

## **I FIRE ALARM**

### **1 GENERAL**

- 1.1 Provide suitable systems to meet code requirements and functional criteria for the facility.
- 1.2 Standards:
  - 1.2.1 [CAN C22.1-98] –Ontario Electrical Code.
  - 1.2.2 [CAN/ULC-S524-1991] - Installation of Fire Alarm Systems.
  - 1.2.3 [ULC-S525-1978] - Audible Signal Appliances for Fire Alarm Systems.
  - 1.2.4 [CAN/ULC-S526-1987(R.1995)] - Visual Signal Appliances, Fire
  - 1.2.5 [CAN/ULC-S527-1987(R.1995)] - Control Units, Fire Alarm.
  - 1.2.6 [CAN/ULC-S528-1991] - Manual Pull Stations.
  - 1.2.7 [CAN/ULC-S529-1987(R.1995)] - Smoke Detectors, Fire Alarm
  - 1.2.8 [CAN/ULC-S530-1991] - Heat Actuated Fire Detectors, Fire Alarm
  - 1.2.9 [CAN/ULC-S531-1987(R.1995)] - Smoke Alarms.
  - 1.2.10 [CAN/ULC-S536-1997] - Inspection and Testing of Fire Alarm Systems.
  - 1.2.11 [CAN/ULC-S537-1997] - Verification of Fire Alarm Systems.
  - 1.2.12 Ontario Building Code – Latest edition
- 1.3 Submittals:
  - 1.3.1 Submit shop drawings for record purposes.
  - 1.3.2 Submit all test and verification reports.
- 1.4 Operations and Maintenance Manuals:
  - 1.4.1 Provide maintenance details for inclusion in Operations and Maintenance Manuel.
  - 1.4.2 Provide list of components.
  - 1.4.3 Provide copies of shop drawings.
  - 1.4.4 Provide operation and maintenance details.
  - 1.4.5 Provide list of spare parts and supplies.
  - 1.4.6 Provide list of devices address identification.
- 1.5 Commissioning:

1.5.1 Systems supplied shall be tested, verified and put into operation complete with all necessary training.

1.6 Warranties:

1.6.1 The Owner shall be furnished with a fully comprehensive warranty on each system for a period of two full years from date of building acceptance.

## 2 DESIGN

2.1 Fire Alarm System:

2.1.1 General:

2.1.1.1 Provide addressable, microprocessor based, zoned, non-coded, electrically supervised, single stage, general evacuation type of fire alarm system with DCLA style data communication link. Provide complete with: active remote annunciators at main entrance.

2.1.1.2 Design and install system in accordance with the requirements of all applicable CAN/ULC standards and meeting all requirements of the Ontario Building Code.

2.1.1.3 Sprinkler system: fully supervised by the fire alarm system and indicate the following conditions: sprinkler flow, tamper, pressure loss.

2.1.1.4 Fire hose cabinets: electrically monitored to signal trouble or tamper conditions.

2.1.1.5 Provide alarm indication by sounding horns and operating strobe lights for visual indication in buildings designed for barrier free access. Strobe lights to also be provided between interconnecting buildings, walkways and tunnels.

2.1.1.6 Wire all circuits for alarm trouble, and signals for DCLA operation from addressable components.

2.1.1.7 System to be modular in design to allow for minimum of 25% future expansion. Each circuit shall not be loaded to more than 80% capacity.

2.1.1.8 Operation of fire alarm system shall not require personnel with special computer training.

2.1.1.9 System to include:

2.1.1.9.1 Central Control Unit in separate enclosure with power supply, stand-by power of sealed gel cell batteries, sized for minimum 24 hour back-up capacity and in accordance with NBC including battery condition monitor/display. Central processor with microprocessor and logic interface, main system

- memory, input-output interfaces for alarm receiving, annunciation/display and program control / signalling.
- 2.1.1.9.2 Auxiliary circuits.
- 2.1.1.9.3 Ancillary devices.
- 2.1.1.9.4 Wiring.
- 2.1.1.9.5 Audible and visual devices.
- 2.1.1.9.6 Event log memory chip.
- 2.1.1.9.7 Historic event records.
- 2.1.1.9.8 Initiating/supervisory devices
- 2.1.1.10 System to be commissioned by system supplier.
- 2.1.1.11 Owner to review all fire zoning, LCD messages and graphic annunciators.
- 2.1.1.12 Tie system into central monitoring located in Boiler Room.
- 2.1.1.13 System shall be verified in accordance with *[CAN/ULC-S537]*.
- 2.1.1.14 All panels, control equipment and wiring shall be marked.
- 2.1.1.15 Provide operation and maintenance manuals and on-site training.
- 2.1.1.16 Locate fire alarm panel in main electrical room.
- 2.1.1.17 Provide two inspections by manufacturer during first year operation.
- 2.1.2 System Operation:
  - 2.1.2.1 System shall operate such that on receipt of an alarm condition from any initiating device the control panel shall
    - 2.1.2.1.1 Sound evacuation signal.
    - 2.1.2.1.2 Annunciate at the main control panel
    - 2.1.2.1.3 Annunciate at the remote annunciator.
    - 2.1.2.1.4 Shut down recirculation air handling units.
    - 2.1.2.1.5 Release all magnetically held doors.
    - 2.1.2.1.6 Transmit signal to remote monitoring station.
  - 2.1.2.2 On receipt of a trouble condition the panel shall:
    - 2.1.2.2.1 Annunciate a visual and audible trouble indicator at main panel, at remote annunciator and at remote monitoring station.

- 2.1.3 System Wiring:
  - 2.1.3.1 System wiring shall be in EMT conduit with set screw connectors, conduit to be concealed.
- 2.1.4 Training:
  - 2.1.4.1 Provide on site training and demonstrations by system manufacturer to train operational personnel in use and maintenance of fire alarm system, including operations and minor troubleshooting. Allow a minimum of two days.
  - 2.1.4.2 Orient training toward system as installed rather than a general training course.

### **3 MATERIALS**

#### **3.1 Fire Alarm**

- 3.1.1 Control Unit
  - 3.1.1.1 Central processing unit (CPU): monitor and control all system components, of modular design and incorporate a 40 character alphanumeric display and keypad. All components fully operational while system is operating in stand-by mode.
  - 3.1.1.2 Unit shall log automatically all system events for future review. Log change of status, alarm and fault messages along with time of day and date. Accomplish this by using either an internal memory log.
  - 3.1.1.3 CPU: microprocessor based. Retain basic life safety software in erasable programmable read only memory (EPROM) and executed from RAM memory to allow password protected field editing. CPU shall have capacity to monitor number of addressable points required for the project plus 25% spare capacity.
  - 3.1.1.4 CPU: continuously monitor communications and data processing cycles of the microprocessor. CPU failure shall cause an audible and visual trouble indication at the panel and transmit a remote trouble signal to the boiler plant.
  - 3.1.1.5 CPU shall have software routines to provide event initiated programs (EIP) whereby the receipt of an alarm or supervisory trouble condition may be programmed to operate any or all of the system control points. Retain event initiated program actions for life safety functions in the non volatile PROM memory for reliability. Provide CPU capable of reprogramming these functions in the field and retaining the changes in the RAM memory until a new set of PROM are programmed.

- 3.1.1.6 Control unit: able to handle the following maximum number of addressable loops and field programmable zones:
  - 3.1.1.6.1 Up to 4 addressable loops per control unit.
  - 3.1.1.6.2 Up to 100 detection devices per line. Max initial loading: not more than 80.
- 3.1.1.7 Each addressable line module to have its own microprocessor based circuit, working independently from each other.
- 3.1.1.8 Monitor all addressable circuits against open circuits and ground fault. Should a malfunction occur in any circuit, this shall result in an indication of a trouble condition of this address location at the control panel while all other addresses continue operating normally.
- 3.1.1.9 Should a detection device respond with a either an alarm or trouble condition, display its location along with its user text of 40 characters. Provide panel capable of displaying the address information of the device in alarm/trouble condition.
- 3.1.1.10 Auxiliary relays to be plug in type, supervised for unauthorized removal units to be complete with by pass switch. Relay contacts to be 3A at 120V for all auxiliary functions, terminals to accept #22 - #12 AWG wiring.
- 3.1.1.11 Control panel CPU shall be capable of storing minimum of 120 alarm and 120 trouble initiations, status to show date and time of event.
- 3.1.2 Manual Pull Stations
  - 3.1.2.1 To be pull lever fully addressable single pole non coded. Glass rod.
- 3.1.3 Heat Detectors
  - 3.1.3.1 Fully addressable fixed temperature 135°C non restorable, rate of rise self-restorable, combination fixed temperature/rate of rise.
- 3.1.4 Product of Combustion Detectors to be plug in type ionization or photo electric as required. Wire in base with red LED alarm indicator.
- 3.1.5 Addressable interface modules to interface non addressable devices to address loop, serial time polling, monitor normally open contacts, without clip switch address programming, build in LED signal.
- 3.1.6 Signal Devices
  - 3.1.6.1 Horns to be polarized electronic suitable for DC operation with a sound output of 1100 DBA at 3 meters.
  - 3.1.6.2 Strobe lights to be solid state circulating with Xenon tube to produce 8000 peak candle power at 1 flash per second. Units to be suitable for DC, V or

AC, V with word "FIRE" inscribed on white polycarbonate lens.

3.1.7 Remote Annunciators

3.1.7.1 To be LCD display type with scroll and event log features to record up to 300 events. Units to be equipped with:

3.1.7.1.1 Audible trouble signal.

3.1.7.1.2 Trouble silence button.

3.1.7.1.3 Alarm acknowledge button.

3.1.7.1.4 Alarm silence button.

3.1.8 Acceptable materials: *[Edwards; Simplex]*.

## 4 INSTALLATION

4.1 Installation shall be in strict compliance with manufacturer's recommendations. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing conduits and pulling wire.

4.2 Conduit and Conductors:

4.2.1 Provide complete wiring and conduit between all equipment. Install in a separate raceway system, maximum 40% fill. If cable is used, conduits of proper size shall be installed from all equipment and devices into accessible space; all devices shall be mounted upon and all splices made in listed boxes. Wiring splices are to be avoided to the extent possible and "Transposing or changing colours will not be permitted". All junction boxes shall be labelled as "Fire Alarm System" with decal or approved markings. Comply with all local, provincial and national codes.

4.3 All equipment shall be held firmly in place. Fastening and supports shall be adequate to support the loads with a safety factor of five.

4.4 Fire Alarm Control Panel shall be connected to a separate dedicated branch circuit. Circuit shall be labelled as "FIRE ALARM" at the main distribution board.

4.5 All wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, disarrangement of any components, or any open circuits in the system, an audible and visual trouble signal will be activated until the system is restored to normal.

4.6 Each zone shall be labelled on the Fire Alarm Control Panel. Names of the zones shall be coordinated with the Owner, and shall meet with their approval.

4.7 Fire Sprinkler System(s) shall each be indicated on a separate zone.

4.8 Testing and Verification

- 4.8.1 Conform with *[CAN/ULC-S537-1997 "Verification of Fire Alarm Systems]*.
- 4.8.2 At the completion of the installation of all system equipment and devices and after the connection to all motors, fans, ventilation and smoke controls, test and verify the entire system using the supervisory services of the manufacturer.
- 4.8.3 After the testing and verification task is completed, and all deficiencies rectified, notify the Owner and the representatives of the Fire Department, and in their presence, demonstrate the proper functioning of the entire system.
- 4.8.4 The purpose of a verification procedure for the system is to make certain that all equipment operates as intended. Provide upon completion of the verification procedures, an approved certificate of verification to the Owner. Display one copy near the control panel, and retain a copy with the system documentation. Provide an equipment schedule, listing each device and showing confirmation that it was verified.
- 4.8.5 The verifying agent is to be a member in good standing of the Canadian Fire Alarm Association (C.F.A.A.).
- 4.8.6 Inspect and test the wiring to every device to verify that removal of the device or breaking wire will cause the trouble signals to operate properly. Verify that trouble signals operate on open circuit, short circuit, ground fault or the removal of any plug-in component. Inspect wiring to ensure that individual terminations have been provided for all conductors and that where applicable correct polarities have been observed.
- 4.8.7 Inspect all equipment installed as part of the system for visible damage and tampering which might interfere with its intended operation.
- 4.8.8 Test devices which are field adjustable to ensure that their settings are acceptable under ambient conditions at the location of installation.
- 4.8.9 Operate each and every manual initiating device to verify their proper operation.
- 4.8.10 Each and every smoke detector, area type: test detector sensitivity according to the manufacturer's recommendations. Live smoke not to be used for testing.
- 4.8.11 Test all audible signal devices for acceptable operation. Make tests to determine that the signal is audible throughout the building above normal ambient noise. Make tests to verify that adequate power is available from both normal and standby sources under the maximum system load.
- 4.8.12 Make installation of additional signals or revisions to power sources to ensure audibility prior to completion of the inspection before a certificate of

verification can be issued.

- 4.8.13 Test annunciator to ensure proper operation, correct voltage, correct zoning and visibility of all legends.
- 4.8.14 Test all control equipment for all acceptable operation. Make an inspection and test of all cable terminals, plus connectors, plug-in circuits, lamp sockets and controls to confirm that their mechanical and electrical connections and mounting are acceptable, and where applicable, to confirm their electrical supervision.
- 4.8.15 Verify that field wiring is terminated on a single conductor per terminal basis.
- 4.8.16 Test all lamps and indicators for acceptable operation. Operate all control functions to verify correct response. Perform simulation of open circuits, short circuits and ground fault on all relevant components to confirm proper trouble circuit response.
- 4.8.17 Test ancillary equipment connections for proper operation. Inspect such equipment to ensure that faults in it will not interfere with alarm system operation.
- 4.8.18 Test sprinkler flow switches, supervisory valves and pressure switches for acceptable operation.
- 4.8.19 On completion of all tests and verification provide the Owner with a certificate of test and verification and proof of liability insurance for tests and verification.
- 4.8.20 Verify and test software for proper operation of system.
- 4.8.21 On completion of training, provide Owner with access codes to allow Owner to disable and enable zones as needed.

## **II TELEPHONE AND DATA SYSTEM**

### **1 GENERAL**

- 1.1 Provide a telephone and data system consisting of
  - 1.1.1 Incoming service and equipment room for cable and racking installations.
  - 1.1.2 Telephone and data system closets distributed throughout the building as required to serve the outlet requirements.
  - 1.1.3 Combined zone conduit and cable tray system connecting the equipment room to the distributed closets and from each system outlet to the closets.
  - 1.1.4 Complete wiring between the main campus data/telecom Room C302 to

the new facility's main equipment room.

1.1.5 Complete wiring between the facility's main equipment room to each system closets distributed throughout the building.

1.1.6 Complete wiring between each system closets to all data and telephone outlets located throughout the facility.

1.2 Submittals:

1.2.1 Submit shop drawings for record purposes.

1.2.2 Submit all test and verification reports.

1.3 Operations and Maintenance Manuals:

1.3.1 Provide maintenance details for inclusion in Operations and Maintenance Manual.

1.3.2 Provide list of components.

1.3.3 Provide copies of shop drawings.

1.3.4 Provide operation and maintenance details.

1.3.5 Provide list of spare parts and supplies.

1.3.6 Provide list of devices address identification.

1.4 Commissioning:

1.4.1 Systems supplied shall be tested, verified and put into operation complete with all necessary training.

1.5 Warranties:

1.5.1 The Owner shall be furnished with a fully comprehensive warranty on each system for a period of two full years from date of building acceptance.

**2 DESIGN**

2.1 Incoming communication service: 4-100 mm and wiring from C302 to the main equipment room. *[Facility to be provided with minimum of 400 pair for telephone and security].*

2.2 Provide a minimum of one telecommunications closet per floor. Locate as close as practical to the centre of the area served. Equipment in closets shall serve only that floor area on which the closet is located. Each floor shall be wired with a minimum of 200 pair cable from the main equipment room.

2.3 Provide capacity for minimum *[200]* phones in the building to be connected to main PBX in C Building. Terminate the main feed to this new building at the 2<sup>nd</sup> floor wiring closet. Distribute equally the phone capacity load among the wiring closets on each

of the floors planned. Phone jacks to be terminated in each room at the designated location.

- 2.4 All classrooms that will be converted into a future computer laboratory must be wired as such for the future. Terminate all the wiring in the ceiling space with the cable length being able to reach the farthest part of the classroom when run in raceways in the future.
- 2.5 Locate the equipment room a minimum of 8000 mm away from sources of electromagnetic interference and at a distance, which will reduce the interference to a minimum throughout the frequency spectrum. Give special attention to electrical power supply transformers, motors, generators.
- 2.6 Wiring closet dimensions shall accommodate all data, telephone and security equipment as well as room for growth. Wiring closet shall not share space with any other utility equipment.
- 2.7 Provide cable tray system to carry data, telephone and security cables for distribution throughout the facility.
- 2.8 Communication conduit and basic materials:
  - 2.8.1 All conduit runs maximum 30 metres in length with a maximum of two 90° bends between pull points, unless otherwise specified. The inside radius of a bend in a conduit not less than ten times the internal diameter of the conduit. Label pull boxes on the exposed exterior.
  - 2.8.2 Bond all metallic conduit and pull boxes together and connect to the approved building ground.
  - 2.8.3 Originate all conduit runs at a telecommunications closet, wire way, pull box or cable tray.
  - 2.8.4 All zone conduit entering a telecommunications closet will protrude into the closet from 25-50 mm without a bend.
  - 2.8.5 Conduit: EMT, bushed at both ends.
  - 2.8.6 Place pull boxes in readily accessible locations only.
  - 2.8.7 Identify pull box locations on As-Built drawings.
  - 2.8.8 Install outlet boxes for data and telephone where identified in room data sheets. Minimum: 100 x 100 x 65 mm deep. Mount at the same level as adjacent duplex receptacles 300 mm AFF, flush with finished walls.
  - 2.8.9 Raceway fill maximum: 40%.
  - 2.8.10 Maximum distance of raceway travel from outlet to termination point in telephone closet: 90 M.

- 2.8.11 Enclose all cables in conduit or support on cable tray from outlet to termination point.
- 2.8.12 DO NOT use: LB, LL and LR type fittings. Provide all conduits with wide sweep bends, 6 times diameter of conduits, under 50 mm, 10 times the diameter of larger conduits.

2.9 Cable Tray:

- 2.9.1 Provide ventilated cable trays where required. Minimum size: 300 mm wide. Prefabricated, ventilated bottom with two 75 mm side rails with dividers as required.
- 2.9.2 Locate trays above the ceiling.
- 2.9.3 Support cable trays to suit loading and recommended support requirements for Class C1 Place supports within 610 mm maximum on either side of any connection to a fitting.
- 2.9.4 Bond all metal cable trays to ground.
- 2.9.5 Provide minimum 300 mm access headroom provided above cable tray where practical. DO NOT permit other building components such as: air conditioning ducts, to restrict access to trays.

2.10 Backboards:

- 2.10.1 Install 20 mm thick x 2440 mm long G/S plywood, anchored to wall, capable of supporting attached equipment. Install plywood backboard as required.
- 2.10.2 Paint all backboards with minimum 2 coats fire retardant paint.

2.11 Grounding:

- 2.11.1 Service entrance and equipment room: provide a No. 1/0 min, insulated, stranded copper ground conductor in conduit, from main building grounding electrode to backboard in equipment room.
- 2.11.2 Equipment closet: provide an independent No. 6, min insulated, stranded copper conductor wire from each backboard to either the main building ground electrode or the equipment room backboard.

2.12 Provide zoned conduit system.

**3 MATERIALS**

- 3.1 All materials and equipment shall be provided as per the Algonquin College Network Infrastructure Master Plan Phase 3 – Cabling Strategy and Design.
- 3.2 All raceway materials such as cable tray, conduits, surface raceways etc. shall be as

per Section D5020.

#### **4 INSTALLATION**

- 4.1 All equipment and wiring shall be installed and tested as per the Algonquin College Network Infrastructure Master Plan, Phase 3 – Cabling Strategy and Design.
- 4.2 Install all systems wiring in raceway system as per section D5020 – III Branch Wiring.
- 4.3 Make all communication terminations in accordance with manufacturers recommendations.
- 4.4 Ensure adequate clearances are maintained between power and communication systems wiring.
- 4.5 Test and commission all systems, provide test and verification reports, and put into operation.

### **III SECURITY**

#### **1 GENERAL**

##### **1.1 Closed Circuit Television System:**

- 1.1.1 A complete CCTV system will be provided and installed by the Owner. The Design shall include all the necessary raceway system as well as power to the equipment to suit the requirements of the program.
- 1.1.2 System to consist of cameras, switches, video monitors, recorders and controls to enable security personnel to determine movement and identifiability.
- 1.1.3 Video equipment, recorders and controls to be rack mounted in cabinet and installed in a designated security control area. Provide power to suit all equipment.
- 1.1.4 System wiring to be installed in conduit and cable tray system.

##### **1.2 Door Access Control:**

- 1.2.1 A state-of-the-art electronic door access security system [ *Northern Computer Inc.* ] consisting of magnetic door holders, electric strikes, proximity card readers, door monitoring contacts, emergency release devices, CPU based controlled and NO access cards will be provided and installed by the Owner. The [ *Design Builder* ] shall install all the necessary raceway system as well as power to the equipment to suit the requirements of the program.
- 1.2.2 System wiring to be installed in conduit and cable tray system.

## **2 DESIGN**

- 2.1 Incoming security service: 2-100 mm c/w necessary cabling from C128 security services of campus.
- 2.2 For equipment room, conduiting and raceway strategies, refer to Section II. Telephone and Data System – 2 Design of Section D5030.

## **3 MATERIALS**

- 3.1 All security equipment will be provided and installed by Owner.

## **4 INSTALLATION**

- 4.1 Install raceway system as per Section D5020 – III Branch Wiring.

***End of Section***