SECTION 28 31 02

MULTIPLEX FIRE ALARM SYSTEM

PART 1 GENERAL

1.1 CODES AND STANDARDS

A. Government of Canada
   1. NBC (Latest), National Building Code of Canada.

B. ISO 8201, Acoustics – Audible emergency Evaluation Signal

C. Underwriter's Laboratories of Canada (ULC)
   1. CAN/ULC-S524, Installation of Fire Alarm Systems.
   2. ULC-S525, Audible Signal Appliances for Fire Alarm.
   3. CAN/ULC-S526, Visual Signal Appliances, Fire Alarm.
   4. CAN/ULC-S527, Control Units.
   5. CAN/ULC-S528, Manual Pull Stations.
   6. CAN/ULC-S529, Smoke Detectors.
   7. CAN/ULC-S530, Heat Actuated Fire Detectors.
   8. CAN/ULC-S536, Inspection and Testing of Fire Alarm Systems.
   9. CAN/ULC-S537, Verification of Fire Alarm Systems.

D. NFPA 720 – Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment

E. NFPA 13 – Standard for the Installation of Sprinkler Systems

F. CSA C22.1 Canadian Electrical Code

G. Manitoba Building Code

H. Winnipeg Electrical Code

1.2 ACRONYMS AND ABBREVIATIONS

A. Acronyms used in Mulitplex Fire Alarm System
   1. BPS – Booster Power Supply
   2. DCLA – Data Communication Link style A
   3. DCLB – Data Communication Link style B
   4. DCLC – Data Communication Link style C
   5. DGP – Data Gathering Panels
   6. FACP – Fire Alarm Control Panel
   7. IDC – Initiating Device Circuit
   8. NAC – Notification Appliance Circuit
   9. N/O – Normally Open
   10. SLC – Signalling Line Circuit

11. CO – Carbon Monoxide

1.3 SYSTEM DESCRIPTION

A. Fully supervised, microprocessor based, fire alarm system, utilizing digital techniques for data control and digital multiplexing techniques for data transmission.

B. 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; and initiating trouble signals.

C. Zoned, non coded single stage.

D. Modular in design to allow for future expansion.

E. System to be operable by personnel not requiring special computer skills.

F. System to include:
1. Re-use and expand the existing Edwards EST3 fire alarm Central Control Unit. Expand all components and systems as required to bring the facility fire alarm system into the new building. This includes but is not limited to modification to the, main system memory, input output interfaces for alarm receiving, local annunciation/display, and program control/signaling, etc.
2. Secondary Central Control Unit in separate enclosure with power supply, stand by batteries, central processor with microprocessor and logic interface, main system memory, input output interfaces for alarm receiving, local annunciation/display, and program control/signalling.
3. Remote Annunciator in separate enclosure with input output interfaces for alarm receiving, and annunciation/display.
4. Power supplies.
5. Initiating/input circuits.
6. Output circuits.
7. Auxiliary circuits.
8. Wiring.
9. Manual and automatic initiating devices.
10. Audible and visual signalling devices.
11. End of line resistors.
12. Smoke door hold-open devices.
13. Carbon monoxide detectors, interconnected to the fire alarm system.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

A. System components: listed by ULC and comply with applicable provisions of National Building Code and Local/Provincial Building Code, and meet requirements of local authority having jurisdiction.

1.5 DESIGN REQUIREMENTS

A. The Contractor shall design conduit layout and wiring interconnection of devices specified.

B. Perform voltage drop calculations and upsize wiring from that shown, as required in order to comply with the CEC.

1.6 SHOP DRAWINGS AND SUBMITTALS

A. Provide Submittals in accordance with Section 01 33 00, Submittal Procedures and Section 26 05 01, Common Work Results – Electrical.

B. Include:
1. Descriptive product information for each individual system component including Manufacturer's name, model number, ratings, and power requirements.
2. Dimensional drawings of panels and associated equipment.
3. Itemized bill of material complete with part numbers.
4. Operating and programming instructions.
5. Complete point-to-point wiring diagrams of the system and device interconnection.
6. Supervisory power requirement calculations.
7. Alarm power requirement calculations.
8. Battery sizing calculations.
9. Voltage drop calculations for wiring runs.
10. Conduit fill calculations.
11. Detail assembly and internal wiring diagrams for control panels, annunciator panel, and booster power supply units.
12. Overall system riser diagram identifying control equipment, initiating zones, and signalling circuits; identifying terminations, terminal numbers, conductors and raceways.
13. Details and performance Specifications for control, annunciation and peripherals with item by item cross reference to Specification for compliance.
14. Recommended types and quantities of spare parts.
15. Written schedule of active and spare addresses on each addressable circuit.

C. Provide informational submittals including:
1. Service technician certifications.
2. Code-enforcement authority approval letter.

1.7 CLOSEOUT SUBMITTALS

A. Provide operation and maintenance data for fire alarm system for incorporation into manual specified in Section 01 77 00, Closeout Procedures.

B. Include:
1. Instructions for complete fire alarm system to permit effective operation and maintenance.
2. Written documentation for logic modules as programmed.
3. System program hard copy and CD-ROM.
4. Documentation of system voltage, current, and resistance readings taken during system installation and testing.
5. NFPA 72, Record of Completion: Submit to Contract Administrator and AHJ.
6. NFPA 72, Inspection and Testing Form: Submit to Contract Administrator and AHJ.
7. Technical data - illustrated parts lists with parts catalogue numbers.

8. Copy of approved Shop Drawings with corrections completed and marks removed except review stamps.
9. List of recommended spare parts for system.

1.8 QUALITY ASSURANCE

A. Qualifications
1. Technician with minimum of Engineering Technologist Certification for fire alarm systems or professional engineer registered in Province of Manitoba shall be available on-site.
2. Service technician shall be formally trained by the fire alarm Manufacturer.

B. Regulatory Requirements
1. Submit Shop Drawings and system design calculations for approval to the AHJ.

1.9 EXTRA MATERIALS

A. Provide maintenance materials in accordance with Section 01 77 00, Closeout Procedures.

B. Include:
1. 2 Extra keys for all enclosures, including but not limited FACP, FAAP, and resetting/opening manual pull stations.

1.10 TRAINING

A. Provide on-site training sessions by the fire alarm equipment Manufacturer to train operational and maintenance personnel in the use and maintenance of the system. See Section 3.5 and 3.6.

1.11 INSPECTION

A. Inspection to conform to CAN/ULC-S536. Submit inspection report to the Contract Administrator.
1. No additional payment for the inspections will be made. Include all costs in the base price for the fire alarm system.

PART 2 PRODUCTS

2.1 GENERAL

A. Not all devices or modules are necessarily listed below. Provide any other components required for a complete and working fire alarm system.

B. Acceptable Manufacturers:
1. Edwards System Technology. No other Manufacturers will be acceptable, as new fire alarm equipment must be integrated with the existing Edwards system.

C. ULC Compliance
   1. Products manufactured within the scope of ULC shall conform to ULC standards and have a ULC listing mark.

D. CSA Approval
   1. All electrical equipment shall be CSA approved.

2.2 MATERIALS

A. Equipment and devices: ULC listed and labeled and supplied by single Manufacturer.

B. Power supply: to CAN/ULC S524.

C. Audible signal devices: to ULC S524.

D. Visual signal devices: to CAN/ULC S526.

E. Control unit: to CAN/ULC S527.

F. Manual pull stations: to CAN/ULC S528.

G. Thermal detectors: to CAN/ULC S530.

H. Smoke detectors: to CAN/ULC S529.

I. Smoke alarms: to CAN/ULC S531.

J. Carbon monoxide detectors: to NFPA 720

2.3 SYSTEM OPERATION: SINGLE STAGE SIGNALS ONLY

A. Actuation of any alarm initiating device to:
   1. Indicate zone of alarm at central control units and remote annunciator.
   2. Cause audible signalling devices to sound continuously throughout facility and at central control unit.
   3. Cause indicated HVAC to shut down to provide required control of smoke movement.
   4. Cause fire doors and smoke control doors, if normally held open, to close automatically.
   5. Indicate zone(s) in alarm to plant operations PLC system via communications link.
   6. Acknowledging alarm: indicated at central control units and remote annunciator.
   7. Possible to silence signals by "alarm silence" switch at control unit, after 60s period of operation.
   8. Subsequent alarm, received after previous alarm has been silenced, to re activate signals.
   9. Actuation of supervisory devices to:
      a. Indicate respective supervisory zone at central control unit and at remote annunciator.
      b. Cause audible signal at central control unit to sound.
      c. Activate common supervisory sequence.
      d. Resetting alarm device not to return system indications/functions back to normal until control unit has been reset.

10. Trouble on system to:
    a. Indicate circuit in trouble at central control unit.
    b. 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.
11. Trouble on system: suppressed during course of alarm.
12. Trouble condition on any circuit in system not to initiate alarm conditions.

2.4 CONTROL PANELS

A. Requirements:
    1. Re-use the existing control panels. Provide all devices, accessories, and programming to accommodate the expansion of the system.
    2. Provide additional required indications at the control panels, including but not limited to:
        a. Supervisory alarm
        b. Alarm for each zone
        c. Trouble for each zone
        d. Alarm signalling circuit trouble
        e. Annunciator circuit trouble
        f. Remote annunciator trouble
        g. Signals silenced
    3. Auxiliary Relays:
        a. Plug-in type, supervised against unauthorized removal by common trouble circuit. Terminals capable of accepting 12-22 AWG wire.

2.5 REMOTE BOOSTER POWER SUPPLIES

A. Located throughout facility in separately enclosed units.

B. Provide independent 2 Amp Class B NAC as required.
    1. Provide signal synchronization for visible signal devices on each NAC.

C. Interconnected to the control panel via NAC OR SLC circuit.
    1. Upon fault or failure of booster power supply unit or BPS NACs, Booster Power Supply (BPS) to open the control panel NAC, indicating fault condition to the control panel.

D. Each BPS: self contained unit, with integral power supply, battery charger and standby batteries. Short circuit, over voltage, and brown out monitoring to protect powered components by automatically switching to standby batteries whenever trouble condition exists in power supply.
    1. Batteries to be sized for 24 hours of standby followed by 5 minutes of alarm.
    2. Power provided by essential power circuit.

E. Acceptable Material: Edwards model APS6A to match existing fire alarm system, or current compatible equivalent Edwards model if no longer available.

2.6 ADDRESSABLE CONTROL MODULES

A. Distributed throughout the facility in suitable electrical boxes, and interconnected to the control panel utilizing multiplex data transmission techniques.
   1. Mounted in rooms with suitable environmental conditions, or else installed in mounting box providing sufficient environmental protection.

B. Control and monitor conventional notification appliance circuit via interface to addressable, intelligent device loop
   1. Control and activate one Class B NAC, as commanded by the control panel.
   2. Relay trouble status of NAC to the control panel.
   3. Provide external 2 A power supply to power devices on the NAC circuit.

C. Module address to be set on module in the field, or electronically by loop controller.

2.7 ADDRESSABLE RELAY MODULES

A. Distributed throughout facility in suitable electrical boxes, and interconnected to the control panel utilizing multiplex data transmission techniques.
   1. Mounted in rooms with suitable environmental conditions, or else installed in mounting box providing sufficient environmental protection.

B. Close one Form C dry contact as commanded by the control panel
   1. Suitable for smoke door release service.

C. Module address to be set on module in the field, or electronically by loop controller.

D. Acceptable Material: Edwards model SIGA-CR to match existing fire alarm system, or current equivalent Edwards model if no longer available.

2.8 ADDRESSABLE MONITOR MODULES

A. Distributed throughout facility in suitable electrical boxes, and interconnected to CCU utilizing multiplex data transmission techniques.
   1. Mounted in rooms with suitable environmental conditions, or else installed in mounting box providing sufficient environmental protection.

B. Provide interface between standard alarm input devices and FACP.
   1. Each addressable monitor module to monitor one conventional Class B IDC and relay alarm and trouble condition of detectors on the circuit back to FACP.

C. Module address to be set on the module in the field, or electronically by loop controller.

D. Acceptable Material: Edwards model SIGA-UM to match existing fire alarm system, or current equivalent Edwards model if no longer available.

2.9 POWER SUPPLIES

A. 120 V, 60 Hz as primary source of power for system.

B. Voltage regulated, current limited distributed system power.

C. Primary power failure or power loss will activate common trouble sequence.

D. Interface with battery charger and battery to provide uninterruptible transfer of power to standby source during primary power failure or loss.

E. 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.

F. Standby batteries: sealed, maintenance free.

G. Continuous supervision of wiring for external initiating and alarm circuits to be maintained during power failure.

2.10 INITIATING/ INPUT CIRCUITS

A. Receiving circuits for alarm initiating devices such as manual pull stations, smoke detectors and heat detectors, wired in DCLA, DCLB, or DCLC configuration to control panels as shown.

B. Alarm receiving circuits (active and spare): compatible with smoke detectors and open contact devices.

C. Actuation of alarm initiating device: cause system to operate as specified in "System Operation".

D. Receiving circuits for supervisory, N/O devices. Devices: wired in DCLA or DCLC configuration to FACPs as shown.

E. Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".

2.11 ALARM OUTPUT CIRCUITS

A. Alarm output circuit: connected to signals, wired in class B configuration to control panels as shown.
   1. Signal circuits' operation to follow system programming; capable of sounding horns. Each signal circuit: rated at 2 A, 24 VDC; fuse protected from overloading/overcurrent.
   2. Manual alarm silence, automatic alarm silence and alarm silence inhibit to be provided by system's common control.

2.12 AUXILIARY CIRCUITS

A. Auxiliary contacts for control functions.

B. Alarm on system to cause operation of programmed auxiliary output circuits.

C. Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.

D. Auxiliary circuits: rated at 2 A at 24 Vdc or 0.5 A at 120 VAC, to be fuse protected.

2.13 WIRING

A. Fire Alarm Cable (FAS)
   1. Use:
      a. Initiating Device Circuits (IDC)
      b. Notification Appliance Circuits (NAC)
      c. Data Communication Link Circuits (DCL)
   2. Cable: to CAN/CSA C22.2 No. 208-03.
      a. Rated FAS 105.
   3. Conductors:
      a. Twisted, stranded copper, with overall shield and tinned copper drain wire.
      b. Notification circuit conductors: stranded copper, minimum 12 AWG.
      c. Initiating Device Circuit conductors: stranded copper, minimum 16 AWG, twisted, stranded, copper with shield.
      d. Data Communication Link circuit conductors: stranded copper, minimum 16 AWG.
   4. Insulation:
      a. PVC.
      b. Voltage Rating: 300
      c. Fire Rating: FT4
   5. Acceptable Manufacturer:
      a. Belden

B. Building Wires
   1. Use:
      a. Control circuits
   2. Requirements:
      a. As per Section 26 05 21, Wires and Cables (0-1000V).
      b. Minimum size: 14 AWG minimum, and in accordance with Manufacturer's requirements.

C. Raceway
   1. Rigid aluminum conduit– except for the Chemical Building areas where exposure to chemical corrosion is possible, and may degrade aluminum materials. Refer to Section 26 05 34, Conduits, Conduit Fasteners, and Conduit Fittings.
   2. EMT is only permitted within the admin building, or within the electrical rooms.

2.14 MANUAL ALARM STATIONS

A. Provide station Manufacturer's approved back box for each manual alarm station.

B. Station colour: red.

C. Conventional manual alarm stations: pull lever, wall mounted surface type, non coded, single pole normally open contact for single stage. English signage.
   1. Restoration to require use of key.
      a. Keys: identical throughout system for stations and control panels. New keys are to match the existing installation, so that all keys are common throughout.

2. Where weatherproof stations are required, provide stations with weatherproof housings with hinged access doors.

D. Addressable manual pull station.
1. Pull lever, surface wall mounted type, single action, single stage, electronics to communicate station's status to addressable module/transponder over 2 wires and to supply power to station. Station address to be set on station in field, or electronically by loop controller.
2. Restoration to require use of key.
   a. Keys: identical throughout system for stations and control panels. New keys are to match the existing installation, so that all keys are common throughout.

E. Additional requirements for classified areas:
1. Class I, Zone 1, Group IIA
2. Pull ring, wall mounted surface type, double action, non coded single pole normally open contact for single stage. English signage.

F. Acceptable Materials: Edwards models MPSR1-S45W, MPSR1-D45WX, or SIGA-278 to match existing fire alarm system, or current equivalent Edwards models if no longer available.

2.15 AUTOMATIC ALARM INITIATING DEVICES

A. Addressable heat detectors, fixed temperature
1. Non restorable, rated 57 degrees C unless indicated otherwise.
2. Electronics to communicate detector's status to addressable module/transponder.
3. Detector address to be set on detector in field, or electronically by loop controller.
4. Plug in type with fixed base.
5. Wire in base assembly with integral red alarm LED.
6. Spot type: ULC rated for 15.2m spacing or greater.
7. Acceptable Material: Edwards model SIGA-HFS to match existing fire alarm system, or current equivalent Edwards model if no longer available.

B. Addressable heat detectors, rate of rise
1. Self-restoring, rated 8.3 degrees C per minute.
2. Electronics to communicate detector's status to addressable module/transponder.
3. Detector address to be set on detector in field, or electronically by loop controller.
4. Plug in type with fixed base.
5. Wire in base assembly with integral red alarm LED.
6. Spot type: ULC rated for 15.2m spacing or greater.
7. Acceptable Material: Edwards model SIGA-HRS to match existing fire alarm system, or current equivalent Edwards model if no longer available.

C. Heat detectors, hazardous rated, explosion-proof, rate of rise
1. Self-restoring, rated 8.3 degrees C per minute.
2. Suitable for use in Class 1, Zone 2, Groups C & D hazardous areas.
3. Spot type: ULC rated for 15.2m spacing or greater.
4. Acceptable Material: Edwards model CR135EWT to match existing fire alarm system, or current equivalent Edwards model if no longer available.

D. Heat detectors, high humidity, rate of rise
   1. Self-restoring, rated 8.3 degrees C per minute.
   2. Suitable for use in high humidity indoor environments and areas that area subject to potential corrosive elements, spray washing, and below freezing temperatures.
   3. Spot type: ULC rated for 22m spacing or greater.

E. Addressable smoke detector.
   1. Photo-electric type.
   2. Electronics to communicate detector's status to addressable module/transponder.
   3. Detector address to be set on detector in field, or electronically by loop controller.
   4. Plug in type with fixed base.
   5. Wire in base assembly with integral red alarm LED.
   6. Spot type: ULC rated for 9.1m spacing or greater.
   7. Acceptable Material: Edwards model SIGA-PS to match existing fire alarm system, or current equivalent Edwards model if no longer available.

F. Conventional smoke detector, hazardous rated, explosion-proof
   1. Optical smoke detector.
   2. Integral red alarm LED.
   3. Self-diagnostic.
   4. Spot type: ULC rated for 9.1m spacing or greater.
   5. Acceptable Material: Edwards model 30-3013 match existing fire alarm system, or current equivalent Edwards model if no longer available.

G. Smoke detectors, high humidity.
   1. Photo-electric type.
   2. Plug in type with fixed base.
   3. Wire in base assembly with integral red alarm LED.
   4. Suitable for use in high humidity indoor environments and areas that area subject to potential corrosive elements, spray washing, and below freezing temperatures.
   5. Spot type: ULC rated for 9.1m spacing or greater.
   6. Acceptable Material: Edwards model C2M-PD1 to match existing fire alarm system, or current equivalent Edwards model if no longer available.

H. Smoke detector: air duct type with sampling tubes with protective housing.
   1. Air velocity rating range of 0.5 to 20 m/s, or greater.
   2. Sampling tube sized to fit duct size indicated on Drawings.
   3. Integral red alarm LED.
   4. Acceptable Material: Edwards model SIGA-SD to match existing fire alarm system, or current equivalent Edwards model if no longer available.

I. Smoke detector: reflective beam type.
   1. Rapid obscuration of the beam to a level of 90 percent or greater will result in a trouble signal rather than an alarm signal.
   2. Coverage range of 30m or greater.
   3. Integral red alarm LED
   4. Acceptable Material: Edwards model EC-50R/EC-100R to match existing fire alarm system, or current equivalent Edwards model if no longer available.

J. Carbon monoxide detector: advanced electrochemical type
   1. Advanced electrochemical carbon monoxide sensing technology with replaceable sensor module.
   2. Electronic, addressable device.
   3. Sounder base, with temporal pattern generator
   4. Acceptable Material: Edwards model SIGA2-COS complete with SIGA-AB4GT Sounder base, and SIGA-TCDR temporal generator.
   5. Provide synchronized sounder, module Edwards SIGA-CRR where CO detectors are located in the same room, to ensure synchronized signaling.
   6. Update the EST3 fire alarm panel to firmware version V4.0 or higher as required for the system to function correctly.

K. Flame detector.
   1. Infrared type.
   2. Minimum 80 degrees horizontal and 70 degrees vertical field of vision.
   3. Suitable for use in Class 1, Zone 2, Groups C & D hazardous areas.
   4. High immunity to false alarms caused by lightning, arc welding, and sunlight.
   5. Integral red alarm LED.
   6. Acceptable Material: General Monitors model FL3102 to match existing fire alarm system, or current equivalent Edwards model if no longer available.

L. Input Modules
   1. Intelligent addressable modules for alarm or supervisory to monitor dry contacts
   2. Acceptable Material: Edwards model SIGA-CT1, SIGA-CT2, SIGA-CT1HT, SIGA-MCT2 to suit the application.

2.16 FAULT ISOLATOR MODULES

A. General:
   1. Provide fault isolator modules to automatically isolate wire-to-wire short circuits on an SLC loop.
   2. Isolator module to automatically open-circuit (disconnect) the SLC loop on a wire-to-wire short. Upon the short circuit condition being corrected, the isolator module is to automatically reconnect the isolated section of the SLC loop.

B. Requirements:
   1. Address setting not to be required.
   2. Completely automatic operation.
   3. It shall not be necessary to replace or reset the fault isolator module after its normal operation.
   4. Mounting:
      a. A standard 54 mm (2-1/8”) deep x 102 mm (4”) square electrical box
      b. Surface-mounted backbox, or
      c. In the Fire Alarm Control Panel.
   5. A single LED which shall flash to indicate that the Isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.
   6. Provide isolator complete with mounting plate and cover.

C. Acceptable Material: Edwards model SIGA-IM to match existing fire alarm system, or current equivalent Edwards model if no longer available.

2.17 AUDIBLE SIGNAL DEVICES

A. General
1. Utilize the ISO 8201 Clause 4.2 Temporal Tone standard for all signalling devices to indicate an alarm signal.

B. Horns – Unclassified Locations:
1. Refer to Drawings for db level settings
2. Weatherproof where indicated on Drawings
3. 24 Vdc
4. Acceptable Materials: Edwards models G1R-HD/G1R-HDVM, 757-1A-T, or 757-xA-TW to match existing fire alarm system, or current equivalent Edwards models if no longer available.

C. Horns – Class I, Zone 2 locations:
1. Suitable for use in Class 1, Zone 2, Groups C & D hazardous areas
2. Refer to Drawings for db level settings
3. 24 Vdc
4. Acceptable Material: Edwards model 889D-AWC to match existing fire alarm system, or current equivalent Edwards model if no longer available.

D. Means provided to synchronize horn audible signals within each notification zone.

2.18 COMBINATION AUDIBLE / VISUAL SIGNAL DEVICES

A. General
1. Utilize the ISO 8201 Clause 4.2 Temporal Tone standard for all signalling devices to indicate an alarm signal.

B. Horn / Strobes – Unclassified Locations:
1. Weatherproof where indicated on Drawings
2. 24 Vdc
3. Acceptable Materials: G1R-HDVM / weatherproof - WG4RN-HVMC

2.19 VISUAL ALARM SIGNAL DEVICES

A. Strobes – Unclassified Locations:
1. Strobe type: flashing, 24 V dc. Refer to Drawings for brightness settings.
2. Designed for surface mounting on walls.
3. Means provided to synchronize flashes within corridors or rooms in the same field of view.
4. Acceptable Material: Edwards model G1R-VM to match existing fire alarm system, or current equivalent Edwards model if no longer available.

B. Strobes – Class I, Zone 2 locations:
1. Suitable for use in Class 1, Zone 2, Groups C & D hazardous areas

2. Strobe type: flashing, 24 V dc. Refer to Drawings for brightness settings.
3. Designed for surface mounting on walls.
4. Means provided to synchronize flashes within corridors or rooms in the same field of view.
5. Fully compatible with existing Edwards fire alarm system.
6. Acceptable Material: Edwards model 116 series to match existing fire alarm system, or current equivalent Edwards model if no longer available.

2.20 END OF LINE DEVICES

A. End of line devices to control supervisory current in notification appliance circuits and non-addressable 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 the FACPs and remote annunciator.

B. Secure identifying label to the front of the cover plate, listing the zone served.

C. Acceptable Material: Edwards model EOL-P1 to match existing fire alarm system, or current equivalent Edwards model if no longer available.

2.21 REMOTE ANNUNCIATORS

A. Existing remote annunciator at the administration building to be reused

2.22 REMOTE PRINTER

A. Not Applicable.

2.23 REMOTE TERMINAL

A. Not Applicable.

2.24 AS BUILT DIAGRAM

A. Update and provide new fire alarm system riser diagram: in glazed frame, minimum size 432 by 279 mm, mounted adjacent to annunciator panel. New documentation shall include the existing systems as well as the new systems.

B. Updated and provide new facility baseplans, indicating locations of zones, including room number labels: in glazed frame, minimum size 432 by 279 mm, mounted adjacent to annunciator panel.

2.25 ANCILLARY DEVICES

A. Remote relay unit to initiate fan shutdown of mechanical equipment
   1. Acceptable Material: Edwards SIGA-CR

B. Electromagnetic door holder releases
   1. Provide as indicated.

2. Acceptable Material: Edwards model 150x-AQN5 to match existing fire alarm system, or current equivalent Edwards model if no longer available.

C. Mount armature portion on door. Armature complete with adjusting screw for setting angle of contact plate.

D. Mount electro-magnetic release on wall or on floor.

E. Activation of fire alarm system, including fire detector designated for door release service, to release doors on circuit to close.

F. Door holders: do not require battery backup power.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install systems in accordance with CAN/ULC S524, Manufacturer's instructions and recommendations, and in accordance with applicable codes and standards.

B. Install carbon monoxide detectors, and connect to the fire alarm system in accordance with NFPA 720.

C. Install sprinkler system flow switches and tamper valve (position switch). Flow switches shall initiate a fire alarm condition. Valve tamper / position switches shall initiate a supervisory signal. Install in accordance with NFPA 13 and all other applicable codes and standards.

D. Configure the existing communication bridge NGW-P10 (Model 8051) for all new and existing signals to communication with the process control system via Modbus TCP

E. Install manual alarm stations and connect to alarm circuit wiring.
   1. Mount stations with operating lever/ring at 1.3 m above finished floor.
   2. Affix a notice to the wall near each manual station indicating that the alarm is local only, and instructing occupants to phone 911 in case of fire.

F. Provide all mounting accessories and devices as required in order to suit the location shown on the Drawings. The Drawings and Specifications do not specifically indicate all required Manufacturer approved mounted accessories.

G. Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 450 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.

H. Connect alarm circuits to FACPs.

I. Install horns and visual signal devices and connect to signaling circuits. Visual signals and combination visual devices must be installed at the elevations dictated by CAN/ULC S524.

J. Connect signalling circuits to FACPs.

K. Install end of line devices as required at end of conventional NACs and IDCs.
   1. End-of-line devices to be in a separate enclosure, mounted less than 1800mm AFF.

L. Install remote annunciator panels and connect to AC essential power supply. Connect to FACPs via data communications network.

M. Install door releasing devices.

N. Install remote relay units to control fan shut down.

O. Splices are not permitted.

P. Provide necessary conduit, cable and wiring to make interconnections to terminal boxes, annunciator equipment and FACPs, as required by equipment Manufacturer.

Q. Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.

R. Mount end-of-line resistors on terminal blocks.

S. Identify circuits and other related wiring at FACPs, remote annunciator, and terminal boxes.

T. Install identifying lamacoids adjacent to each device on all signalling circuits and initiating circuits, including each manual alarm station, automatic alarm initiating device, audible signal device, visual alarm signal device, and end-of-line device. Label each device in the format FAS-x-yyy-zzz, as shown in the Drawings. Identifying lemuroids are to have white lettering on a red background

3.2 CONDUIT

A. Install separate raceway system for the fire alarm system, independent of all other wiring.

B. Conduit fill not to exceed 40 percent.

C. Install pull boxes in each conduit at intervals not to exceed 30m. Pull boxes to be 100 mm square, minimum.

D. Paint pull boxes, junction boxes, conduit bodies, and terminal cabinets red prior to installation. Provide touch-up painting prior to final acceptance testing.

3.3 FIELD QUALITY CONTROL

A. Perform tests in accordance with Section 26 05 01, Common Work Results - Electrical and CAN/ULC S537.

B. Fire alarm system:
   1. Test each device and alarm circuit to ensure manual stations, thermal, smoke, and flame detectors transmit alarm to control panel and actuate general alarm and ancillary devices.

2. Check annunciator panels to ensure zones are shown correctly.
3. Simulate grounds and breaks on (new or modified) alarm and signalling circuits to ensure proper operation of systems.
4. Addressable circuits system style DCLA:
   a. Test each conductor on all (new or modified) 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.
   b. Test each conductor on all (new or modified) DCLA addressable links for capability of providing 3 or more subsequent alarm signals during ground fault condition imposed near midmost point of each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
5. Addressable circuits system style DCLB:
   a. Test each conductor on all (new or modified) DCLB addressable links for capability of providing 3 or more subsequent alarm signals on line side of single open circuit fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
   b. Test each conductor on all (new or modified) 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.

3.4 MOUNTING HEIGHTS

A. Mount fire alarm equipment at heights specified or if not specified, as indicated in CAN/ULC S524.

B. Manual Stations: 1300 mm above finished floor.

3.5 MODBUS TCP DEMONSTRATION

A. Demonstrate communication over Modbus TCP interface to the satisfaction of the Contract Administrator.

B. Provide all computers, equipment, and wiring for demonstration purposes.

C. Demonstration to provide adequate evidence of specified functionality.

3.6 DEMONSTRATION AND TRAINING

A. Provide on site lectures and demonstration by fire alarm equipment Manufacturer of any fire alarm system components that do not match existing to train operational personnel in use and maintenance of fire alarm system.

B. Prepare one classroom training session for City Operations personnel. Topics to be focussed on system functionality and operation, with a highlight on changes made to the existing system.

C. Prepare one classroom training session for City Electrical Maintenance personnel. Topics to be focussed on system functionality and operation, as well as maintenance. Minimum duration to be three hours.

D. Prepare and distribute appropriate training manual for use and reference during training sessions.

END OF SECTION

SECTION 28 36 01

GAS DETECTION EQUIPMENT

PART 1 GENERAL

1.1 REFERENCES

A. Comply with latest edition of the codes and standards applicable and/or referenced in this section.

B. CSA C22.2 No. 152 Combustible Gas Detection Instruments.

C. CSA 61010-1, Safety Requirements for electrical equipment for measurement, control and laboratory use, Part-1 General Requirements.

D. Canadian Electrical Code, Part 1, CSA - C22.1, Safety standard for electrical installations.

1.2 APPROVED MANUFACTURER

A. The City has Standardized on Mine Safety Appliance (MSA) Company for all gas detection equipment via Request For Proposal 123-2014. All questions, requests for quotations and purchasing shall be addressed to their representative, CB Engineering Ltd. Contact information is as follows:

CB Engineering Ltd.
5040 – 12A Street SE
Calgary, AB T2G 5K9

B. All requests for purchase or quotation shall reference RFP 123-2014 to receive standardized pricing that the City has negotiated with the vendor.

1.3 STORAGE

A. Store gas detection instruments in their original shipping containers in a dry location that is free of fumes and vapours. Never store an instrument in an area where desensitizing agents (such as paint or silicone) may be present.

1.4 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 01 33 00, Submittal Procedures.

PART 2 PRODUCTS

2.1 CONTROLLER

A. Number of channels: As noted on drawings.

B. Channel relay cards: As noted on drawings.

C. Battery Backup: None, unless otherwise noted.

D. Communication Interface: Modbus TCP

E. Approved products:
   1. MSA model series: GasGard XL
   2. No alternates or substitutes will be accepted, as this product was selected by the City via RFP 123-2014.

2.2 H2S DETECTOR

A. Sensor: 0 – 50 PPM H2S

B. Enclosure: Explosion Proof

C. Signals: 3-wire, 4-20 mA with HART

D. Relays: None, unless otherwise noted.

E. Approved products:
   1. MSA model series: Ultima X
   2. No alternates or substitutes will be accepted, as this product was selected by the City via RFP 123-2014.

2.3 IR HYDROCARBON DETECTOR

A. Sensor: 0 – 100 percent LEL- Methane IR Combustible

B. Enclosure: Explosion Proof

C. Signals: 3-wire, 4-20 mA with HART

D. Relays: None, unless otherwise noted.

E. Approved products:
   1. MSA model series: Ultima X
   2. No alternates or substitutes will be accepted, as this product was selected by the City via RFP 123-2014.

2.4 ACCESSORIES

A. Provide the latest version of the GasGard XL Configuration Software.

B. Provide one intrinsically safe handheld IR Ultima Controller/Calibrator for Calibration and Configuration of gas detectors.

C. Provide Calibration Kit with sufficient number of Gas Cylinders to calibrate supplied gas detectors.

2.5 SAMPLE AND CALIBRATION TUBING

A. The calibration tubing shall be 6mm (1/8”) stainless steel tubing.

B. Provide supports as required for all metal tubing.

2.6 AUDIBLE SIGNAL DEVICES

A. See Specification Section 40 91 01, I&C Components.

2.7 VISUAL ALARM SIGNAL DEVICES

A. See Specification Section 40 91 01, I&C Components.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide a sign adjacent to strobe lights, readable from 10m indicating:

STROBE INDICATES HAZARDOUS GAS DETECTED
IF ACTIVATED LEAVE AREA IMMEDIATELY

B. All equipment shall be mounted in accordance with manufacturer's recommendations.

C. Install gas detection equipment as per location drawings and installation details.

D. Install a lamacoid nameplate directly on or adjacent to equipment with equipment name and description.

E. Equipment installed in Category 2 wet locations shall be mounted a minimum of 12 mm from supporting surface as per the Canadian Electrical Code Section 22.

F. Locations of all field instruments are subject to modification by the Contract Administrator who reserves the right to move any item up to 3 meters from the position shown, without change to the contract price, provided notice is given before the related work has commenced.

G. Exact locations of all field instruments shall be site determined by the Contractor to the satisfaction of the Contract Administrator to ensure proper operation of the device.

3.2 CALIBRATION

A. Calibrate all gas detection sensors.

3.3 TESTING

A. Test the sound levels of notification horns in the areas covered by the horns. Provide a report indicating the ambient sound level, and the average, maximum, and minimum horn sound levels in dB.

3.4 CITY TRAINING

A. General:
   1. Provide an integrated training program for the City's personnel.
   2. Perform training to meet specific needs of the City's personnel.
   3. Provide a detailed training manual covering all aspects of the training provided.
   4. Include training sessions, classroom and field, for maintenance personnel.
   5. Provide instruction on all working shift(s) as needed to accommodate the City's personnel schedule.
   6. The City reserves the right to make and reuse recordings of all training sessions.

B. Training Requirements:
   1. Provide a minimum of 1 day of training at the site indicated by the City for personnel in the operation and maintenance of the gas detection controller and detectors
   2. Topics to include, but not be limited to:
      a. Operation and maintenance of the gas detection controller
      b. Operation and maintenance of the gas detection sensors
      c. Troubleshooting

END OF SECTION