

PART 1 - GENERAL

<u>1.1 REFERENCES</u>	.1	CAN/ULC-S524-2006, Standard for the Installation of Fire Alarm Systems.
	.2	CAN/ULC-S525-2007, Audible Signal Device for Fire Alarm Systems.
	.3	CAN/ULC-S526-2007, Visual Signal Devices for Fire Alarm Systems.
	.4	CAN/ULC-S527-1999, Control Units.
	.5	CAN/ULC-S528-2005, Manual Pull Station for Fire Alarm Systems.
	.6	CAN/ULC-S529-2009, 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-S536-04, Inspection and Testing of Fire Alarm Systems.
	.10	CAN/ULC-S537-04, Verification of Fire Alarm Systems.
	.11	NBCC- National Building Code of Canada.
	.12	NFCC- National Fire Code of Canada.
	.13	Fire Protection Standard from Treasury Board of Canada.
	.14	Where the standards listed above reference other standards, those requirements shall also apply.
<u>1.2 SYSTEM DESCRIPTION</u>	.1	Fully supervised, microprocessor based, fire alarm system, utilizing digital techniques for data control and digital and multiplexing techniques for data transmission.
	.2	System to carry out fire alarm and protection functions; including receiving alarm signals; initiating two stage alarm; supervising components and wiring; actuating annunciators

1.2 SYSTEM
DESCRIPTION
(Cont'd)

- .2 (Cont'd)
and auxiliary functions; initiating trouble signals and signalling to monitoring post within the Institution.
 - .3 Zoned, coded, two stage, addressable.
 - .4 Modular in design to allow for future expansion.
 - .5 Operation of system shall not require personnel with special computer skills.
 - .6 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/signalling.
 - .2 Fire alarm annunciator complete with graphic.
 - .3 All panel modules and add-on cards, connections, software and programming as required. Provide 25% spare capacity in control panel cabinet for future cards/modules.
 - .4 Power supplies.
 - .5 Initiating/input circuits.
 - .6 Output circuits.
 - .7 Auxiliary circuits.
 - .8 Wiring.
 - .9 Manual and automatic initiating devices.
 - .10 Ancillary devices.
 - .11 Relay outputs to initiate device shutdown on alarm.
 - .12 Audible and visual signalling devices.
 - .13 End of line devices.
 - .14 Printer or Event log memory chip.
 - .15 Historic event recorder.
 - .7 The new fire alarm system in the living unit shall be a fully networked node of the existing Siemens network system at the Institution. Existing active graphic annunciators shall be updated to display new living unit. The existing fire alarm programming shall be updated to reflect the new living unit. Provide cards and modules in existing system accordingly.
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1.3 REQUIREMENTS
OF REGULATORY
AGENCIES

- .1 System:
 - .1 To Fire Protection Standard from Treasury Board of Canada.
 - .2 Subject to Fire Commissioner of Canada (FC) approval.
 - .3 Subject to FC inspection for final acceptance.
- .2 System components: listed by ULC and comply with applicable provisions of National Building Code, and meet requirements of local authority having jurisdiction.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with the requirements of this section, Section 26 05 00.
- .2 Include:
 - .1 Overall system riser identifying control equipment, initiating zones, signaling circuits; devices and end-of-line devices (as applicable).
 - .2 Details for all products and devices used to produce a working system. Include all initiating and annunciating devices, end-of-line devices, panels, ancillary devices, and other devices required to produce a complete working fire alarm system.
 - .1 Identify all options and features that will be present with equipment as installed, including but not limited to: operating ranges, colors, voltage, phase, dimensions, enclosure ratings, materials or protective features.
 - .3 Step by step operating sequence, (cross-referenced to logic flow diagram if required for clarification).

1.5 CLOSEOUT
SUBMITTALS

- .1 Provide operation and maintenance data for fire alarm system for incorporation into manual specified in Section 01 78 00.
 - .2 Include:
 - .1 Instructions for complete fire alarm system 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.
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1.5 CLOSEOUT SUBMITTALS (Cont'd)	.2	Include:(Cont'd) .4 List of recommended spare parts for system.
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1.6 MAINTENANCE	.1	Provide individual price on tender form for temporary program changes during construction period, to include zone labels, control functions, system operation.
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PART 2 - PRODUCTS

2.1 MATERIALS	.1	Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
	.2	Power supply: to CAN/ULC-S524.
	.3	Audible signal devices: to ULC-S525.
	.4	Visual signal devices: to CAN/ULC-S526.
	.5	Control unit: to CAN/ULC-S527.
	.6	Manual pull stations: to CAN/ULC-S528.
	.7	Thermal detectors: to CAN/ULC-S530.
	.8	Smoke detectors: to CAN/ULC-S529.
	.9	Smoke alarms: to CAN/ULC-S531.

2.2 SYSTEM OPERATION: TWO STAGE - SIGNALS ONLY	.1	Actuation of any alarm initiating device on first stage to: .1 Cause electronic latch to lock in alarm state at central control unit (and data gathering panels/transponders where installed). .2 Indicate zone of alarm at central control unit and at remote annunciator(s). .3 Cause audible devices throughout building to sound depending on the location of alarm: .1 For inmate living area with device that initiated the alarm, a stage 1 alarm will be audible throughout that living area. .2 For all other inmate living areas, a stage 1 alarm will not be audible. Stage 1 alarms will be received and managed by supervising staff.
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2.2 SYSTEM
OPERATION: TWO
STAGE - SIGNALS
ONLY
(Cont'd)

- .1 (Cont'd)
 - .3 (Cont'd)
 - .3 For administrative (non-living) areas, a stage 1 alarm will be audible.
 - .4 Transmit alert signal to fire department via ULC communicator. Signals to fire department to be delayed by 15 seconds to allow response time by supervising staff.
 - .5 Where alert signals are present (non-living areas and living area with device that initiated alarm), lighting relays for those areas shall be forced 'on'.
 - .6 Cause air conditioning and ventilation fans to shut down or to function to provide required control of smoke movement.
 - .7 Cause elevators to return to floor of egress, or to alternate floor, as required.
 - .8 Cause all delayed egress hardware to release.
- .2 Actuation of any alarm initiating device on second stage to:
 - .1 Cause audible signalling devices to sound in the entire building.
 - .2 Cause fire doors and smoke control doors, if normally held open, to close automatically.
 - .3 Where alert and alarm signals are present, lighting relays for those areas shall be forced 'on'.
 - .4 Cause additional ancillary device shutdowns to occur.
- .3 Signals shall be capable of being silenced in staff supervisory stations and control rooms.
- .4 If first stage alarm is not acknowledged within 5 min, system to automatically go into second stage.
- .5 Acknowledging alarm: indicated at central control unit.
- .6 Possible to silence signals by "alarm silence" switch at central control unit, after 60 s period of operation.
- .7 Subsequent alarm, received after previous alarm has been silenced, to re activate signals.
- .8 Actuation of any supervisory device to:
 - .1 Cause electronic latch to lock in supervisory state at central control unit (and data gathering panels/transponders where installed).

2.2 SYSTEM
OPERATION: TWO
STAGE - SIGNALS
ONLY

(Cont'd)

- .8 (Cont'd)
 - .2 Indicate respective supervisory zone at central control unit and remote annunciator panels.
 - .3 Cause audible signal at central control unit to sound.
 - .4 Activate common supervisory sequence.
- .9 Resetting alarm or supervisory device will not return system indications/functions back to normal until control unit is reset.
- .10 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; visual indication to remain until trouble is cleared and system is back to normal.
 - .3 Troubles on system: suppressed during course of alarm.
 - .4 Trouble condition on any circuit in system not to initiate alarm conditions.

2.3 CONTROL PANEL

- .1 Central control unit (CCU).
 - .1 Suitable for DCLA communication style: to CAN/ULC-S524.
 - .2 Features specified are minimum requirements for microprocessor based system with digital data control and digital multiplexing techniques for data transmission.
 - .3 Minimum capacity of 500 addressable monitoring and 500 addressable control/signal points. Points may be divided between 2 communication channels in distributed system, each channel operating independently of other. Faults on one communication channel not to affect operation of other channel.
 - .4 Maintain 25% spare device capacity in each SLC loop.
 - .5 System to provide for priority reporting levels, with fire alarm points assigned highest priority, supervisory and monitoring lower priority, and third priority for troubles. Possible to assign control priorities to control points in system to guarantee operation or allow emergency override as required.
 - .6 Integral power supply, battery charger and standby batteries.
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- 2.3 CONTROL PANEL .1 (Cont'd)
- (Cont'd)
- .7 Basic life safety software: retained in non volatile Erasable Programmable Read Only Memory (EPROM). Extra memory chips: easily field installed. Random Access Memory (RAM) chips in panel to facilitate password protected field editing of simple software functions (e.g. zone labels, priorities) and changing of system operation software.
- .8 Circuitry to continuously monitor communications and data processing cycles of microprocessor. Upon failure, audible and visual trouble indication to activate.
- .9 Communication between CCU and remote DGP's/TPR's to be supervised, DCLA. Should communications fail between CCU and remote units, audible and visual trouble to be indicated at CCU. Data communication to be binary DC, baseband, time division multiplex, half duplex. Each data channel: capable of communicating up to distance of 3,000 m.
- .1 Communication between nodes in networked system to be supervised, DCLA. Should communications fail between any 2 nodes, other nodes on loop to continue to communicate with each other and programmed functions on communicating nodes to continue operating.
- .10 Support up to 2 RS 232 C I/O ports. CCU output: parallel ASCII with adjustable baud rates to allow interface of any commercially available printer, terminal or PC.
- .11 Equipped with software routines to provide Event Initiated Programs (EIP); change is status of one or more monitor points, may be programmed to operate any or all of system's control points.
- .12 Software and hardware to maintain time of day, day of week, day of month, month and year.
- .13 On board, 20 column, DC strip printer, thermal head with automatic paper take up, and silent operation; operational while system is operating on standby power.
- .14 Printer to record activities on system controlled by EIA RS 232 C link from within CCU.
- 2.4 POWER SUPPLIES .1 120 V, 60 Hz as primary source of power for system.
- .2 Voltage regulated, current limited distributed system power.
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- 2.4 POWER SUPPLIES (Cont'd)
- .3 Primary power failure or power loss (less than 102 V) will activate common trouble sequence.
 - .4 Panel load calculation to be submitted with shop drawing submittal.
 - .5 Interface with battery charger and battery to provide uninterruptible transfer of power to standby source during primary power failure or loss.
 - .6 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.
 - .7 Standby batteries: sealed, maintenance free. Minimum expected lifespan of 4 years. Sized in accordance with NBC.
 - .8 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/DCLC 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
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2.6 ALARM OUTPUT .1 (Cont'd)
CIRCUITS
(Cont'd) .1 (Cont'd)
continuously in a temporal pattern. Each signal
circuit: rated at 2 A, 24 VDC; fuse protected
from overloading/overcurrent.

2.7 AUXILIARY .1 Auxiliary contacts for control functions.
CIRCUITS
 .2 Alarm and supervisory, trouble on system to
 cause operation of programmed auxiliary output
 circuits where shown or specified.
 .3 Two sets of separate contacts for elevator
 capture (to main floor of egress and to
 alternate floor of egress).
 .4 Upon resetting system, auxiliary contacts to
 return to normal or to operate as pre-
 programmed.
 .5 Auxiliary circuits: rated at 2 A, 24 VDC or
 120 VAC, fuse protected.

2.8 WIRING .1 Twisted copper conductors installed in conduit.
 .2 Minimum wire gauges:
 .1 120 VAC wiring, #12 AWG minimum, installed
 in conduit.
 .2 To initiating circuits: #18 AWG minimum,
 ULC listed, and in accordance with
 manufacturer's requirements.
 .3 To signal circuits: #16 AWG minimum for
 horn/strobe circuits, ULC listed, #14 AWG for
 bell circuits, and in accordance with
 manufacturer's requirements.
 .4 To control circuits: #14 AWG minimum, ULC
 listed, and in accordance with manufacturer's
 requirements.
 .3 Size all signalling and control circuits for
 maximum 5% voltage drop at last
 signalling/control device on each circuit.
 .4 Conduit shall not enter the fire alarm control
 panel, or any other remotely mounted control
 panel equipment or back-boxes, except where
 conduit entry is specified by the manufacturer.
 .5 One strand of 50/125 Multi-mode fiber optic
 wire from the new Control Panel to the existing

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| 2.8 WIRING
(Cont'd) | .5 | (Cont'd)
site wide central control panel in new and existing conduits and ducts. |
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| 2.9 MANUAL ALARM STATIONS | .1 | Addressable manual pull station: Pull lever, semi flush wall mounted type, single action, two stage, electronics to communicate station's status to addressable module/transponder over 2 wires and to supply power to station. Station address to be labelled on station in field. |
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| 2.10 AUTOMATIC ALARM INITIATING DEVICES | .1 | Addressable thermal fire detector.
.1 Combination fixed temperature and rate of rise, non restorable fixed temperature element, self restoring rate of rise, fixed temperature 57°C, rate of rise 8.3°C per minute.
.1 Electronics to communicate detector's status to addressable module/transponder.
.2 Detector address to be set on detector base in field. |
| | .2 | Addressable smoke detector.
.1 Ionization type.
.2 Electronics to communicate detector's status to addressable module/transponder.
.3 Detector address to be set on detector base in field. |
| | .3 | Addressable Duct Type Smoke Detector.
.1 Air duct type with sampling tubes with protective housing.
.2 Plug-in type with fixed base.
.3 Wire-in base assembly with integral red alarm LED and terminals for remote alarm LED. |
| | .4 | Addressable Carbon Monoxide Detector.
.1 Listed to UL 2075.
.2 Equipped with an audible alarm and a trouble relay. Alarm to sound at 85dB, 3m from detector.
.3 Dual colour LED indicator light. |
| | .5 | Electronics to communicate detector's status to addressable module/transponder. |
| | .6 | Plug in type with fixed base. |
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| 2.10 AUTOMATIC
ALARM INITIATING
DEVICES
<u>(Cont'd)</u> | .7 | Wire-in base assembly with integral red alarm LED. |
| | .8 | Detector address to be labelled on detector in field. |

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| 2.11 AUDIBLE
SIGNAL DEVICES | .1 | Bells: flush or surface mounted, single stroke, polarized, 24 VDC, 150 mm, 92 dB. |
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| 2.12 VISUAL ALARM
SIGNAL DEVICES | .1 | Strobe type: flashing, white, 24 VDC. |
| | .2 | Synchronize operation of visual signals. |
| | .3 | Field selectable brightness settings (lux/cd). |
| | .4 | Designed for surface mounting on walls (or as indicated). |

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| 2.13 END-OF-LINE
DEVICES | .1 | Required for Class B (non-coded) fire alarm circuits. |
| | .2 | End of line devices to control supervisory current in alarm circuits and/or 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. |
| | .3 | Install EOL devices in separate box with labels indicating zone. Where coded devices (addressable) are installed with a single device per zone, the EOL may be installed in the initiating device box. |

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| 2.14 REMOTE
ANNUNCIATORS | .1 | Alphanumeric type, with designation cards to indicate zones. |
| | .2 | Display:
.1 Alarms and troubles for alarm initiating circuits.
.2 Supervisory alarms and troubles for supervisory initiating circuits. |
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| 2.14 REMOTE
ANNUNCIATORS
(Cont'd) | .2 | Display: (Cont'd) |
| | .3 | Common system trouble. |
| | .3 | Trouble buzzer. |
| | .4 | Acknowledging trouble at main panel to silence trouble buzzers in system. |
| | .5 | Supervised, with LED test button and stage 1 and stage 2 alarms acknowledge button. |
| 2.15 GRAPHIC
DISPLAY | .1 | Passive type, in glazed frame, at remote annunciator. |
| 2.16 AS-BUILT
RISER DIAGRAM | .1 | Fire alarm system riser diagram: in glazed frame on black lamicoid sheet with bevelled edges, white lettering and designations, minimum size 600 x 600 mm. |
| 2.17 ANCILLARY
DEVICES | .1 | Relay output to initiate fan shutdown. |
| | .2 | Relay outputs to initiate scan on of lighting relays as described in these specifications. |

PART 3 - EXECUTION

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| 3.1 GENERAL | .1 | All construction waste to be handled in accordance with requirements of Section 01 74 20. |
| | .2 | All materials delivered and stored on site shall be protected from theft, mechanical and environmental damage (temperature, moisture, dust and other contaminants). |
| 3.2 INSTALLATION | .1 | Install systems in accordance with CAN/ULC-S524 and Fire Protection Standard from Treasury Board of Canada. |
| | .2 | Install central control unit and connect to ac power supply, ac dc standby power. |
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3.2 INSTALLATION (Cont'd)

- .3 Install manual alarm stations and connect to alarm circuit wiring.
 - .4 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of 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 bells and visual signal devices and connect to signalling circuits.
 - .7 Connect signalling circuits to main control panel.
 - .8 Install end of line devices at end of alarm and signalling circuits (as required).
 - .9 Install remote annunciator panels and connect to annunciator circuit wiring.
 - .10 Install door releasing devices.
 - .11 Install remote relay units to control fan shut down.
 - .12 Sprinkler system: wire alarm and supervisory switches and connect to control panel.
 - .13 Install detectors. Make necessary connections between room detection panel and main fire alarm panel.
 - .14 Locate and install audible signals and visual alarms.
 - .15 Connect fire suppression systems to control panel.
 - .16 Splices are not permitted.
 - .17 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and CCU, as required by equipment manufacturer.
 - .18 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.
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3.2 INSTALLATION .19 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.

3.3 FIELD QUALITY .1 Perform tests in accordance with Section CONTROL 26 05 00 and CAN/ULC-S537.

- .2 Fire alarm system:
 - .1 Test all zones, signal, alarm, ancillary and annunciation devices which have been installed.
 - .2 Test such device and alarm circuit to ensure manual stations, thermal and smoke detectors, and sprinkler system devices transmit alarm to control panel and actuate alarm states and operate ancillary devices.
 - .3 Test each signal device and each signal circuit; including auxiliary inputs and trouble signals.
 - .4 When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.
 - .5 Check annunciator panels to ensure zones are shown and actuated correctly. Ensure that each smoke detector and zone is properly annunciated.
 - .6 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of systems.
 - .7 Tests to be carried out by the contractor or contractors agent.
 - .8 Tests to include witness of fan shutdown, activation of lighting circuits on alarm, magnetic door holder operation, preaction/clean agent system operation and all other ancillary devices.
 - .9 Tabulated, contractor stamped, signed and dated test results are to be submitted to the Departmental Representative for review and approval, and included in the O&M manual.
 - .10 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
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- 3.3 FIELD QUALITY CONTROL (Cont'd)
- .2 Fire alarm system: (Cont'd)
- .10 (Cont'd)
- .1 (Cont'd)
- 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 EPROM program for system incorporating program changes made during construction.
- 3.4 VERIFICATION
- .1 Verify all zones, signal, and alarm, which have been installed or modified in any fashion. Verification to CAN/ULC-S537. Include verification costs in tender price.
- .2 Test each device and alarm circuit to ensure manual stations, thermal and smoke detectors transmit alarm to control panel and actuate first stage alarm, general alarm and ancillary devices.
- .3 Test each signal device and each signal circuit.
- .4 Check the fire alarm panel display to ensure zones are shown and actuated correctly. Ensure that each smoke detector is properly annunciated.
- .5 Simulate grounds and breaks on alarm and signalling devices and circuits to ensure proper operation of trouble signals.
- .6 Test to be carried out in the presence of a Departmental Representative from the engineering office where applicable.
- .7 Verification to include the operation at the existing central station connections.
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| 3.4 VERIFICATION
(Cont'd) | .8 | Verification to include a witness of the ventilation system (and other ancillary shutdowns) shutdown on fire alarm. |
| | .9 | The contractor will be responsible for corrective deficiencies in the contractor's work that are reported by the verification agent. |
| | .10 | Fire alarm verifier to certify one plan drawing. Certification to be included on fire alarm verification report. |
| | .11 | Contractor to carry the cost of the verification in the bid price. |
| 3.5 DEMONSTRATION
AND TRAINING | .1 | Provide on site lectures and demonstration by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system. |
| | .2 | Allow for three (3) separate training sessions, three (3) hours for each. |
| 3.6 AS-BUILT
DRAWINGS | .1 | Record all wiring, terminations/splicing, pipe runs and junction box locations on the asbuilt drawings. Include wire gauge, conduit size and junction box size. |
| | .2 | As-built drawings to show ladder diagram of operation detailing input signals to programmed output function for programmed systems. |
| | .3 | As-built drawings to show fire alarm zoning, device addresses and the location of each field device of the fire alarm system including fault isolation modules, ancillary devices and control panels. |
| | .4 | Include room and corridor numbers. |
| | .5 | Show all line voltage branched circuit connections including ancillary connections. Include panel identification, circuit number and over-current protection. |
| | .6 | Identify each drawing in lower right hand corner in letters at least 12mm high as follows:
"ASBUILT DRAWINGS: THIS DRAWINGS HAS BEEN REVISED TO SHOW ELECTRICAL SYSTEMS AS INSTALLED"
complete with electricians signature and date. |
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3.6 AS-BUILT DRAWINGS (Cont'd)	.7	Submit completed record drawing with Operating & Maintenance Manuals to the Departmental Representative for approval and make corrections as directed.
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