FIRE FIGHTING & ALARM INSTALLATION

SECTION 5 - CONVENTIONAL FIRE ALARM SYSTEM

5.1 General

The fire alarm system shall comprise smoke detectors, heat detectors, manual call points, alarm bells, Main Alarm Panel (MAP), Sub Alarm Panels (SAP), batteries and chargers, relays and all necessary wirings as detailed hereunder and as shown in the Specification Drawings.

The fire alarm system shall be installed in accordance with the current edition of the Singapore Standard CP 10: Code of Practice for The Installation and Servicing of Electrical Fire Alarm Systems and comply with all regulations, orders and requirements of the relevant Local Authorities. The Sub-Contractor shall be wholly responsible for the entire installation to meet these requirements.

The Sub-Contractor shall also be responsible for making necessary applications and arrangements with the Authorities concerned for the provision of a direct telephone line connecting the Main Alarm Panel (MAP) to an approved authorised monitoring agent and all costs connected therewith for the full maintenance period are deemed to have been included in the Sub-Contract Sum.

5.2 System of Operation

The smoke detectors, heat detectors and manual call points in the Building are divided into zones and connected to the respective Sub Alarm Panels, i.e. SAPs. The system of operation shall be such that an alarm is initiated by breaking a glass in any of the manual call points or actuation of any of the smoke/heat detectors. Such actions shall also energise the associated zone lamp in the MAP and SAPs concerned. Alarm bells shall be so connected that upon receipt of a fire alarm signal, all bells of the same contactor grouping shall sound simultaneously with buzzer in the MAP and the associated SAPs. The operation of alarm cut-off key switch at the boards shall mute the buzzers and the alarm bells. However, the operation of the alarm cut-off keys shall not cancel the visual lamp signal on the boards. Visual lamp signal shall be cancelled only when the circuit has been reset by a reset switch on the MAP. In the event of receipt of a second or subsequent alarm during this period, the fire alarm bells and buzzers shall be energised again and the origin of the second and subsequent calls registered visually on the main and Sub Alarm Panels as before.

The alarm system shall be of the close-circuit electrically monitored type so that should fault develops in any of the circuit, it will be detected immediately whereupon the fault buzzers and signal lamps in the MAP as well as the associated SAP shall be energised. A muting switch shall be incorporated in each board so as to enable the audible fault alarm to be cut-off but the visual fault signal should persist until the fault is cleared.

Alarm bell circuits shall be so designed that on receipt of a fire alarm signal originated from anywhere in the entire building all the bells associated with the fire alarm system shall ring simultaneously.

A silencing switch shall be provided at the operator's console in the fire command centre and linked to the MAP for silencing all the fire alarm bells in the Building when the Emergency Voice Communication System provided by the Electrical Sub-Contractor is in use; however the switch shall be effective only after the bells have operated initially for not less than one minute. Visual flashing signal shall be provided to indicate when this switch is operated.

A pre-setting timer shall be incorporated in the MAP to automatically restore the sounding of the fire alarm bells after a pre-determine time period of between 0 to 3 minutes has elapsed.
Operation of the silencing switch during 'alarm' condition shall not cancel the visual signal lamp of the alarm, nor shall it prevent the proper registration of subsequent alarms at the MAP.

The Main Alarm Panel shall show a fault indication whenever the fault buzzer and signal lamp are energised at the sub-panel.

5.3 Smoke Detectors

Smoke detectors shall be of the solid state ionisation type capable of detecting fire in its incipient stages. The units shall be neat and compact in appearance, finished in light colour, suitable for ceiling mounting. Smoke detectors shall be installed in such a way that each may be readily withdrawn from service for testing or replacement without affecting the effectiveness of the remaining detectors and installation. Smoke detectors shall be suitable for operation on 24 volt D.C. system and of the type acceptable to the Fire Safety and Shelter Department, Singapore Civil Defence Forces.

5.4 Heat Detectors

Heat detectors shall be of a neat and compact appearance and shall be of the combined rate-of-rise and fixed temperature type incorporating bi-metallic elements with adjustable temperature calibration housed in a corrosion resistant, dust-tight casing complete with escutcheon plate suitable for ceiling mounting. They shall be installed in such a way that each may be readily withdrawn from service for testing or replacement without affecting the effectiveness of the remaining detectors and installation. Heat detectors which are used in the battery room shall be of the sealed type not affected by the corrosive atmosphere.

5.5 Manual Call Points

Each manual call point shall be fixed at a height of 1,400mm above floor level and shall be of the closed circuit, break-glass type adequately rated for operation on 24 volt D.C. supply and housed in a cast iron case with tapped 20 mm E.T. entry suitable for flush mounting and having an aluminium front plate finished signal red enamel colour suitably glazed and with a plate behind with bold red lettering inscribed 'FIRE ALARM - IN CASE OF FIRE BREAK GLASS' all secured by plated screws.

5.6 Alarm Bells

Fire alarm bells shall be the weather-proof type suitable for wall mounting at ceiling height and shall comprise a gravity cast aluminium base with tapped 20mm E.T. entry containing a single bobbin movement, having enamelled copper wire wound for continuous operation on 24 volt D.C. supply and provided with phosphor bronze armature and contact springs, heavy duty silver contacts, two pole terminal block and 150mm diameter harden steel strident tone type gong painted to signal red in accordance with CP 10.

5.7 Main Alarm Panel (MAP)

The Main Alarm Panel shall be located at the position as indicated in the Specification Drawings. The Board shall be mounted at eye level to the approval of the Architect and shall include the following equipment:

(a) A signal unit fitted with three colour lamps:

  (i) green to indicate 'supply on'

  (ii) white to indicate 'partial disablement'

  (iii) blue to indicate 'power failure'

(b) Zone indicating units with the following lamp indicators:

  (i) red to signal a fire in the zone

  (ii) amber to indicate a fault

(iii) green to indicate normal

Each zone indicating unit shall be self-contained incorporating a tamper-proof, key-operated rotary selector switch with provisions for testing circuit fault and alarm condition and also for circuit isolation.

(c) Fault buzzer, fault alarm muting switch, fire alarm bell, fire alarm muting switch and re-set switch for each of the sub-panels.

(d) A code-wheel transmitter or other relays suitable for connection to a circuit line telephone service to the approved alarm monitoring station including facility for testing this line and means of isolating this line while testing other circuits.

(e) Relays/contactors to initiate the emergency power operation of staircase pressurisation and ventilation fans, smoke free lobby fans, car park ventilation fans and also to automatically trigger the emergency operation of lifts as follows:

(i) In the event of any fire alarm, a signal from the Main Alarm Panel (normally open or normally close) shall be made available in the lift machine rooms for each group of lifts to initiate the emergency operation of all lifts. The Sub-Contractor shall supply and install one set of signal cables (1 x 2.5mm^2/2C FR each in cable tray) to each of the lift machine rooms on the respective floor.

(ii) In the event of any fire alarm, a signal (normally open) shall be made available to initiate the operation of each system of the staircase ventilation/pressurisation fans, lobby ventilation fans and car park ventilation fans. The Sub-Contractor shall supply and install one set of signal cables (1 x 2.5mm^2/2C FR each in cable tray) to each fan room.

(iii) In the event of any fire alarm, a signal (normally open or normally close) shall be made available to trip all the Air Handling Units serving the Atriums. The Sub-Contractor shall supply and install one set of signal cables (1 x 2.5mm^2/2C FR each in cable tray) to each atrium Air Handling Unit.

(iv) Where gas solenoid valves are installed, a signal shall be made available to gas solenoid valves to shut off the gas in the event of any fire alarm system.

(v) Where automatic sliding doors are installed at the main entrances and exits, a signal shall be made available to the doors to hold these doors in the open position in the event of any fire alarm.

The locations of termination at the lift switchboards, fan switchboards, air conditioning switchboards etc shall be instructed to the Sub-Contractor by the Architect at the site.

(f) Key operated switches for isolation of the 24 volt D.C. fire alarm signal risers. Keys shall be withdrawable only at 'ON' position.

(g) A latching type push button and relay circuit to enable manual starting of the smoke stop lobby fan, smoke extract fan, staircase pressurisation and carpark ventilation fan.

(h) A red push button and relay system to ring the alarm bells of the entire Building.

(i) Signal lamps etc. relating to D.C. power supply unit as specified hereinafter.

(j) All necessary labels (clear perspex, reverse engraved and machine screwed), H.R.C. fuses, terminal blocks, relays and wiring.

(k) 10 nos. spare ways in the board for future uses.

(l) All other necessary items specified elsewhere in these Specification and the Specification Drawings and/or required by the local Authorities.

All lamp indicators shall be the double filament type with domed lens, chromium-plated bezel, locking ring etc. arranged for easy replacement from the front.

The casing for the indicator board shall be dust-proof wall mounted type fabricated from sheet steel of approved thickness with hinged lockable door upon which are mounted the indicator lamps and all other external control.

All metal work shall be treated against corrosion, painted with primer, undercoat and finished outside with light grey synthetic enamels all as specified elsewhere in these Specifications.

Wiring shall be neatly bundled and secured by means of self- locking nylon cable ties. Cable terminations involving different voltages shall be properly segregated and labelled to the approval of the Architect.

Select this clause only where no SAPs are specified.
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A suitable perspex with colour reversed engraved diagrams showing in reduced scale the areas covered by the fire alarm system, position of the Fire Lift, escape corridors, staircases, heat/smoke detectors, manual call points, zone delineations etc., shall be provided and mounted on this board.

5.8 Sub Alarm Panels (SAP)

A Sub Alarm Panel shall be located at each floor as shown in the Specification Drawings. These SAPs shall be constructed similar to the MAP incorporating all items except 5.7 (d), (e), (f), (g) and (h) to indicate all modes of operation of the circuits with labels and all necessary cabling.

A reduced scale floor plan shall be provided on each SAP showing in reduced scale the areas covered by the fire alarm system, position of the Fire Lift, escape corridors, staircase, zone delineations, heat/smoke detectors, manual call points, etc.

5.9 D.C. Power Supply Units

Centralised D.C. power supply units shall be provided. Each D.C. power supply unit shall comprise 24 volt nickel cadmium batteries of sufficient capacity such that it is capable of maintaining the standing loss or losses of the portion of the system for at least 24 hours plus the maximum alarm load for at least one hour. For each D.C. power supply unit, a proprietary make fully automatic two rate battery tricker charger (constant voltage type) comprising double-wound vacuum impregnated transformer, full-wave bridge connected rectifier and relays, etc. shall be provided to keep the batteries fully charged under all condition of service for all the panels. The battery and charger shall be supplied complete with HRC fuse distribution board, first grade MISC ammeters to read D.C. charging current and D.C. load current, D.C. voltmeters marked to indicate both float and boost charge voltages, mains on indicating lamp, non-locking load test switch and suitable rated test load with the voltmeters scale clearly marked in red showing the terminal voltage considered desirable when feeding the test load, float/manual selector switch, battery charger failure alarm, battery cut-off alarms, battery earth leak-age detector, engraved instruction labels for manner and duration of test labels, all necessary cable connections etc. and these items shall be mounted in the top compartment of the unit concerned or in the associated Main Alarm Panel. The compartment housing the batteries shall be fitted with vermin proof louvres at the front plate. The internal shall be fully lined with formica or other materials against corrosive elements from the batteries.

The D.C. power supply unit shall be the floor standing type of similar construction as the Main Alarm Panel. The unit may be integrated to form part of the Main Alarm Panel in separate compartments.

5.10 Testing Unit

One set of portable testing unit shall be provided to enable any detector to be tested. The testing unit shall be designed and calibrated to suit the detectors installed.

5.11 Wiring System

All wirings shall be enclosed in conduit run in the following manner:

(a) Wiring within false ceiling spaces, riser ducts, electrical switchrooms, sub-stations, and mechanical plantrooms shall be in surface mounted G.I. conduits.

(b) Wiring for all other areas shall be in heavy duty UPVC concealed conduits to be buried/cast in wall plastering/columns/concrete slabs etc.

(c) Where part of the conduit run is on surface and part concealed, then the entire run of conduit shall be of G.I. to assure electrical continuity.

Fire alarm circuits shall be separated from other circuit runs and conduit/trunking for fire alarm system shall not in any circumstances contain wiring other than that associated with the fire alarm system. Wiring shall be multi-strand of sizes to suit the system but shall not be less than 1.5 sq. mm section, of high conductivity copper wire insulated with 450/750 volt grade PVC to BS 6004 or SS 50.