

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
- .2 Treasury Board of Canada Secretariat (TBS), Occupational Safety and Health (OSH)
 - .1 Fire Protection Standard-10.
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524-06, Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S526-07, Visible Signal Devices for Fire Alarm Systems, Including Accessories.
 - .3 CAN/ULC-S527-99, Standard for Control Units for Fire Alarm Systems.
 - .4 CAN/ULC-S528-05, Manual Stations for Fire Alarm Systems, Including Accessories.
 - .5 CAN/ULC-S529-09, Smoke Detectors for Fire Alarm Systems.
 - .6 CAN/ULC-S530-91(R1999), Heat Actuated Fire Detectors for Fire Alarm Systems.
 - .7 CAN/ULC-S531-02, Standard for Smoke Alarms.
 - .8 CAN/ULC-S537-04, Standard for the Verification of Fire Alarm Systems.
 - .9 CAN/ULC-S1001-11-REV2, Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems.
 - .10 CAN/ULC-S561-2022, Standard for Installation and Services for Fire Signal Receiving Centres and Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for multiplex fire alarm system and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province Territory, Canada.
 - .2 Indicate on shop drawings:
 - .1 Detail assembly and internal wiring diagrams for control units. Consoles Auxiliary cabinets.
 - .2 Overall system riser wiring diagram identifying control equipment initiating zones signaling circuits; identifying terminations, terminal numbers, conductors and raceways.
 - .3 Details for devices.
 - .4 Details and performance specifications for control, annunciation

and peripherals with item by item cross reference to specification for compliance.

.5 Step-by-step operating sequence, cross referenced to logic flow diagram.

.4 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan Waste Reduction Workplan highlighting recycling and salvage requirements.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for fire alarm system for incorporation into manual.

.3 Include:

.1 Instructions for complete fire alarm system to permit effective operation and maintenance.

.2 Technical data - illustrated parts lists with parts catalogue numbers.

.3 Copy of approved shop drawings with corrections completed and marks removed except review stamps.

.4 List of recommended spare parts for system.

1.4 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 60 00 - Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of

pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan.

PART 2 - PRODUCTS

2.1 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; initiating general two-stage alarm; supervising components and wiring; actuating annunciators and auxiliary functions; initiating trouble signals and signaling to monitoring agency fire department.
- .3 Zoned, non-coded single stage .
- .4 Modular in design to allow for future expansion.
- .5 Operation of system shall not require personnel with special computer skills.
- .6 System to include:
 - .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/signaling.
 - .2 Data Gathering Panels/Transponders with stand-alone capabilities.
 - .3 Power supplies.
 - .4 Initiating/input circuits.
 - .5 Output circuits.
 - .6 Auxiliary circuits.
 - .7 Wiring.
 - .8 Manual and automatic initiating devices.
 - .9 Audible and visual signaling devices.
 - .10 End-of-line resistors.
 - .11 Local and Remote annunciators displays.
 - .12 Printer Event log memory chip.
 - .13 Historic event recorder.
 - .14 Y2K compliancy.
- .7 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .8 Power supply: to CAN/ULC-S524.
- .9 Audible signal devices: to CAN/ULC-S524.
- .10 Visual signal devices: to CAN/ULC-S526.

- .11 Control unit: to CAN/ULC-S527.
- .12 Manual pull stations: to CAN/ULC-S528.
- .13 Thermal detectors: to CAN/ULC-S530.
- .14 Smoke detectors: to CAN/ULC-S529.
- .15 Smoke alarms: to CAN/ULC-S531.
- .16 Regulatory Requirements:
 - .1 System components: listed by ULC and comply with applicable provisions of OBC Provincial Building Code, and meet requirements of local authority having jurisdiction.

2.2 SYSTEM OPERATION: SINGLE STAGE - SIGNALS ONLY

- .1 Actuation of any alarm initiating device to:
 - .1 Cause electronic latch to lock-in alarm state at central control unit and data gathering panel/transponder.
 - .2 Indicate zone of alarm at central control unit and remote annunciator display.
 - .3 Cause audible signaling devices to sound continuously throughout building and at central control unit.
 - .4 Transmit signal to fire department via master fire alarm box central station.
 - .5 Cause air conditioning and ventilation fans to shut down or to function to provide required control of smoke movement.
 - .6 Cause fire doors and smoke control doors, if normally held open, to close automatically.
 - .7 Cause elevators to return to floor of egress, or to alternate floor, as required.
- .2 Acknowledging alarm: indicated at central control unit.
- .3 Ensure that it is possible to silence signals by "alarm silence" switch at control unit, after 60 seconds period of operation.
- .4 Subsequent alarm, received after previous alarm has been silenced, to re-activate signals.
- .5 Actuation of supervisory devices 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 at remote annunciator display.
 - .3 Cause audible signal at central control unit to sound.
 - .4 Activate common supervisory sequence.

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- .6 Resetting alarm supervisory device not to return system indications/functions back to normal until control unit has been 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; whereas visual indication to remain until trouble is cleared and system is back to normal.
 - .8 Trouble on system: suppressed during course of alarm.
 - .9 Trouble condition on any circuit in system not to initiate alarm conditions.

2.3 CONTROL PANEL

- .1 Central control unit (CCU).
 - .1 Suitable for DCLA communication style: to CAN/ULC-S524.
 - .2 Features specified are minimum requirements for microprocessor-based system with digital data control and digital multiplexing techniques for data transmission.
 - .3 Minimum capacity of 250 addressable monitoring and 250 addressable control/signal points. Points may be divided between 2 communication channels in distributed system, each channel operating independently of other. Faults on one communication channel not to affect operation of other channel.
 - .4 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.
 - .5 Integral power supply, battery charger and standby batteries.
 - .6 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 (i.e. zone labels, priorities) and changing of system operation software.
 - .7 Circuitry to continuously monitor communications and data processing cycles of microprocessor. Upon failure, audible and visual trouble indication to activate.
 - .8 Communication between CCU and remote DGP's/TPR's to be supervised, DCLA. Should communications fail between CCU and remote units, audible and visual trouble to be indicated at CCU. 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. Should communications fail between any 2 nodes, other nodes on loop to continue to communicate with each other and programmed functions on communicating nodes to continue operating.
 - .9 Support up to 2 46 RS-232-C I/O ports. CCU output: parallel ASCII with adjustable baud rates to allow interface of any commercially available printer, terminal or PC.

- .10 Equipped with software routines to provide Event-Initiated-Programs (EIP); change is status of one or more monitor points, may be programmed to operate any or all of system's control points.
- .11 Software and hardware to maintain time of day, day of week, day of month, month and year.
- .12 Software to operate variable sensitivity addressable smoke detectors and annunciate their status and sensitivity settings at control panel.

2.4 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.

2.5 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 central control unit DGP's/transponders.
- .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 Receiving circuits for supervisory, N/O devices. Devices: wired in DCLB DCLA configuration to central control unit DGP's/transponders.
- .5 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".

2.6 ALARM OUTPUT CIRCUITS

- .1 Alarm output circuit: connected to signals, wired in class B configuration to central control unit DGP's/transponders.
 - .1 Signal circuits' operation to follow system programming; capable of sounding horns continuously at 20 spm. Each signal circuit: rated at 2 A, 24 VDC; fuse-protected from overloading/overcurrent.
 - .2 Manual alarm silence, automatic alarm silence and alarm silence inhibit to be provided by system's common control.

2.7 AUXILIARY CIRCUITS

- .1 Auxiliary contacts for control functions.
- .2 Actual status indication (positive feedback) from controlled device.
- .3 Alarm and or supervisory trouble on system to cause operation of programmed auxiliary output circuits.
- .4 2 sets of separate contacts for elevator capture to main floor of egress and to alternate floor of egress.
- .5 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.
- .6 Fans: stagger-started upon system reset; timing circuit to separate starting of each fan or set of fans connected to auxiliary contact on system.
 - .1 Timing circuit: controlled by CCU.
- .7 Auxiliary circuits: rated at 2 A, 24 Vdc or 120 Vac, fuse-protected.

2.8 WIRING

- .1 Twisted copper conductors: rated 120 300 600 V.
- .2 To initiating circuits: 18 AWG minimum, and in accordance with manufacturer's requirements.
- .3 To signal circuits: 16 AWG minimum, and in accordance with manufacturer's requirements.
- .4 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.

2.9 MANUAL ALARM STATIONS

- .1 Addressable manual pull station.
 - .1 Pull lever, break glass rod, semi-flush wall mounted type, single action, single 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.

2.10 AUTOMATIC ALARM INITIATING DEVICES

- .1 Heat detectors, fixed temperature, non- restorable, rated 57 88 degrees C.
- .2 Thermal fire detectors, combination fixed temperature and rate of rise, non-restorable fixed temperature element, self-restoring rate of rise, fixed temperature 57 88 degrees C, rate of rise 8.3 degrees C per minute.
- .3 Addressable thermal fire detectors, combination fixed temperature and rate of rise, non-restorable fixed temperature element, self-restoring rate of rise, fixed temperature 57 88 degrees C, rate of rise 8.3 degrees C per minute.
 - .1 Electronics to communicate detector's status to addressable module/transponder.
 - .2 Detector address to be set on detector base head in field.
- .4 Smoke detector: ionization photo-electric type air duct type with sampling tubes with protective housing.
 - .1 Twistlock Plug-in type with fixed base.
 - .2 Wire-in base assembly with integral red alarm LED, and terminals for remote relay alarm LED.
- .5 Addressable smoke detector.
 - .1 Photo-electric type.
 - .2 Electronics to communicate detector's status to addressable module/transponder.
 - .3 Detector address to be set on detector base head in field.
- .6 Addressable variable-sensitivity smoke detectors.
 - .1 Photo-electric type.
 - .2 Electronics to communicate detector's status to addressable module/transponder.
 - .3 Detector address to be set on detector base head in field.
 - .4 Sensitivity settings: 3 7 settings, determined and operated by control panel. No shifting in detector sensitivity due to atmospheric conditions (dust, dirt) within certain parameters.
 - .5 Ability to annunciate minimum of 2 levels of detector contamination automatically with trouble condition at control panel.

2.11 AUDIBLE SIGNAL DEVICES

- .1 Horns: 90 db, weatherproof mounting, 24 V dc.
- .2 Mini-horns: 90 db, surface flush mounting, red beige colour, 24 V dc.
- .3 Audible signal devices in sleeping rooms shall emit a low frequency signal as per sentence 3.2.4.18 (6) of the OBC. The low frequency signal shall be in the

range of 470 Hz to 570 Hz.

2.12 VISUAL ALARM SIGNAL DEVICES

- .1 Strobe type: flashing , , 24 V dc.
- .2 Designed for surface mounting on ceiling or walls as indicated.

2.13 END-OF-LINE DEVICES

- .1 End-of-line devices to control supervisory current in alarm circuits and signaling 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.

2.14 REMOTE ANNUNCIATORS

- .1 LED remote alphanumeric type, with designation cards to indicate zones.
- .2 Display:
 - .1 Alarms and troubles for alarm initiating circuits.
 - .2 Supervisory alarms and troubles common supervisory alarm for supervisory initiating circuits.
 - .3 Common system trouble.
- .3 Trouble buzzer:
 - .1 Acknowledging trouble at main panel to silence trouble buzzers in system.
- .4 Supervised, with LED test button and alarm trouble acknowledge button.
- .5 Minimum wiring configuration with main panel and other remote annunciators.

2.15 GRAPHIC DISPLAY

- .1 Passive type.

2.16 AS-BUILT RISER DIAGRAM

- .1 Fire alarm system riser diagram: in glazed frame on black lamincoid sheet with bevelled edges, white lettering and designations, minimum size 600 x 600 mm.

2.17 ANCILLARY DEVICES

- .1 Remote relay unit to initiate fan shutdown.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for fire alarm installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

- .1 Install systems in accordance with CAN/ULC-S524 and TB Fire Protection Standard.
- .2 Install central control unit and connect to ac power supply, ac dc standby power.
- .3 Install manual alarm stations and connect to alarm circuit wiring.
- .4 Locate and install detectors and connect to alarm circuit wiring. Mount detectors more than 1 m from air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.
- .5 Connect alarm circuits to main control panel.
- .6 Install signal bells chimes horns and visual signal devices and connect to signaling circuits.
- .7 Connect signaling circuits to main control panel.
- .8 Install end-of-line devices at end of alarm and signaling circuits.
- .9 Install remote annunciator panels and connect to annunciator circuit wiring.
- .10 Install door releasing devices.
- .11 Install remote relay units to control fan shut down.
- .12 Sprinkler system: wire alarm and supervisory switches and connect to control panel.
- .13 Room detection system.
 - .1 Install detectors. Make necessary connections between room detection

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- panel and main fire alarm panel.
 - .2 Locate and install audible signals visual alarms.
 - .3 Locate and install detectors under raised floor. Fasten to steel brackets approximately 300 mm above sub-floor level to clear cables and conduits.
 - .14 Connect fire suppression systems to control panel.
 - .15 Splices are not permitted.
 - .16 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and CCU, as required by equipment manufacturer.
 - .17 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.
 - .18 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and CAN/ULC-S537.
- .2 Fire alarm system:
 - .1 Test such device and alarm circuit to ensure manual stations, thermal and smoke detectors sprinkler system transmit alarm to control panel and actuate first stage alarm general alarm ancillary devices.
 - .2 Check annunciator panels to ensure zones are shown correctly.
 - .3 Simulate grounds and breaks on alarm and signaling circuits to ensure proper operation of systems.
 - .4 Addressable circuits system style DCLA:
 - .1 Test each conductor on all DCLA addressable links for capability of providing 3 or more subsequent alarm signals on each side of single open-circuit fault condition imposed near midmost point of each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
 - .2 Test each conductor on all DCLA addressable links for capability of providing 3 or more subsequent alarm signals during ground-fault condition imposed near midmost point of each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
 - .5 Addressable circuits system style DCLB:
 - .1 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals on line side of single open-circuit fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
 - .2 Test each conductor on all DCLB addressable links for capability

of providing 3 or more subsequent alarm signals during ground-fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.

- .3 Provide final PROM program re-burn for system Consultant incorporating program changes made during construction.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Place materials defined as hazardous or toxic waste in designated containers.

3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by fire alarm system installation.

3.6 CLOSEOUT ACTIVITIES

- .1 Provide on-site lectures and demonstration by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

3.8 INTEGRATED SYSTEMS TESTING

- .1 Where fire protection and life safety systems, and systems with fire protection and life safety functions, are integrated with each other, the systems shall be tested as a whole in accordance with CAN/ULC-S1001, "Integrated Systems Testing of Fire Protection and Life Safety Systems" to verify that the systems have been properly integrated. Testing shall be completed by a Professional Engineer Licensed in the province of Ontario and certified by ULC for completing this testing. The electrical contractor shall include the cost of the engineer and the cost for coordinating the various trades that will be required for this testing including the fire protection contractor, elevator contractor and mechanical

contractor. Electrical contractor shall coordinate with the S1001 engineer to determine which trades are required on site and coordinate also with the general contractor to include the cost for these trades to participate in this testing. An integrated systems testing plan shall be submitted for review and approval.

END OF SECTION