

PART 1 GENERAL

1.1 General Requirements

- .1 Division 1 and the General Conditions of the Contract between the departmental representative and the Contractor shall deem to apply and be part of this section.

1.2 Related Sections

- .1 Section [01 33 00 - Submittal Procedures].
- .2 Section [01 74 21 - Construction/Demolition Waste Management and Disposal].
- .3 Section [01 78 00 - Closeout Submittals].
- .4 Section [26 05 00 - Common Work Results - Electrical].

1.3 References

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations.
- .2 Fire Commissioner of Canada (FC)
- .3 Treasury Board of Canada Secretariat (TBS), Occupational Safety and Health (OSH)
 - .1 TBS OSH Chapter3-3, [1997], Fire Protection Standard for Electronic Data Processing Equipment.
 - .2 TBS OSH Chapter3-4, [92], Standard for Fire Alarm Systems.
- .4 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524 - Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S525 - Audible Signal Devices for Fire Alarm.
 - .3 CAN/ULC-S526 - Visual Signal Appliances.
 - .4 CAN/ULC-S527 - Control Units.

- .5 CAN/ULC-S528 - Manual Pull Stations.
- .6 CAN/ULC-S529 - Smoke Detectors.
- .7 CAN/ULC-S530 - Heat Actuated Fire Detectors.
- .8 CAN/ULC-S531 - Smoke Alarms.
- .9 CAN/ULC-S536 - Inspection and Testing of Fire Alarm Systems.
- .10 CAN/ULC-S537 - Verification of Fire Alarm Systems.

1.4 System Description

- .1 The electrical contractor will provide, store, care for, wire, and test fire alarm components based on the noted specification.
- .2 Fully supervised, microprocessor-based, fire alarm system, utilizing digital techniques for data control and digital, and multiplexing techniques for data transmission.
- .3 System to carry out fire alarm and protection functions; including receiving alarm signals; initiating two-stage alarm; supervising components and wiring; actuating annunciators and auxiliary functions; initiating trouble signals and signalling to fire department.
- .4 Zoned, non-coded.
- .5 Modular in design to allow for future expansion.
- .6 Operation of system shall not require personnel with special computer skills.
- .7 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/signalling;

- .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 with voice reproducing capability.
- .12 End-of-line resistors.
- .13 Local "Active" annunciators integral to the fire alarm panel.
- .14 System shall be complete with two separate methods of notifying the approved (and listed) monitoring agency. This shall be accomplished using separate and non-interdependent communication paths:
 - .1 Provide one (1) ULC Land Line Dialer and one (1) ULC Cellular Dialer.

1.5 Shop Drawings

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Include:
 - .1 Detail assembly and internal wiring diagrams for control units.
 - .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.

1.6 Quality Assurance

- .1 Inspection tests to conform to: CAN/ULC-S536.
- .2 Submit inspection report, to Departmental representative.

1.7 Closeout Submittals

- .1 Provide operation and maintenance data for fire alarm system for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 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.

1.8 Regulatory Requirements

- .1 System:
 - .1 Subject to FC approval.
 - .2 Subject to FC inspection for final acceptance.
- .2 System components: listed by ULC and comply with applicable provisions of National Building Code, Local/Provincial Building Code, and meet requirements of local authority having jurisdiction.

1.9 Waste Management and Disposal

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal, and with the Waste Reduction Workplan.

- .1 Place materials defined as hazardous or toxic waste in designated containers.
- .2 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

1.10 Maintenance

- .1 Provide one year's free maintenance with two inspections by manufacturer during warranty period.

1.11 Extra Materials

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

PART 2 PRODUCTS

2.1 Materials

- .1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .2 Power supply: to CAN/ULC-S524.
- .3 Audible signal devices: to ULC-S525.
- .4 Control unit: to CAN/ULC-S527.
- .5 Manual pull stations: to CAN/ULC-S528.
- .6 Thermal detectors: to CAN/ULC-S530.
- .7 Smoke detectors: to CAN/ULC-S529.
- .8 Smoke alarms: to CAN/ULC-S531.

2.2 System Operation: Two Stage - Signals Only

- .1 Actuation of any alarm initiating device on first stage to:
 - .1 Cause electronic latch to lock-in alarm state at central control unit and data gathering panel/transponder. Transmit signal to dispatch local fire authority.
 - .2 Indicate zone of alarm at central control unit and at each fire alarm panel annunciator.

- .1 For low rise buildings:
 - .1 Cause audible devices throughout building to sound at 20 strokes per minute.
 - .2 Cause audible devices in zone of alarm to sound continuously while other audible devices throughout building sound at 20 strokes per minute.
- .2 Actuation of any alarm initiating device on second stage to:
 - .1 Cause audible signalling devices to sound in alarm tone throughout building.
- .3 If first stage alarm is not acknowledged within 5 min, system to automatically go into second stage.
- .4 Acknowledging alarm: indicated at central control unit.
- .5 Possible to silence signals by "alarm silence" switch at control unit, after minimum 60s period of operation.
- .6 Subsequent alarm, received after previous alarm has been silenced, to re-activate signals.
- .7 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 alarm control unit and at each fire alarm panel annunciator.
 - .3 Cause audible signal at central control unit to sound.
 - .4 Activate common supervisory sequence.
- .8 Resetting alarm device not to return system indications/functions back to normal until control unit is reset.
- .9 Trouble on system to:

- .1 Indicate circuit in trouble on 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.
- .10 Troubles on system: suppressed during course of alarm.
- .11 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 or DCLB 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.
 - .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 (e.g. 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, DCLB or 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 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.
- .10 Software and hardware to maintain time of day, day of week, day of month, month and year.
- .11 Software to operate variable-sensitivity addressable smoke detectors and announce their status and sensitivity settings at control panel.

2.4 Data Gathering Panels
Dgp's)/ Transponders -

- .1 Fire control modules: distributed throughout building in separately enclosed units (DGP'S) and interconnected to central control unit utilizing multiplex data transmission techniques.
- .2 Fire alarm integrated DGP's: microprocessor based, provide interface between standard alarm input/output devices and central control unit.
- .3 Each DGP: circuitry with ability to detect failure in communication with CCU resulting from faults in communication wiring. In event of loss of communication with CCU, DGP capable of operating in stand-alone mode. In this mode, DGP capable of reacting to connected input devices, and apply stand-alone programming to determine state of connected outputs. Stand-alone programming instructions: independent of, but capable of executing same type of algorithms as, that of CCU.
- .4 Each DGP: self-contained unit, with integral power supply, battery charger and standby batteries. Short circuit, over voltage, and brown-out monitoring to protect powered components by automatically switching to standby batteries whenever trouble condition exists in power supply.
- .5 Addressable DGP's.
 - .1 DGP's: addressable type, provide two-way data communication with 2000 addressable devices/interface modules, utilizing digital poll/response protocol communication format. Each addressable device: uniquely identified by own address, set at time of installation.
 - .2 Addressable DGP's: stand-alone capability.
 - .3 Interface modules: facilitate connection of non-addressable devices (e.g. flow switch) to addressable DGP; provided in different types for connection to monitoring devices (e.g. flow/tamper switch), signalling

devices (e.g. bells, horns, speakers), and control functions (e.g. fan shutdown, door release); communicate with addressable DGP over minimum number of wires (specified by manufacturer).

- .4 Possible to connect all 3 types of addressable interface modules (monitoring, signal and control) to same addressable communication loop.
- .5 Addressable DGP's: self-contained, as specified.
- .6 Possible to connect variable-sensitivity addressable smoke detectors together with other addressable devices to same addressable communication loop.

2.5 Power Supplies

- .1 120V, 60Hz as primary source of power for system.
- .2 Voltage regulated, current limited distributed system power.
- .3 Primary power failure or power loss (less than 102V) 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, 10 year rated.
- .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 DGP's/transponder.
- .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 DCLA configuration to DGP's/transponders.
- .5 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".

2.7 Alarm Output Circuits

- .1 Alarm output circuit: connected to speakers, wired in class B or class A configuration to DGP's/transponders.
 - .1 Manual alarm silence, automatic alarm silence and alarm silence inhibit to be provided by system's common control.
 - .2 Speaker circuits operation: follow system programming; capable of reproducing tones and voice fed by audio channels.
 - .3 Audio channel available to each speaker circuit to be automatically and dynamically selected by system's microprocessor.
 - .4 Manual selection and operation of alarm tones to be provided on floor-by-floor basis.
 - .5 Manual selection for emergency paging to be provided on floor-by-floor basis].
 - .6 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 Actual status indication (positive feedback) from controlled device.
- .3 Alarm and or trouble on system to cause operation of programmed auxiliary output circuits.

- .4 Two 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. Timing circuit: controlled by CCU.
- .7 Auxiliary circuits: rated at 2A, 24Vdc or 120Vac, fuse-protected.

2.9 Wiring

- .1 Copper conductors.
- .2 To initiating circuits: 18AWG minimum, and in accordance with manufacturer's requirements.
- .3 To signal circuits: 16AWG minimum, and in accordance with manufacturer's requirements.
- .4 To speaker circuits: twisted, shielded pairs, and in accordance with manufacturer's requirements.
- .5 To telephone circuits: twisted, shielded pairs, and in accordance with manufacturer's requirements.
- .6 To control circuits: 14AWG minimum, and in accordance with manufacturer's requirements.

2.10 Manual Alarm Stations

- .1 Description: Addressable single-or double-action type, red LEXAN, with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.
- .2 Addressable Single Stage Keyed Manual Pull Stations, surface box (where installed in unfinished spaces).
- .3 Protective Shield: Where required provide a tamperproof, clear LEXAN

shield and red frame that easily fits over manual pull stations. When shield is lifted to gain access to the station, a battery powered piercing warning horn shall be activated. The horn shall be silenced by lowering and realigning the shield. The horn shall provide 85dB at 10 feet and shall be powered by a 9 VDC battery

2.11 Automatic Alarm
Initiating Devices

- .1 Heat detectors, fixed temperature, non-restorable, rated 57°C.
- .2 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°C (programmed), rate of rise 8.3°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.
- .3 Addressable variable-sensitivity smoke detectors.
 - .1 Ionization, Photo-electric, Heat type.
 - .2 Electronics to communicate detector's status to addressable module/transponder.
 - .3 Detector address to be set on detector base in field.
 - .4 Sensitivity settings: 3 settings (minimum), 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.

2.12 Audible Signal Devices

- .1 Speakers:

- .1 Horn type with compression driver:
102mm, semi-flush mounted.
 - .1 Corrosion, vibration and
vermin resistant.
 - .2 Taps: multiple, adjustable
from 1 to 2W.
 - .3 Frequency response: 400 to
4000 Hz.
 - .4 Output sound level: 90 db at
3 m with 1W tap.
 - .5 With integral strobe.

2.13 End-Of-Line Devices

- .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.

2.14 Backboxes

- .1 Where fire alarm pull stations are
surface mounted, provide a surface
backbox over a standard octagon box.
- .2 Where fire alarm detectors are surface
mounted, provide an surface backbox
over a standard octagon box.
- .3 Where fire alarm horns and strobes are
surface mounted, provide a surface
backbox over a standard octagon box.

2.15 Ancillary Devices

- .1 Remote relay unit to initiate fan
shutdown.

PART 3 EXECUTION

3.1 Installation

- .1 Install systems to CAN/ULC-S524.
- .2 Install central control unit and
connect to ac power supply, 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. Do not mount detectors within 1 m of 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 Connect signalling circuits to main control panel.
- .7 Install end-of-line devices at end of alarm and signalling circuits.
- .8 Install door releasing devices.
- .9 Install remote relay units to control fan shut down.
- .10 Room detection system.
 - .1 Install detectors. Make necessary connections between room detection panel and main fire alarm panel.
 - .2 Locate and install audible signals.
- .11 Connect fire suppression systems to control panel.
- .12 Splices are not permitted.
- .13 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and CCU, as required by equipment manufacturer.
- .14 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.
- .15 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.

3.2 Field Quality Control

- .1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical and to 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 alert.

- .2 Check annunciator panels to ensure zones are shown correctly.
- .3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.
- .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 Departmental representative incorporating program changes made during construction.

3.3 Demonstration

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

END OF SECTION
