boards shall be fitted per 3U module with a total capacity of 126 per CIE CPU. The controls shall be positioned to ensure they meet AS1670.1:2004 Section 3.9.1 control and indication mounting height requirements. Each control / display board shall comprise of 3 x push button contorts (e.g. on, auto, off) with Led indications and 4 x status indications (run, stop, fault, alarm). The function of each control and indication shall be clearly labelled and the operation shall be as follows: [specify functions IE solenoid test or pump controls].

(The control / display modules shall be capable of being duplicated and operated from multiple locations to provide site redundancy or backup)*.

(The control / display modules shall be capable of being networked to remote DGPs or SIPs to enable connecting to the mechanical service boards or other systems via network cabling as opposed to wiring each individual connection back into the CIE)*.

** Optional: include, modify or delete as required.*

7.7 *MAINS POWER*

Mains wiring shall be wired in accordance with AS 3000 and terminated in a fixed, 10 A socket-outlet, with dual sockets within the c.i.e.

7.8 *ADDRESSABLE LOOP AND LINES*

The addressable loop/lines shall be wired in red sheathed cable according to AS 1670.1.

Intrinsically safe wire in hazardous areas shall be blue with red markers, or red with blue marker or some other colour with both blue and red markers in accordance with the relevant standards.

All lines (non-loop wired) shall be connected to the addressable loop with short circuit isolators such that not more than 40 devices can be affected by a short circuit.

Sprinkler alarms wiring shall be protected to a minimum of AS 3103 classification WS51W. Where the sprinkler alarm is connected to the monitoring service provider via the addressable loop external to the fire alarm cabinet, the whole of the addressable loop shall be protected to a minimum of WS51W and WS52W in area accessible in accordance with the fire ratings appendix in AS 1670.1.

7.9 *EXTERNAL ALARM (FIRE STROBE)*

The external alarm circuit shall connect to the external fire alarm strobe only and shall not be used as part of the occupant warning system. The wiring shall be supervised for open and short circuit faults.

7.10 *MONITORING SERVICE (FIRE DISPATCH CENTRE)*

The alarm signalling equipment (ASE) used to connect the c.i.e. to the monitoring service shall provide for this connection to be 2-wire only. This wiring shall be supervised by the ASE for open and short circuit faults, the occurrence of which shall cause a fault signal to be sent to the monitoring service provider as required by AS 4428.6.

8. COMMISSIONING

8.1 *COMMISSIONING TESTS*

The entire installation shall be tested in accordance with AS 1670.1 and witnessed by the Engineer. Where the c.i.e. interfaces to mechanical ventilation services and/or sound systems for emergency purposes, representatives for these systems shall be present to verify that all interfaces to these systems function according to the specifications for the fire detection and alarm system and the interfaced systems.

The acceptance inspector shall be notified before the start of the required tests. All items found at variance with the drawings or this specification during testing or inspection by the acceptance inspector shall be corrected. Test reports shall be delivered to the acceptance inspector when completed. All test equipment, instruments, tools and labour required to conduct the system tests shall be made available by the installing contractor.

In addition to the testing specified to be performed by the installing contractor, the installation shall be subject to test by the acceptance inspector. All fire alarm circuits shall be tested for continuity, earth faults and short circuits.

** Optional: Include, modify or delete as required.*

8.2 *ACCEPTANCE TESTING*

A written acceptance test procedure (ATP) for testing the fire detection and alarm system components and installation to this specification will be supplied by the Engineer. The contractor shall be responsible for the performance of the acceptance test, demonstrating the function of the system and verifying the correct operation of all system components, circuits and programming. A complete listing of all device labels for alphanumeric displays and logging printers shall be prepared by the installing contractor prior to the ATP. The acceptance inspector shall use the system record drawings in combination with the specification during the testing procedure to verify operation as programmed.

In conducting the ATP, the acceptance inspector shall request demonstration of any or all input and output functions. The tests shall include but not be limited to the items listed below.

System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:

- Open and shorted analogue signalling circuit;
- (Open and shorted communications loops/circuit to other systems;)*
- (Open and shorted remote display unit communications circuit;)*
- Open and shorted zone circuits;
- (Removal of detectors on collective circuit modules;)*
- Mains Power failure at the c.i.e;
- Removal of analogue detectors or addressable devices.

System indications shall be demonstrated as follows:

- Correct message display for each alarm input at the c.i.e. and each remote display;
- Correct zone indication for each alarm input at each display;
- If printer fitted, correct printer logging for all system activity.

System off-site reporting functions shall be demonstrated as follows:

- Correct signal transmitted for each alarm input;
- Fault signals received when alarm zone circuits are disconnected.

Battery and battery charger capabilities shall be demonstrated as follows:

- Mains power shall be disconnected for the relevant period of time specified in AS 1670.1. At the end of that period, an alarm condition shall be created and the system shall perform as specified.

In the event of system failure to perform as specified during the acceptance test procedure, at the discretion of the acceptance inspector, the test shall be terminated. The installing contractor shall re-test the system, correcting all deficiencies and providing test documentation to the acceptance inspector. The acceptance inspector may elect to require the complete ATP to be performed again if, in his or her opinion, modifications to the system hardware or software warrant complete re-testing.

** Optional: include, modify or delete as required.*

8.3 *DOCUMENTATION*

System documentation shall be furnished to the owner and shall include, but not be limited to the following:

- System as-built drawings and wiring details including one set of reproducible masters;
- System operation, installation and maintenance manuals;
- Written documentation and two backup disks of all site specific data including the cause and effect logic as programmed;
- Documentation of system voltage, current and resistance readings taken during the installation, testing and ATP phases of the system installation.

8.4 *SERVICES*

The contractor shall warrant the entire system against mechanical and electrical defects for the period described in the contract general conditions. This period shall begin upon completed certification and test of the system or upon first beneficial use of the system, whichever is earlier. The fire detection and alarm system subcontractor or manufacturer shall offer for the owner's consideration at the time of system submittal a priced inspection, maintenance, testing and repair contract in full compliance with the requirements of AS 1851 (Weekly testing not required.)*

The services offered under this contract shall be performed at no charge during the first year after system acceptance and the owner shall have the option of renewing for single or multiple years upon completion of the warranty period.

The contractor performing the contract services shall be qualified and accredited to maintain ongoing certification of the completed system to the relevant authority having jurisdiction.

** Optional: Include, modify or delete as required.*

Appendix A: Air Conditioning System Controls and Functions

** Optional: include, modify or delete as required.*

** Optional: Include, modify or delete as required.*