Fire detection and alarm

Aesthetic

Install all cabling and cable containment neatly and unobtrusively, meeting the highest electrical industry installation standards. Neatly lay and securely fix cables. Cables and cable containment shall follow horizontal / vertical building lines. It is not permissible to use site fabricated containment system bends, tees, etc.

Functional requirements

The University campus-wide Fire Alarm strategy is for all new Fire Alarm systems to be Analogue Addressable Vigilon manufactured by Gent and utilising S Quad technology.

Full layout drawings shall be produced to be incorporated within the graphics of Drax alarm monitoring system see section 4.24.

A full cause and effect matrix must be submitted to Estates before commencement of installation.

Standards

It is the University policy to install Fire Alarms systems to category L1. Only in certain circumstances will the University relax this policy and only after consultation with the University Fire Officer.

The design, installation, commission and acceptance of fire detection and alarm systems shall be in accordance with all relevant British Standards and Codes of Practice.

The design and manufacturer of fire detection and alarm system equipment shall comply with relevant British Standards and carry LPCB approval.

Designers, installers and commissioning organisations shall demonstrate their competence by third party certification.

System Design

Prior to starting design work, the system designer shall consult with the University of Bath project management team, University of Bath fire safety advisor, Building Control and other relevant parties. The consultation shall establish:

- The scope of work
- Category of system
- Suitability of existing system and equipment
- Requirements for compliance with the requirements of the Equality Act
- Measures required to limit false alarms
- Requirements for pre-alarm delay periods
- Requirements for staged evacuation alarm
- Requirements for alarm sounder tone frequency
- Requirements for interfacing with other fire safety systems
- Requirements for interfacing with mechanical services systems
- Requirements for interfacing with laboratory extract systems
- Requirements for the provision of fire door hold-open devices
- Requirements for override controls
- Requirements for remote fire signal communication and method of communication
- Cause and effect strategy
- Other relevant requirements

Where the project requires alteration to an existing system, the system designer shall undertake an assessment of the existing building wide fire detection and alarm system and equipment with reference to the existing Building Fire Risk Assessment.

Following the consultation meeting, the system designer shall develop a Design Requirements Document. This document will set the specification requirements for the fire detection and alarm system design.

Where an existing system requiring alteration does not meet the requirements of the Design Requirements Document, the project shall allow for updating or replacing the entire system.

The design of all new systems shall make allowance for future system expansion, with a minimum 25% spare loop load capacity based on the system design load.

Integrated within the Gent Vigilon Fire Panel is an interface isolation button U1, this button provides isolation to selected interfaces controlling M&E services.

Careful consideration shall be undertaken on what building systems are connected to this button and consultation must take place between Estates, University Fire Officer and the Building Architect to establish that only essential services are isolated via the U1 button. For example, gas isolation valves are deemed essential, however door closures are not deemed essential.

**System Selection - Guidance Notes**

In systems where the total number of devices will not exceed approximately 20, an acceptable choice will be a system comprising conventional open-circuit monitored control and indicating equipment.

Other systems shall utilise control and indicating equipment with addressable devices.
Loop device numbers not to exceed 99.

Safe addressing mode not to be used.

All detectors to be duel chamber types – single chamber will not be permitted.

The use of radio-linked and aspirating systems requires special consideration. Where the System Design Requirement document identifies the need for such a system, approval to progress with the design is necessary using the 'Deviating from the PPR' procedure.

Specific Design Requirements

Cabling

Fire detection and alarm system wiring shall meet these requirements;

- On all new installations fire alarm wiring will be in 2 core 1.5mm² MICV/LSF cable (red) with earth tag screw-on cold pot seals only.
- No other type of cable or core numbers will be permitted due to surface wiring and clipping constraints imposed in this specification.
- Should Firetuf® or FP gold® be considered for new build projects only, this must be with prior written approval from the University’s responsible person for the electrical and fire alarm systems. This type of cable must then be FULLY contained throughout its entire length regardless of whether it is run in voids, ceiling spaces, walls, etc. Where running is floor voids, this containment will be of the fully enclosed type to avoid mechanical damage.
- Firetuf®/FP gold® cables will be fully clipped on any open containment in voids/ceilings, etc and tie-wrappping as means of securing will not be permitted.
- No surface cabling will be permitted unless contained in conduit or trunking.
- All connections must be via stuffing gland boxes and cable ends must not be left “flying” in boxes or panels.
- Cables shall be single pair only - it is not acceptable to use multi-pair cables under any circumstances.
- Segregate from mains cables
- Mechanically protected by means of steel conduit or trunking where cables pass through floors, flushed in walls, or other high-risk applications.
- All wiring above ceilings will be fully clipped onto soffits, walls or slab. Wiring on tray or basket will be permitted if cabling is clipped with proprietary clips.
- Tie wraps will not be permitted.
- All drops to Manual call points, sounders, beacons, etc may be enclosed in red MK mini-trunking provided pot seal boxes are used for final connections.
- For network cable requirements, refer to manufacturers specification.

Control and Indicating Equipment
Addressable control and indicating equipment shall:

- Non addressable to be used wherever possible for small properties less than three stories high and will be of a range that is compatible with the use of open protocol apollo-type sounders, MCP’s and detectors.
- All fire alarm panels must have a lockable front cover to prevent access by unauthorised users.
- Panels must be fully compliant to both BS5839 and BS EN54
- Addressable systems to be 2 wire loop controlled devices only with no spurs and tees permitted as manufactured by TBC type system.
- All devices to be fully analogue addressable with integral short circuit and open circuit isolation individually for each and every device.
- All interfaces will be fully loop compatible.
- All devices shall be fully analogue addressable including sirens, sounders, MCP’s, strobes, voice annunciation devices, etc., and shall use the same loop wiring.
- All detectors will be of type suitable for the panel and will incorporate at least three separate channels for Heat, Smoke and Co2.
- No single channel detectors to be used.
- Have IP gateway capability compatible with the University of Bath Data Network.
- Located at the main entrance to a building, in a position that is accessible at all times.

**Automatic detectors**

Select automatic detectors suited to the space, to satisfy the System Design Requirements and to limit false alarms.

In areas identified as having a high risk for false alarms, provide detectors that enhance the performance of the system by using multi-sensors with the following features:

- The optical sensing element shall have two separate optical detection angles with two infrared transmitters.
- Heat sensing elements will be by a thermistor

The least sensitive detection element will determine sensor head spacing.

Building with sleeping accommodation presents a high risk of false alarms. To reduce instances of false alarms correct sensor device selection and system programming is essential. Designers shall seek advice from the system manufacturer to ensure appropriate selection of sensor device and programming.

The general design principle for sensors in bedrooms shall be:

- Dual angle multi-sensor with detector state programmed for delayed medium optical + A1 heat.
• Bedroom pre-alarm condition: Smoke detection will trigger the sounder in the room only, with supervisory buzzer at the control and indicating equipment. The pre-alarm sounder tone will be different from the general alarm tone. Configure the system to silence the sounder following a suitable time out delay. Alarm and indicating equipment will remain in 'FIRE' until re-set.

• Heat detection during a pre-alarm condition will trigger the general alarm.

• Heat detection only will trigger the general alarm.

• During a pre-alarm, activation of a second smoke detector will trigger the general alarm.

The general design principle for corridors in sleeping accommodation buildings shall be:

• General corridor areas: Single optical / heat sensor with detector state programmed for medium optical + A1 heat.

• Corridors either side of kitchen and bathroom doors: Dual angle multi-sensor with detector state programmed for delayed medium optical + A1 heat.

• Activation of a general corridor area sensor shall trigger a general alarm.

• Activation of a corridor sensor sited either side of kitchen and bathroom doors shall trigger a pre-alarm activating the integral sounder only with supervisory buzzer at the control and indicating equipment. The pre-alarm sounder tone will be different from the general alarm tone. Configure the system to silence the sounder following a suitable time out delay. Alarm and indicating equipment will remain in 'FIRE' until reset.

• Heat detection during a pre-alarm condition will activate the general alarm. Heat detection only will activate the general alarm.

• During a pre-alarm, activation of a second smoke detector will activate the general alarm.

The general design principle in sleeping accommodation buildings kitchens shall be:

• Fixed temperature heat detector.

• Heat detection will trigger the general alarm.

• To prevent kitchen doors being held open too long, provide a local mains powered alarm system. The alarm system will monitor the door position, activate the alarm if the door is held open for 60 seconds, and auto reset the alarm 5 seconds after the door is shut.

**Alarm sounders, visual alarm indicators and pager systems**

Alarm sounders shall be electronic and may be integral with sensor devices or be a stand-alone device. Sounders shall have the facility to make voice announcements. To ensure sounder device tone is compatible with teaching and research environments, sounders shall have selectable tone frequency outputs.

To aid compliance with the Equality Act:
• Provide visual alarm devices to ensure equal visual cover to that provided by audible alarms throughout a building. Visual alarms may be integral with sensor, integral with sounders or a separate device.
• Where identified as needed in the Project Requirements Document, provide a pager system comprising a fixed transmitter serving portable receivers.
• In sleeping accommodation, provide under-pillow vibrating pads with integral strobe and alarm clock. To ensure flexibility, the vibrating pad units shall be portable. Units shall incorporate battery backup to ensure operation in the event of mains power supply failure or failure of the primary battery supply.

Emergency voice communications systems

Provide an emergency voice communication system in buildings with refuge areas and areas where the fire marshal communication is required. The system shall comprise:

• Central control equipment located adjacent the principle fire alarm system control and indicating equipment. All circuits shall have continuous fault monitoring with visual and audible fault indication provided. A call from an outstation shall generate a visual and audible signal with facility for call waiting indication to show simultaneous calls.
• Intercom outstations at each refuge location providing full hands free duplex speech communication with the central control equipment.
• Fire telephone outstations each incorporating a telephone handset in a lockable red steel cabinet.
• The system shall be mains powered with standby battery backup.
• To ensure effective communication between a refuge call point and the central refuge call-system control equipment, omit audible alarm sounders at communication points and provide visual alarm devices only.

Electricity controlled hold-open system

To aid free movement through a building and for compliance with the Equality Act, provide electrically controlled hold-open devices to self-closing fire doors where identified in the system requirements document. Hold-open systems shall comprise:

• Power supply unit with 24 volt FC output
• Electromagnetic hold-open devices
• Electromagnetic hold-open devices integral with the self-closing device
• Relays for fire alarm system interface
• Manual release controls

When phased building evacuation is required, arrange self-closing the fire door hold-open devices in groups according to building zones. Generally, the recommendation is one power supply per four hold-open devices.

Provide a manual release switch in an easily accessible position adjacent each door or pair of doors. Install the switch at 1100mm AFFL. Label 'PRESS TO RELEASE FIRE DOOR'.

Interfacing with other systems

Fire detection and alarm systems shall incorporate input/output interface devices to activate fire safety related systems, and other systems identified in the System Design Requirements.

When the fire alarm system goes into alarm, the configuration of interface devices shall trigger outputs as follows:-

• Activate closing of gas/oil valves
• Activate ventilation plant shut down
• Activate closure of fire dampers
• Activate smoke extraction systems
• Activate closure of self-closing fire doors
• Activate closure of shutters
• Activate release of electric door magnet locks, electro-mechanical locks and electro-mechanical strikes
• Activate audio system shut down
• Activate grounding of lifts to designated floor
• Activate pager alert systems
• Activate remote fire signal communication

Fume cupboard extract systems shall continue to run in the event of fire alarm activation, with shut down controlled by a switch.

Override controls

At the control and indicating equipment position, provide controls to perform temporary override and controlled override functions.
For routine testing and maintenance operations, provide a two-position key-operated switch configured to disable the shut down activation of fire related safety systems and other systems. The key must remain retained in the 'Routine Test Position'. Label the key-operated switch 'Routine Test Override Control', with the switch positions labelled 'Normal' and 'Routine Test'. Operation of the switch shall generate a supervisory buzzer and 'Routine Test' message at the control and indicating equipment.

Provide switches as necessary configured to function when the fire alarm system activates to enable control of specific systems by the Fire Service. This will apply to fume cupboard extract system, ventilation plant etc. Label the switch according to function, i.e. 'Fume Cupboard Extract System', with the switch positions 'On' and 'Shut Down'.

**Staged alarms and alarm delay period**

Configure systems for staged evacuation in accordance with the System Design Requirements.

Where the System Design Requirements identifies the need for a pre-alarm to allow time to investigate the nature of the fire alarm activation, the system configuration shall be:

- Alarm delay period - four minutes
- Pre-alarm triggered by activation of a smoke sensor
- A second detector activation shall immediately sound the general alarm
- Activation of a heat detector shall immediately sound the general alarm
- Activation of a manual call point shall immediately sound the general alarm

**Fire signal communication to Security Services**

Fire alarm systems shall communicate pre-alarm and fire condition to the university 24 hour Security Services Control room.

There are two suitable methods:

- Via the university internal telephone network
- Via the TBC Data Network
- The System Design Requirements document will state the communication method on a project-by-project basis.

Equipment necessary to provide communication shall be included in the fire alarm system design, generally as follows:
For telephone system connection, include installation of a digital communicator, installation of telephone extension wiring and allocation of a number programming of BOLD (the alarm receiving system).

**Pre-commissioning information**

The Designer shall prepare pre-commissioning information. This shall include:

- The cause and effect matrix
- The device label schedule
- As-built drawings
- Fire zone information

The System Design Requirements document will assist in developing the cause and effect matrix.

The device label schedule shall include device reference numbers, type of device, description of device location and buildings fire zone information. The accuracy of the device label schedule is essential, and the designer is responsible for ensuring it is correct.

Designers shall issue pre-commissioning information to the project manager three weeks prior to the system commissioning date. The project manager is responsible for verifying the information is correct.

**Fire zone chart**

Adjacent each control and indicating equipment panel the project shall provide a full colour A3 sized laminated drawing identifying:

- All floor plans
- Location of control and indicating equipment, including a 'you are here' locator
- Fire detection zones
- Location of all manual call points
- Location of the incoming gas service isolation valve
- Location of the incoming fuel oil isolation valve
- Location of the incoming mains electricity isolation switch

The fire zone chart shall follow the University standard. Refer to attached drawing for reference.

**Commissioning**

The fire alarm system manufacturer or a manufacturer approved organisation, shall undertake commissioning of the fire alarm system. The project manager is responsible for providing the commissioning organisation with the following:
- System Design Requirements
- Cause and effect matrix
- Device label schedule
- As-built drawings
- Fire zone chart

On completion of the system commissioning, the commissioning organisation shall confirm the system operates correctly.

Before putting a system into service, it shall undergo a soak test. Smoke and heat sensors will be enabled and manual call points, sounders, strobes and interface devices disabled. The minimum soak test period is two weeks.

The project manager is responsible for arranging daily monitoring of the system during the soak test, and for ensuring that any fault conditions and alarm conditions that arise receive attention and are resolved.

After the soak test period the system can be set to full operation, subject to confirmation by the project manager that all faults are clear and false alarm incidents are acceptable. The commissioning organisation shall enable all devices and perform a witness test in the presence of the project manager to prove all system components function correctly.

Existing systems shall remain operational until the new system is set to full operation.

**Labelling**

Label all system devices as follows:

- Control and indicating equipment: Unique asset reference number (available from Estates Operations).
- Devices: Loop number of circuit reference, zone and device reference.
- Affix a coloured self-adhesive label to all devices. This requirement is to aid inspection and servicing in large buildings, where testing of devices takes place at four-month intervals, with 1/3 of devices tested at each service visit. A system of coloured discs (red, green and blue) is used identify devices requiring service at each visit.
- Manual call points: Additional labelling requirements. Number each manual call point in sequence from level 1 throughout the building. It is acceptable to print the MCP number on the coloured service interval disc.

Labels shall correspond to the reference numbers on record drawings and the control and indicating equipment text address. Device labels shall be laser printed black text on white tape, laminated and self-adhesive, and able to resist scuffs, heat, chemicals and be water resistant. Coloured disc labels
shall meet the same performance requirements, with the text colour to provide suitable contrast with the background colour to ensure clarity.

**Handover information**

On completion, provide a full set of handover documents in accordance with the University handover procedure.

As fitted drawings shall show:

- all devices
- device labels
- zones
- sound pressure readings

**Lifecycle**

At least 25 years

**Approved manufacturers**

TBC

**Spares**

Each project shall provide:

- ten manual call point spare glasses
- ten manual call point test keys
- four spare control and indicating equipment door keys