

**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 26 05 21 – Wires and Cables (0 – 1000V).
- .3 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

**1.2 SUMMARY**

- .1 Section Includes
  - .1 Materials and installation for fire alarm systems.
  - .2 Control panel to carry out fire alarm and protection functions including receiving alarm signals, initiating general single-stage alarm, supervising system continuously, actuating zone annunciators, and initiating trouble signals.
  - .3 Trouble signal devices.
  - .4 Power supply facilities.
  - .5 Manual alarm stations.
  - .6 Automatic alarm initiating devices.
  - .7 Audible signal devices.
  - .8 End-of-line devices.
  - .9 Annunciators.
  - .10 Visual alarm signal devices.
  - .11 Ancillary devices.
- .2 Scope of Work but not limited to:
  - .1 Materials and installation for fire alarm systems.
  - .2 Control panel to carry out fire alarm and protection functions including receiving alarm signals, initiating general single-stage alarm, supervising system continuously, actuating zone annunciators, initiating trouble signals, and communication with Building #1 main fire alarm system.
  - .3 Trouble signal devices.
  - .4 Power supply facilities.
  - .5 Manual alarm stations.
  - .6 Automatic alarm initiating devices.
  - .7 Audible signal devices.
  - .8 End-of-line devices.
  - .9 Annunciators.
  - .10 Visual alarm signal devices.

- .11 Ancillary devices.
- .3 Related requirements
  - .1 Section 26 05 00 - Common Work Results for Electrical.

### 1.3 REFERENCES

- .1 Government of Canada:
  - .1 NBC-2015, National Building Code of Canada.
- .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-S528-14, 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-S537-04, Standard for the Verification of Fire Alarm Systems.
- .3 National Fire Protection Agency
  - .1 NFPA 72-2002, National Fire Alarm Code.
  - .2 NFPA 90A-2002, Installation of Air Conditioning and Ventilating Systems.

### 1.4 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 Indicate on shop drawings:
    - .1 Detail assembly and internal wiring diagrams for control unit, and 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.

## **1.5 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.

## **1.6 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: company or person specializing in fire alarm system installations approved by manufacturer with 5 years documented experience.
- .2 Provide services of representative or technician from manufacturer of system, experienced in installation and operation of type of system being provided, to supervise installation, adjustment, preliminary testing, and final testing of system and to provide instruction to project personnel.
- .3 System:
- .4 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
  - .2 Include:
    - .1 5 spare glass rods for manual pull box stations if applicable.
- .5 Maintenance Service:
  - .1 Provide one year's free maintenance with two inspections by manufacturer during warranty period. Inspection tests to conform to CAN/ULC-S536. Submit inspection report to Departmental Representative.

## **Part 2 Products**

### **2.1 DESCRIPTION**

- .1 There is an existing fire alarm system Simplex 4100U. The new fire alarm panel must be compatible with and connected to with fiber optic cables. The scope of work under this specifications and associated drawings is an expansion of the existing system.
- .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 general alarm; supervising components and wiring; actuating annunciators and auxiliary functions; initiating trouble signals.
- .4 Addressable, non-coded, single stage.
- .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 Data gathering panels/transponders with stand-alone capabilities (Nodes). 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 Power supplies.
  - .3 Initiating/input circuits.
  - .4 Output circuits.
  - .5 Auxiliary circuits.
  - .6 Wiring.
  - .7 Manual and automatic initiating devices.
  - .8 Audible and visual signalling devices.
  - .9 End-of-line resistors.
  - .10 Remote annunciators.
  - .11 Y2K compliancy.
- .8 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .9 Power supply: to CAN/ULC-S524.
- .10 Audible signal devices: to CAN/ULC-S524.
- .11 Visual signal devices: to CAN/ULC-S526.
- .12 Control unit: to CAN/ULC-S527.
- .13 Manual pull stations: to CAN/ULC-S528.
- .14 Thermal detectors: to CAN/ULC-S530.
- .15 Smoke detectors: to CAN/ULC-S529.
- .16 Regulatory Requirements:
  - .1 System components: listed by ULC and comply with applicable provisions of NBC, 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.

- .2 Indicate zone of alarm at central control unit and remote annunciator.
- .3 Cause audible signalling devices to sound continuously throughout building and at central control unit.
- .4 Cause air conditioning and ventilation fans to shut down or to function to provide required control of smoke movement.
- .5 Cause fire doors and smoke control doors, if normally held open, to close automatically.
- .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.
  - .2 Indicate respective supervisory zone at central control unit and at remote annunciator.
  - .3 Cause audible signal at central control unit to sound.
  - .4 Activate common supervisory sequence.
- .6 Resetting alarm or 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 318 addressable monitoring 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 via fiber optic network. 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.
- .9 Equipped with multi-mode fiber optic network communication module.
- .10 Support 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.
- .11 Equipped with software routines to provide Event-Initiated-Programs (EIP); change in status of one or more monitor points, may be programmed to operate any or all of system's control points.
- .12 Software and hardware to maintain time of day, day of week, day of month, month and year.

## **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 and heat detectors, wired in DCLA configuration to node.
- .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 node.

- .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 node.
  - .1 Signal circuits' operation to follow system programming; capable of sounding horns at 20 spm, 2 A, 24 VDC; fuse-protected from overloading/overcurrent.
  - .2 Manual 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 Alarm supervisory on system to cause operation of programmed auxiliary output circuits.
- .3 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.
- .4 Fans: stagger-started upon system reset; timing circuit to separate starting of each fan or set of fans connected to auxiliary contact on system.
  - .1 Timing circuit: controlled by CCU.
- .5 Auxiliary circuits: rated at 2 A, 24 Vdc or 120 Vac, fuse-protected.

## **2.8 WIRING**

- .1 Twisted copper conductors: rated 300 V.
- .2 To initiating circuits: 18 AWG minimum, and in accordance with manufacturer's requirements.
- .3 To signal circuits: 14 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, double action, single stage, electronics to communicate station's status to addressable module over 2 wires and to supply power to station. Station address to be set on station in field. Bilingual signage
  - .2 Acceptable manufacturer:
    - .1 Notifier #NBG-12LX
- .2 Conventional manual pull station.
  - .1 Weatherproof pull lever, break glass rod, semi-flush wall mounted type, normally open switch contacts, double action, single stage
  - .2 Acceptable manufacturer:
    - .1 Notifier #NBG-12LO
  - .3 Manual pull station to be explosion proof rated where indicated on drawings.

## **2.10 AUTOMATIC ALARM INITIATING DEVICES**

- .1 Conventional heat detectors, fixed high temperature, non- restorable, rated 90 degrees C. Installed in attic space.
- .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 degrees C, rate of rise 8.3 degrees C per minute.
  - .1 Electronics to communicate detector's status to addressable module.
  - .2 Detector address to be set on detector head in field.
- .3 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 head in field.
  - .4 Sensitivity settings: 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.
- .4 Acceptable manufacturer:
  - .1 Notifier #FST-851RA (Addressable heat detector)
  - .2 Notifier #FSP-851A (Addressable smoke detector)
- .5 Smoke detectors to be explosion proof rated where indicated on drawings.

## **2.11 AUDIBLE/VISUAL SIGNAL DEVICES**

- .1 Combination Horn/Strobe: Selectable output level (88 dBA min), weatherproof where required, 24 V dc.
- .2 Combination Strobe type: field configurable candela output, flashing, white, 15 to 110 Cd, 24 V dc.
- .3 Designed for surface mounting on walls.
- .4 Acceptable manufacturer:
  - .1 Notifier #P2RLA (horn/strobe)
  - .2 Notifier #P2RKA-B (Weatherproof horn/strobe)
- .5 Signaling devices to be explosion proof rated where indicated on drawings.

## **2.12 MONITORING MODULE**

- .1 Addressable monitoring module to monitor conventional type fire alarm initiating devices
- .2 Acceptable manufacturer:
  - .1 Notifier #FMM-1A



## **2.13 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.

## **2.14 GRAPHIC DISPLAY**

- .1 Passive type. Passive graphic on white photo bond paper in metal frame(s) with polycarbonate glazing. Graphic designed to meet NFPA 72 6.2.3 to render them tamper resistant.
- .2 Graphic shall be mounted at Fire alarm control panel and all locations of remote annunciators. Orient graphic based on each location. All wording on graphic shall be bilingual.
- .3 Graphic shall indicate:
  - .1 Building floor plan, including corridors, stairways, elevators.
  - .2 Location and divisions of fire alarm zones, control panel, and annunciators
  - .3 Location of sprinkler room, relevant duct smoke detectors, deluge valves, and other suppression systems
  - .4 Accurate "You are here" indicator.

## **2.15 AS-BUILT RISER DIAGRAM**

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

## **2.16 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 Departmental Representative.
  - .2 Inform Departmental Representative 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 Departmental Representative.

### **3.2 INSTALLATION**

- .1 Install systems in accordance with 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. 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 horns 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 remote relay units to control fan shut down.
- .11 Splices are not permitted.
- .12 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and CCU, as required by equipment manufacturer.
- .13 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.
- .14 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 smoke detectors 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.
- .3 Provide final PROM program re-burn for system Departmental Representative incorporating program changes made during construction.

- .4 All cost associated with final commissioning system shall be included in the contractor's tender price.

### **3.4 PROTECTION**

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

### **3.5 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.

**END OF SECTION**