

1 General

1.1 **SUMMARY**

.1 Section includes:

- .1 Labour, products, equipment and services necessary to complete the work of this Section.

1.2 **RELATED SECTIONS**

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

1.3 **REFERENCES**

- .1 Refer to latest in force version of codes and standards indicated below per the National Building Code of Canada.
  - .2 Design, manufacture, install and test fire alarm system in accordance with good industry practice and in accordance with the following Codes and Standards:
    - .1 CAN/ULC-S524 - Standard for the Installation of Fire Alarm Systems
    - .2 CAN/ULC-S536 - Standard for the Inspection and Testing of Fire Alarm Systems
    - .3 CAN/ULC-S537 - Standard for the Verification of Fire Alarm Systems
    - .4 National Building Code
    - .5 National Fire Code
    - .6 Canadian Electrical Code
    - .7 CAN/ULC-S525 - Audible Signal Appliance for Fire Alarm Signal
    - .8 CAN/ULC-S526 - Visual Signalling Appliances
    - .9 CAN/ULC-S527 - Control Units for Fire Alarm Systems
    - .10 CAN/ULC-S528 - Manually Actuated Signalling Boxes for Fire Alarm System
    - .11 CAN/ULC-S529 - Smoke Detectors for Fire Alarm Systems
    - .12 CAN/ULC-S530 - Heat Detectors for Fire Protective Signalling Systems
    - .13 CAN/ULC-S531 - Smoke Alarm
    - .14 CAN/ULC-S548 - Water Flow Indicators for Fire Protective Signalling System
    - .15 CSA 282 - Emergency Electrical Power Supply for Buildings
    - .16 CAN4-S101 - Methods of Fire Endurance Tests of Building Construction and Material
  - .3 If any of the requirements of the above Codes and Standards is in conflict with the Drawings or Specifications, the Code or Standard requirements shall govern, but,
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in no instance shall the standards established by these Drawings and Specifications be reduced by any of the Codes and Standards listed above.

1.4 **SUMMARY**

- .1 The fire alarm shall be a new stand-alone fire alarm system.
- .2 Supply and install components of the fire alarm system in accordance with these specifications as indicated on plan drawings.
- .3 The fire alarm system will include all components including dedicated call out system for fire department notification. This system can consist of one hard wired dialler and one cell dialler back up.
- .4 This Section covers fire alarm systems, including initiating devices, notification appliances, controls, supervisory devices and voice communication devices.
- .5 Work covered by this section includes the furnishing of labour, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.
- .6 The Fire Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:
  - .1 Fire alarm and detection operations
  - .2 Control and monitoring of elevators, door hold-open devices, fire suppression systems, emergency power systems, and other equipment as indicated in the drawings and specifications.

1.5 **MANUFACTURER'S ATTENDANCE**

- .1 Provide services of manufacturer's representative in accordance with section 26 05 00 Common Work Results – Electrical and this specification section.

1.6 **SUBMITTALS**

- .1 Submit shop drawings in accordance with Division 01 and items noted below.
    - .1 Documentation to be project specific.
    - .2 Generic documentation and/or alternate or as-equal products are unacceptable.
    - .3 Product data for each type of system component including list of materials and Underwriters' Laboratories of Canada (ULC) listing. Product data to include technical documentation features, and/or functions, and parts list.
    - .4 Plan drawings illustrating location of all devices, system components, conduit runs with types and quantities of conductors.
    - .5 Dimensioned drawings illustrating minimum clearances and any required access space.
    - .6 Drawings illustrating all features and devices including circuiting and details of graphic annunciator.
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- .7 Dimensional elevation of fire alarm control panel and mounting instructions.
- .8 Point to point wiring diagrams of the entire installed system differentiating clearly between factory and field installed wiring. Identify all terminals and interconnections including conductor numbering.
- .9 System operation description to include method of operation and supervision of each type of circuit and sequence of operation for all manually and automatically initiated systems input and output.
- .10 Operation and Maintenance Manuals: Data on each product type including all features and operating sequences for both automatic and manual operations including trouble shooting and maintenance instructions, schematic and wiring diagrams, final reviewed shop drawings, manufacturer's warranty and verification test report.
- .11 Signed certified product documentation of system components confirming products comply with specified requirements.
- .12 Final device address list and application program listing for the system as installed at the time of acceptance.
- .13 A list of all input and output points in the system with a label indicating location or use of initiating device circuit, notification appliance circuit, relay, sensor, and auxiliary control circuits.
- .14 System power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate per the prescribed backup time periods and under all voltage conditions per ULC standards
- .15 Operating instructions for control panel.
- .16 Installation and programming manuals covering the installed system.
- .17 All final and certified documentation.
- .18 Drawings in PDF format.

#### 1.7 **AUTHORITIES HAVING JURISDICTION SUBMISSIONS**

- .1 Contact authorities for required list of submissions for review.
- .2 Submit contract drawings as required, to depict component location in order to facilitate review.
- .3 Upon receipt of comments submit comments to Departmental Representative for review.
- .4 Resubmit, if required, for revision and/or clarification in order to obtain approval.

#### 1.8 **QUALITY ASSURANCE**

- .1 Testing Personnel Qualifications: In addition to the requirements specified in Division 1 Section "Quality Control", provide persons currently certified by the Canadian Fire Alarm Association (CFAA) for fire alarm system testing and verification, to supervise on-site testing and verification as specified in Part 3.
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- .2 Installer Qualifications: Engage an experienced factory-authorized installer to supervise work of this Section.
- .3 Single-Source Responsibility: Obtain fire alarm components from a single source who assumes responsibility for compatibility of system components.
- .4 Compliance with Local Requirements: Comply with the applicable building code, local ordinances, and regulations, and the requirements of the authorities having jurisdiction.
- .5 Listing and Labelling: Provide fire alarm systems and components specified in this Section that are listed and labelled by ULC.

1.9 **TESTING AND COMMISSIONING**

- .1 Perform testing and commissioning services described herein, after fire alarm and voice communication system has been installed and pretested.

1.10 **MAINTENANCE MATERIALS**

- .1 Provide the following maintenance materials:
  - .1 5 spare audible signal appliances.
  - .2 5 spare visual signal appliances.
  - .3 5 spare manual pull stations.
  - .4 5 spare smoke detectors of each type used.
  - .5 5 spare heat detectors of each type used.
  - .6 3 spare fuses of each type and rating used.
  - .7 5 spare control switches of each type used.
  - .8 4 spare addressable input modules for non-addressable devices.
  - .9 4 spare addressable output modules for equipment control purposes.
  - .10 8 spare isolator modules
  - .11 1 spare amplifier
  - .12 1 power supply unit
  - .13 5 end of line resistors
- .2 Provide a storage cabinet to hold spare parts, clearly labelled "FIRE ALARM SYSTEM SPARE PARTS".
- .3 Provide the above noted material prior to installation. Package material with protective cover for storage. Identify with labels clearly describing contents.

1.11 **DEMONSTRATION/TRAINING**

- .1 Startup Services: Engage a factory-authorized service representative to provide startup service and to demonstrate and train Owner's maintenance personnel as specified below.

- .1 Train Owner's maintenance personnel on procedures and schedules related to system operation, startup and shutdown, troubleshooting, servicing, adjusting, and preventive maintenance.
- .2 Instruct and demonstrate programming procedures.
- .3 Training Aid: Use the approved final version of the operation and maintenance manual as a training aid. Provide sufficient documentation to train 4 people.
- .4 Provide course outline and list of documentation to be provided.
- .5 Schedule training with Departmental Representative with at least 7 days' advance notice.

#### 1.12 **WARRANTY**

- .1 Provide a warranty for materials and workmanship, including microprocessor components and software, to be free of defects for period from date of acceptance of system by Departmental Representative in accordance with the General Conditions.
- .2 Repair response times for problems defined as routine to be addressed and corrected within twenty-four (24) hours, excepting statutory holidays and weekends.
- .3 Repair response times for problems defined as major to be addressed and corrected within four (4) hours, excepting statutory holidays and weekends.
- .4 Contractor to provide a recommended list of spare components and devices.
- .5 Manufacturers of the major components to provide written confirmation of full warranty, extended warranty and service back-up in case of the failure to perform or insolvency of the successful supplier.
- .6 Maintain maintenance records for each system supplied, and must submit a monthly report containing a time and date record of all reported or detected problems, detail of corrective action taken and the cause of the problem.
- .7 At end of warranty period, perform tests described above, and in accordance to CAN/ULC-S536 annual inspection and produce a final inspection report.

#### 1.13 **MAINTENANCE MANUALS**

- .1 Cable or Wiring Layout Manuals and Drawings: Prepare and submit in accordance with Division 01, showing external interconnecting cable and wiring diagram showing exact point to point connections and identifications, including junction and pull boxes.
- .2 Operations and Maintenance Manuals: Submit such manuals in accordance with Division 01, and prior to completion of project, in triplicate, containing following:
  - .1 Actual system functional description, and sequence of operation of completed installation.

- .2 Detailed maintenance instructions for control equipment and each device type, maintenance schedule in accordance with CAN/ULC-S536. Trouble shooting guide for control panels and devices.
- .3 Pictorial drawing of control equipment layout, showing location of components, modules and parts, indicating catalogue numbers.
- .4 Schematic diagrams of control equipment, except modules which can be exchanged as unit and internal interconnecting cables and wires.
- .5 Copy of verification certificate, verification report and warranty certificates such as for fire alarm system, batteries, ancillary devices, including battery suppliers date coding for batteries.
- .6 Name, address and telephone number of service representative of manufacturer to be contacted during warranty period.
- .7 Name, address and telephone number of representative responsible for future software programming changes.

#### 1.14 **SEQUENCE OF OPERATION**

- .1 Implement the following sequence of operation for a single stage fire alarm system in a low rise building as defined by the Alberta Building Code Latest Edition.
  - .2 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 as per local fire authority.
    - .2 Indicate zone of alarm at central control unit and remote annunciator display.
    - .3 Cause audible devices throughout building to sound at 20 strokes per minute.
    - .4 Cause visual devices to activate throughout building.
    - .5 Transmit signal to fire department and facilities via master fire alarm box.
    - .6 Cause air conditioning and ventilation fans to shut down.
    - .7 Cause fire doors and smoke control doors, if normally held open, to close automatically.
    - .8 Cause elevators to return to floor of egress, or to alternate floor, as required.
    - .9 Cause to release doors equipped with electromagnetic door locks.
    - .10 Cause to relay signal to security systems.
    - .11 Cause to relay signal to network lighting control system.
    - .12 Cause to relay signal to audio/visual systems.
    - .13 Cause to relay signal to Building Management Systems (BMS).
  - .3 Acknowledging alarm: indicated at central control unit.
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- .4 Possible to silence signals by "alarm silence" switch at control unit, after silencing inhibit timer has timed out. If the "Alarm Silence" button is pressed, all audible and visible alarm signals shall cease operation.
- .5 Subsequent alarm, received after previous alarm has been silenced, to re-activate signals.
- .6 Upon activation of a supervisory device including but not limited to fire pump power failure, low air pressure switch, and tamper switch, the system shall operate as follows:
  - .1 Cause electronic latch to lock-in supervisory state at central control unit and data gathering panel/transponder.
  - .2 Indicate respective supervisory zone at local and remote annunciator display.
  - .3 Cause audible signal at central control unit to sound.
  - .4 Activate common supervisory sequence.
  - .5 Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.
  - .6 Record the event in the FACP historical log.
  - .7 Restoring the condition shall cause the Supervisory LED to clear and restore the system to normal.
- .7 System Reset
  - .1 The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-arming the system. The display message shall indicate "ALARM PRESENT, SYSTEM RESET ABORTED."
  - .2 Should an alarm condition continue, the system will remain in an alarmed state.
- .8 Trouble on system to:
  - .1 Indicate circuit in trouble on central control unit.
  - .2 Activate "system trouble" indication, buzzer and common trouble sequence.
  - .3 Acknowledging trouble condition to silence audible indication; visual indication to remain until trouble is cleared and system is back to normal.
- .9 Troubles on system: suppressed during course of alarm.
- .10 Trouble condition on any circuit in system not to initiate alarm conditions.

- .1 The complete fire detection and alarm system comprising fire alarm system and emergency voice communication system, shall be electrically supervised for open circuits, ground faults, short circuit condition and loss of power supply, for all circuitry.
- .2 Audible and visible trouble signals shall be individually indicated at the control panel, commonly indicated at the annunciator and the CFAP.
- .3 Provide at the annunciator location, the following:
  - .1 Trouble and signal silence switch, with ring-back and subsequent alarm features. Access to these features only by direct key locked door.
  - .2 Loss of normal power indication.

1.16 **SOFTWARE REPROGRAMMING**

- .1 Carry and include allowance for additional costs for the system manufacturer to make necessary on site final changes to applicable system/equipment software. Reprogramming changes are to be completed after successful testing and verification of the systems, but prior to turn over to Departmental Representative. After successful final verification of the work, confirm and obtain approval of final nomenclature in writing from Departmental Representative. The software revisions to incorporate final room names/area names/building names and equipment identification.

2 **Products**

2.1 **MATERIALS**

- .1 All new material shall comply with the related IEEE, ANSI and ASTM standards.
- .2 Control Panel
  - .1 Control panel shall be housed in a surface wall mounted cabinet of code gauge construction with baked enamel finish, full viewing window and hinged front door cover complete with lock and two keys. Opening cabinet door shall provide access to all operating controls, but will not expose live electrical connections.
  - .2 Control panel, with number of zones as identified on fire alarm schedule plus 20% spare capacity, shall contain the following:
    - .1 Reset button, LED test button, alarm signal silencing push button, ground fault indicator light, system trouble indicating light, trouble signal silencing button and annunciator trouble indicating light.
    - .2 Relays and control modules as required for door releases, fan shut-down, extinguishing system release and audible alarms.
    - .3 Alarm receiving modules for number of zones as indicated on drawings plus provision for 20% spares. Zone modules shall be capable of handling any type of device including pull stations, smoke detectors, and heat detectors to allow for future changing of



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- devices without changing modules. Each module to contain a trouble alarm indicator.
- .4 Power supply modules as required.
  - .5 Gate valve supervision module as required.
  - .6 Signal control modules as required.
  - .7 Fire department connection plug-in module complete with disconnect switch and LED "Disconnect" indicator.
  - .8 All modules shall have visual supervision against removal.
- .3 Central Processing Unit (CPU)
- .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. Minimum capacity of 1000 addressable monitoring and 1000 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.
  - .3 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.
  - .4 Integral power supply, battery charger and standby batteries.
  - .5 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.
  - .6 Circuitry to continuously monitor communications and data processing cycles of microprocessor. Upon failure, audible and visual trouble indication to activate.
  - .7 Communication between CPU and remote DGP's/TPR's to be supervised, DCLA. Communications failure between CPU and remote units, audible and visual trouble to be indicated at CPU. 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. Communication failure between any 2 nodes, other nodes on loop to continue to communicate with each other and programmed functions on communicating nodes to continue operating.
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- .8 Equipped with software routines to provide Event-Initiated-Programs (EIP); change is status of one or more monitor points, may be programmed to operate any or all of system's control points.
  - .9 Software and hardware to maintain time of day, day of week, day of month, month and year.
  - .10 Software to operate variable-sensitivity addressable smoke detectors and annunciate their status and sensitivity settings at control panel.
  - .11 Central processing unit shall come complete with alphanumeric display and keyboard.
  - .12 CPU shall be housed in flush mounted surface mounted free standing cabinet with sufficient capacity to allow maximum system expansion and to house alphanumeric display and audio system microphone.
  - .13 CPU shall be equipped with a real time output for the purpose of synchronizing clocks.
  - .14 CPU shall display both alarm and trouble indication from each fire alarm zone, where each zone can be a device. The system shall indicate the exact location and description of activity.
  - .15 As a result of alarm conditions received at the CPU, the system shall have ability to automatically operate specified control points such as tripping municipal box to summon fire department, or stopping exhaust fans or air conditioning units and releasing magnetically held doors and other Fire Alarm related devices.
  - .16 Multiplex system shall be equipped with standby batteries to provide system operation and vital fire/security protection during commercial power outages. It shall also have provisions to operate an LED annunciator to provide a simple lamp type status indicator for critical system functions. These annunciators shall be operable from the system communication circuits (same wiring used to communicate with transponders), eliminating the need for special wiring.
- .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 Continuous supervision of wiring for external initiating and alarm circuits to be maintained during power failure.
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- .7 Standby batteries: sealed, maintenance free, lead calcium sealed batteries.
    - .1 The batteries shall be sealed maintenance free type with expected life of ten years.
    - .2 Batteries shall be enclosed in a steel housing.
    - .3 A fully automatic battery charger shall be provided which shall be capable of restoring 90% of a dead batteries capacity within 24 hours.
    - .4 The battery shall be protected against excessive discharge by automatically disconnecting battery from system when voltage of battery drops to 60%.
  - .5 Initiating/ Input Circuits
    - .1 Receiving circuits for alarm initiating devices including but not limited to manual pull stations, smoke detectors, heat detectors and water flow switches, wired in DCLA configuration to central control unit.
    - .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.
    - .5 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".
  - .6 Alarm Output Circuits
    - .1 Alarm output circuit: connected to horns, and strobes, wired in Class B configuration to central control unit and GDP.
      - .1 Signal circuits' operation to follow system programming. Each signal circuit: rated at 3 A, 24 V DC; fuse-protected from overloading/overcurrent.
      - .2 Manual alarm silence, automatic alarm silence and alarm silence inhibit to be provided by system's common control.
  - .7 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 Four sets of separate contacts for elevator capture (to main floor of egress and to alternate floor of egress).
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- .5 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.
  - .6 Auxiliary circuits: rated at 2 A, 24 V dc or 120 V ac, fuse-protected.
  - .8 Wiring
    - .1 Copper conductors: Type FAS 105
    - .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 horn 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 for DGPs: twisted, shielded pairs, 2 h fire-rated mineral insulated configured to eliminate interference and cross-talk.
    - .8 Fire alarm systems wiring to meet minimum sizes noted above and in accordance with the OESC, whichever is most stringent.
  - .9 Alarm Initiating Devices
    - .1 Heat detectors, fixed temperature, non- restorable, rated 57 degrees C.
      - .1 Moisture proof type, where indicated on drawings.
    - .2 Thermal fire detectors, combination fixed temperature and rate of rise, non-restorable fixed temperature element, self-restoring rate of rise, fixed temperature 88 degrees C, rate of rise 8.3 degrees C per minute.
    - .3 Addressable thermal fire detectors, combination fixed temperature and rate of rise, non-restorable fixed temperature element, self-restoring rate of rise, fixed temperature 88 degrees C, rate of rise 8.3 degrees C per minute.
      - .1 Electronics to communicate detector's status to addressable module/transponder.
      - .2 Detector address to be set on detector base head in field.
    - .4 Smoke detector: photo-electric air duct type.
      - .1 Provide integral control and power modules required for operation with main control panel.
      - .2 Ensure detectors and associated modules are compatible with main control panel and suitable for use in supervised circuit.
      - .3 Detector circuits: 4-wire type where detector operating power is transmitted over conductors separate from initiating circuit.
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- Malfunction of electrical circuits to detector or its control or power modules to cause operation of system trouble signals. Provide a separate, fused power circuit for each smoke detection initiating circuit.
- .4 Failure of power circuit: indicated as a trouble condition on corresponding initiating circuit.
  - .5 Provide duct detectors in accordance with NFPA 90A.
  - .6 Provide duct detectors with approved duct housing, mounted exterior to duct, with perforated sampling tubes extending across width of duct. Provide access door on duct for maintenance purposes.
  - .7 Activation of duct detectors to cause shutdown of associated air handling unit annunciation at control panel and tripping of master box transmitter and sounding of building evacuation alarms.
  - .8 Provide detectors with visible indicator lamp that flashes when detector is in normal standby mode and glows continuously when detector is activated.
  - .9 Provide remote indicator lamp for each detector.
  - .10 Permanently label remote indicator with description number of associated air handling unit(s).
  - .11 Provide each detector with remote test switch. Mount switch not more than 1.8 m above finished floor.
  - .12 Permanently label test switch with description number of associated air handling unit(s).
- .5 Addressable smoke detector:
- .1 Photo-electric type. Electronics to communicate detector's status to addressable module/transponder.
  - .2 Detector address to be set on detector base in field.
- .6 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 base 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.
- .7 Air Aspiration Addressable Duct Smoke Detection.
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- .1 Photo-electric type.
  - .2 Available as either a single or dual inlet detection system
  - .3 Supports remote housing up to 25 m with 26.7 mm O.D. rigid pipe
  - .4 Supports remote housing up to 15 m with 19 mm O.D. flexible tubing
  - .5 Microprocessor controlled aspiration system provides:
    - .1 Adjustable air speed settings for easy setup
    - .2 Integral indicators located under the front cover for
    - .3 Convenient programming and status indications
    - .4 Easily accessible air filter element
  - .6 Separate 24 VDC power
  - .7 Duct sensor housing with supervised output for multiple remote relays
  - .8 Relay output is controlled through programming at the fire alarm control panel and can be activated / deactivated manually or in response to a separate alarm or other input or can be bypassed for unobtrusive system testing
  - .9 Remote functional smoke testing capability
  - .10 Magnetic test feature for alarm initiation at housing
  - .11 Sampling tubes:
    - .1 Multiple lengths to match elevator shaft dimensions or duct size.
  - .8 Addressable Manual Alarm Stations
    - .1 Pull lever, push, semi-flush wall mounted type, double 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. Bilingual English French signage.
    - .2 Auxiliary contact for exit door release that is electrically held closed by security system.
    - .3 Auxiliary contact for door held open device that is electrically controlled by security system.
    - .4 Key operated reset lock in order that they may be tested, and so designed that after actual Emergency Operation, they cannot be restored to normal except by use of a key.
    - .5 Provide protective cover to mitigate false alarms where indicated on plans. Cover to be ULC listed and labelled, hinged door Lexan cover. Where required by Code or by AHJ, include integral audible alarm to sound when cover is opened.
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- .6 For non-climate control applications, such the basement garage, provide weather-proof ULC listed and labelled, hinged door Lexan cover. Where required by Code or by AHJ, include integral audible alarm to sound when cover is opened.
  - .10 Addressable Circuit Interface Modules
    - .1 Addressable Circuit Interface Modules: Arrange to monitor or control one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of waterflow, valve tamper, non-addressable devices, and for control of AHU systems.
      - .1 Addressable Dry Contact Monitor Module
      - .2 Addressable Control Module
      - .3 Addressable Relay Module
    - .2 Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signaling line circuit or a separate two wire pair running from an appropriate power supply, as required.
    - .3 All Circuit Interface Modules shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions. Modules shall have an on-board LED to provide an indication that the module is powered and communicating with the CPU. The LEDs shall provide a troubleshooting aid since the LED blinks on poll whenever the peripheral is powered and communicating.
  - .11 Isolators
    - .1 Provide isolators in accordance with code requirements and installed as per system manufacturer's requirements to isolate/monitor zones, loops, group of devices within the building and between buildings.
  - .12 Visual Alarm Signal Devices
    - .1 Strobe type: flashing, 24 V DC, synchronized, "FIRE" marking on polycarbonate lens; illumination of at least 75 cd @ 50' (15m) with other settings of 15/30/110 cd; suitable for mounting on surface/flush back boxes; red/white plastic housing
    - .2 Designed for recessed mounting in finished areas and surface mounted in service areas.
    - .3 Designed as weatherproof where required.
    - .4 Combined with horn where shown on plans.
  - .13 End-of-line Resistors
    - .1 End-of-line devices to control supervisory current in signalling circuits, sized to ensure correct supervisory current for each circuit. Open, short or
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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 End-of-line resistors shall be mounted on a stainless steel plate and bear a ULC label.

.14 Door Holders

- .1 Door holders shall be magnetic type, wall floor mounted, with approximately 35 lbs holding power, for operation on 12V DC 24C DC 24V AC 120C AC.

.15 Remote Alarm Indicators

- .1 Remote alarm indicators shall be wall ceiling mounted and shall provide remote indication of a specific detector using an electrical connection. Unit shall consist of a red LED lamp on a mounting plate.

.16 Remote Test Station

- .1 Remote test station shall provide testing of a detector and indication of an alarm condition at a remote location. Unit shall consist of a key test switch and a red LED lamp mounted on a single gang plate.

3 Execution

3.1 **CONNECTIONS TO OTHER SYSTEMS**

.1 Sprinkler and Fire Standpipe Systems

- .1 Provide wiring and connections from the fire alarm system to all alarm check valves, supervised valves and pressure switches supplied and installed under Mechanical Division.
- .2 Provide wiring and connections from the fire alarm system to sprinkler and fire standpipe system pumps supervisory contacts supplied and installed under Mechanical Division, for "Loss of Power" and "Pump(s) Running" annunciation.
- .3 Wire all excess pressure pumps.

.2 Motor Starter Connections

- .1 The fire alarm panel shall be complete with shutdown relays to stop all motors of supply air fans, return air fans upon fire alarm activation.
- .2 Provide all wiring and connections from the fire alarm system to designated new starters. All other starter controls wiring shall be under Mechanical Division.

3.2 **INSTALLATION**

- .1 Install to CAN/ULC S524.
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- .2 Install wiring for standard type initiating circuits in separate raceway system from alarm signal circuits, unless wiring is individually shielded and single point ground connected and acceptable to equipment manufacturer.
  - .3 Wire alarm signals in accordance with requirements by manufacturer and operation. Install end-of-line device for signal circuit in suitable box adjacent to last signal of signal circuit or mounted on suitable terminal strips in control panel.
  - .4 Install lightning protection units at each interior building local alarm initiating or signal circuit wire, connected to ground bus in control panel with #12 gauge copper conductor.
  - .5 Install surge protector at each external to building initiating or signal circuit as required by manufacturer.
  - .6 Equip raceways with separate green ground-wire and bond to ground lug at each outlet box of device and bond ground wires directly to ground bus in control panel.
  - .7 Take power for control panel from bus on load side of main disconnecting device as described in Section 32 of Canadian Electrical Code. Make connection using approved lugs. Bond ground cable to ground bus at control panel.
  - .8 Install external power regulator in electrical room close to electrical distribution supply and connect to 120 Volt AC, 60 Hz supply for fire alarm system in accordance with manufacturer's instructions.
  - .9 Clear wiring of shorts, opens and grounds on completion of work.
  - .10 Mount detectors on ceiling as per CAN/ULC-S524 Standard unless otherwise specified herein with minimum and maximum distances as required for respective type of detector, at highest point where variations in ceiling height exist. Do not mount detectors on sides, undersides, or less than 600 mm from walls, beams, joints, ducts, open web steel joists or any structure projecting below actual ceiling height and especially from lighting fixtures and air exhaust handling or heating outlets, but 900 mm from air supply handling or heating outlet.
  - .11 Should interference from obstruction, lamp positions, air outlets or heat radiating surfaces be encountered in locating any detector where indicated, locate detector as near as possible to indicated position, clear of obstacles, to satisfaction of Departmental Representative, but maintain clear space of 600 mm on ceiling, below and around.
  - .12 Identify signal circuit, alarm initiating circuit, auxiliary circuit and other wiring at fire alarm control panel, annunciator, terminal boxes or elsewhere on completion of work with appropriate marking labels. Mark single conductors with suitable self adhesive type, indelible numbered markers, identify cables with clear polyester tag, attached with self-locking TY-RAP.
  - .13 Provide, install and connect wiring and interconnecting wires and cables as specified herein, as required by control panel manufacturer and as indicated on Drawings.
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- .14 Supply and install 1- 15 A, 120 Volt AC duplex receptacle beside new control panel, connect into nearest receptacle circuit of adequate capacity.
- .15 Where moisture-proof, corrosion resistant or waterproof detectors are used, use raintight connectors with waterproof gasketed back box and tape wiring connectors.
- .16 Maintain following heights from finished floor to centre of box for
  - .1 Manual Station: 1200 mm
  - .2 Alarm signal: not less than 1800 mm.
  - .3 End of Line device: not more than 1800 mm.
  - .4 Annunciator: 1600 mm from finished floor to top of unit.
  - .5 Control Panel: as per Site instruction by c.
- .17 Wiring:
  - .1 In no case shall the voltage drop exceed 5%.
- .18 Class A wiring shall be used for all alarm initiating devices.
- .19 Power to be provided by 120V AC emergency circuit.
- .20 Provide EMT rigid conduits with steel set screw fittings with nylon insulated thread rigid coupling as manufactured by T & B or approved equal. Size conduits to Code requirements or larger sizes where indicated.
- .21 Terminal cabinets shall be 460 x 610mm type "T" with wood back, door within the trim complete with latch and lock.
- .22 Outlet box for alarm signals shall be a single gang, masonry box unless indicated otherwise and shall be flush mounted in all areas with finished ceilings. In all other areas, outlet boxes shall be 101 mm square surface.
- .23 Outlet boxes for manual stations shall be a single gang masonry box unless indicated otherwise and shall be flush mounted, in all areas with finished ceilings. In all other areas, outlet boxes shall be flush mounted if possible.
- .24 Should interference from obstructions, lamp positions or heat radiating surfaces be encountered in locating any fire alarm device where shown, the device shall be located as near as possible to indicated position, clear of obstacles, to the satisfaction of Departmental Representative.

### 3.3 **FIELD QUALITY CONTROL**

- .1 Inspection and Verification
    - .1 Only directly prior to verification, remove smoke detector protectors and clean smoke detectors thoroughly.
    - .2 Inspect and verify each individual device in entire system for proper connection, supervision and function in accordance with CAN/ULC-S537.
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Identify detectors, manual pull stations and signal appliances not installed within requirements of CAN/ULC-S524 in remarks column of verification report and bring to Departmental Representative attention prior to acceptance test.

- .3 Hire the services of a professional engineer licensed in the province of Alberta to witness the fire alarm verification in accordance with the local AHJ. The electrical contractor is not obligated to hire NORR Architects Engineers Planners to witness the fire alarm verification. Another party may be utilized provided they are licensed to do so by the Authority Having Jurisdiction.
- .4 If an alternate professional engineer is utilized to witness the fire alarm verification a copy of the fire alarm verification reports and certificates must be sent to NORR once completed. The building code C schedules will not be released until these documents have been received.
- .5 If the electrical contractor chooses to carry NORR Architects Engineers Planners to witness the fire alarm verification please contact NORR for a quote for services.
- .6 Obtain verification certificate and report from professional engineer showing each device checked, and that this work has been carried out.
- .7 Obtain verification certificate and verification report from manufacturer showing each device checked, and that this work has been carried out. Utilize standard verification forms similar to Canadian Fire Alarm Association (C.F.A.A.) forms.
- .8 Inspection and checking shall include smoke testing of each ionization or photoelectric smoke detector when installed with similar material found in area protected or as directed otherwise by Departmental Representative. Submit smoke detectors sensitivity calibration reading, as read on place of installation as part of verification report.
- .9 Fire alarm manufacturer shall supply to electrical contractor reasonable amounts of technical assistance with respect to any changes necessary to execute work during period of inspection by manufacturer, electrical contractor shall make available, to manufacturer, electricians as designated by manufacturer.
- .10 Verify only when entire system is fully operational and no subsequent work will be performed, unless project is designated for phased occupancy.
- .11 For phased occupancy construction provide interim testing and verification service and retest entire system at the end of the project.
- .12 Issue certificate of verification only after completion of deficiencies noted during verification have been corrected and re-verified.

### 3.4 FINAL COMMISSIONING

- .1 After completion of above inspection and verification, make arrangement with Departmental Representative, manufacturer of control equipment and other

installers of related and connected equipment (extinguishing systems, fans, doors, elevators and other equipment) to perform functional acceptance tests, giving ample notice to parties concerned to be present.

.2 Tests to include:

- .1 Spot check of devices to ensure proper connections and supervision.
- .2 Operation of at least 1 alarm initiating device on each detection circuit to verify required operation of alarm devices, annunciator and other installations.
- .3 Testing of signal devices for correct operation and function.
- .4 Testing of smoke detectors with similar material found in area to be protected.
- .5 Record sound pressure levels in each room during an alarm condition and at ambient levels.

3.5 **DEMONSTRATION**

- .1 Provide 20 hrs familiarization and instruction period, to familiarize user and Owner's maintenance staff with working and function of system and equipment and to instruct maintenance personnel about proper maintenance.

End of Section

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