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2.1 VENTILATION SYSTEMS

2.1.1 Fresh Air Ventilation Systems

A heat recovery system has been installed to provide fresh air to the first and ground floor areas.

A Lossnay unit (HE1), manufactured by Mitsubishi Electric, has been installed within the loft area. Exhaust air, which is used in the heat recovery process, is drawn from the served spaces through ceiling mounted extract grilles and ducted to the heat recovery unit to enable the heat recovery process to take place. Within the unit a plate "air to air" heat exchanger recovers the exhaust heat. Ductwork from the unit is routed and discharged to atmosphere via a louvre mounted in the external wall.

Fresh air that is drawn from outside through an external louvre is ducted and connected to the plenum of the heat recovery unit. From the unit the air is distributed through the ductwork into the served areas through ceiling mounted diffusers.

The heat recovery unit incorporates EU3 grade air filtration and an electric heater battery (HB1) has been installed on the fresh air intake to protect the heat exchanger from freezing. The heater is linked in to the ventilation controller and includes an airflow switch to prevent the heater from operating when no or insufficient airflow is present.

An attenuator has been installed in the ductwork branch between the ground floor Waiting Area and the Informal Meeting Room to prevent cross talk between the areas.

The system is controlled by the air conditioning systems central controller and is interlocked with the building's fire alarm system to shut down when the alarm is activated.

The fresh air intake ductwork to the heat recovery unit has been thermally insulated to prevent condensation.

All ductwork has been manufactured and installed in compliance to the HVCA ductwork specification DW144. Fire dampers have been installed where the ductwork passes through ceiling barriers or fire resisting structures. Volume control dampers have been installed to enable balancing the system air distribution to suit the design requirements.

The heat recovery unit has been provided with an electrical supply from a local mounted switch isolator.

2.1.2 Extract Fans and Systems

A number of extract fans have been installed to serve specific areas and meet the ventilation design requirements of the first and ground floor areas.

Areas served by dedicated extract fans and systems are as follows:

Fan Ref.	Area Served
EF1	Disabled WC
EF2	Comms Room

Fan Ref.	Area Served
EF3	First Floor WC
EF4	First Floor Cleaners
EF5	First Floor Shower

The fans are speed controlled using variable speed electronic controllers and have PIR sensor control with an adjustable overrun timer.

Wall mounted fans are complete with sleeves and fittings to suit the application. The ducted systems have been manufactured and installed in compliance to the HVCA ductwork specification DW144 and are complete with exhaust louvres and extract grilles as required. Fire dampers have been installed where the ductwork passes through fire resisting structures.

The extract fans are interlocked with the building's fire alarm system to shut down when the alarm is activated.

2.1.3 Automatic Controls

The heating and ventilation supply and extract systems have been provided with an automatic control system designed by a controls specialist.

The system comprises a control panel positioned in the electrical intake cupboard on the ground floor. The panel provides the following control:

- HAND/OFF/AUTO switching to the fresh air ventilation (heat recovery) unit
- OFF/AUTO switching to the electric heater battery
- HAND/OFF/AUTO switching to the extract fans
- Plant time-switch control
- Panel live indication lamp
- Plant fault indication lamp
- Lamp test button

The electrical contractor has installed incoming power to the Control Panel and run all outgoing power and control wiring to the plant and equipment with final connections to the control panel being carried out by the Controls specialist.

The Control Panel has been interfaced with the building fire alarm system to shut down all ventilation plant and equipment should the fire alarm system be activated.

2.2 AIR CONDITIONING SYSTEMS

2.2.1 Direct Expansion (DX) Systems

Air conditioning has been installed to provide comfort cooling and heating to the specified ground and first floor areas.

The installation comprises 2 No split systems of the direct expansion (DX) type each comprising internal fan coil unit inter-connected to an external air-cooled heat pump condensing unit.

The air conditioning equipment has been selected from the range of inverter heat pumps manufactured by Mitsubishi Electric. The systems utilise refrigerant R410A.

The externally mounted matched inverter heat pump units (CU1 & CU2) are located at ground floor level to the rear of the building. The installation is complete with interconnecting refrigerant pipework and electrics to the indoor evaporator units (AC1 & AC2).

The units are complete with supply air fan assembly, coil, washable filter and condensate collection tray.

Refrigerant pipework has been connected between the internal and external units. The pipework has been run on medium duty galvanised steel tray. From each fan coil unit the liquid and gas line pipework generally runs within the ceiling void to a point where it exits the building to connect to the respective condenser unit.

The pipework used is small-bore refrigeration high quality copper pipework and has been insulated in compliance with the specification. All pipework penetrations through walls and ceilings have been fire stopped using fire rated expanding foam.

The condensate produced within the indoor units when cooling and dehumidifying is drained into the buildings waste system via gravity.

Each system is locally controlled from a wall mounted controller that provides detailed operational control and status. Interconnecting control cabling has been installed between the internal and external units routed along with the refrigerant pipework.

New electrical power supplies for the systems have been installed and run to the new condenser units.

Following completion of the installation works the refrigerant pipework was pressure tested with oxygen free nitrogen to the manufacturers stated test pressure and duration.

The systems were then fully operationally tested and commissioned, and left in working order.

2.3 HEATING SYSTEM

2.3.1 Boiler & Radiators

A new fully functioning low temperature hot water (LTHW) heating system has been installed to generate hot water for perimeter heating and domestic hot water.

The system includes boiler, flue, primary pump, pressurisation unit, valves, drains, and distribution pipework.

A gas fired combination boiler (B1) has been positioned in the cleaners' room on the first floor. The boiler has a balanced flue arrangement for dispersal of the combustion gases to atmosphere. The boiler has been installed fully in accordance with the manufacturers' instructions.

Pressure in the system is maintained by means of a packaged pressurisation unit that incorporates all necessary isolating, servicing valves, controls, and indicator lamps. It also has a manual quick-fill / flushing valve and pressure reducing valve to enable the system to be filled without electrical power.

Pipework is fabricated in copper and has been sleeved where it passes through walls and floors. All pipework has been thermally insulated in compliance with the specification.

The cleaners' room has been provided with high and low level ventilation openings in compliance with statutory regulations.

Steel panel radiators (R1 to R8) have been installed in the required rooms with low surface temperature (LST) units being located in designated areas as shown on the record drawings. All radiators have been fitted with lockshield valves and thermostatic radiator valves (TRV).

New electrical power supplies have been installed by the electrical contractor to all relevant items of equipment.

The boiler is controlled from a seven day text display programmer that allows automatic time and date setup, and automatic summer/wintertime changeover.

A hardwired room thermostat has been provided with the boiler to provide optimum start functionality.

The boiler has been installed in accordance to the manufacturer's requirements and current statutory regulations.

Prior to the system being filled all pipework was flushed and cleaned. The system has corrosion inhibitor added to the recommendations of the boiler manufacturer.

2.3.2 Gas Service

A new gas service has been installed to serve the building and in particular the new LTHW boiler.

The local gas utility supplier has run a new 22mm incoming mains supply to a meter located in a secure enclosure at the front of the ground floor. From the meter the pipework is routed

to the outside rear of the building from where it rises to the first floor level and enters the cleaners' room to connect to the gas fired boiler.

The gas pipework and equipment installation has been carried out in strict accordance with the following:

- Document IGE/UP/2 from The Institution of Gas Engineers
- In full compliance to CORGI requirements

The internal gas distribution system has been fabricated from steel pipework to BS 1387, BS3601, API 5L.

A gas train has been installed to the boiler to meet the manufacturer's requirements.

A gas shut off solenoid valve has been installed at entry to the building. The valve is linked to the fire alarm system.

A thermal link has been positioned above the boiler and knock-off button positioned adjacent to the boiler along with the necessary control wiring to shut-off the gas solenoid valve.

2.3.3 Water Treatment

Water treatment has been provided to the LTHW heating system.

A specialist water treatment company has taken samples of the water in the system and issued recommendations to suit the system.

2.4 DOMESTIC SERVICES

2.4.1 Cold Water Services

A new incoming mains water supply has been provided to serve the building by the water authority. The incoming main connects to a new water meter located at the front of the ground floor.

The existing distribution system was cut back to the incoming position and new distribution pipework installed to suit the new architectural layout, with feeds run to cleaner's sink, ground and first floor wash hand basins, the tea point (to electric hot water boiler), WCs, and shower facilities.

The system includes all necessary isolation valves, thermostatic and backflow protection devices to fully comply with current Water Supply (Water Fitting) regulations.

The cold water distribution system has been fabricated from copper pipework with ring type capillary fittings with compression on final connection. Pipework has been sleeved where it passes through walls and floors. All pipework has been thermally insulated in compliance with the specification.

The system incorporates a water conditioner in the form of an electronic water descaler.

2.4.2 Hot Water Services

Hot water is provided by the LTHW Combination Boiler (Refer to Section 2.3.1 Boiler & Radiators for details).

The existing hot water system was removed and new distribution pipework installed to suit the new architectural layout, with feeds run to the cleaner's sink and ground and first floor toilet wash hand basins.

An electric shower has been installed to the first floor shower room.

The hot water distribution system has been fabricated from copper pipework with ring type capillary fittings with compression on final connection. Pipework has been sleeved where it passes through walls and floors. All pipework has been thermally insulated in compliance with the specification.

The system includes all necessary isolation valves, balancing valves, drains, thermostatic and backflow protection devices to fully comply with current Water Supply (Water Fitting) regulations.

2.4.3 Trace Heating

Trace heating has been provided to the domestic hot water pipework from the boiler to all outlet points.

The trace heating system is an energy efficient, self-regulating HWAT system as manufactured by Raychem Ltd. It has been installed directly on the HWS flow pipework and terminates with a gel end seal at the end of each circuit.

The system incorporates a control unit, heating tape, fittings, power connectors, isolators, etc. in compliance with HS(G)70.

Warning Labels have been placed on the system as necessary.

2.4.4 Sanitaryware

Sanitaryware has been provided to the WC, Disabled WC, Cleaners' Room, Shower, and Teapoint.

Items of sanitaryware installed include the following:

- Shower tray and shower screen
- Hand wash basins
- Mixer taps
- WC pans complete with seat with dual flush pneumatic cistern,
- Doc "M" Disabled toilet pack
- Warm air hand dryers

2.5 DRAINAGE & WASTE

Waste services have been provided to the sanitaryware installed in the tea point, shower, disabled toilet and first floor toilet areas.

All appliances are trapped and run to fall and connect into the building's existing SVP / WVP systems.

The ground floor disabled toilet has been provided with a Saniflo pump unit. The waste pipe from the unit connects to the existing SVP waste pipe at the rear of the building.

2.6 ELECTRICAL POWER INSTALLATION

Socket outlets, fused connection units, isolating switches and other accessories together with the associated wiring have been supplied, installed and connected in accordance with the Specification and shown on the "As Installed" drawings.

The positions, finishes and method of mounting of all outlets have been checked with the Consultant Building Services Engineer prior to the installation commencing. Unless otherwise specified, 13A switched socket outlets complying with BS1363 have been used and wired as ring circuits having conductors no less than 2.5 sq. mm. Socket outlets have not be spurred from the ring circuit nor connected as a radial circuit unless specified or authorised by the Consultant Building Services Engineer. Circuits as indicated on the "As Installed" drawings. Where the circuits have not been detailed the number of outlets per circuit is limited to a maximum of 9. Socket outlets generally are of the flush pattern with all insulated or metal front plate of the finish and colour specified, mounted in metal or PVC boxes, according to the system of installation, not less than 35mm deep with cable or conduit entries as appropriate. PVC boxes have accessory fixing lugs with brass screw inserts. Each socket outlet has a separate earth continuity conductor, minimum size 2.5 sq. mm connected to an earth terminal on the box.

13 A-fused plugs complying with BS1363 have been provided where specified.

Fuses supplied separately for each plug in the ratio of 2:1 for 13A and 3A.

Plugs are of moulded all insulated white material with safety sleeving on the live and neutral pins.

5A socket outlets and plugs installed generally as specified for 13A outlets and plugs. Socket outlets are of the shuttered type and the plugs are unfused. Each socket outlet is provided with one plug.

Socket outlets mounted externally are of galvanised water resistant pattern with gasket, screwed cover plate, securing chain and screwed plug top. Three phase outlets are four pole with earth connection and interlocked switch. Each socket outlet is provided with a water resistant plug. Fused connection units comply with BS3676 and BSEN60669-1 and are designed so that withdrawal of the fuse holder does not expose any live parts or permit any extraneous connection to the contacts. The units contain a fuse of the appropriate rating for the appliance served or 13A where the rating is not known.

Power accessories comply with the relevant British Standard as scheduled below:

- (a) 13A socket outlets BS.1363
- (b) 2A, 5A and 15A socket outlets BS.546
- (c) 13A Connection Units (spur outlets) BS.5733
- (d) 20A, 25A, 32A, 45A and 63A BS.3676: Part 1 Double Pole Switches
- (e) Cooker Control Units BS.4177
- (f) Cooker Connection Units BS.5733
- (g) Junction Boxes BS.6220

Accessories mounted flush provided with flush steel boxes to BS.4662 as required. Boxes recessed such that they are finished level with the plaster or wall finish.

Surface mounted accessories provided with surface mounting metal clad or steel boxes to BS.5733 or surface moulded boxes to BS.5733 as appropriate.

Miscellaneous accessories comply with the relevant British Standards as scheduled below:

- (a) Shaver Socket - Outlets BS.4573
- (b) TV Co-axial socket – outlets. None Published
- (c) Line Jack Telephone – outlets. None Published
- (d) Computer Terminal – sockets. None Published
- (e) Flex outlet – front plates. None Published
- (f) Fused Clock Connectors. None Published
- (g) Blank Plates. None Published
- (h) Non Standard 13A socket - outlets plug 13A (fused) BS.1363

Accessories mounted flushed provided with flush steel boxed to BS.4662 as required.

Boxes recessed such that they are finished level with the plaster or wall finish. Surface mounting metalclad or steel boxes installed to BS.5733 as appropriate.

Contactors comply with BSEN60947-4-1 and rated in accordance with 'uninterrupted duty' and utilisation category AC1 unless otherwise specified.

Contactors are metal clad of the continuously rated pattern, as required by the particular duty and the number of operations per hour. Each contactor fitted with a minimum of one normally open and one normally closed auxiliary contact unless otherwise specified or required by the duty.

Unless specified otherwise, all contactor coils are wound for single-phase 240V AC supply and protected by a suitable fuse link or MCB. The coils are AC or rectified (one rectifier per coil) DC operated.

Where small contactors are incorporated in composite panels the wiring is brought to terminal blocks adjacent so that each complete unit can be easily removed and replaced. Such contactors (together with any associated relays) are housed in a separate compartment with its own-hinged lid.

Time switches are self-contained units, 7 day, 24 hour dial, solar dial or digital type as specified, suitable for operation on the local low voltage AC supply.

The switches include a self-starting synchronous motor with a 36 hours spring reserve or quartz movement with 100 hour reserve.

The solar dial is capable of switching 'ON' at sunset and 'OFF' at sunrise through the year by control of a secondary calendar dial with month and day settings, and automatic switch time adjustable up to one hour.

Facilities include for day omission and separate motor connections protected by a suitable fuselink or MCB.

Each time switch is encased in a dust-tight metal or plastic casing having a front cover with a clear Perspex window. Metallic casings have been effectively earthed.

The time switches provided complete with metal conduit box.

2.7 LIGHTING

All luminaries, including all circuits and necessary materials, have been supplied, installed, and connected in accordance with the Specification and schedule of luminaries and as shown on the as installed drawings.

Luminaries shall comply with BS 4533.

All diffusers have, unless otherwise specified, been manufactured from acrylic material, satisfying BS2782 and are in accordance with the requirements of the Local Fire Officer.

Conduit or chain suspensions as specified have been provided for all pendant fittings.

The stems of conduit suspensions are screwed to ball and socket type dome lids with positive earth connection.

The lighting installation has been wired in single core PVC/LSF insulated cable except where otherwise specified.

Luminaries in suspended ceilings connected using flexible cables from plug in type ceiling roses. Flexible cables are of a minimum length to facilitate the disconnection of the respective luminaire and in any event are not more than 2m in length.

Metallic louvres provided with an equipotential bonding conductor between the main body of the luminaire and louver.

Within plantrooms, luminaries are complete with chain suspensions of adequate length to provide suitable illumination when all plant is erected.

Luminaries intended for external use are of a minimum of IP23 classification.

Steel conduit terminations to all aluminium fittings fitted with brass bushes to prevent corrosive action between the steel and aluminium components.

Lamp holders with the exception of handlamps and fluorescent bi-pin units are of the non-ferrous metal type. Lamp holders are types ES and GES connected that the screw portion is in the neutral conductor.

Lighting track installed for flexible display lighting or simple stage lighting comes complete with power supply box, connectors, fixing clamps, end plugs and spotlight adapters.

The installation is wired on the 'looping-in' system. The 'looping-in' of live conductors are effected at the switch positions and the neutral conductors at the lighting points.

Final connections by means of heat resisting flexible cord sized to suit the circuit protective device.

Ceiling roses for pendant luminaries are white plastic and comply with BS67 having substantial terminals including an earth connection and a completely shrouded looping terminal and an effective cable-anchoring device. They have an enclosed integral pattress incorporating knockouts and a screw on cover, which conceal the fixing screws. All terminals are of the pinching screw type. The base is suitable for direct mounting on to a conduit box.

Pendant lamp holders are white plastic, bayonet socket, short sleeve shade carrier pattern with an effective cable anchoring device, have non-rising terminal posts and so designed that the dome of the lamp holder cannot become detached by the action of removing the lamp or shade carrier sleeve. The whole complies with BSEN61184.

Batten lamp holders are of white plastic and comply with BSEN61184, have substantial terminals including an earth connection and a completely shrouded looping terminal and shall permit intermediate connection between the terminals and circuit wiring with heat resisting flexible cable. They have an enclosed integral pattress incorporating knockouts and the lamp holder attachments are independently secured to the base and conceal the fixing screws.

Extra Low Voltage Lighting transformers are safety isolating type to IEC72 BSEN60742, Class II with voltage regulation of 5% or better and suitable for dimming. The transformers are enclosed in a steel casing and fused protection provided to the primary of each transformer. Secondary terminals have been sized to accommodate the required number of outgoing cables.

Terminals labelled with either 240 volts or the appropriate low voltage output.

Where transformers are used to feed a number of luminaires each luminaire is fed with a separate cable from the transformer secondary terminals. Cabling between transformers and luminaires carried out using high temperature PVC/PVC 85°C flexible cord 300/500-volt grade to BS6500.

All discharge and fluorescent luminaires comes complete with control gear, power factor capacitors and lamps. The metalwork of all fittings and starting equipment are effectively earthed to the installation. Fittings without a shunt connected PF capacitor incorporate a voltage dependent resistor to counteract surge voltages. Shunt capacitors do not incorporate any integral fusible element.

The control gear complies with the relevant BS Specifications where indicated and marked with the Kite mark. A separate set of control gear generally be provided for each lamp.

All (unless otherwise specified) the control gear for fluorescent luminaires is electronic.

A suitably rated cartridge fuse and terminal block is mounted in an approved manner adjacent to the cable entry.

Where luminaires have spines that are narrower than a standard besa box, cover plates have been provided to obscure each box. Plates are coloured to suit the ceiling finish.

Each luminaire is complete with a lamp for each lamp way. Tungsten lamps are clear type where enclosed and opal type where exposed. Fluorescent lamps are of the appropriate size and ratings and of the bi-pin pattern. All lamps of each type (tungsten, fluorescent) supplied by the same manufacturer.

Fluorescent lamps are of the high efficiency, low energy type with a colour temperature of 3000 deg. K (unless otherwise specified). They are compatible with the control gear supplied with the fluorescent lighting fitting.

All lighting switches supplied and installed in accordance with the types and ratings specified elsewhere in the Specification. The positions of all lighting switches are shown on the as installed drawings. The switches are located on the handle side of the door opening

with the exception of glass fronted offices, where the light switch is positioned 500mm past the edge of the open door.

Local switches controlling lighting and equipment complies with BS3676 and BSEN60669-1 and are of the finish and type specified.

Switches are of the slow break 'AC only' pattern in which the successful operation of the switches does not wholly depend upon the action of a spring and the operating mechanism is insulated from all parts. The switches are 15A minimum rating (5A for all insulated plate switches) and suitable for inductive operation at their rated capacity.

Where more than one phase occurs in one switchbox, phase barriers have been installed to segregate the circuits on different phases. In addition a label engraved "Danger 415 Volts", has been attached to or engraved upon the front grid plate.

Where metal or metalclad switches are utilised, a 1.5mm² earth continuity conductor has been installed between a metalclad switch and its associated metal box.

All boxes used for fixing switches supplied with an earth terminal or screw in the base of the box.

Every switch controlling an appliance not visible from the switching position has been engraved with the name of the appliance it controls, and where called for fitted with 0.5 watt neon indicating lamp.

Switches are of one of the types detailed below and selected to suit the finishes schedule.

a) All Insulated Plate Switches

Switches are rocker type mounted on an insulated front plate.

The switches are mounted on boxes not less than 25mm deep of metal or white PVC depending on the type of construction with cable or conduit entries.

Where switches are mounted in PVC boxes these have accessory fixing lugs/columns with brass-fixing screw inserts.

The front plate shall overlap the box on all sides.

b) Grid Switches

The switch has been fixed in a grid with adjustable fixings, and an earth terminal.

The switch and grid have been mounted in a sheet steel box not less than 40mm deep.

For surface units the cover plate are steel and fit flush with the edge of the box and are of matching colour.

For flush units the cover plate are metal or PVC and of the specified finish.

Boxes for surface installations do not have knockouts but are drilled on site.

c) Weatherproof Switches

Weatherproof switches are mounted in heavy galvanised cast iron boxes having dome covers with waterproof machine joints, neoprene seals and external fixing lugs.

A rotating knurled knob, the stem of which passes through a packed gland, operates the switches.

The switches are of a minimum classification of IP54.

d) Ceiling Switches

Ceiling switches are of the 15A or where specified 45A all while insulated pattern cord operated type, with a positive action capable of being operated when the cord is 30 degrees from the vertical. 45A switches include a mechanical on/off indicator and complies with the requirements of The IEE Wiring Regulations and all latest amendments.

The switch is of the pattern that the cord can be replaced without removal of the cover.

The switch is suitable for mounting upon a circular conduit box or a purpose made pattress.

e) Dimmer Switches

Dimmer switches are of the plate switch pattern, suitable for operation at 250 volts and rated to the circuit load shown on the as installed drawings.

Each plate has either a dimmer control on its own or a dimmer control and switch.

The dimmer control is of the solid-state type and the variation in illumination level is carried out by either thyristor or triac control.

The finish of the plate and switches is as specified for other switches in the same room, as particularly specified or detailed on the as installed drawing.

Lighting accessories complies with the relevant British Standards as scheduled below:

- (a) Flush plate switches and grid switch BS.3676: Part 1
- (b) Flush dimmer switches BS.5518
- (c) Ceiling roses (plug in) BS.7001
- (d) Ceiling switches BS.3676: Part 1
- (e) Ceiling roses BS.67
- (f) Batten lamp holders BS.5042
- (g) Junction boxes BS.6220

2.7.1 Emergency Lighting

The emergency lighting system has been installed in accordance with the recommendations of BS5266 and BSEN 1838 and to the complete satisfaction of the Fire Officer. The system provides emergency illumination for a period of three hours to selected luminaries as shown on the as installed drawings and indicated in the schedule of luminaries.

The complete system including all batteries, lamps, luminaries, chargers, inverter units, enclosures and wiring have been supplied, installed, tested and commissioned.

Conversion packs are contained within the spine of the luminaire wherever possible or in a purpose made enclosure fixed to the back of the luminaire or to the wall or ceiling soffit in a concealed or inconspicuous position. Conversion units are wherever possible factory fitted under strict quality control conditions.

All inverter modules and self-contained non-maintained emergency luminaries are ICEL approved. All battery packs are vented high temperature nickel cadmium types. Inverter modules and chargers are entirely solid state. A red monitoring LED located is normally visible to provide charging indication.

Individual self-contained emergency lighting units and those contained within the normal lighting luminaries are connected direct to the mains supply and in the event of a failure the unit automatically connects to the battery housed within the unit. On restoration of the permanent supply the unit reverts to mains operation. All units supplied complete with rechargeable battery, changeover relay and silicone rubber covered cable interconnections.

Each unit includes solid state switching and the re-charge equipment enables a fully discharged battery to be fully re-charged within 14 hours. Facilities shall be included to prevent reverse polarity at low battery voltage.

Each unit derives its supply from an unswitched circuit connected directly to the MCB or fuse serving the normal local mains lighting such that the battery is on automatic charge when the mains are healthy. A key switch has been included in the live connection to the unit so that simulation of power failure can be achieved without intercepting the supply to the normal lighting. The switch have been engraved "Emergency Lighting Test Switch".

Emergency lighting systems connected from central batteries are connected direct from the battery cubicle or associated double pole distribution board. No intermediate switches are included in the circuits. Where switches are shown on the as installed drawings, they apply to the standard AC lighting points forming an integral part of the same lighting fittings.

2.8 CONTAINMENT

Containment included the supply and installation of the cable ladder, tray and cable basket as required for the entire installation.

In addition to the required containment systems provision for at least 10% spare capacity for future usage has been allowed.

The containment systems comprise various sections as follows:

- a) Cable Tray - Mains, sub mains distribution and earthing.
- b) Cable Basket - Ancillary Services.
- c) Cable Tray/Trunking - Mains and sub mains cabling (up to and including 16mmsq).

The ancillary services containment system provided on behalf of others accommodates the following services:

- a) Control Wiring
- b) Intruder alarm system (TBC)
- c) Data / IT Cabling

The cable tray, cable basket and trunking system is fully interconnected and continuous throughout. We have installed earth links as the containment systems are installed.

We have ensured that any service routed in any floor trench is adequately supported and segregated from other services of different voltages.

Routes of cable tray, runs, etc., are detailed on the "As Installed" drawings.

2.9 FIRE ALARM SYSTEM

A complete fire detection and alarm system has been supplied, installed, connected, tested and commissioned generally as indicated on the "As Installed" drawings. The system is fully in accordance with BS5839 and latest amendments.

The system is of the microprocessor based conventional type, and incorporates the following components:-

- 1) System main control and operating panel.
- 2) Power supply unit with standby batteries.
- 3) Automatic fire detection devices.
- 4) Manual alarm break-glass units.
- 5) Fire alarm sounder units.

All fire alarm equipment complies with the relevant British Standard as scheduled below:-

EQUIPMENT, BS PUBLICATIONS

- Manual Call Points
- Automatic Release Mechanisms
- Control and Indicating Equipment
- Optical Beam Smoke Detectors
- Heat Sensitive Detectors - Point Detectors
- Point Type Smoke Detectors
- BS 5839: Part 2
- BS 5839: Part 3
- BS 5839: Part 4
- BS 5839: Part 5
- BS 5445: Part 5
- High Temperature Heat Detectors
- BS 5445: Part 7
- BS 5445: Part 8

The system is of modular design incorporating standard hardware and software packages only, and is arranged such that expansion and modification of the system is possible at a future date, with minimal change to existing system modules.

All basic equipment utilised within the system has been designed and manufactured by the same manufacturer.

The main control and operating panel and alarm annunciation terminals are contained within the same wall mounted enclosure.

The central data processing unit (CPU) is of the multiprocessor type, and of modular design to enable future expansion of the alarm system.

The software package is modular in organisation and enables the following facilities:

- i) System data base and operating programme
- ii) System monitoring and control
- iii) Output message generation
- iv) Auxiliary facility programme

The CPU incorporates access protection to system operating functions such that access to the system for editing, priority changes etc., is only possible via entry of a pre-selected pass code.

The main control and indication panel provides the alarm system main indication and operating functions.

The panel incorporates facilities for connection and indication of a minimum of 4 No. alarm loops.

The general arrangement of alarm zones for fire detection devices and sounders is detailed on the as installed drawings.

Indication of fire and fault zone alarms are by means of LEDs contained on the fascia of the indication panel, and additionally the panel contains a LED or display which give indication of the device operating under alarm or fault conditions.

The panel incorporates a numeric function keypad, which provides operation of the alarm system control facilities, and allow interrogation of the system status.

In addition, the panel incorporates LED indication for the following system functions:

1. Mains supply failure
2. DC supply failure
3. System in day mode operation
4. System in night mode operation
5. Remote transmission isolated

The panel incorporates 4 No. sets of auxiliary voltage free changeover contacts, which operate signalling to mechanical plant installations and ancillary building services systems.

A separate power supply unit, comprising sealed lead acid batteries and charger unit, is provided for the fire alarm main control and indication panel.

The power supply unit is suitable for operation from a 240 volt 50Hz AC supply, and incorporates standby supply batteries of nominal 24 volt DC output.

The power supply unit is provided with sufficient battery capacity to maintain the system in an operational condition for a minimum of 24 hours in the event of a mains supply failure and has sufficient capacity remaining to operate all alarm sounders for a minimum period of 30 minutes.

Each power supply unit is fully monitored to indicate its operational status and failure of either AC or DC supplies shall initiate a fault alarm on the alarm indication panel.

Automatic fire detectors have been provided as indicated on the as installed drawings and are of either the photo-optical (scattered light) or ionisation pattern smoke detection type, or rate-of-rise pattern heat detection type, as shown.

Each detector incorporates an individually addressable module for connection onto the addressable detection loops provided from the main alarm control panel.

Each detector is provided with a separate plug-in type base connection unit housing the addressable module, and detector types are interchangeable between bases without further modification to system configuration.

Each detector base incorporates an LED indicator to denote operation of a detector and, where shown on the as installed drawings, extended indication facilities have been provided remote from the detector base.

Manual alarm call points provided generally as indicated on the as installed drawings, and comprise semi-recessed units incorporating a base plate, alarm module and cover.

The alarm call points incorporate a suitable activation device such that the breaking of the glass (or Perspex) cover shall immediately indicate an alarm signal. Additionally, each unit is provided with facilities to test the operation of the unit without destroying the glass cover or removing the cover frame.

All manual alarm call points are individually addressable and compatible with automatic detection devices for connection to the addressable alarm loops provided from the main alarm control panel.

Alarm sounders are provided as indicated on the as installed drawings and comprise high output electronic pattern devices giving a nominal sound power level of 110 dB at 1 metre at 1.2 kHz frequency or 150mm diameter under-dome type bells as specified elsewhere.

Alarm sounders are generally surface mounted units suitable for fixing direct to standard flush mounted BESA conduit boxes, and connected on zones as detailed on the as installed drawings.