

Part 1 General

1.1 REFERENCES

- .1 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S304-16, Signal Receiving Centre and Premise Burglar Alarm Control Units.
 - .2 CAN/ULC-S306-03, Intrusion Detection Units.
 - .3 ULC-S318-96 (R2016), Standard for Power Supplies for Burglar Alarm Systems.
 - .4 ULC-C634-M1986, Guide for the Investigation of Connectors and Switches for Use with Burglar Alarm Systems.
- .3 Underwriters' Laboratories (UL)
 - .1 UL 603-08, Power Supplies For Use With Burglar-Alarm Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for control panels, keypad, sensors and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Safety Requirements and Section 01 35 43 - Environmental Procedures.
 - .3 Submit:
 - .1 Functional description of equipment.
 - .2 Technical data for devices.
 - .3 Device location plans and cable lists.
 - .4 Devices mounting location detail drawings.
 - .5 Typical devices connection detail drawings.
- .3 Shop Drawings:
 - .1 Shop drawings to indicate project layout, mounting heights and locations, wiring diagrams, detection device coverage patterns, contact operating gaps, etc.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .1 Submit UL Product Safety Certificates.
 - .2 Submit verification Certificate that service company is ULC/UL List alarm service company.
 - .3 Submit verification Certificate that intrusion alarm system is Certified Alarm System.
- .5 Test and Evaluation Reports:

- .1 Submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Manufacturer's Instructions: submit manufacturer's installation instructions.
- .7 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.3 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
 - .1 Include:
 - .1 System configuration and equipment physical layout.
 - .2 Functional description of equipment.
 - .3 Instructions of operation of equipment.
 - .4 Illustrations and diagrams to supplement procedures.
 - .5 Operation instructions provided by manufacturer.
 - .6 Cleaning instructions.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect intrusion detection from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return of padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.5 WARRANTY

- .1 Manufacturer's Warranty: submit, for Departmental Representative's acceptance, manufacturer's standard warranty document executed by authorized company official.
 - .1 Include manufacturer/dealer recommendations, information and support services for 1 year.

Part 2 Products

2.1 MATERIALS

- .1 Design Criteria:
 - .1 Design intrusion detection system using only ULC/UL listed products.

- .2 Design intrusion detection system using alarm service company specializing in intrusion detection systems.
 - .3 Design intrusion detection system as a ULC/UL certified alarm system.
 - .1 Annunciating undesirable, abnormal or dangerous condition.
 - .2 Prioritizing alarms by alarm type; i.e. panic/duress, intrusion and tamper.
 - .3 Determining zone where alarm occurred.
 - .4 Annunciating power failure and power restoration.
 - .5 Annunciating low battery condition.
 - .6 Operate continuously for minimum period of 4 hours in the event of a power failure.
 - .4 Provide a complete and operational intrusion alarm system including but not limited to Intrusion alarm panel, glass break detector, vibration sensor, door contact, keypad, wireless duress button, wireless transceiver, motion detector, cabling and miscellany.
- .2 INTRUSION ALARM CONTROL PANEL
- .3 The controller unit along with power supply shall be housed in a lockable hinged-door cabinet suitable for wall mounting.
 - .4 The controller unit shall be able to monitor up to 128 security zone inputs and 2 to 8 partitions. The control panel shall have eight hardwired inputs, on board PSTN communications and four hardwired programmable relay outputs (Form C). It shall allow the use of wired and wireless expansion modules.
 - .5 Zone inputs shall be wired in an End of Line resistor configuration allowing the control unit to interpret a zone condition as either Open, Closed, Short, or Disconnect, in order to determine the response that shall occur. The following responses shall be possible:
 - .1 Signal a remote central monitoring station
 - .2 Signal on-site PC based monitoring software
 - .3 Local visual and or audible annunciation
 - .4 A combination of the above
 - .6 The control panel shall provide a robust and feature-rich platform to reduce operational costs and provide ultimate reliability for end users.
 - .7 The control panel shall support VoIP or mobile phones, Cellular and/or IP communication methods. The control panel, alarm reporting paths can be combined through the Public Switched Telephone Network (PSTN) if so desired, plus Cellular and/ or IP channels.
 - .8 The communicators shall be able to conveniently utilize the Cellular and/or IP network as a primary or back-up communication path to ensure high speed, reliable and secure alarm communications. The integrated communicators also allow security professionals to offer RMR services such as alarm verification, even in instances where a traditional phone line is not present.
 - .9 The control panel shall utilizes innovative, regionally compliant alarm verification solutions such as visual verification and sequential detection.
 - .10 The control panel shall have be equipped with the following features:
 - .1 Multichannel, Frequency Hopping Spread Spectrum technology that enables the system to hop between wireless frequency channels to ensure the seamless transmission of secure communications between the devices and the control panel.

- .2 Adaptive Transmission Power translates into up to eight years of battery life for the system's devices and peripherals, reducing battery-replacement incurred costs.
- .3 High transmission ranges allow for devices to reliably communicate within up to 2km/1.24 miles line-of-sight, therefore reducing the cost of installing additional repeaters to service larger premises.
- .4 TDMA synchronized communication technology prevents messages from colliding by splitting channels into various time slots, allowing for an increased amount of data transmission and ensuring that devices are able to consistently communicate when needed.
- .5 128 bit AES encryption offers exceptionally high level of protection against analysis tools and digital attacks.
- .11 The panel shall be able to be configured using the following software;
 - .1 Downloading Software
 - .2 Remote Diagnostics Software for remote diagnostics
 - .3 Inspections and maintenance
 - .4 Web System Administrator Software for end-user system maintenance.
- .12 Leverage powerful support software, an accurate remote assessment is made of the situation inside the premises when an alarm is triggered by a burglary attempt, fire or other emergency. This eliminates the need for unnecessary site checks – ultimately saving time and cost while enabling responders to be alerted about any potentially dangerous situations.
- .13 The controller unit must be equipped with a 3 ampere power supply.
- .14 The controller must be UL/ULC listed as suitable for Fire and/or Burglary applications.
- .15 The AC input of the power supply must be fused.
- .16 The DC output of the power supply must be fused.
- .17 The controller unit must have a cabinet tamper switch.
- .18 Acceptable Product: DSC NEO model HS2032 to match existing alarm panel.
- .3 **EXPANSION MODULES**
 - .1 The 8-Input/1 Output Node shall be capable of monitoring a minimum of 1 zone input and a maximum of 8 zone inputs. The zone inputs connect to devices such as motion detectors, door contacts, glass break detectors, smoke detectors, etc.
 - .2 Each zone input on the 8-Input/1-Output node must be wired in a 2-EOL resistor configuration to guarantee tamper protection at all times.
 - .3 The on-board relay shall be assigned to any output number and responds under program control from the control unit.
 - .4 The 8-Input/1-Output node must communicate to the controller unit via the RS485 bi-directional Ringnet cable.
 - .5 The 8-Input/1-Output node must have an internal tamper switch which activates upon removal of the cover.
 - .6 The 8-Input/1-Output node must have a ULC label.
 - .7 The 8-Input/1-Output node must have an internal buzzer.
 - .8 The 8-Input/1-Output node must have a RS485 activity LED.
 - .9 Acceptable Manufacturer: DSC HSM2108
- .4 **KEYPAD**

- .1 The remote keypad node must feature a 2-line by 16 character LCD display, adjustable backlit keys for low-light situations and five programmable keys for simple one button activation of system functions.
- .2 The remote keypad node must be customizable keypad to include an input/output terminal that can be programmed to operate as a zone input, a programmable output or as a low temperature sensor..
- .3 The remote keypad node shall have door chime function allows for multiple pre-programmed chimes to identify specific zones.
- .4 The remote keypad node must have status LED indicators and must have a minimum 2 zone inputs (wired in a 2 EOL configuration), and a relay output.
- .5 The remote keypad node must have a ULC label.
- .6 The remote keypad node must have an internal tamper switch which activates upon removal of the cover.
- .7 Acceptable Manufacturer: DSC model HS2LCD.

.5 DUAL PATH ALARM COMMUNICATOR

- .1 Fully redundant Internet and Cellular dual-path alarm communication
- .2 Integrated call routing
- .3 Panel remote uploading/downloading support via Cellular and Internet
- .4 Supervision heartbeats via Cellular or Internet
- .5 128-bit AES encryption via Cellular and Internet
- .6 Full event reporting
- .7 SIA and Contact ID protocol
- .8 SIM Card (included)
- .9 Remote activating and programming through C24 Communications
- .10 UL standard & encrypted line security
- .11 ULC passive or active line security levels
- .12 Active Cellular account is required to use Internet function
- .13 Antenna Extension Kits available:
 - .1 GS-15ANTQ, GS-25ANTQ,
 - .2 GS-50ANTQ
- .14 Signal strength and trouble display
- .15 PC-Link connection
- .16 Visual verification over Cellular or Internet
- .17 Communicator can be housed in separate cabinet using PCL-422 Communicator Remote Mounting Module
- .18 Command and Control via SMS
- .19 Compatible with Sur-Gard System I-IP/II/III/IV/5 monitoring station receivers (System 5 required for Visual Verification) UL/ULC listed.
- .20 Acceptable Product: DSC model TL2803G

.6 Detection Accessories:

- .1 Passive Infrared Detectors/Microwave (PIR's): ULC approved, digital.
 - .1 Coverage pattern: minimum 18m, 90 degrees.

- .2 Temperature requirement: 0 – 40 degrees Celsius.
 - .3 Tamper switch.
 - .4 Mounting: wall and ceiling.
- .2 Door Contacts : ULC approved.
 - .1 Mounting: Surface.
 - .2 Mounting locations: door.
 - .3 Operating gap: 25 mm.
 - .4 Security level: high security
 - .5 Type: magnetic balanced.
 - .6 Colour identical throughout the installation.
 - .7 Provide separate and independent contacts for intrusion
 - .8 Sensors shall be installed as close as possible to the leading edge of the door, as a minimum an alarm shall be generated when door movement exceeds 25mm
 - .9 UL/ULC approved
- .3 Wireless Door Contacts : ULC approved.
 - .1 Selectable operation of auxiliary input as NO, NC or EOL supervision
 - .2 Visible link quality indicator shown on device
 - .3 Case and wall tamper
 - .4 Colour white
 - .5 User-selectable operation of auxiliary input as NC or EOL
 - .6 Prolonged battery life (8 years with typical use)
 - .7 Back tamper switch (MC-302E T PG2 model)
 - .8 Dimensions: 81 x 32 x 25mm (3.19 x 1.25 x 1 in)
 - .9 Acceptable Manufacturer: DSC model PG9945 complete with back tamper switch.
- .4 Wireless Pet-Immune Passive Infrared Detectors (PIR's): ULC approved, digital.
 - .1 Coverage pattern: minimum 18m, 90 degrees.
 - .2 Temperature requirement: 0 – 40 degrees Celsius.
 - .3 Tamper switch.
 - .4 Mounting: wall and ceiling.
 - .5 Based on the Bravo® 6 hardwire motion detector
 - .6 High-traffic shutdown
 - .7 Pet immunity up to 85 lb (39 kg)
 - .8 4 'AA' batteries included
 - .9 Acceptable Product: DSC model WLS914-433
- .7 Tamper Alarm
 - .1 All enclosures containing electronic components shall be equipped with a tamper alarm.
- .8 End of Line Devices

- .1 End of line supervisory devices to be mounted with the field device
- .9 Power Supplies: to ULC-S318 UL 603.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for intrusion detection installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install panels, intrusion detection system and components in accordance with manufacturer's written installation instructions to locations, heights and surfaces shown on reviewed shop drawings.
- .2 Install panels, intrusion detection system and components secure to walls, ceilings or other substrates.
- .3 Install required boxes in inconspicuous accessible locations.
- .4 Conceal conduit and wiring.

3.3 SITE TEST AND INSPECTION

- .1 Perform verification inspections and test in the presence of Departmental Representative and Consultant.
 - .1 Provide necessary tools, ladders and equipment.
 - .2 Ensure appropriate subcontractors , and manufacturer's representatives and security specialists are present for verification.
- .2 Visual verification: objective is to assess quality of installation and assembly and overall appearance to ensure compliance with Contract Documents. Visual inspection to include:
 - .1 Sturdiness of equipment fastening.
 - .2 Non-existence of installation related damages.
 - .3 Compliance of device locations with reviewed shop drawings.
 - .4 Compatibility of equipment installation with physical environment.
 - .5 Inclusion of all accessories.
 - .6 Device and cabling identification.
 - .7 Application and location of ULC approval decals.
- .3 Technical verification: purpose to ensure that all systems and devices are properly install and free of defects and damage. Technical verification includes:
 - .1 Measurements of coverage patterns

- .2 Connecting joints and equipment fastening.
- .3 Compliance with manufacturer's specification, product literature and installation instructions.
- .4 Operational verification: purpose to ensure that devices and systems' performance meet or exceed established functional requirements. Operational verification includes:
 - .1 Operation of each device individually and within its environment.
 - .2 Operation of each device in relation with programmable schedule and or/specific functions.

3.4 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Obtain written reports from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product.
 - .2 Submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Ensure manufacturer's representative is present before and during testing.
 - .4 Schedule site visits to review Work at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work on which Work of this Section depends is complete, but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.

3.5 ADJUSTING

- .1 Adjust all components for correct function.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove protective coverings from accessories and components.
 - .2 Clean housings and system components, free from marks, packing tape, and finger prints, in accordance with manufacturer's written cleaning recommendations.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 This Section covers items common to Sections of Divisions 23, 26 and 28. These Sections supplement requirements of Division 1.
- .2 This Section covers the fire alarm systems for the Big House, Men's House and the Furloft building.
- .3 New Fire Alarm System from each building shall individually be wired/interlocked for monitoring (via existing underground multipair cables) to existing Fire Alarm Panel located at the Museum's building. Electrical Contractor to verify/test existing conductors and use the best possible pairs.
- .4 Provide all hardware, software and required re-programming on existing Siemens TXL-1000 FACP to make the system fully operational for the entire complex.

1.2 REFERENCES

- .1 All panels and components to be CSA approved.
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524-2014, Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S525, Audible signal Appliances for Fire Alarm Systems.
 - .3 CAN/ULC-S526-07, Visible Signal Devices for Fire Alarm Systems, Including Accessories.
 - .4 CAN/ULC-S527-99, Standard for Control Units for Fire Alarm Systems.
 - .5 CAN/ULC-S528-05, Manual Stations for Fire Alarm Systems, Including Accessories.
 - .6 CAN/ULC-S529-09, Smoke Detectors for Fire Alarm Systems.
 - .7 CAN/ULC-S530-91(R1999), Heat Actuated Fire Detectors for Fire Alarm Systems.
 - .8 CAN/ULC-S531-02, Standard for Smoke Alarms.
 - .9 CAN/ULC-S536, Inspection and Testing of Fire Alarm Systems.
 - .10 CAN/ULC-S537-04, Standard for the Verification of Fire Alarm Systems.
 - .11 National Fire Protection Association (NFPA):
- .3 National Fire Protection Association (NFPA):
 - .1 No. 13 Sprinkler Systems
 - .2 No. 17 Dry Chemical Extinguishing Systems
 - .3 No. 72 National Fire Alarm Code
 - .4 No. 101 Life Safety Code
- .4 Local and Provincial Building Codes.
 - .1 NBCC
- .5 All requirements of the Authority Having Jurisdiction (AHJ).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for multiplex fire alarm system and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 At least two copies of all submittals shall be submitted to the Engineer for review.
- .3 Shop Drawings:
 - .1 Indicate on shop drawings:
 - .1 Detail assembly and internal wiring diagrams for control units. Consoles and Auxiliary cabinets.
 - .2 Overall system riser wiring diagrams identifying control equipment, initiating zones, signaling circuits; identifying terminations, terminal numbers, conductors and raceways.
 - .3 Details and specifications for control, annunciation and peripherals with item by item cross reference to specification for compliance.
 - .4 Step-by-step operating sequences, cross referenced to logic flow diagram.
 - .5 Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - .6 Include manufacturer's name, model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
 - .7 Show annunciators layouts, configurations, and terminations.

1.4 VERIFICATION

- .1 The complete system for each building and the entire complex shall be tested and verified in accordance with current CAN/ULC-S537 Standard for the Verification of Fire Alarm System Installation. Upon completion, a Certificate of Verification and a copy of the Verification Report shall be submitted to the Engineer and Departmental Representative.

1.5 WITNESS TEST

- .1 Provide witness test for each new system and the entire complex after fire alarm has been verified. Provide document stamped and sealed by a professional Engineer registered in the Province of Manitoba.

1.6 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for fire alarm system for incorporation into manual.
- .3 Include:
 - .1 Instructions for complete fire alarm systems to permit effective operation and maintenance.
 - .2 Technical data - illustrated parts lists with parts catalogue numbers.
 - .3 Copy of approved shop drawings with corrections completed and marks removed except review stamps.
 - .4 List of recommended spare parts for system.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
- .3 Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
- .4 Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

1.8 SOFTWARE MODIFICATIONS

- .1 Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes.
- .2 Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications onsite. Modification of software shall not require power down of the system or loss of system fire protection while modifications are being made.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.10 GUARANTY

- .1 All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labour and materials required to correct any defect during this one year period shall be included in the submittal bid.

Part 2 Products

2.1 DESCRIPTION

- .1 All equipment and components shall be addressable, new of the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signalling (fire alarm) system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

- .2 All equipment and components shall be installed in strict compliance with manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system installation. Refer to the riser/connection diagram for all specific system installation/termination/wiring data.
- .3 All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load
- .4 Fully supervised, microprocessor-based, fire alarm system, utilizing digital techniques for data control and multiplexing techniques for data transmission for each building.
- .5 System to carry out fire alarm and protection functions; including receiving alarm signals; initiating general alarm; supervising components and wiring; actuating annunciators and auxiliary functions; initiating trouble signals and signaling to monitoring agency.
- .6 Modular in design to allow for future expansion.
- .7 Operation of system shall not require personnel with special computer skills.
- .8 Each system to include:
 - .1 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, annunciation/display, and program control/signaling.
 - .2 Data Gathering Panels/Transponders with stand-alone capabilities.
 - .3 Power supplies.
 - .4 Isolation Modules
 - .5 Initiating/input circuits.
 - .6 Output circuits.
 - .7 Auxiliary circuits.
 - .8 Wiring.
 - .9 Manual and automatic initiating devices.
 - .10 Audible and visual signaling devices.
 - .11 End-of-line resistors.
 - .12 Local and Remote annunciators.
 - .13 Printer and Event log memory chip.
 - .14 Historic event recorder.

2.2 SYSTEM OPERATION: ADDRESSABLE, SINGLE STAGE

- .1 Operation to actuation following:
 - .1 Manual station.
 - .2 Heat detector.
 - .3 Smoke detector.
 - .4 Automatic fire sprinkler system.
 - .5 Fire extinguishing system.
- .2 Actuation of any alarm initiating device to initiate the following:

- .1 Cause electronic latch to lock-in alarm state at central control unit and data gathering panel/transponder.
- .2 Indicate zone of alarm at central control unit and remote annunciators.
- .3 Cause audible signaling devices to sound continuously throughout building and at central control unit.
- .4 Transmit signal to fire department via monitoring station.
- .5 Cause air conditioning and ventilation fans to shut down or to function to provide required control of smoke movement.
- .6 Cause elevators/lift in Big House to return to floor of egress, or to alternate floor, as required.
- .3 Actuation of supervisory devices to:
 - .1 Cause electronic latch to lock-in supervisory state at central control unit and data gathering panel/transponder.
 - .2 Indicate respective supervisory zone at central control unit and at remote annunciator.
 - .3 Cause audible signal at central control unit to sound.
 - .4 Activate common supervisory sequence.
- .4 Resetting alarm device not to return system indications/functions back to normal until control unit has been reset.
- .5 Trouble on system to:
 - .1 Indicate circuit in trouble at central control unit.
 - .2 Activate "system trouble" indication, buzzer and common trouble sequence. Acknowledging trouble condition to silence audible indication; whereas visual indication to remain until trouble is cleared and system is back to normal.
- .6 Trouble on system: suppressed during course of alarm.
- .7 Trouble condition on any circuit in system not to initiate alarm conditions.

2.3 CONTROL PANEL-BIG HOUSE/MEN'S HOUSE/FURLOFT BUILDINGS

- .1 All panels to be interconnected together for trouble and alarm.
- .2 Class A.
- .3 Single stage operation.
- .4 Zoned.
- .5 Non-coded.
- .6 Enclosure:
 - .1 CSA Enclosure 4, c/w lockable concealed hinged door customized for low temperature operation, full viewing window, flush lock and 2 keys.
 - .2 Provide modular type panel installed in flush mounted steel cabinet with hinged door and cylinder lock.
 - .3 Mount with panel centerline 1.5 m above finished floor elevation.
 - .4 Switches and other controls: not accessible without use of key.
 - .5 Design of control panel: neat, compact assembly containing parts and equipment required to provide specified operating and supervisory functions of system.

- .6 Control panel components: CSA approved and approved by control panel manufacturer for use in control panel.
- .7 Panel cabinet: finished on inside and outside with factory-applied enamel finish.
- .8 Provide main annunciator located on exterior of cabinet door or visible through cabinet door.
- .9 Provide audible trouble signal.
- .10 Provide permanent engraved identification plates, attached to rear face of panel viewing window, for lamps and switches.
- .11 Provide 1 set of Form C dry alarm contacts per zone, common system Form C dry alarm contact, and common system Form C dry trouble contact. Indicate set/unset condition of master box by control panel.
- .12 Permanently label switches.
- .13 Provide panel with following switches:
 - .1 Trouble silencing switch which silences audible trouble signals including remote trouble devices without extinguishing trouble indicating lamp(s).
 - .1 For non-self-resetting type switch: Upon correction of trouble condition, audible signals will again sound until switch is returned to its normal position.
 - .2 Evacuation alarm silencing switch which when activated will silence alarm notification appliances without resetting panel, and cause operation of system trouble signals. Subsequent alarm(s) from additional zone(s) not originally in alarm to cause activation of notification appliances even with alarm silencing switch in "silenced" position.
 - .3 Individual zone disconnect switches which when operated will disable only their respective initiating circuit and cause operation of system and zone trouble signals.
 - .4 Reset switch which when activated will restore the system to normal standby status after cause of alarm has been corrected, and activated initiating devices reset.
 - .1 Operation of reset switch to restore activated smoke detectors to normal standby status.
 - .5 Lamp test switch.
 - .6 Drill switch which will enable test of notification appliances and restoration to normal without tripping master box.
 - .7 HVAC shutdown bypass switch. Operation of the switch to allow HVAC system to operate with detectors in alarm and cause operation of system trouble signals.
- .7 Supervised, modular design with plug-in modules:
 - .1 Alarm receiver with trouble and alarm indications provision for remote supervised annunciation, for class A initiating circuit.
 - .2 Spare zones: compatible with smoke detectors and open circuit devices.
 - .3 Space for future modules.
 - .4 Latching type supervisory receiver circuits. Discrete indication for both off-normal and trouble.
- .8 Components:
 - .1 Coded alarm receiver panel with trouble and alarm indications for class A initiating circuit.

- .2 Single stage alarm pulse rate panels:
 - .1 Single stroke control type for output to signal control panel continuously.
- .3 Audible signal control panel with sufficient control circuits complete with terminals for wiring and enough plug-in modules for dc signals up to 2.0 A load with trouble indication with class A connection.
- .4 Common control and power units:
 - .1 Control panel containing following indications and controls:
 - .1 "Power on" LED (green) to monitor primary source of power to system.
 - .2 "Power trouble" indication.
 - .3 "Ground trouble" indication.
 - .4 "Remote annunciator trouble" indication.
 - .5 "System trouble" indication.
 - .6 "System trouble" buzzer and silence switch c/w trouble resound feature.
 - .7 System reset switch.
 - .8 "LED test" switch if applicable.
 - .9 "Alarm silence" switch to silence signals manually. If new alarm occurs after signals have been silenced, signals to resound.
 - .10 "Signals silenced" indication.
 - .2 Master power supply panel to provide 24 V dc to system from 120 V ac, 60 Hz input.
 - .3 Fire department connections:
 - .1 Fire department bypass switch c/w indicator for trouble at panel.
- .5 Auxiliary relays: plug-in type, dust cover, supervised against unauthorized removal by common trouble circuit and c/w individual bypass switch.
 - .1 Contacts: 2.0 A, 120 V ac, for functions such as release of door holders or initiation of fan shut down.
 - .2 Contact terminal size: capable of accepting 22-12 AWG wire.
- .9

2.4 POWER SUPPLIES

- .1 120 V, ac, 60 Hz input, 24 V dc output from rectifier to operate alarm and signal circuits, with standby power of gell cell batteries minimum expected life of 4 years, sized in accordance with NBC.
- .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.

2.5 INITIATING/INPUT CIRCUITS

- .1 Receiving circuits for alarm initiating devices such as manual pull stations, smoke detectors, heat detectors and water flow switches, wired in 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".

2.6 ALARM OUTPUT CIRCUITS

- .1 Alarm output circuit: connected to signals, wired in class A configuration to central control unit.
 - .1 Signal circuits' operation to follow system programming; capable of sounding horns continuously at 20 spm 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.

2.7 AUXILIARY CIRCUITS

- .1 Auxiliary contacts for control functions.
- .2 Actual status indication (positive feedback) from controlled device.
- .3 Alarm trouble on system to cause operation of programmed auxiliary output circuits.
- .4 2 sets of separate contacts for Big House lift to capture to main floor of egress.
- .5 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.
- .6 Fans: stagger-started upon system reset; timing circuit to separate starting of each fan or set of fans connected to auxiliary contact on system.
 - .1 Timing circuit: controlled by CCU.
- .7 Auxiliary circuits: rated at 2 A, 24 Vdc or 120 Vac, fuse-protected.
- .8 Auxiliary contacts for "Low Temperature Alarm" for Furloft and Mens House buildings.

2.8 WIRING

- .1 Twisted copper conductors: rated 600 V.
- .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 control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.

2.9 MANUAL ALARM STATIONS

- .1 Manual alarm stations: pull lever, wall mounted surface type, non-coded single pole normally open contact for single stage and general alarm English signage.
- .2 Addressable manual pull station.
 - .1 Pull lever, recessed wall mounted type, single action, electronics to communicate station's status to addressable module/transponder to supply power to station. Station address to be set on station in field.
 - .2 Mounting height 1050-1150 mm AFF to the center of pullstation.

2.10 AUTOMATIC ALARM INITIATING DEVICES

- .1 4-Wire Smoke Detectors: detector circuits 4-wire type capable of transmitting detector operating power over conductors separate from initiating circuit.
 - .1 Provide separate, power circuit for each smoke detection initiating circuit (zone).
 - .2 Failure of power circuit to be indicated as trouble condition on corresponding initiating circuit.
- .2 Ionization Detectors: multiple chamber type responsive to both invisible and visible particles of combustion.
 - .1 Detectors: not susceptible to operation by changes in relative humidity.
- .3 Locate detectors in accordance with their listing by ULC and the requirements of NFPA 72, except provide at least 2 detectors in rooms of 54 square meters or larger in area.
- .4 Mount detectors at underside of ceiling or deck above unless otherwise indicated.
 - .1 For mounting heights greater than 3 m above floor level, reduce actual detector linear spacing from listed spacing as required by NFPA 72.
 - .2 For heights greater than 9 m space detectors no farther apart than 34% of their listed spacing.
- .5 Temperature rating of detectors: in accordance with NFPA 72.
- .6 Locate detectors minimum 300 mm to lighting fixtures and not closer than 600 mm to air supply or return diffuser.
- .7 Ensure detectors, located in areas subject to moisture or exterior atmospheric conditions or hazardous locations as defined by NFPA 70, are approved for such locations.
- .8 Provide detectors with terminal screw type connections.
- .9 Removal of detector head from its base to cause activation of system trouble signals if detectors are provided with separable heads and bases.

2.11 Alarm initiating device spacing and location

- .1 Detector spacing and location: in accordance with manufacturer's recommendations and requirements of NFPA 72.
- .2 Provide at least 2 detectors in rooms of 54 square meters or larger.
- .3 Spacing: not to exceed 9 m by 9 m per detector, and 9 linear m per detector along corridors.
- .4 Locate detectors minimum 1.5 m from air discharge or return grille, and not closer than 300 mm to lighting fixtures.

- .5 In areas without finished ceilings, mount detectors at underside of deck above unless otherwise indicated.
- 2.12 Duct smoke detectors
 - .1 Provide detectors installed in ducts of ionization type and listed by ULC duct installation.
 - .2 Provide integral control and power modules required for operation with main control panel.
 - .3 Ensure detectors and associated modules are compatible with main control panel and suitable for use in supervised circuit.
 - .4 Detector circuits: 4-wire type where detector operating power is transmitted over conductors separate from initiating circuit. Malfunction of electrical circuits to detector or its control or power modules to cause operation of system trouble signals.
 - .5 Provide a separate, fused power circuit for each smoke detection initiating circuit.
 - .6 Failure of power circuit: indicated as a trouble condition on corresponding initiating circuit.
 - .7 Provide duct detectors in accordance with NFPA 90A.
 - .8 Provide duct detectors with approved duct housing, mounted exterior to duct, with perforated sampling tubes extending across width of duct.
 - .9 Activation of duct detectors to cause shutdown of associated air handling unit annunciation at control panel and sounding of building evacuation alarms.
 - .10 Provide detectors with visible indicator lamp that flashes when detector is in normal standby mode and glows continuously when detector is activated.
 - .11 Provide remote indicator lamp for each detector.
 - .12 Permanently label remote indicator with description of associated air handling unit(s).
 - .13 Provide each detector with remote test switch. Mount switch not more than 1.8 m above finished floor.
 - .14 Permanently label test switch with description of associated air handling unit(s).
- 2.13 Audible signal devices
 - .1 Provide remote system trouble horns arranged to operate in conjunction with panel's integral trouble signal.
 - .2 Locate remote trouble horn as indicated.
 - .3 Audible device(s):
 - .1 Horns: 85 db, weatherproof mounting where required, 24 V dc.
 - .4 Do not exceed 80 percent of listed rating in amperes of notification appliance circuit. Provide additional circuits above those shown if required to meet this requirement.
 - .5 Provide appliances specifically listed for outdoor use in locations exposed to weather.
 - .6 Finish appliances in red enamel.
 - .7 For surface mounting provide appliance manufacturer's approved back box. Back box finish to match appliance finish.

- 2.14 End-of-line devices
 - .1 End-of-line devices to control supervisory current in alarm and signalling circuits, sized to ensure correct supervisory current for each circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.
- 2.15 Remote annunciator panels
 - .1 Provide panels where indicated mounted 1.5 m above finished floor elevation.
 - .2 Panels: duplicate requirements for control panel annunciator, with exception of individual trouble lamps are not required.
 - .3 LED type with designation cards to indicate zone.
 - .4 LEDs to annunciate alarm and trouble.
 - .5 Wired in multiple with main control panel.
 - .6 Supervised, including trouble signal for open circuit.
 - .7 LED test button.
- 2.16 Graphic annunciator panel
 - .1 Provide panel located as shown.
 - .2 Mount with panel centerline 1.5 m above finished floor elevation.
 - .3 Panel: interior, sprinklerproof type, flush-mounted.
 - .4 Panel: provided with building floor plan, drawn to scale, with alarm lamps mounted to represent location of each concealed detector and each initiating device.
 - .5 Panel graphic: show locations of annunciator panel and control panel, and have "you are here" arrow showing its location. Orient building floor plan on graphic to location of person viewing graphic, i.e. direction viewer is facing is toward top of graphic display. Provide North arrow.
 - .6 Label principal rooms and areas shown with room numbers.
 - .7 Provide detectors mounted above ceilings and on ceilings, and different types of initiating devices with different symbols for identification. Lamps to illuminate upon activation of corresponding device and remain illuminated until system is reset.
 - .1 Provide panel with lamp test switch.
- 2.17 Visual alarm signal devices
 - .1 Flush-mounted assembly of stroboscopic type suitable for use in electrically supervised circuit and powered from notification appliance circuits.
 - .2 Appliances: minimum of 15 candela measured as approved by ULC, but not less than effective intensity required by National Building Code of Canada for appliance spacing and location shown.
 - .3 Protect lamps with thermoplastic lens and labelled "FIRE" in letters at least 12 mm high.
 - .4 Provide visible appliances within 300 mm of each audible appliance.
 - .5 Visible appliances may be part of audio-visual assembly, where more than two appliances are located in same room or corridor.

- 2.18 Freeze protection thermostatic switch
 - .1 Provide switch with concealed set point, cover, and allen head screws.
 - .2 Omit temperature indicator or conceal indicator within cover. Switch: not to be adjustable below 4 degrees C. Switch contacts to transfer close when fire protection equipment room air temperature drops below 4 degrees C, causing supervisory signal on fire alarm system. Removal of switch from circuit to cause trouble signal on its respective zone.
 - .3 Mount switch with centerline 1.5 m above finished floor.
 - .4 Provide with insulating subbase when mounting on exterior wall.
- 2.19 Valve flow and tamper switches
 - .1 Provide switches to monitor open position of valves controlling water supply to sprinkler systems.
 - .2 Switch contacts to transfer from normal position to off-normal position during first two revolutions of hand wheel or when stem of valve has moved not more than one-fifth of distance from its normal position.
 - .3 Provide switch with tamper resistant cover.
 - .4 Removal of the cover to cause switch to operate into off-normal position.
- 2.20 **NITROGEN GENERATOR**
 - .1 Provide dry contacts on Fire Alarm Panel for Nitrogen Generator leak detection and by-pass alarms.
- 2.21 Off-premises fire alarm
 - .1 Provide auxiliary connection to base fire alarm system in accordance with NFPA 72.
- 2.22 Grounding
 - .1 Ground equipment by connection from grounding terminal connection of box to either driven ground rod or buried, metallic water pipe.
 - .1 Resistance to ground: not exceed 10 ohms.
 - .2 Ground rods: sectional type, copper-encased steel, with minimum diameter of 19 mm and total length of 3 m.
 - .3 Rods: hard, clean, smooth, continuous copper surface throughout rods length.
 - .4 Copper: minimum wall thickness of 0.325mm at any point on rod.
 - .5 Ground rods: not to protrude more than 75 mm above grade.
- 2.23 Conduit
 - .1 Electrical Metallic Tubing (EMT): Red.
- 2.24 Wiring
 - .1 Wire for 120 V circuits: No. 12 AWG minimum solid copper conductor.
 - .2 Wire for low voltage DC circuits: No. 14 AWG minimum solid copper conductor
 - .3 Wire to remote annunciators: No. 18 AWG minimum solid copper conductor.

- .4 Wire for connection to base telegraphic alarm loop: No. 12 AWG minimum solid copper conductor.
- .5 Insulation 75 degrees C minimum with nylon jacket.
- .6 Colour code wiring.
- 2.25 Surge suppression
 - .1 Provide line voltage and low voltage surge suppression devices to suppress voltage transients which might damage control panel and transmitter components.
 - .2 Mount suppressors in separate enclosure(s) adjacent to control panel and transmitter unless suppressors are specifically UL approved for mounting inside control panel and transmitter provided and approved for such use by control panel and transmitter manufacturer.
- 2.26 Line voltage surge suppressor
 - .1 Suppressor : ULC approved with maximum 330 volt clamping level and maximum response time of 5 nanoseconds.
 - .2 Suppressor: multi-stage construction which includes inductors and silicon avalanche zener diodes.
 - .3 Equip suppressor with light emitting diode which extinguishes upon failure of protection components.
 - .4 Fuses: externally accessible.
 - .5 Wire in series with incoming power source to protected equipment using screw terminations
- 2.27 Low voltage surge suppressor
 - .1 Provide surge suppression for circuits which leave building shell.
 - .2 When circuits interconnect 2 or more buildings, provide arrestor at circuit entrance to each building.
 - .3 Suppressor: UL 497B listed with maximum 30 volt clamping level and maximum response time of 5 nanoseconds.
 - .4 Suppressor: multi-stage construction and both differential and common mode protection.
- 2.28 **REMOTE ANNUNCIATORS (BIG HOUSE)**
 - .1 LED remote alphanumeric type, with designation cards to indicate zones.
 - .2 Display:
 - .1 Alarms and troubles for alarm initiating circuits.
 - .2 common supervisory alarm for supervisory initiating circuits.
 - .3 Common system trouble.
 - .3 Trouble buzzer:
 - .1 Acknowledging trouble at main panel to silence trouble buzzers in system.
 - .4 Supervised, with LED test button trouble acknowledge button.
 - .5 Minimum wiring configuration with main panel and other remote annunciators.

2.29 GRAPHIC DISPLAY

- .1 Passive type.

2.30 AS-BUILT RISER DIAGRAM

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

2.31 ANCILLARY DEVICES

- .1 Remote relay unit to initiate fan shutdown.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for fire alarm installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install systems in accordance with CAN/ULC-S524.
- .2 Install central control unit and connect to ac power supply, dc standby power.
- .3 Install manual alarm stations and connect to alarm circuit wiring.
- .4 Locate and install detectors and connect to alarm circuit wiring. Mount detectors more than 1 m from air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.
- .5 Connect alarm circuits to main control panel.
- .6 Install horns and visual signal devices and connect to signaling circuits.
- .7 Connect signaling circuits to main control panel.
- .8 Install end-of-line devices at end of alarm and signaling circuits.
- .9 Install remote annunciator panels and connect to annunciator circuit wiring.
- .10 Install remote relay units to control fan shut down.
- .11 Sprinkler system: wire alarm and supervisory switches and connect to control panel.
- .12 Connect fire suppression systems to control panel.
- .13 Splices are not permitted.
- .14 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and CCU, as required by equipment manufacturer.

- .15 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.
- .16 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and CAN/ULC-S537.
- .2 Fire alarm system:
 - .1 Test such device and alarm circuit to ensure manual stations, smoke detectors transmit alarm to control panel and actuate general alarm ancillary devices.
 - .2 Check annunciator panels to ensure zones are shown correctly.
 - .3 Simulate grounds and breaks on alarm and signaling circuits to ensure proper operation of systems.
 - .4 Addressable circuits system style DCLA:
 - .1 Test each conductor on all DCLA addressable links for capability of providing 3 or more subsequent alarm signals on each side of single open-circuit fault condition imposed near midmost point of each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
 - .2 Test each conductor on all DCLA addressable links for capability of providing 3 or more subsequent alarm signals during ground-fault condition imposed near midmost point of each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
- .3 Provide final PROM program re-burn for system Departmental Representative incorporating program changes made during construction.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.5 Training

- .1 Arrange and pay for on-site lectures and demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

3.6 PROTECTION

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

3.7 CLOSEOUT ACTIVITIES

- .1 Provide on-site lectures and demonstration by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

3.8 MAINTENANCE

- .1 Provide individual price on tender form for subsequent PROM re-burns. Price: good for 5 years from date of project completion.
- .2 Provide individual price on tender form for temporary program changes during construction period, to include zone labels, control functions, system operation.

END OF SECTION