PART 1 GENERAL

1.1 REGULATORY REQUIREMENTS

.1 All equipment shall be listed by Underwriters' Laboratory of Canada (ULC).

.2 All components of the system shall be the product of a single manufacturer.

.3 The system and installation shall conform to the latest edition of the Ontario Building Code (OBC) and the Ontario Electrical Safety Code (OESC).

.4 The system shall be installed in accordance with CAN/ULC-S524-14, and shall be subject to the approval of the local Authority Having Jurisdiction.

.5 Fire Alarm System to be verified to CAN/ULC-S537-13

1.2 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittals

.2 Section 01 78 00 – Closeout Submittals

.3 Section 01 91 13 – Commissioning Requirements

.4 Section 26 05 00 – Common Work Requirements Electrical

.5 Section 26 90 00 – Wiring of Equipment Supplied by Others

1.3 SUBMITTALS

.1 Submit pdf shop drawings in accordance with 01 33 00 – Submittal Procedures.

.2 Shop drawings must be submitted and approved by project Engineer before any equipment is shipped to site.

.3 Shop drawings to consist of the following:

- .1 Project title page with project name, Engineer, contractor, and equipment manufacturers.
- .2 Project detailed equipment list
- .3 Project verification requirements
- .4 System/device data sheets and typical wiring schematics
- .5 Graphic annunciators detailed construction drawings.
- .6 Main fire alarm control panel.
- .7 Fire alarm transponder panel (if applicable).

.4 Provide ‘as-built’ drawings upon completion showing all devices c/w addresses including line isolator and conduit runs.

1.4 OPERATION AND MAINTENANCE MANUALS

.1 Operation and maintenance manuals to consist of the following:

.1 Operation and maintenance instructions for the complete fire alarm system to permit effective operation and maintenance.

.2 Recommended spare parts list with parts catalogue numbers.

.3 Copy of approved shop drawings.

1.5 MAINTENANCE

.1 Provide one year's free maintenance with two inspections by manufacturer during the year. Inspection tests to conform to CAN/ULC-S537-13.

1.6 TRAINING

.1 Provide on-site lectures and demonstrations by fire alarm equipment manufacturer, to train operational personnel in use and maintenance of the fire alarm system. Two separate lectures a minimum of 2 hours each. Coordinate training schedule with Owner.

1.7 QUALIFICATIONS OF MANUFACTURERS

.1 Manufacturers bidding this project must provide a Letter of Compliance, indicating they have met the specifications and system operation exactly.

1.8 SYSTEM DESCRIPTION

.1 Existing conventional fire alarm system to be replaced with new addressable system. New system to be extended to buildings on site, as per the contract drawings.

.2 Provide a supervised, micro-processor based, zoned, non-coded, single-stage, addressable fire alarm system, utilizing automatic/manual devices, wired in DCLA style 6 configuration, and operating at 24 VDC nominal voltage from a rectified 120 VAC power supply.

.3 Any circuit wiring leaving or entering a building shall be provided with a combination choke, MOV, and gas-discharge transient protector. Any circuit servicing a Class 1, Div. 2 area shall be isolated using intrinsically safe barriers.

.4 System shall notify the fire department of an alarm condition by way of a signal to a central monitoring station conforming to CAN/ULC-S561.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Equipment and devices: ULC listed and labelled; standard product of single manufacturer. Addressable type unless otherwise noted.

.2 Power supply: to CAN/ULC-S524 and OBC requirements.

.3 Audible signal devices: to ULC-S525.

.4 Control unit: to CAN/ULC-S527.

.5 Manual fire alarm stations: to ULC-S528.

.6 Smoke detectors: to CAN/ULC-S529.

.7 Thermal detectors: to ULC-S530.

2.2 SYSTEM OPERATION – SINGLE STAGE

.1 Single stage operation. Operation of any alarm initiating device:

- .1 Cause on electronic latch to lock-in the alarm state at the control panel.
- .2 Cause audible signal devices to sound throughout entire building.
- .3 Transmit signal to remote monitoring station via telephone line to CAN/ULC S561.
- .4 Cause zone of alarm signal to be indicated on fire alarm control panel and remote annunciator panel.
- .5 Automatically record the time, date and zone of alarm at the control panel.
- .6 Cause fire doors and smoke control doors if normally held open, to close automatically.
- .7 Fire alarm system shall automatically shut down the A/C systems and fans which are fitted with duct smoke detectors or otherwise indicated. Provide relay as required.
- .8 Fire alarm system shall recall elevator in the event of fire detection in the elevator machine room.

.2 Supervisory Device Activation

- .1 Actuation of and supervisory device shall:
  - .1 Cause on electronic latch to lock-in the supervisory state at the control panel.
  - .2 Indicate the respective supervisory zone at the control panel.
  - .3 Automatically record the event by time and date at the control panel.
  - .4 Cause a distinctive audible signal at the control panel.
  - .5 Activate a common supervisory sequence.

.3 Resetting System:

.1 Resetting the alarm or supervisory device and the system shall:

.1 Be automatically recorded at the control panel.

.2 Return all other system indications/functions back to normal.

.4 Trouble Activation:

.1 The system shall continuously monitor the system devices and wiring. Any trouble on the system shall:

.1 Indicate the circuit/device in trouble on the control panel.

.2 Automatically record the time, date and device in trouble.

.3 Activate the “system trouble” indication, buzzer and the common trouble sequence. Acknowledging the trouble condition shall silence the audible indication, whereas the visual indication shall remain until the trouble is cleared and the system is back to normal.

2.3 CONTROL PANEL

.1 DCLA System style in accordance with CAN-ULC-S524. Minimum of one loop per floor and one spare loop capacity.

.2 Each device individually addressed unless otherwise noted.

.3 Non-coded.

.4 Enclosure: CSA Enclosure 1, c/w lockable concealed hinged door, full viewing window, flush lock and 2 keys, wall mounted, max. 750 mm width.

.5 Central Processing Unit (CPU):

.1 The CPU is to monitor and control the entire system and allow control of all systems components connected to the system. The CPU shall be of modular design.

.2 The Central Processing Unit (CPU) shall be complete with forty (40) character alphanumeric display and keypad. All components shall be fully operational while the system is operating on the standby batteries.

.3 Basically all events are to be logged automatically in the system for future review.

.4 The CPU electronics shall be microprocessor-based. Basic life safety software shall be retained in erasable programmable read only memory (EPROM) and executed from random access memory (RAM) to allow password protected field editing. The CPU shall have the capacity to monitor the number of addressable points required for this project plus 25% spare capacity.

.5 The CPU must incorporate circuitry to continuously monitor the communications and data processing cycles of the microprocessor. On

CPU failure, an audible and visual trouble signal shall initiate and provide a remote trouble at Fire Department Control panel.

.6 The CPU shall be equipped with software routines to provide event initiated programs (EIP) whereby the receipt of an alarm or supervisory trouble condition may be programmed to operate any or all of the system's control points. EIP actions for life safety functions shall be retained in the non-volatile PROM memory for reliability. The CPU shall also be retained in the non-volatile PROM memory for reliability. The CPU shall also be capable of reprogramming these EIP functions in the field and retaining the changes in the RAM memory until a new set of PROM are programmed.

.7 The control unit shall be able to process and evaluate incoming signals from addressable devices such as automatic detectors, manual pull station, supervisory valves, etc., via DCLA style link.

.8 The control unit shall be able to handle the following maximum number of addressable links and field-programmable zones:

.1 Up to four addressable links per control unit.

.2 Up to 100 detection devices per line. Maximum initial loading to be no more than 80.

.9 Provide operating power for the detection devices through a regular two-wire line.

.10 Each addressable line module is to have its own microprocessor based circuit, working independently from the central processor board located in the control unit and independently from each other.

.11 All addressable circuits shall be monitored against open circuits and ground faults. Should a malfunction occur in any circuit, this must result in an indication of a trouble condition of this address location at the Control Panel while all other addresses continue operating normally.

.12 Should a detection device respond with either an alarm or trouble condition, its location must be displayed along with its user text of 40 characters. For maintenance purposes. The panel shall have the ability to display the address information of the device in alarm/trouble condition.

.13 Auxiliary relays: plug-in type, dust cover, supervised against unauthorized removal by common trouble circuit and c/w individual bypass switch.

.1 Contacts: 2 A, 120 V ac, for functions such as release of door holders or initiation of fan shut down. Provide also 2 N.O. and 2 N.C. contacts for security system monitoring of 'trouble' and 'alarm' connections to Control panel.

.2 Contact terminal size capable of accepting 22-12 AWG wire.

.14 The system shall be capable of logging and storing 300 events in an alarm log and300 events in a trouble log. These events shall be stored in a battery protected random access memory. Each recorded event shall include the time and date of that event's occurrence.

.1 The following Historical Alarm log events shall be stored:

.1 Alarms.

.2 Alarm acknowledgement.

.3 Trouble acknowledgement.

.4 Supervisory acknowledgement.

.5 Alarm verification tallies.

.6 Trouble Historical log cleared.

.15 Provide a general evacuation switch in the control panel to provide the fire department the option of causing a general alarm.

.6 General System Operation:

.1 Reset of the alarm system and return of the control panel to normal operation will be accomplished as follows:

.1 Resetting the fire alarm system shall not be possible until all the alarm zones have been reset or properly cleared after the Code required time delay.

.2 A supervisory input signal initiated by the actuation of a standpipe supervised valve shall cause:

.1 An audible trouble signal shall sound only at the control panel until acknowledged by authorized personnel.

.2 A latched-type visual indication of the location of the supervisory zone on the control panel.

.3 Print out of the time, date and the trouble zone on the printers.

.4 An open circuit fault on a supervisory circuit shall result in a specific trouble indication.

.5 Manual pull station, heat detectors, or flow switches will immediately cause the system to activate and report an alarm condition without verification requirement.

.3 The system will be programmable on site as outlined below:

.1 The fire alarm system shall allow for on-site loading or editing of the fire alarm programs as required to accommodate and facilitate expandability, building parameter changes or changes as required by the authority having jurisdiction.

.2 Fire alarm programs shall be written in an equation format comparable to ladder logic equations. The equations shall consist of input and output statements providing selective input/output control functions based on binary logic (and, or, not, timing) and other specially coded operational commands.

.3 Programming or editing a forty (40) character description label shall be made possible for any system monitor or control point. Extension of messages for any system point or group of points shall be field programmable.

.4 Assigning the same control point more than one level of control priority indifferent equations shall be possible to allow for automatic and/or manual override functions.

.5 The following conditions shall exist when disabling any part of the system.

.1 When a point has been disabled from the system it shall not disable the supervisory circuit for that zone. Tampering with the wiring of the disabled circuit shall initiate a point trouble condition at the Control Panel CPU.

.2 For an alarm received from any other monitor circuit which has not been disabled, the system shall operate as programmed.

.3 Whenever an initiating circuit has been disabled or disconnected a trouble condition shall be initiated and its location displayed at the main CPU and the monitoring control centre.

.6 All on-site programming or editing changes to the fire alarm system shall be password protected.

2.4 POWER SUPPLY

.1 The Control Panel is to contain the power supply for the entire system. 120 VAC, 60 Hz input, 24 VDC output from rectifier to operate alarm and signal circuits, with standby power of gel cell battery minimum expected life of four years, sized in accordance with OBC.

.2 The power supply unit must contain suitable over-voltage protection to prevent any malfunction or damage which might occur from line power surges.

.3 Upon loss of mains power, the power supply unit must contain suitable over-voltage protection to prevent any malfunction or damage which might occur from line power surges.

.4 When battery voltage drops below 22V, a fault indication is to be provided to indicate a battery fault condition.

.5 A visible and audible signal is to be generated to indicate that the control unit is operating under emergency power.

.6 The master fault indicator on the control unit is to be illuminated until power has been returned.

.7 When the AC power is restored, the control unit must automatically revert to normal operation without requiring any manual restarting procedures.

.8 Battery Charger shall be designed to suit the characteristics of the battery providing automatic boost charge facility when the battery bank potential falls below acceptable voltage for maintaining a working system and return to float charge when the battery bank reaches maximum acceptable voltage.

.9 Automatic equalizing type battery charger must be rated to recharge to at least 70% within 12 hours, and to operate from 120V, 60 Hz, single phase input.

2.5 MANUAL PULL STATIONS

.1 All manual stations shall be addressable.

.2 Manual alarm stations: pull lever, break glass, wall mounted flush type, non-coded single pole normally open contact for single stage.

2.6 AUTOMATIC ALARM INITIATING DEVICES

.1 All automatic initiating devices to be addressable.

.2 Heat detectors, combination fixed temperature and rate of rise, non-restorable fixed temperature element, self-restoring rate of rise, fixed temperature 57°C, rate of rise 8.3°C per minute. Low profile type.

.3 Heat detector base to be compatible with smoke detectors.

.4 Smoke detector: ionization type

.1 Plug-in type.

.2 Wire-in base assembly with integral continuously lit red LED, when in alarm mode. Flashing or alarm pulsating is not acceptable.

.3 Base compatible with heat detectors.

.4 Low profile type.

.5 Duct type smoke detectors; ionization type addressable c/w remote indicating lamp.

.6 All devices to be low profile type.

2.7 ADDRESSIBLE INTERFACE MODULES

.1 Provide addressable interface modules to interface non-addressable devices to the addressable loop including kitchen fire suppression system.

.2 Actuated as a distinct and separate address for each supervisory device.

2.8 AUDIBLE/VISUAL SIGNAL DEVICES

.1 Red Flush Mount Housing

.2 Horns and Horn/Strobes with field adjustable Hi/Lo dB setting.

.3 Strobes and Horn/Strobes with field adjustable 15/30/75/110cd strobe output.

.4 Equivalent to Edwards Genesis Series Horns and Strobes.

.5 Provide protective wire cages in arena setting.

2.9 GRAPHIC ZONE MAP

.1 Provide a graphic zone map indicating the name and extents of each zone for installation adjacent to the main control panel and remote annunciator panel.

.2 Floor plan, graphic style at: 1:200 scale, include:

.1 Building Outline
.2 Entrance and exit locations.
.3 “You are here” indications.
.4 Zone Boundaries.
.5 North Arrow.
.6 Stairwells
.7 Elevators

.3 Construct graphic in black on white non-fade medium. (Do not use ink as it will fade).

.4 Address (Zone) wording to correspond to panel annunciator wording.

.5 Upper case mechanically printed lettering. Sized for each reading.

.6 Building orientation to suit exact building layout when viewed from front.

.7 Building outline and zone boundaries to be distinguished by line thicknesses, line types, etc.

.8 Set in polished metallic frame with mark resistant Lexan overall cover.

.9 Suitable for screw fixing to wall.

.10 Submit PDF copy of graphic drawing for Engineer's approval prior to manufacturing.

2.10 SPARE PARTS

.1 Provide the following spare parts:

.1 5 glass rods for pull stations

2.11 SYSTEM MANUFACTURES

.1 Acceptable manufacturers:

.1 Edwards
.2 Simplex

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install systems in accordance with CAN-ULC-S524.

.2 Install main control panel and connect to ac power supply, ac dc standby power. Install unit so that alphanumeric display is between 1500 mm and 1700 mm A.F.F.

.3 Locate and install manual alarm stations and connect to the addressable loop.

.4 Locate and install detectors and connect them to the addressable loop. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors.

.5 Connect addressable loops to main control panel.

.6 Locate and install horns and strobes and connect to signaling circuits.

.7 Connect signaling circuits to main control panel. Alternate signal circuits within floor space (i.e. circuit 'A' device adjacent to circuit 'B' device)

.8 Locate and wire door releasing devices.

.9 Install all wiring for fire alarm system monitoring, control and communication circuits in conduit. Minimum conduit size shall be 21 mm. All wiring must be clear of shorts, opens and grounds on completion of installation. All wires must be clearly identified at all termination points.

.10 Ensure wire and cable are copper conductors with insulation rated at 300 V minimum, as follows:

.1 Fire alarm addressable circuits shall be #18 AWG twisted shielded pair. Maximum allowable length of run (wire distance) must not exceed 762 m.

.2 Signal circuit: 300 V 105°C PVC insulated copper conductors. Minimum conductor size #12 AWG. Voltage drop must not exceed the maximum permissible value recommended by the manufacturer.

.3 All wiring to be in conduit, unless otherwise specified on Contract Drawings.

.11 Ground panel and conduits.

.12 Provide connection to security system for remote monitoring of 'alarm' and 'trouble'.

.13 All Fire Alarm devices shall have both the device and its base labelled with p-touch to indicate building (if in a campus), floor, column line, device type. i.e. device labelled as T2-5-G3-SD would indicate tower 2, floor 5, column G3, smoke detector. This description should also be indicated at the annunciator and control panel.

.14 All fire alarm work is to be logged in at the main security station by the contractor, and shall indicate the location of the work, a description of the work, and the name of the contractor performing the work.

.15 The installation contractor shall notify the building owner of verification times, so the owner can include their maintenance contractor in review.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and CAN/ULC S536.

.2 Fire alarm system:

.1 Test each device and alarm circuit to ensure manual stations, thermal and smoke detectors transmit alarm to control panel and actuate general alarm ancillary devices.

.2 Test to demonstrate correct operation of each interlock device, auxiliary device, and by-pass switches.

.3 Check annunciator panels to ensure zones are shown correctly.

.4 Simulate grounds and breaks on alarm and signaling circuits to ensure proper operation of trouble signals and the capability for providing a subsequent alarm during any imposed single circuit fault condition (open, ground).

.5 Perform the system verification and certification per Clause 3.3 "Verification and Certification".

3.3 CERTIFICATION AND VERIFICATION

.1 Verify system to "CAN-ULC-S537".

.2 Verification is the responsibility of the manufacturer for testing the wiring in relation to field devices operation.

.3 To avoid unnecessary alarms during testing, the system's program shall be capable of being temporarily disabled to disconnect only the audible signals that are being tested. Re-enable the zones after the testing is performed at the end of the day.

.4 Inspect and test wiring to every device to verify the removal of the device or breaking the wire will cause a trouble condition at the Control Panel.

.5 Inspect all equipment installed as part of the system for visible damage or tampering which may be a potential problem with its intended operation.

.6 Activate each manual initiating device to verify and ensure their proper operation.

.7 Test each self-restoring heat detector utilizing a heat source to test the device operation.

.8 Test each ionization smoke detector. Detector operation shall be tested by introducing "smoke" into the detector head.

.9 Test all audible signals for proper operation. Tests shall be made to determine that the signal is audible throughout the area and above the normal ambient noise level.

.10 Verify all field wiring and terminate on a single conductor per terminals basis.

.11 Test system annunciators to ensure proper operation correct zoning and visibility of window inscriptions. All lamps and indicators shall be tested for proper operation.

.12 Test all control equipment for proper operation. Inspect and test all cable terminals, plug connectors, plug-in modules circuitry, lamp sockets and controls to confirm that their mechanical and electrical connections and mounting are acceptable to confirm their electrical supervision.

.13 Test ancillary equipment connections. Inspect such equipment to ensure that faults and malfunctions will not interfere with the alarm system.

.14 Test the following control functions for proper supervision, operation and annunciation.

.1 The Central station connection.

.15 Only make changes to the system program or zone identifications as approved by authorized personnel.

.16 Notify and demonstrate the complete system to Owner's representative and Building Inspection's representatives only after testing and verification performances has been completed and all deficiencies rectified. In their presence, demonstrate the proper functioning of the system. Have system manufacturer's certified technician present.

.17 Upon completion of the inspection and when all of the above conditions have been performed and complied with, the manufacturer shall issue to the Owner's representative the following:

.1 A copy of the inspection report identifying the location of each device and certifying the test results of each device.

.2 A certificate of verification confirming that the inspection has been completed and outlining the conditions upon which such an inspection and certification have been rendered.

.3 Proof of liability insurance for the inspection.

.18 All costs involved in this inspection for both the manufacturer's and the Contractor's work shall be included in the overall tender price.

3.4 VERIFICATION RECORDS

.1 Complete accurate records of the verification shall be maintained with the following requirements but not limited to:

.1 Show the date on which each device and equipment has been verified.

.2 Show the date of all deficiencies encountered in the control system equipment, wiring and field devices.

.3 Show the date when the deficiencies have been corrected and re-verified.

.4 Show dB levels measured during verification.

3.5 MONITORING COMPANY

.1 Arrange and pay for remote monitoring by an authorized (ULC listed) firm (approved by the Owner) for transmission of signals over leased line. Include one year of monitoring. Owner to pay for leased line.

.1 Owners approved vendor for this scope is:

R & M Security Solutions

305 River Valley Road, Quinte West, ON, K0K 3E0,

Canada

3.6 INTEGRATED SYSTEMS TESTING

.1 Following are tests required to show system integration with other systems. Initiate a fire alarm via a manual pull station verify the following:

.1 Alarm initiated.

.2 Elevators return to ground level.

.3 Signal sent to central alarm facility.

.4 Signal sent to security system.

.5 Alarm annunciates at fire control panel.

.6 Fire shutters release & close.

.7 Audible devices are operating.

.2 Verify connections to elevators. Coordinate all wiring and functionality with elevator system provider.

.1 Simulate activate of ground floor lobby smoke detector and verify that elevator returns to alternate floor.

END OF SECTION