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**Part 1            General**

**1.1            RELATED SECTIONS**

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

**1.2            REFERENCES**

- .1            Underwriters Laboratories of Canada (ULC)
  - .1            CAN/ULC-S524-14, Installation of Fire Alarm Systems.
  - .2            CAN/ULC-S525-07, Audible Signal Appliances for Fire Alarm.
  - .3            CAN/ULC-S526-07, Visual Signal Appliances, Fire Alarm.
  - .4            CAN/ULC-S527-11, Control Units.
  - .5            CAN/ULC-S528-14, Manual Pull Stations.
  - .6            CAN/ULC-S529-09, Smoke Detectors.
  - .7            CAN/ULC-S530-1991 (R1999), Heat Actuated Fire Detectors.
  - .8            CAN/ULC-S531-14, Smoke Alarms.
  - .9            CAN/ULC-S536-13, Inspection and Testing of Fire Alarm Systems.
  - .10            CAN/ULC-S537-13, Verification of Fire Alarm Systems.
  - .11            CAN/ULC-S561-13, Installation and Services for Fire Signal Receiving Centres and Systems.
  - .12            CAN/ULC-S1001-11. Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems.
- .2            National Standards
  - .1            National Building Code of Canada, latest edition in force.

**1.3            SYSTEM DESCRIPTION**

- .1            Existing fire alarm system within the building is a fully supervised, microprocessor-based, fire alarm system, utilizing digital techniques for data control and digital, and multiplexing techniques for data transmission.
- .2            System carries 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 monitoring agency fire department via Departmental Representative supplied leased telephone line.
- .3            New fire alarm equipment supplied and installed must be compatible with and connected to the existing building Notifier fire alarm system and equipment.

**1.4            REQUIREMENTS OF REGULATORY AGENCIES**

- .1            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.

## **1.5 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Include:
  - .1 Overall system riser wiring diagram identifying control equipment initiating zones signalling circuits; identifying terminations, terminal numbers, conductors and raceways.
  - .2 Details for devices.
  - .3 Details and performance specifications for control, annunciation and peripherals with item-by-item cross reference to specification for compliance.
  - .4 Step-by-step operating sequence, cross referenced to logic flow diagram.

## **1.6 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 Technical data - illustrated parts lists with parts catalogue numbers.
  - .2 Copy of approved shop drawings with corrections completed and marks removed except review stamps.
  - .3 Copies of certificates indicating that the fire alarm system equipment has been installed and tested to:
    - .1 CAN/ULC S524-06
    - .2 CAN/ULC S536-04
    - .3 CAN/ULC S537-04
    - .4 CAN/ULC S561-13

## **1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal, and with the Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

## **1.8 ON SITE DOCUMENTATION**

- .1 The electrical contractor shall maintain a copy of the following standards on site at all time throughout the construction and certification period of the project:
  - .1 National Building Code of Canada
  - .2 CAN/ULC S524-14
  - .3 CAN/ULC S536-04
  - .4 CAN/ULC S537-13

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**Part 2            Products**

**2.1            MATERIALS**

- .1    Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .2    Audible signal devices: to ULC-S524.
- .3    Visual signal devices: to CAN/ULC-S526.
- .4    Manual pull stations: to CAN/ULC-S528.
- .5    Thermal detectors: to CAN/ULC-S530.
- .6    Smoke detectors: to CAN/ULC-S529.

**2.2            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 DCLB configuration to fault isolator modules.
- .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 configuration to fault isolator modules.
- .5    Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".

**2.3            ALARM OUTPUT CIRCUITS**

- .1    Alarm output circuit: connected to speakers, wired in Class B configuration to central control unit.
  - .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.

## **2.4 EMERGENCY TELEPHONE CIRCUITS**

- .1 Telephone circuits for connection of remote emergency telephones: wired in Class B configuration to central control unit.
- .2 Two-way communication via telephone voice circuits between master telephone handset and remote telephones. Telephone circuits: controlled by CCU.
- .3 Field wiring of telephone circuits between remote handsets and CCU supervised for open circuits and grounds.

## **2.5 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 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.
- .5 Auxiliary circuits: rated at 2A, 24 Vdc or 120 Vac, fuse-protected.

## **2.6 WIRING**

- .1 Copper conductors.
- .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 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: 14 AWG minimum, and in accordance with manufacturer's requirements.
- .7 Risers: twisted, shielded pairs, 1 h fire-rated configured to eliminate interference and cross-talk.

## **2.7 AMPLIFIERS**

- .1 Modular in construction, solid state in design, digital control, with power output of 70V RMS, for constant voltage distribution to speaker circuits.
- .2 Continuously supervised for proper operation. Loss of power, open or short circuit on input or output of amplifier, or total amplifier failure, to activate trouble sequence at central control unit with visual indication.
- .3 Housed in separate enclosure. Powered through system power supply and supported by standby batteries in case of power failure.
- .4 Riser amplifiers: housed in separate enclosures, with outputs connected to voice communication risers.
- .5 Standby amplifiers: at every amplifier location; sized to meet requirements of largest amplifier in that location, with automatic transfer to be on priority basis.
- .6 Amplifiers: 25% spare capacity for future expansion.

## **2.8 MANUAL ALARM STATIONS**

- .1 Addressable manual pull station.
  - .1 Pull lever, surface wall mounted type, single action, 2 stage, electronics to communicate station's status to addressable module/transponder and to supply power to station. Station address to be set on station in field.

## **2.9 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 88°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 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.
- .3 Addressable duct smoke detectors.
  - .1 Photoelectric type.
  - .2 Detector address to be set on unit.
  - .3 Unit shall operate in air velocities from 0.5 to 20.32 m/sec.

- .4 Integral dust filter system.
- .5 Sampling tube.

**2.10 AUDIBLE SIGNAL DEVICES**

.1 Recessed Ceiling Speakers:

- .1 Cone type, round 200mm.
- .2 Fire retardant, moisture proof.
- .3 Multiple taps adjustable from 0.25 to 2W.
- .4 Frequency response: 400 to 4000Hz.
- .5 Output sound level: 90db at 3m with 1W tap.
- .6 Dispersion angle: 180-degree range.
- .7 White in colour.

.2 Recessed Ceiling Speaker/Strobe

- .1 Cone type, round 200mm.
- .2 Fire retardant, moisture proof.
- .3 Multiple taps adjustable from 0.25 to 2W.
- .4 Frequency response: 400 to 4000Hz.
- .5 Output sound level: 90db at 3m with 1W tap.
- .6 Dispersion angle: 180-degree range.
- .7 White in colour.
- .8 Field selectable strobe candela settings including 15, 15/75, 30, 75, 95, 110, 115, 135, 150, 177, 185

.3 Wall Mount Speaker

- .1 Square faceplate.
- .2 Fire retardant, moisture proof.
- .3 Multiple taps adjustable from 0.25 to 2W.
- .4 Frequency response: 400 to 4000Hz.
- .5 Output sound level: 90db at 3m with 1W tap.
- .6 Dispersion angle: 180-degree range.
- .7 White in colour.

.4 Wall Mount Speaker Strobe

- .1 Cone type, round 200mm.
- .2 Fire retardant, moisture proof.
- .3 Multiple taps adjustable from 0.25 to 2W.
- .4 Frequency response: 400 to 4000Hz.
- .5 Output sound level: 90db at 3m with 1W tap.
- .6 Dispersion angle: 180-degree range.
- .7 White in colour.

- .8 Field selectable strobe candela settings including 15, 15/75, 30, 75, 95, 110, 115, 135, 150, 177, 185
- .5 Strobe Synchronization Module
  - .1 Shall operate on all strobe circuits such that all strobes are synchronized at 1Hz.

## **2.11 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.

## **2.12 REMOTE EMERGENCY TELEPHONES**

- .1 Constructed of ABS material and complete with 2m coiled cord.
- .2 Telephone cabinet: steel, red, surface mounted, with lockable break glass door.

## **2.13 MONITOR MODULES**

- .1 Single or dual configuration, addressible.
- .2 Operating Voltage: 15 to 22VDC
- .3 Maximum Current: 5.0mA
- .4 Maximum Operating Current: .375mA
- .5 Maximum IDC wiring resistance: 1500 ohms
- .6 EOL Resistance: 47,000 ohms

## **2.14 RELAY MODULES**

- .1 Addressable complete with two (2) Form C contacts.
- .2 Operating Voltage: 15 to 32VDC
- .3 Average Operating Current: .250mA
- .4 Maximum Current Draw: 6.5mA
- .5 Maximum Contact Voltage Rating: 125VAC @ .3A

## **2.15 FAULT ISOLATOR MODULE**

- .1 Unit shall provide automatic isolation of wire to wire short circuits on an SLC loop.
- .2 Operating Voltage: 15 to 32VDC.

- .3 Coverplate shall have an identifying label indicating device function. Provide type written label indicating the fire alarm zone in which it serves.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 Install manual alarm stations and connect to alarm circuit wiring.
- .2 Locate and install smoke detectors and connect to alarm circuit wiring. Do not mount detectors within 1m of air outlets. Maintain at least 600mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.
- .3 Connect alarm circuits to main control panel.
- .4 Install speakers and visual signal devices and connect to circuits.
- .5 Connect signalling circuits to main control panel.
- .6 Install end-of-line devices at end of supervisory and control circuits.
- .7 Install door releasing devices.
- .8 Install remote relay units to control fan shut down.
- .9 Sprinkler system: wire alarm and supervisory switches and connect to control panel.
- .10 Splices are not permitted.
- .11 "T-Tapping" or t-style connections are not permitted for initiating, control or monitoring devices.
- .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.

#### **3.2 FIELD QUALITY CONTROL**

- .1 Fire alarm system:
  - .1 Test each new device and alarm circuit to ensure manual stations, thermal and smoke detectors and sprinkler system transmit alarm to control panel and actuate first stage alarm, general alarm and ancillary devices.
  - .2 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of systems.

- .3 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 each 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.

### 3.3 VERIFICATION AND CERTIFICATION OF THE FIRE ALARM EQUIPMENT

- .1 The contractor shall retain the services of the fire alarm system manufacturer's authorized factory representative to verify and certify fire alarm system operation. The manufacturer's authorized factory representative shall:
  - .1 Inspect all newly installed fire alarm equipment to ensure installation conforms to the manufacturer's recommendations.
  - .2 Test all new alarm initiating devices to ensure each device is operable and will initiate alarm and trouble signals as specified.
  - .3 Test all new alarm indicating devices to ensure each device operates upon alarm and is correctly wired to provide supervision.
  - .4 Verify that all new magnetic holding devices release as specified.
  - .5 Verify that all new mechanical ventilation equipment controlled by the fire alarm system shuts down upon alarm. Note: Verifying control module contact operation only is not allowed. Actual equipment shut downs must be verified.
  - .6 Verify that all new sprinkler system tamper and flow switches are correctly wired and initiate the required alarm and trouble signals. Note: Simulation of sprinkler tamper and flow switch operation only is not allowed. Tamper and flow switches must be operated to verify correct connection.
- .2 The contractor shall provide the manufacturer's authorized representative with sufficient personnel during system identification.
- .3 The manufacturer's authorized representative shall provide the contractor with technical assistance to correct deficiencies identified during the verification.
- .4 Inspection Certification:

- .1 On completion of the verification the contractor shall issue to the Consulting Engineer the following:
  - .1 A Certificate of Verification and copies of the verification worksheet that the fire alarm system has been completed as per CAN/ULC S537-04, and that the system is fully operational.
- .5 All costs involved in this inspection, both for the manufacturer's and the electrical contractor's work shall be included with the electrical contractor's total tender price.

### **3.4 INTEGRATED LIFE SAFETY SYSTEMS TEST**

- .1 At the completion of construction but prior to deeming the contract substantially complete, the contractor shall carry out an integrated life safety systems test. This test shall include the following:
  - .1 Demonstrate that all ancillary functions that are initiated by the fire alarm system operate as specified.
  - .2 Demonstrate the continued operation of all of the functions noted in .1 while the building power supply has been turned off.
  - .3 Demonstrate the continued operation of all of the functions noted in .1 during the restoration of the building power supply.
- .2 The consultant shall prepare a detailed sequence of events prior to the test. The contractor shall arrange for personnel to assist in the test including other sub trades.

**END OF SECTION**