

## **PART 1        GENERAL**

### **1.1            SUMMARY**

- .1      This Section covers fire alarm systems, including initiating devices, notification appliances, controls and supervisory devices.
- .2      Work covered by this section includes the furnishing of labour, equipment and materials for installation of the fire alarm system as indicated on the drawings and specifications.
- .3      The fire alarm system shall consist of all necessary hardware equipment and software programming to perform the following functions:
  - .1      Fire alarm and detection operations
  - .2      Control and monitoring of door hold open devices, fire suppression systems, emergency power systems, AHU shutdowns, and other equipment as indicated in the drawings and specifications (including all appendices and previous fire alarm system annual test and inspection report).

### **1.2            SYSTEM DESCRIPTION**

- .1      Fully supervised, microprocessor-based, fire alarm system, utilizing digital techniques for data control and digital, and multiplexing techniques for data transmission.
- .2      System to carry out fire alarm and protection functions; including receiving alarm signals; supervising components and wiring; actuating annunciators and auxiliary functions; initiating trouble signals and signalling to monitoring agency.
- .3      Zoned system: Signalling devices shall correspond to initiating zones. Subdivision of alarm signalling zones shall be based on:
  - .1      Fire separations
  - .2      Sprinkler zones
  - .3      Floor levels
  - .4      Each cell as one address
  - .5      Fire suppression system
- .4      Operation of system shall not require personnel with special computer skills.
- .5      For Buildings 1,2, and 3: Provide an LED indicator light in every fire alarm panel and annunciator. This LED indicator light shall be "On" in the event that Building 4 is in alarm.
- .6      For Building 4: Provide an LED indicator light in every fire alarm panel and annunciator. This LED indicator light shall be "On" in the event that Buildings 1, 2, and 3 are in alarm.

- .7 System to include, but not limited to:
  - .1 Central Control Unit in separate enclosure with power supply, stand-by batteries, central processor with microprocessor and logic interface, main system memory, input-output interfaces for alarm receiving, annunciation/display, and program control/signalling; master telephone microphone with necessary switches and controls.
  - .2 Data Gathering Panels/Transponders with stand-alone capabilities.
  - .3 Power supplies.
  - .4 Initiating/input circuits.
  - .5 Output circuits.
  - .6 Telephone circuits.
  - .7 Auxiliary circuits.
  - .8 Amplifiers.
  - .9 Wiring.
  - .10 Manual and automatic initiating devices.
  - .11 Audible and visual signalling devices.
  - .12 End-of-line resistors.
  - .13 Local and Remote annunciators.
  - .14 Historic event recorder.

### **1.3 REGULATORY REQUIREMENTS**

- .1 Installation subject to approval, inspection and test of Consultant and Fire Marshall for final acceptance.
- .2 All equipment shall be listed by Canadian Standards Association or nationally recognized fire test laboratory, compatible to form an integrated fire alarm system.
- .3 System to be provided, installed, and verified in accordance with CSA Standard CAN/ULC4-S524-14, S536-13, and S537-13.

### **1.4 MANUFACTURERS**

- .1 Acceptable manufacturers as listed:
  - .1 Simplex Grinnell
  - .2 Chubb Edwards
  - .3 Siemens
  - .4 Notifier.
- .2 Being listed as an acceptable manufacturer in no way relieves obligations to provide all equipment and features in accordance with these specifications.
- .3 It shall be the company's responsibility, providing the quotation, to ensure that the product manufacturers provide to the Consultant in writing prior to seven (7) business days of bid closing meet specifications. Written confirmation to be a fully itemized line-by-line list for every aspect of all equipment. A copy of the manufacturer's brochures will not be accepted.

- .4 The Manufacturer shall be a nationally recognized company specializing in fire alarm and detection systems. This organization shall employ factory trained and/or CFAA (Canadian Fire Alarm Association) certified technicians, and shall maintain a service organization within 100 kilometres of this project location. The Manufacturer and service organization shall have a minimum of ten (10) years' experience in the fire protective signalling systems industry.

## **1.5 SUBMITTALS**

- .1 General: Submit the following according the conditions of the contract and Division 01 Specification Sections. Shop drawings to include but not limited to:
- .1 Product data sheets for system components, only for the specific products, features, or functions to meet this specification. Alternate or as-equal products submitted under this contract must provide line-by-line comparison of how the submitted product meets, exceeds or does not comply with this specification.
  - .2 Complete installation wiring diagrams for the whole system, from the manufacturer.
  - .3 Panel elevation drawings showing equipment layout.
  - .4 Shop drawings showing system details including location of Control panels, all devices, circuiting and details of the graphic annunciator.
  - .5 System power and battery charts with performance graphs and voltage drop calculations to assure the system will operate per the prescribed backup time periods and under all voltage conditions as per ULC and Building Code requirements.
  - .6 System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output points in the system shall be provided with a label indicating location or use of IDC, NAC, Relay, Sensor, and auxiliary control circuits.
  - .7 Operating instructions for the Control Panel's.
  - .8 Operation and maintenance data for inclusion in the Operating and Maintenance Manual. Include data for each type product, including all features and operating sequences, both automatic and manual. Provide the names, addresses, and telephone numbers of service organizations.
  - .9 Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.
  - .10 Record of field tests of system in compliance with CAN/ULC-S537.
- .2 Submission to the Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make resubmissions if required to make clarifications or revisions to obtain approval.

## **1.6 EXTRA MATERIALS**

- .1 Provide maintenance materials as follows:
- .2 Include:
  - .1 Six (6) spare glass rods for manual pull box stations.
  - .2 Six (6) smoke detectors
  - .3 Six (6) smoke detectors c/w local alarm
  - .4 Six (6) duct detectors
  - .5 Six (6) heat detectors
  - .6 Three (3) high heat detectors
  - .7 Three (3) manual pull stations
  - .8 Six (6) Addressable input modules
  - .9 Six (6) Addressable control relays
  - .10 Two (2) Strobes
  - .11 Two (2) Horn/strobes
  - .12 Four (4) passive graphics
  - .13 Two (2) sprinkler flow switches
  - .14 Two (2) sprinkler tamper switches
  - .15 Two (2) sprinkler pressure switches
  - .16 Six (6) sprinkler switch monitor modules
  - .17 Six (6) end-of-line resistors

## **1.7 WARRANTY**

- .1 The Fire Alarm / Life Safety system manufacturer shall supply a one (1) year warranty from date of verification for all control system, field devices, and appliances.
- .2 The Contractor shall warrant the installed system to be free from defects of material and installation for a period of one (1) year from acceptance by the Departmental Representative. Any deficiencies shall be immediately corrected at no additional cost to the project.
- .3 The Fire Alarm Manufacturer's authorized service organization shall provide a separate maintenance contract for a period of one (1) year from the date of system commissioning. As part of the systems maintenance, the service company will provide printed reports which detail the sensitivity of each smoke detector in the system and the date of the report.

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## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Materials and devices shall be supplied by a single manufacturer and shall be ULC listed as follows:
  - .1 Power Supply CAN/ULC S527
  - .2 Audible Signal Devices CAN/ULC S525
  - .3 Visual Signal Devices CAN/ULC S526
  - .4 Control Unit CAN/ULC S527
  - .5 Manual Fire Alarm Stations CAN/ULC S528
  - .6 Heat Detectors CAN/ULC S530
  - .7 Smoke Detectors CAN/ULC S529

### **2.2 SYSTEM OPERATION:**

- .1 This project will consist of two (2) complete fire alarm systems. One (1) system will control devices located in Buildings 1, 2, and 3 of the facility with the FACP in the basement of Building 1. The second system will control devices located in Building 4 of the facility with the FACP on the ground floor of Building 4. Both FACPs will send a supervisory signal to the other panel when the system it monitors goes into alarm. Each system will be a single-stage system.
- .2 Actuation of any alarm initiating device to:
  - .1 Indicate the general alarm condition at the FACP and annunciators.
  - .2 Identify the device and its zone that is the source of the alarm at the FACP and annunciators.
  - .3 Display the alarm on LCD display. Once acknowledged, the alarm shall latch on. A subsequent alarm received from another zone shall flash the system alarm LED on the control unit and display the annunciator. The display shall show the new alarm information.
  - .4 A alarm tone shall occur within the control unit and the annunciators until the event has been acknowledged.
  - .5 Operate strobe lights throughout the building.
  - .6 All visible alarm notification appliances shall flash continuously.
  - .7 Smoke detection for a zone with alarm verification shall cause the following:
    - .1 Activation of a listed and approved *alarm verification* sequence at the FACP and the detector.
    - .2 The control unit shall have the capability to display the number of times (tally) a zone has gone into a verification mode.
  - .8 Shutdown main air handling systems.
  - .9 Close fire and smoke doors normally held open by magnetic door holders.

- .10 Close fire shutters (if any).
- .11 Start pressurization fan system (if any).
- .12 Close smoke dampers on system serving zone where alarm is initiated.
- .13 Activate a supervised signal to notify the local fire department.
- .3 Possible to silence signals by "alarm silence" switch at central control unit, after silencing inhibit after timer has timed out.
  - .1 Silencing of an alarm shall not be possible during the first one (1) minute of alarm.
  - .2 A silenced alarm shall re-initiate after ten (10) minutes of silence if the condition remains unchanged
  - .3 Means shall be provided to manually re-initiate the audible signal from a 'silence' condition.
- .4 Subsequent alarm, received after previous alarm has been silenced, to re-activate signals.
- .5 Actuation of any supervisory device to:
  - .1 Cause electronic latch to lock-in supervisory state at central control unit and data gathering panel/transponder.
  - .2 Indicate respective supervisory zone at central control unit and remote annunciators.
  - .3 Cause audible signal at central control unit to sound.
  - .4 Activate common supervisory sequence.
- .6 Resetting alarm and/or supervisory device not to return system indications/functions back to normal until control unit is reset.
- .7 Trouble on system to:
  - .1 Indicate circuit in trouble at central control unit.
  - .2 Activate "system trouble" indication, buzzer and common trouble sequence. Acknowledging trouble condition to silence audible indication; visual indication to remain until trouble is cleared and system is back to normal.
- .8 Troubles on system: suppressed during course of alarm.
- .9 Trouble condition on any circuit in system not to initiate alarm conditions.
- .10 The time required to complete a single monitoring sequence for all zones and devices shall not exceed five (5) seconds.
- .11 The capacity of the system shall accommodate, at minimum, all present and future known requirements plus 50%.
- .12 The fire alarm system shall be completely independent of all other security, communications, and monitoring systems.

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## 2.3 DISTRIBUTED FIRE ALARM CONTROL PANELS

- .1 Display unit LCD display module with a Liquid Crystal Display. With two (2) lines, 40 characters display, to include previous, next and Expanded message display controls with switches. To provide event queues with display control switches for Alarm, Supervisory, and Trouble Conditions.
- .2 Suitable for DCLA communication style: to CAN/ULC-S524.
- .3 Features specified are minimum requirements for microprocessor-based system with digital data control and digital multiplexing techniques for data transmission.
- .4 Minimum capacity of 2000 addressable monitoring and 1000 addressable control/signal points. Points may be divided between two (2) communication channels in distributed system, each channel operating independently of other. Faults on one (1) communication channel not to affect operation of other channels.
- .5 System to provide for priority reporting levels, with fire alarm points assigned highest priority, supervisory and monitoring lower priority, and third priority for troubles. Possible to assign control priorities to control points in system to guarantee operation or allow emergency override as required.
- .6 Integral power supply, battery charger and standby batteries.
- .7 Basic life safety software: retained in non-volatile Erasable Programmable Read-Only-Memory (EPROM). Extra memory chips: easily field-installed. Random-Access-Memory (RAM) chips in panel to facilitate password-protected field editing of simple software functions (e.g. zone labels, priorities) and changing of system operation software.
- .8 Circuitry to continuously monitor communications and data processing cycles of microprocessor. Upon failure, audible and visual trouble indication to activate.
- .9 Communication between Control panels to be supervised, DCLA. Should communications fail between Control panels, audible and visual trouble to be indicated at each unit. Data communication to be binary DC, baseband, time-division multiplex, half-duplex. Each data channel: capable of communicating up to distance of 3,000 m.
  - .1 Communication between nodes in networked system to be supervised, DCLA. Provide a two (2) hour rating between the runs of the loop between the Fire Alarm Control Panel(s) and Fire Alarm Annunciator(s). Should communications fail between any two (2) nodes, other nodes on loop to continue to communicate with each other and programmed functions on communicating nodes to continue operating.
- .10 Support up to two (2) RS-232-C I/O ports. Control panel output: parallel ASCII with adjustable baud rates to allow interface of any commercially available printer, terminal or PC.
- .11 Equipped with software routines to provide Event-Initiated-Programs (EIP); change in status of one or more monitor points, may be programmed to operate any or all of system's control points.

- .12 Software and hardware to maintain time of day, day of week, day of month, month and year.
- .13 Software to operate variable sensitivity addressable smoke detectors and annunciate their status and sensitivity settings at control panel.
- .14 Comply with CAN/ULC-S527 "Standard for Control Units for Fire Alarm Systems".

## **2.4 FIRE ALARM PANEL**

- .1 Display unit LCD display module with a Liquid Crystal Display. In the alarm mode display up to eight (8) events simultaneously, including the first seven (7) highest priority events, the last event, the total number of unacknowledged events and the type of events on display. To include previous, next and Expanded message display controls switches. To provide event queues with display control switches for Alarm, Supervisory, and Trouble Conditions.
- .2 System Maintenance and Testing Facility
  - .1 Provide required hardware/software such that system alarm zones can be temporarily disabled by site personnel to enable annual testing of system devices without the use of a password. A trouble signal would be present during testing but system ULC approval will be unaffected. All bypass and auxiliary functions are to be operated by means of a toggle type on/off switch located at the main fire alarm control panel. Use of keypad for bypass auxiliary functions is not acceptable. Auxiliary functions include but are not necessarily limited to;
  - .2 Switch Bank 1 – access code required to activate all switches
    - .1 Switch 1 – All smoke detectors in the system will be bypassed – only one trouble will be reported.
    - .2 Switch 2 – All sprinkler zones in the system will be bypassed – only one trouble will be reported.
    - .3 Switch 3 – All duct detectors in the system will be bypassed – only one trouble will be reported.
    - .4 Switch 4 – All audible/strobes in the system will be bypassed – only one trouble will be reported.
    - .5 Switch 5 – Control center monitoring point (City) will be bypassed – only one trouble will be reported.
    - .6 Switch 6 – Spare.
    - .7 Switch 7 – Spare.
    - .8 Switch 8 – Spare.



- .3 Bank 2 no access code required.
  - .1 Switch 9 – All door holders in the system will be by-passed.
  - .2 Switch 10 – Spare.
  - .3 Switch 11 – All security door unlock schemes in the system will be bypassed.
  - .4 Switch 12 – Remote annunciator bypass – operating this switch will prevent annunciators from operating and causing noise disruption to public during testing.
  - .5 Switch 13 – Alarm inhibit bypass – causes the system to ignore its one (1) minute alarm silence and system reset inhibit function.
  - .6 Switch 14 – All air or fan system shut downs in the system will be bypassed.
  - .7 Switch 15 – All exhaust fans to shut down.
  - .8 Switch 16 – Spare.

## **2.5 POWER SUPPLIES**

- .1 120 V, 60 Hz as primary source of power for system.
- .2 Voltage regulated, current limited distributed system power.
- .3 Primary power failure or power loss (less than 102 V) will activate common trouble sequence.
- .4 Interface with battery charger and battery to provide uninterruptible transfer of power to standby source during primary power failure or loss.
- .5 During normal operating conditions fault in battery charging circuit, short or open in battery leads to activate common trouble sequence and standby power trouble indicator.
- .6 Standby batteries: sealed, maintenance free.
- .7 Continuous supervision of wiring for external initiating and alarm circuits to be maintained during power failure.

## **2.6 INITIATING/ INPUT CIRCUITS**

- .1 Receiving circuits for alarm initiating devices such as manual pull stations, smoke detectors, heat detectors and water flow switches, wired in DCLA configuration to associated control panel.
- .2 Alarm receiving circuits (active and spare): compatible with smoke detectors and open contact devices.
- .3 Actuation of alarm initiating device: cause system to operate as specified in "System Operation".
- .4 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".
- .5 Input circuits to have isolation built in for panel protection. Systems that do not have circuit isolation shall be provided with panel mounted isolators.

## **2.7 ALARM OUTPUT CIRCUITS**

- .1 Alarm output circuit: connected to horns, wired in class B configuration to central control unit.
  - .1 Horn circuits operation: follow system programming; capable of reproducing tones and voice fed by audio channels.
  - .2 Manual selection and operation of alarm tones to be provided on floor-by-floor basis.
  - .3 Manual selection for emergency paging to be provided on floor-by-floor basis.
  - .4 Proprietary evacuation control switch to be provided to shunt out automatic system programming once manual control of system has been assumed by authorized personnel.

## **2.8 AUXILIARY CIRCUITS**

- .1 Auxiliary contacts for control functions.
- .2 Alarm on system to cause operation of programmed auxiliary output circuits.
- .3 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.
- .4 Fans: stagger-started upon system reset; timing circuit to separate starting of each fan or set of fans connected to auxiliary contact on system. Timing circuit: controlled by Control Panel.
- .5 Auxiliary circuits: rated at 2 A, 24 Vdc or 120 Vac, fuse-protected.

## **2.9 AMPLIFIERS**

- .1 Modular in construction, solid state in design, with power output of 70 V RMS, for constant voltage distribution to horn circuits.
- .2 Continuously supervised for proper operation. Loss of power, open or short circuit on input or output of amplifier, or total amplifier failure, to activate trouble sequence at central control unit with visual indication.
- .3 Housed in central control unit. Integral power supply and supported by standby batteries in case of power failure.
- .4 Riser amplifiers: housed in central control unit, with outputs connected to voice communication risers.
- .5 Standby amplifiers: at central control unit; sized to meet requirements of largest amplifier in that location, with automatic transfer to be on priority basis.
- .6 Amplifiers to be sized to 50% spare capacity for future expansion.

## **2.10 ANNUNCIATOR**

- .1 LCD display module with a Liquid Crystal Display. In the alarm mode display up to eight (8) events simultaneously, including the first seven (7) highest priority events, the last event, the total number of unacknowledged events and the type of events on display. To include previous, next and Expanded message display controls switches. To provide event queues with display control switches for Alarm, Supervisory, and Trouble Conditions.
- .2 Complete with a hinged, lockable door with viewing window.

## **2.11 BOOSTER POWER SUPPLY**

- .1 Booster power supply / NAC Extender complete with four (4) Class "B" audible/visual signal circuits, each rated for 2 amps at 24 Vdc and programmable for a continuous or temporal output. Booster power supply to provide 500 mA of auxiliary power output and be complete with a battery and charger sized for twenty-four (24) hours of standby power followed by one (1) hour of alarm. Following this period, the batteries must retain 85% of their rated voltage. The source shall be capable of full recovery within twenty-four (24) hours.
- .2 Booster power supplies to be connected to one or two signal circuits from the control panel to follow the sequence of the control panel signal circuits.
- .3 Booster power supply to be supervised for trouble conditions and annunciate a signal circuit fault on the main control panel.
- .4 Power supply conductors shall be stranded copper of adequate size to handle the current required to supply the maximum capacity of the system plus 50%.

## **2.12 MANUAL ALARM STATIONS**

- .1 Addressable manual pull station.
  - .1 Pull lever, break glass rod, surface or semi-flush wall mounted type, single action, 2 stage, electronics to communicate station's status to addressable module/transponder over 2 wires and to supply power to station. Station address to be set on station in field. Pull stations to come with guard at areas indicated on drawings.

## **2.13 AUTOMATIC ALARM INITIATING DEVICES**

- .1 Heat detectors - fixed temperature, non-restorable, rated 88<sup>0</sup>C.
- .2 Heat detectors - fixed temperature, non-restorable, rated 135<sup>0</sup>C. This is for areas with high humidity.
- .3 Heat detectors - high heat for mechanical rooms and as indicated in the drawings.

- .4 Addressable thermal fire detectors, combination fixed temperature and rate of rise, non-restorable fixed temperature element, self-restoring rate of rise, fixed temperature EC, rate of rise 8.3<sup>0</sup>C per minute.
  - .1 Electronics to communicate detector's status to addressable module/ transponder.
  - .2 Detector address to be set on detector base in field or by automatic electronic addressing.
  - .3 The detector or base shall contain an LED to provide indication of communication to the control unit. The LED shall provide indication of alarm condition.
  - .4 Each detector shall be scanned by the Control unit for its type identification to prevent inadvertent substitution of another type of sensor. Upon detection of a "wrong device", the control unit shall operation with the installed unit's inherent settings for that type of unit, but shall indicate a trouble condition shall be logged on the system.
- .5 Addressable Duct Smoke detector: photo-electric type air duct type with sampling tubes with protective housing.
  - .1 Twistlock type with fixed base.
  - .2 Wire-in base assembly with integral red alarm LED, and terminals for remote relay and alarm LED.
  - .3 Electronics to communicate detector's status to addressable module/transponder.
  - .4 Detector address to be set on detector base in field or by automatic electronic addressing.
  - .5 The detector or base shall contain an LED to provide indication of communication to the control unit. The LED shall provide indication of alarm condition.
  - .6 Each detector shall be scanned by the Control unit for its type identification to prevent inadvertent substitution of another type of sensor. Upon detection of a "wrong device", the control unit shall operation with the installed unit's inherent settings for that type of unit, but shall indicate a trouble condition shall be logged on the system.
  - .7 The detector shall be installed at a location in the main supply air duct on the downstream side of the filter units; and at a location in the return air duct prior to exhausting from the building.

- .6 Addressable variable-sensitivity smoke detectors.
  - .1 Photo-electric type.
  - .2 Electronics to communicate detectors status to addressable module/ transponder.
  - .3 Detector address to be set on detector in field or by automatic electronic addressing.
  - .4 The detector or base shall contain an LED to provide indication of communication to the control unit. The LED shall provide indication of alarm condition.
  - .5 Sensitivity settings: three (3) settings, determined and operated by control panel. No shifting in detector sensitivity due to atmospheric conditions (dust, dirt) within certain parameters.
  - .6 Ability to annunciate minimum of two (2) levels of detector contamination automatically with trouble condition at control panel.
  - .7 Each detector shall be scanned by the Control unit for its type identification to prevent inadvertent substitution of another type of sensor. Upon detection of a "wrong device", the control unit shall operation with the installed unit's inherent settings for that type of unit, but shall indicate a trouble condition shall be logged on the system.
- .7 Addressable variable-sensitivity smoke detectors complete with local alarms.
  - .1 **All smoke detectors complete with local alarms are to send a supervisory to the main fire alarm panel only. Only the local alarm within the smoke detector is to go into alarm. All general horns/bells in the building will not go into alarm and there is no requirement to call the fire department. This is to be the procedure, unless otherwise noted on the drawings.**
  - .2 Photo-electric type.
  - .3 Electronics to communicate detector's status to addressable module/ transponder.
  - .4 Detector address to be set on detector in field or by automatic electronic addressing.
  - .5 The detector or base shall contain an LED to provide indication of communication to the control unit. The LED shall provide indication of alarm condition.
  - .6 Sensitivity settings: three (3) settings, determined and operated by control panel. No shifting in detector sensitivity due to atmospheric conditions (dust, dirt) within certain parameters.
  - .7 Ability to annunciate minimum of two (2) levels of detector contamination automatically with trouble condition at control panel.
  - .8 Each detector shall be scanned by the Control unit for its type identification to prevent inadvertent substitution of another type of sensor. Upon detection of a "wrong device", the control unit shall operation with the installed unit's inherent settings for that type of unit, but shall indicate a trouble condition shall be logged on the system.

- .9 Detector will sound locally when smoke is detected and cease when the smoke has cleared. A supervisory signal will be sent to the fire alarm panel, but the system will not be sent into alarm when smoke is detected.
- .10 Detectors located in Building 4 will sound upon general alarm in addition to the local alarm described above.

## **2.14 BASES**

- .1 Standard base to mount on either octagon box or 4x4 square box. Provide trim ring or adapter plate for all detectors.
- .2 Relay output, sounder and isolator bases shall be supported alternatives to the standard base.
- .3 No isolation bases to be used with detectors. Isolators and detectors to have separate bases for easier verification and future troubleshooting.

## **2.15 INPUT MODULES**

- .1 Addressable input module complete with a supervised Class "B" input circuit to monitor non-addressable contact devices. Module to include a polling LED and an alarm LED.
- .2 Addressable input module complete with two (2) supervised Class "B" input circuit to monitor non-addressable contact devices. Module to include a polling LED and an alarm LED.
- .3 Input modules to wire to end-of-line resistor located after the contact device.

## **2.16 RELAY MODULES**

- .1 Addressable relay complete with a form "C" dry relay contact rated 0.5 amps at 120 Vac or 2A at 24Vdc. Module to include a polling LED and an alarm LED.

## **2.17 ISOLATOR MODULES**

- .1 Line isolator module. Module to isolate short circuits within floor areas not exceeding 2,000 square metres and between floors, so that a fault within one floor area shall not affect another floor area. At least two (2) isolator modules shall be provided for each protected zone of the building.
- .2 The use of isolation modules shall not severely limit the input circuit quantity of detectors or modules, and shall not have a limitation of the number of detectors between isolators. The use of additional isolators to add quantity of detectors onto the loop will not be allowed.
- .3 Furnish and install two (2) fire alarm isolators at two (2) hour fire rated walls or ceilings: install one (1) isolator on both sides of wall or ceiling staggered and in accordance with CAN/ULC-S524. Maximum of twelve (12) isolators per initiating loop.

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## **2.18 AUDIBLE SIGNAL DEVICES**

- .1 Horns: 92 db (with the possibility of adjusting the levels), 24 V dc. Contractor to pressure test audible signal devices to ensure a minimum 10dB above the ambient noise level in each room, and a minimum 75dB at every sleeping location is maintained. Adjust device settings accordingly.
- .1 Integral synchronized strobe (where indicated) with field selectable output of 15, 30, 60, 75, or 110cd (refer to drawings for cd levels)

## **2.19 VISUAL ALARM SIGNAL DEVICES**

- .1 Synchronized strobe type: flashing, white, 24 V dc.
- .2 Strobes with field selectable ratings: 15, 30, 60, 75, or 110cd.
- .3 Designed for surface mounting on ceiling or walls, as indicated.
- .4 Strobes shall be synchronized.

## **2.20 END OF LINE RESISTORS**

- .1 End-of-line devices to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

## **2.21 PASSIVE GRAPHIC ANNUNCIATOR**

- .1 Provide passive graphic display at locations shown on the drawings plus four (4) additional graphics to leave with site maintenance. Graphic display to indicate fire zones on annunciator in multiple colours at consultant's direction and locations of main system. Graphic display to be placed under Lexan lens framed and installed as directed on site. Provide beside the main fire alarm panel, annunciators and as indicated on the drawings.

## **PART 3 EXECUTION**

### **3.1 PROGRAMMING**

- .1 The system shall be fully programmable in the field with the need for special tools and shall not require field replacement of electronic integrated circuits. Systems that require factory burning of e-proms will not be accepted.
- .2 All programming to be performed via the control panel keypad or a laptop computer.
- .3 All field programming to be stored in a non-volatile memory.
- .4 The system programming shall have 4 levels of password protection.
- .5 Any system output, control module or riser module may be programmed to activate on any single input or any combination of inputs.

- .6 Final system programming shall be performed during the construction period.
- .7 The system shall be fully programmed and operational prior to the commencement of the verification inspection.
- .8 Provide 19 mm conduit from main fire alarm control panel to main telephone board or cabinet. Provide 6 #18 AWG wires for monitoring of the alarm, supervisory and trouble contacts of the fire alarm panel by others. Contractor to coordinate with the Departmental Representative for the arrangement of the monitoring of the fire alarm system by a ULC listed central monitoring agency.

### **3.2 INSTALLATION**

- .1 All fire alarm wiring shall be installed in approved raceways.
- .2 End-of-line resistor for each box circuited to be mounted in separate box located not more than 2 m above finished floor beyond the last bell and strobe circuits.
- .3 Mount fire alarm boxes at 1150 mm above finished floor to center of the manual pull station.
- .4 Detectors must be installed to have a clear space around the detector for 450 mm. This space is to extend below and around the detector as well as on the ceiling. Detectors must not be mounted closer than 450 mm to an outlet of any air distribution system.
- .5 From the fire alarm control panel, make connection to all motor control centres and relate equipment as required for fan systems control. Provide one set of individual relay contacts per fan unit in separate fan control relay box.
- .6 Provide addressable monitor module at each sprinkler flow valve, tamper, and pressure location and tie in flow switch to provide activation of zone at fire alarm under flow condition. Confirm locations on-site and allow sufficient wire and cable to make required connections.
- .7 Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes.
- .8 Install monitor modules at the following locations:
  - .1 Where shown on the drawings and fire alarm riser.
- .9 Install control modules at the following locations:
  - .1 Motor control centres and motor starters controlling air systems.
  - .2 Door hold open devices.
  - .3 Where shown on the drawings.
  - .4 Stairwell pressurization units.
- .10 Provide 120 volt power to main panel and remote power supplies.
- .11 Provide 120 volt power to door holders from closest unswitched circuit.



- .12 Provide high current relays where the load exceeds the rating of the addressable relays.
- .13 Install monitoring of emergency generator (run and trouble) and fire pump (run and trouble).
- .14 Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes additional and detection devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on site. Modification of software shall not require power down of the system or loss of system fire protection while modifications are being made. All programming to be completed prior to final verification. Division 26 to confirm all device addresses with User prior to initial programming.

### **3.3 CONDUIT**

- .1 Conduit shall be in accordance with the Canadian Electrical Code, Local and Provincial requirements.
- .2 Where possible, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40% of interior cross sectional area where three or more cables are contained within a single conduit.
- .3 Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit junction box or raceway containing these conductors.
- .4 Wiring for 24 volt control, alarm notification, emergency communication and similar power limited auxiliary functions to be run in separate conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designated to permit simultaneous operation of all circuits without interference or loss of signals.
- .5 Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.

### **3.4 WIRING**

- .1 Fire alarm conductor terminations in control panel and annunciator panel to be made on terminal strips with separate point for each conductor. All such strips to be number identified as schedule for in wiring diagrams attached to inside of door of control panel. Wiring to be neatly installed to all terminal strips and clipped with nylon cable straps or laced with jute cord. Termination of cabling to be set up in such a manner that sections of the system may be isolated or sorted out for servicing a trouble or fault.

- .2 Wiring shall be in accordance with Local, Provincial and National Codes and as recommended by the manufacturer of the fire alarm system.
  - .1 To initiating circuits: 18AWG minimum, and in accordance with manufacturer's requirements.
  - .2 To signal circuits: 16AWG minimum, and in accordance with manufacturer's requirements.
  - .3 To control circuits: 14AWG minimum, and in accordance with manufacturer's requirements.
- .3 Wiring used for multiplex communication loop shall be twisted and shielded and installed in conduit unless specifically accepted by the fire alarm equipment manufacturer. The system shall permit use of IDC and IAC wiring in the same conduit with the communication loop.
- .4 Attach wiring diagram to inside of panel door.
- .5 All fire alarms system wiring shall be new.
- .6 Splices are not permitted.
- .7 All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signalling system.
- .8 All field wiring shall be completed supervised.

### **3.5 FIRE SYSTEMS INSPECTION**

- .1 Complete system programming. Multiple programming trips will be required during construction.
- .2 Prior to requesting verification of the fire alarm system by the Consultant, Electrical Contractor and the system manufacturer's technical staff shall:
  - .1 Inspect system to ensure that the fire alarm system is correctly installed, connected and fully operational in accordance with the requirements of the full contract documents and manufacturer's recommendations. This shall include all auxiliary equipment connected to fire alarm system such as central station tie-in, fan shutdown, sprinklers, door hold-open devices, as follows:
  - .2 Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
  - .3 Close each sprinkler system flow valve and verify supervisory alarm at the FACP.
  - .4 Verify activation of all flow switches with actual flow test.
  - .5 Open initiating device circuits and verify that the trouble signal actuates.
  - .6 Open and short signalling line circuits and verify that the trouble signal actuates.

- .7 Open and short indicating applicable circuits and verify that trouble signal actuates.
  - .8 Ground all circuits and verify response of trouble signals.
  - .9 Check presence and audibility of tone at all alarm notification devices.
  - .10 Check installation, supervision and operation of all intelligent smoke detectors using the Walk Test.
  - .11 Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
  - .12 When the system is equipped with operational features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.
  - .13 Ensure that any subsequent work remaining to be performed on the above noted items will not invalidate examinations and tests performed during verification procedure.
  - .14 Twenty-four (24) hour test on batteries.
  - .15 Ensure that operation and maintenance data has been submitted.
  - .16 Ensure that spare parts and maintenance materials have been delivered.
  - .17 Contractor shall complete and sign the Consultant pre-verification checklist. Checklist can be obtained at anytime during tender or construction. Failure to provide complete this checklist, the Consultant reserves the right to cancel the verification.
- .3 Advise the Consultant, in writing, that the above prerequisites have been fulfilled and list known exceptions in the form of a list of items to be completed or corrected, prior to proceeding with the verification.
- .4 The Consultant will proceed with the verification or advise Contractor that prerequisites are not adequately fulfilled.

### **3.6 FIRE ALARM VERIFICATION**

- .1 The direction of the procedure for the inspection, testing and completion of the reports for the verification of the fire alarm system shall be in accordance with ULC Standard CSA/ULC-S537 "Standard for Verification of Fire Alarm System Installation".
- .2 Assist and cooperate with the Consultant in the verification procedure. Fire alarm manufacturer shall provide the following:
  - .1 Velometer
  - .2 Artificial smoke
  - .3 Rate of rise heat detector tester
  - .4 Minimum of four portable communication devices

- .3 Do not proceed with the verification unless the following parties are present at all times during verification procedures:
  - .1 Electrical Contractor
  - .2 Fire alarm system manufacturer's representative.
  - .3 Departmental Representative
  - .4 Consultant Engineer
- .4 Disassemble and re-assemble system components.
- .5 Disconnect and reconnect wiring.
- .6 Perform required field adjustments.
- .7 Repair defective work and replace defective components.
- .8 Electrical Contractor to include in his base bid all costs (including but not limited to Fire Alarm Manufacturer representative, Elevator Manufacturer, and Engineer representative for fire alarm system verification and any additional costs to change or alter operation or installation to meet intent of the specification or regulatory code.
- .9 Pressure test for audible devices to be performed. Maintain a minimum of 10dB above ambient noise level in each room and 75dB at every sleeping location. Adjust device settings accordingly.

### **3.7 CSC OCCUPANCY CHECKLIST**

- .1 Prior to project close-out, the CSC occupancy checklist will be completed as follows:
  - .1 Fire alarm verification report per CAN/ULC-S537 (with all deficiencies noted as corrected).
  - .2 Confirmation of proper installation of fire alarm panel (CAN/ULC-S537) signed off by fire alarm technician.
  - .3 Confirmation of fire alarm emergency power capacity. Twenty-four (24) hour battery test as described in CAN/ULC-S537, signed off by fire alarm technician. The emergency power under full load shall be operational for one (1) hour following the twenty-four (24) hour supervisory period.
  - .4 Fire safety plan signed off by Regional Fire Safety Advisor.
  - .5 Final inspection conducted on behalf of CSC by a fire protection engineer.

### **3.8 COMMISSIONING**

- .1 In addition to the completion of the fire alarm verification, fire alarm commissioning must be completed. Refer to other sections.

### **3.9 DEMONSTRATION**

- .1 Provide on-site lectures and demonstration by fire alarm equipment manufacturer and electrical contractor to train operational personnel in use and maintenance of fire alarm system for a minimum three (3) days. Demonstration to include a video to be handed to the Departmental Representative.
- .2 Training is to take place after completion and verification, but prior to final acceptance.

**END OF SECTION**

