

---

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1            Section 26 05 00 - Common Work Results for Electrical.

**1.2                REFERENCES**

- .1            Treasury Board of Canada Secretariat (TBS), Occupational Safety and Health (OSH).
  - .1            Fire Protection Standard-10.
- .2            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-S527-11, 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.

**1.3                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 of Quebec, Canada.
  - .2            Indicate on shop drawings:
    - .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.
- .3 Mock-ups.
  - .1 Supply, install, and connect temporarily fire alarm devices required in mock-ups for Work, as indicated and in accordance with Section 01 45 00 - Quality Control.
    - .1 Construct mock-ups in the following locations:
      - .1 Manual stations and horns with cabling in one frame of the lobby and the multipurpose room.
    - .2 Remove mock-up at conclusion of Work or when acceptable to Departmental Representative, connect permanently to incorporate in final Work, according to Section 01 45 00 - Quality Control.

#### **1.4 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.
- .4 Inspection report and compliance certificate for the fire alarm system.

#### **1.5 MAINTENANCE MATERIAL SUBMITTALS**

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

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store, and handle materials in accordance 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, 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.

## **1.7 ACCEPTABLE PRODUCTS AND MATERIALS**

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.

## **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 single-stage alarm; supervising components and wiring; actuating annunciators and auxiliary functions; initiating trouble signals and signalling to 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/signalling.
  - .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 signalling devices.
  - .10 End-of-line resistors.
  - .11 Remote annunciators.
  - .12 Historic event recorder.
- .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 To TBS Fire Protection Standard.
  - .2 Subject to Fire Commissioner of Canada (FC) approval.
  - .3 Subject to FC inspection for final acceptance.
  - .4 To Canadian Forces Fire Marshal approval.
  - .5 System components: listed by ULC and comply with applicable provisions of NBC, local and 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 signalling devices to sound continuously throughout building and at central control unit.
  - .4 Transmit signal to fire department via 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.
- .6 Resetting alarm 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 DCLB and 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.
  - .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 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 in 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 DATA GATHERING PANELS (DGP'S)/TRANSPONDERS**

- .1 Addressable DGP's.
  - .1 DGP's: addressable type, provide two-way data communication with up to 128 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 (i.e. flow switch) to addressable DGP; provided in different types for connection to monitoring devices (i.e. flow/tamper switch), signalling devices (i.e. bells, horns), and control functions (i.e. 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**

- .1 120 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 central control unit or 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 DCLA configuration to central control unit or 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 signals, wired in class B configuration to central control unit or DGP's/transponders.
  - .1 Signal circuits' operation to follow system programming; capable of sounding horns at 20 spm and operating strobes. Each circuit to operate at 3 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.

## **2.8 AUXILIARY CIRCUITS**

- .1 Auxiliary contacts for control functions.
- .2 Actual status indication (positive feedback) from controlled device.
- .3 Alarm supervisory or trouble on system to cause operation of programmed auxiliary output circuits.
- .4 6 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.

## **2.9 WIRING**

- .1 Twisted copper conductors: rated 300 V.
- .2 To initiating circuits: 18 AWG minimum, type FAS 105, shielded, red color, and in accordance with manufacturer's requirements.
- .3 To signal circuits: 16 AWG minimum, type FAS 105, unshielded, red color, and in accordance with manufacturer's requirements.

- .4 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.

## **2.10 MANUAL ALARM STATIONS**

- .1 Addressable manual pull station.
  - .1 Pull lever, 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.

## **2.11 AUTOMATIC ALARM INITIATING DEVICES**

- .1 Addressable thermal fire 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.
  - .1 Electronics to communicate detector's status to addressable module/transponder.
  - .2 Detector address to be set on detector head in field.
- .2 Addressable variable-sensitivity smoke detectors.
  - .1 Ionization or photo-electric type, as indicated.
  - .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: 5 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.
- .3 Addressable smoke detectors for ventilation ducts.
  - .1 Detector to be identical to ceiling smoke detectors, combined to a casing and relay that would shut down the ventilation unit in case of detector alarm, or general alarm or a definite alarm.

## **2.12 UNIVERSAL DETECTOR BASE**

- .1 Detector mounting base, standard model, to be mounted on a standard single octagonal north american box 83 mm or 102 mm or 102 mm square.
- .2 Base to allow mounting of any type of detector and to meet the following requirements:
  - .1 Removal of a detector should not have an impact on communication with other detectors.
  - .2 Base to allow connection of a remote alarm indicator.

## **2.13 AUDIBLE SIGNAL DEVICES**

- .1 Horns: 92 dB, 24 VDC, surface or flush mounting, as indicated.

---

## **2.14 VISUAL ALARM SIGNAL DEVICES**

- .1 Strobe type: flashing, blue, 24 VDC.
- .2 Combined audible/visual alarm signal devices, as indicated.
- .3 Designed for surface mounting on ceiling or walls, as indicated.

## **2.15 ADDRESSABLE MODULES**

- .1 Addressable modules with one or two inputs for connecting one or two Class B circuits.
- .2 Installation in a single north american electrical box 64 mm deep or square 103 mm and 38 mm deep with a simple cover.
- .3 The module is intended to connect the following types of circuits:
  - .1 Alarm, normally open, with delayed locking (water flow contacts);
  - .2 Active surveillance, normally open, non-locking (monitoring fans, dampers, etc.);
  - .3 Active surveillance, normally open, with locking (contacts supervisory or default sprinklers).

## **2.16 ADDRESSABLE RELAYS**

- .1 Control relay modules with "C" shape dry contact and rated current of 4 A at 120 VAC, to control external equipment or to shutdown an equipment.
- .2 The relay shall be classified to ensure system control and stopping.
- .3 Position of relay contact to be confirmed by system software.
- .4 Installation in a single north american electrical box 64 mm deep or square 103 mm and 38 mm deep with a simple cover.

## **2.17 LINE ISOLATORS**

- .1 This module shall be connected on the intelligent detection circuit and shall allow to isolate one or a group of intelligent devices installed on the same circuit. Yellow LED light indication, flashing, mounted on the front plate, shall indicate a short-circuit in the circuit.
- .2 Line isolator module shall not take an additional address on the circuit.

## **2.18 END-OF-LINE DEVICES**

- .1 End-of-line devices to control supervisory current in 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.

## **2.19 REMOTE ANNUNCIATORS**

- .1 Remote alphanumeric type, with designation cards to indicate zones.

- .2 Display:
  - .1 Alarms and troubles for alarm initiating circuits.
  - .2 Supervisory alarms and troubles 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 and trouble acknowledge button.
- .5 Minimum wiring configuration with main panel and other remote annunciators.

## **2.20 AS-BUILT RISER DIAGRAM**

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

## **2.21 ACCEPTABLE PRODUCTS**

- .1 EST3 System of Chubb Edwards.
- .2 MXL System of Siemens.
- .3 NFS System of Notifer.
- .4 4100ES System of Simplex.
- .5 Replacement materials or products approved by addendum, according to Instructions to bidders.

## **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.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

### **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, 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 audible and visual signal devices and connect to signalling circuits.
- .7 Connect signalling circuits to main control panel.
- .8 Install end-of-line devices at end of signalling 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 Splices are not permitted.
- .14 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and CCU, as required by equipment manufacturer.
- .15 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.
- .16 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, and sprinkler system transmit alarm to control panel and actuate general alarm.
  - .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 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 inspection report and compliance certificate of fire alarm system to Departmental Representative.
- .4 Provide final PROM program re-burn for system to the Departmental Representative, incorporating program changes made during construction.

### **3.4 COMMISSIONING**

- .1 After transmission of inspection report, make necessary arrangements with Departmental Representative to undertake system commissioning under his verification, according to Sections 01 91 13 - General Commissioning (CX) Requirements and 01 91 31 - Commissioning (CX) Plan.

### **3.5 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .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 11 - Cleaning.

### **3.6 PROTECTION**

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

### **3.7 CLOSEOUT ACTIVITIES**

- .1 Make necessary arrangements to provide on-site lectures and demonstration by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.
  - .1 Planning of training session to be set with Departmental Representative one month ahead.

- .2 Provide minimum 8 hours training session.
  - .1 Provide all documents required for training.

**END OF SECTION**