**75 Point Analog Addressable Fire Alarm System**

PART 1.0 – GENERAL

1.1 DESCRIPTION:

1. This section of the specification includes the furnishing, installation, connection, and testing of the intelligent, microprocessor controlled, analog addressable, fire alarm equipment required to form a complete and operational system. It shall include but not be limited to a Fire Alarm Control Panel (FACP), alarm initiating devices, alarm notification appliances, auxiliary control devices, annunciators, TCP/IP (Ethernet) and/or digital alarm communications to central stations, and wiring as shown on the drawings and specified herein.
2. The fire alarm system shall comply with the requirements of NFPA 72 National Fire Alarm Code except as modified by the local Authority Having Jurisdiction and supplemented by this specification. The system field devices shall be supervised either electrically or through software driven polling process.
3. The FACP and associated field devices shall be manufactured or supplied 100% by a single U.S. manufacturer that is ISO 9001 certified.
4. The FACP and associated field devices system shall comply with the following Underwriters Laboratories Inc. (UL) USA listing standards as applicable.

	1. No. 38 Manually Actuated Signaling Boxes
	2. No. 50 Cabinets and Boxes
	3. No. 864 Control Units for Fire Protective Signaling Systems
	4. No. 268 Smoke Detectors for Fire Protective Signaling Systems
	5. No. 268A Smoke Detectors for Duct Applications
	6. No. 346 Waterflow Indicators for Fire Protective Signaling Systems
	7. No. 464 Audible Signaling Appliances
	8. No. 521 Heat Detectors for Fire Protective Signaling Systems
	9. No. 1638 Private Mode Emergency and General Utility Signaling
	10. No. 1971 Visual Notification Appliances
5. The FACP shall meet the requirements of UL ANSI 864 Ninth Edition. Systems listed to UL ANSI 864 Eighth Edition or earlier revisions are not acceptable.
6. The installing company shall provide employ NICET Level II (or higher) fire alarm technicians to supervise the programming and testing of the system and to ensure the systems integrity.

1.2 SCOPE:

1. An intelligent, microprocessor controlled, analog addressable fire alarm detection system shall be installed in accordance with the project specifications and drawings.
2. Basic Performance:

	1. Analog Addressable devices shall be connected to the FACP Signaling Line Circuit (SLC)
	2. The FACP SLC shall support either Class A (Style 6 or 7) or Class B (Style 4) wiring configuration.
	3. The SLC loop shall not require twisted or shielded cabling. Systems that require twisted and/or shielded cabling for the SLC loop are not acceptable.
	4. The FACP Notification Appliance Circuits shall support either Class A (Style Z) or Class B (Style Y) wiring configuration.
	5. The FACP RS-485 bus shall support either Class A or Class B wiring configuration.
	6. All circuits shall be power limited per UL 864 requirements.
	7. The secondary power source of the fire alarm control panel shall be capable of providing at least 24 hours of backup power with the ability to power the system for an additional 5 minutes in an alarm condition, at the end of the 24 hour backup period.

1. Basic System Operation
	1. When an off normal condition occurs (Alarm, Supervisory, or Trouble) the respective LED on the FACP shall illuminate.
	2. A piezo sounder shall activate at the FACP during any off normal condition until the SILENCE button is pressed by an authorized user.
	3. A Red LED shall illuminate when an alarm or pre-alarm condition exists.
	4. An Amber (yellow) LED shall illuminate when a Supervisory or Trouble condition exists.
	5. A backlit 2 line 32 character LCD screen shall display all messages that refer to an off-normal condition.
	6. An Alarm condition shall have priority over all other signals.
	7. The FACP shall include an event buffer that maintains the last 1000 system events including a date and time stamp for each.
	8. In response to a fire alarm condition, the systems notification appliances and relay controlled output circuits that are associated through programming with the device initiating the alarm, shall automatically activate. Additionally the system shall notify an approved central station via dial-up, IP, or cellular means as deemed acceptable by the local Authority Having Jurisdiction (AHJ).

1.3 SUBMITTALS:

1. General
	1. Two (2) copies of all submittals shall be submitted to the Architect/Engineer for review and approval.
	2. All references to manufacturers model numbers and other pertinent information herein is intended to establish minimum standards of performance, function, and quality.
	3. For equipment other than that specified, the contractor shall provide proof that the proposed substitute equipment equals or exceeds the form, feature, function, performance, and quality of the specified equipment.
2. Shop Drawings
	1. Drawings shall be provided that include all field devices that are installed as part of the fire alarm system including the address, circuit, location, and type for each. Whenever possible, the drawings shall reflect other components of the building such as air diffusers, HVAC returns, lights, etc. to determine compliance.
	2. The drawings shall include conductor counts and wire sizes for each circuit.
	3. The location and mounting configuration of the FACP, remote power supplies, and terminal cabinets shall be indicated on the drawings.
3. Other documentation
	1. In addition to the shop drawings, the following information shall also be included with the submittal.

		1. Manufacturer’s technical data sheets for each piece of equipment that will be installed.
		2. Standby battery calculations for the FACP and any remote power supply or other panels that include their own standby batteries.
		3. Voltage drop calculations showing the worst case end of line voltage for all notification appliance circuits
		4. Detailed description of the overall operation of the system or a sequence of operation matrix.
		5. Proof of factory training and certification of the supervising technician assigned to the project.
		6. Proof of factory training and certification of a service technician employed by the installation company that can be onsite to troubleshoot and repair any service related problems with the system, within 4 hours of being notified of the problem.

1.4 WARRANTY:

1. All of the main fire alarm system components including control panels, detectors, modules, and notification devices furnished under this contract shall include a warranty from the manufacturer for a period of five (5) years from the date of purchase. All other materials, labor and work performed under this contract shall be free of defects and shall remain so for a period of one (1) year from the date of acceptance. The full cost of materials and labor to correct any defects during these warranty periods shall be included in the installed price of the system.

1.5 MAINTENANCE:

1. Maintenance and testing shall be on a semi-annual basis or as required by the AHJ. A preventative maintenance schedule shall be provided by the contractor describing the protocol for preventative maintenance. The schedule shall include:

	1. Systematic testing and complete inspection of the entire fire alarm system including control panels, field devices, and wiring terminations including smoke sensors, heat sensors, manual pull stations, sprinkler system switches, remote panels, power supplies, and terminal boxes, and all other fire alarm accessories, in accordance with NFPA 72. Cleaning and adjusting of these devices shall be conducted at this time.
	2. An inspection and test of system power supplies, batteries, circuit breakers, and fuses as well as a load test of the batteries shall be conducted in accordance with NFPA 72.
	3. Placing the system into an alarm condition and checking each notification device for proper operation.
	4. Removing devices from the FACP SLC circuit to ensure a trouble condition occurs.
	5. Input and output mapping shall be tested to ensure proper sequence of operation.
	6. Signal transmission shall be tested to the Monitoring Station.
	7. A report showing the calibrated sensitivity of each of the systems smoke detectors shall be generated from the fire alarm control panel and verified to ensure all smoke detectors are within UL tolerance.
	8. Following each periodic maintenance and test, the owner shall be provided with a detailed report of the test results including any deficiencies found.

1.6 POST CONTRACT EXPANSIONS:

1. The contractor shall supply any necessary parts and/or labor necessary for expansion of the system for a period of 1 year from the date of completion.
2. When submitting the fire alarm system bid package, the contractor shall provide a quote for the expansion of the system by 10%. The quote shall include all costs for a complete installation including labor and materials for 1/10th of the number of devices used in the original overall specification and installation. The pricing shall be itemized to show single lot individual pricing of each item.
3. The prices quoted for system expansion will remain valid for 1 year from the date of completion.
4. The system expansion pricing shall be all inclusive and include costs for programming or reprogramming the system as needed.
5. Submittals that do not include a quote for expansion will be rejected.

1.7 APPLICABLE STANDARDS AND SPECIFICATIONS:

1. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

	1. National Fire Protections Association (NFPA)

		1. No. 13 Sprinkler Systems
		2. No. 70 National Electric Code (NEC)
		3. No. 72 National Fire Alarm Code
		4. No. 101 Life Safety Code
	2. Local and State Building Codes
	3. All requirements of the local Authority Having Jurisdiction (AHJ)

1.8 APPROVALS:

1. The system shall have the proper listing and/or approval from the following recognized agencies:

	1. UL Underwriters Laboratories Inc.
	2. CSFM California State Fire Marshall
	3. NYCFD New York City Fire Department

PART 2.0 – PRODUCTS:

2.1 EQUIPMENT AND MATERIALS:

1. All equipment and components shall be new, and of the manufacturers current model. The materials, appliances, equipment, and devices shall be tested and listed for its intended purpose by a recognized national listing testing laboratory.
2. All equipment and components shall be installed in strict compliance with the manufacturer’s recommendations as indicated in the installation manuals and wiring diagrams for the system.
3. All equipment attached to walls and ceiling shall be securely fastened. Ceiling mounted devices shall not be supported solely by suspended ceilings. A back box shall be used for mounting all equipment. A listed and compatible back box shall be used on all outdoor devices or those devices installed in locations subject to moisture.
4. All equipment shall be manufactured by an ISO 9001 certified company.
5. All equipment shall be readily available through wholesale distribution outlets to licensed installation contractors that are independent of the systems manufacturer.

2.2 CONDUIT AND WIRE:

1. Conduit:

	1. The conduit or raceway shall be installed in accordance with the National Electrical Code, state and local requirements.
	2. Where required, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40% on the interior cross sectional area where three or more cables are contained within a signal conduit.
	3. All conduit and raceway shall be listed and/or approved by a recognized national testing laboratory.
	4. Conduit size shall be ¾” minimum.
	5. Conduit may only enter the fire alarm control panel, power supply, annunciator, and other system cabinets through the pre-punched knockouts provided by the system manufacturer.
	6. Fire alarm cables must be separated from any Class 1 circuits, and shall not be placed in any conduit, junction box, or raceway containing Class 1 or light or power circuits.
	7. With the exception of telephone connections, wiring for 24 volt DC control, alarm, notification, emergency communication and similar power-limited auxiliary functions, may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
2. Wire:
	1. All fire alarm wiring shall be new.
	2. Wiring shall be installed in accordance with local, state, and national codes and as recommended by the manufacturer of the fire alarm system.
	3. All wire and cable shall be listed and/or approved by a recognized national testing laboratory for its intended purpose.
	4. The Signaling Line Circuit (SLC) loop shall be installed with a minimum #18 AWG wire, and shall allow the use of non-twisted and non-shielded solid or stranded wire. Systems that require twisted and/or shielded wiring are not acceptable.
	5. Notification Appliance Circuits (NAC) shall be wired with not less than #16 AWG wire as required for proper end of line operating voltage.
	6. All field wiring shall be supervised for open circuits and earth ground faults.
	7. The FACP RS-485 wiring bus shall be capable of operating system devices up to 6500 feet away from the main panel, without the use of additional power supplies, boosters or signal amplifiers.
3. Terminal Boxes, Junction Boxes, and Cabinets

	1. All terminal boxes, junction boxes, and accessory cabinets shall be listed for their intended purpose.

2.3 FIRE ALARM CONTROL PANEL (FACP)

1. The FACP shall be a Potter Electric Signal Company model PFC-6075 microprocessor based analog addressable type system.
2. Overview and Features:

	1. The FACP shall include one (1) Signaling Line Circuit (SLC) that will power, supervise, monitor, and control a maximum of 75 analog addressable points which may be made up of any combination of sensors and modules. The SLC shall have the capability to be wired in an NFPA Style 4, 6, or 7 (Class A or B) configuration.
	2. The FACP shall have 3 form C relays dedicated to Alarm, Trouble, and Supervisory conditions. These relays shall have a contact rating of 3 Amps at 24VDC.
	3. The FACP shall have a power supply capable of providing a minimum of 3.5 amps of 24 VDC power to devices requiring auxiliary power and/or notification appliances.
	4. The FACP shall have two (2) programmable Notification Appliance Circuits rated at no less than 3 amps per circuit and capable of being wired in a Class A or Class B configuration. These circuits shall be programmable for the following output types:

		1. Notification Appliance Circuit – Continuous Output
		2. Notification Appliance Circuit – ANSI Temporal Output
		3. Notification Appliance Circuit – Synchronized Output
		4. Auxiliary Power – Constant
		5. Auxiliary Power – Resettable
		6. Door Holder Power – Constant
		7. Door Holder Power – Low AC Dropout
		8. City Tie - Reverse Polarity Output for applications in compliance with applicable NFPA standards.
	5. The FACP NAC circuits shall include the capability to automatically synchronize notification appliances from multiple manufacturers simultaneously on the same FACP without the need for a synchronization module. Systems that do not allow for multiple brands of strobes to be synchronized together on the same panel are not acceptable. The following manufacturers synchronization protocol shall be supported as a minimum:
		1. Amseco
		2. Gentex
		3. Wheelock
		4. System Sensor
	6. The FACP shall include a 4-wire serial P-LINK bus for communication with system annunciators, power supplies, expansion modules, and other accessories. The P-LINK bus shall support a wiring distance of no less than 6500 feet from the panel to the furthest device.
	7. The FACP shall have two (2) programmable I/O Circuits rated at 1 amp per circuit and capable of being wired in a Class B configuration. These circuits shall be programmable for the following output types.
		1. Notification Appliance Circuit – Continuous Output
		2. Notification Appliance Circuit – ANSI Temporal Output
		3. Notification Appliance Circuit – Synchronized Output
		4. Auxiliary Power – Constant
		5. Auxiliary Power – Resettable
		6. Door Holder Power – Constant
		7. Door Holder Power – Low AC Dropout
		8. City Tie - Reverse Polarity Output for applications in compliance with applicable NFPA standards.
		9. Contact Input Pull Station
		10. Contact Input Waterflow
		11. Contact Input Supervisory
		12. Contact Input Tamper
		13. Contact Input Fire Drill
		14. Contact Input Trouble Monitor
		15. Contact Input Aux.
		16. Trigger IO Reverse Polarity
		17. Trigger IO Reverse Polarity No Trouble
		18. Contact Input Reset
		19. Contact Input Silence
	8. The FACP shall include an operator interface keypad and annunciation panel that includes a 32 character backlit LCD display and color coded system status LED’s.
	9. The FACP shall include a LEARN feature to quickly and automatically detect and enroll all system devices, and make them operational. The LEARN function shall allow an authorized user to subsequently run a LEARN function after initial installation in order to make changes to the system, without deleting any existing programming. Systems that include auto-program functions that delete existing programming when ran are not acceptable.
	10. The FACP shall be housed in a UL listed key locked cabinet with sufficient space to house 8AH or 18AH batteries.
	11. The FACP shall include programming terminals for the purpose of addressing system SLC devices without the need for a special programmer.
	12. The FACP shall be capable of being programmed with an IP address so that it can reside on a standard TCP/IP network. The IP address shall be able to be assigned dynamically through DDNS or programmed statically.
	13. The FACP shall include a built-in TCP/IP Ethernet port for programming and communications purposes.
		1. The TCP/IP Ethernet port shall be capable of communicating to an approved UL listed central station via the internet or other compliant TCP/IP network connection, without the need for additional modules or software.

			1. The central station communication shall be transmitted in a format capable of transmitting event information by point or by software zone.
			2. If applicable, the installation contractor shall verify the building network components compliance with any applicable codes and standards including NFPA and UL.
		2. The TCP/IP Ethernet port shall be capable of connecting a computer to the FACP for programming purposes using a standard Ethernet patch cable. Systems that require special cables, modules or adapters for programming are not acceptable.
		3. The FACP shall be capable of emailing the systems software program, event history, detector status, and any off-normal events that occur, to up to 20 preauthorized email recipients. Authorized email recipients shall have the ability to opt in and out of email transmissions by sending the FACP a standard email message.
	14. The FACP shall include the ability to add a Digital Alarm Communicating Transmitter (DACT). The DACT shall be capable of being used in lieu of or in addition to the IP central station communication capability.
	15. The FACP operating software shall include the following features:

		1. The ability to program any input to activate any output or group of outputs on the system.
		2. Drift compensation to ensure smoke detector accuracy between maintenance inspections.
		3. Maintenance alert function to warn of excessive dust or dirt accumulation in a smoke detector.
		4. Built-in detector sensitivity test meeting the requirements of NFPA 72.
		5. 1000 event history buffer that stores all off-normal conditions and actions along with a time/date stamp of when they occurred.
		6. Alarm verification feature with a programmable timer.
		7. Positive Alarm Sequence capability meeting NFPA 72 requirements.
		8. One person walk-test capability with all devices tested during walk-test mode recorded in the event history buffer.
		9. Duplicate device address detection to determine if more than 1 device per SLC loop shares the same address. An authorized user shall also be able to turn on the LED for any device address to assist in troubleshooting duplicate address troubles.
3. Operator Control and Interface

	1. The FACP shall include an intuitive operator interface that includes the following:

		1. Acknowledge (ACK) Button

			1. Depressing the FACP ACK button in response to new alarms and/or troubles shall silence the local piezo sounder and change the alarm and trouble LED’s from flashing mode to steady ON mode. The alarm or trouble event information on the LCD display shall also display an icon indicating that the event has been acknowledged.
		2. Alarm Silence (SILENCE) Button

			1. Depressing the FACP SILENCE button shall cause all silenceable alarm notification appliances and relays to return to their normal non-alarm condition. The selection of which notification appliance circuits and relays that are silenceable by this button, shall be fully field programmable within the confines of all applicable codes and standards. The FACP software shall include silence inhibit and auto silence/unsilence timers.
		3. Alarm Activate (DRILL) Button

			1. Depressing the FACP DRILL button shall activate all notification appliance circuits. The drill function shall latch until the ESC button is depressed.
		4. System (RESET) Button

			1. Depressing the FACP RESET button shall cause all electronically latched input devices and software zones, as well as all associated output devices and circuits to return to their normal condition.
		5. Display
			1. The user interface display shall be a backlit 2 line 32 character LCD.

2.4 SYSTEM COMPONENTS

1. Compatible FACP Accessories
	1. Digital Alarm Communicating Transmitter
		1. Potter Electric Signal model UD-1000
	2. Class A module
		1. Potter Electric Signal model CA-6075
			1. CA-6075 shall provide the means to allow the FACP’s SLC, P-LINK, and NAC circuits to be wired in a Class A configuration.
	3. LCD Remote Annunciators
		1. Potter RA-6500
			1. RA-6500 shall provide the means for an authorized user to operate the system from a location remote to the main panel.

* + - 1. RA-6500 shall include a 4 line 160 character backlit LCD display.
			2. The system shall support a total of 31 LCD Remote Annunciators.
		1. Potter RA-6075
			1. RA-6075 shall provide the means for an authorized user to operate the system from a location remote to the main panel.
			2. RA-6075 shall include a 2 line 32 character backlit LCD display.
			3. The system shall support a total of 31 LCD Remote Annunciators.
		2. LED-16
			1. 16 LED annunciator with common indicators in a locked metal enclosure
			2. The system shall support a total of 10 LED Remote Annunciators.
	1. Intelligent Power Expanders
		1. Potter Electric Signal Model PSN-1000(e)
			1. PSN-1000(e) shall add 10 amps of power, 6 programmable NAC circuits, and 2 programmable I/O circuits.
			2. The PSN-1000(e) shall be capable of Quadrasync strobe synchronization as described earlier in this specification.
			3. The system shall support a total of 31 PSN-1000(e) Intelligent Power Expanders.
	2. LED Driver
		1. Potter Electric Signal model DRV-50
			1. Shall be used to connect up to 50 LEDs in a graphic display
			2. May mount in an accessory cabinet, AE-2 ,AE-8 or AE-14 Accessory Cabinets or the PSN-1000/E Power Supply
			3. The system shall support a total of 10 LED Drivers
	3. Fire Communication Bridge
		1. Potter Electric Signal model FCB-1000
			1. Shall provide remote mounting of the FACP’s Ethernet connection
			2. May mount in an accessory cabinet, AE-2 ,AE-8 or AE-14 Accessory Cabinets or the PSN-1000/E Power Supply
			3. May be installed in the stacker bracket or ordered with optional rack mount enclosure.
	4. Fiber Interface Bridge
		1. Potter Electric Signal model FIB-1000
			1. The system shall support a total of 31 Fiber cards
			2. May mount in an accessory cabinet, AE-2 ,AE-8 or AE-14 Accessory Cabinets or the PSN-1000/E Power Supply
			3. May be installed in the stacker bracket or ordered with optional rack mount enclosure.
	5. Serial Parallel Gateway
		1. Potter Electric Signal model SPG-1000
			1. The system shall support a total of 31 Serial / Parallel Printer modules
			2. May mount in an accessory cabinet, AE-2 ,AE-8 or AE-14 Accessory Cabinets or the PSN-1000/E Power Supply
			3. May be installed in the stacker bracket or ordered with optional rack mount enclosure.
	6. Relay Expander
		1. Potter Electric Signal model RLY-5
			1. The system shall support a total of 31 Relay cards
			2. May mount in an accessory cabinet, AE-2 ,AE-8 or AE-14 Accessory Cabinets or the PSN-1000/E Power Supply
			3. Contacts Rated to 3.0A at 24VDC and 3.0A at 125VAC
1. Compatible SLC Devices
	1. Analog Addressable Photoelectric Smoke Detector
		1. Potter Electric Signal model PSA
	2. Analog Addressable Photoelectric Smoke Detector w/Heat Detector
		1. Potter Electric Signal model PSHA
	3. Analog Addressable Fixed Temperature Heat Detector
		1. Potter Electric Signal model FHA
		2. The FHA shall be programmable for a 135 up to 185 degree operating temperature.
	4. Analog Addressable Rate-of-Rise Heat Detector
		1. Potter Electric Signal model RHA
	5. 6” Detector base
		1. Potter Electric Signal model AB-6
	6. 4” Detector Base
		1. Potter Electric Signal model AB-4
	7. Addressable Detector Base with Sounder
		1. Potter Electric Signal model ASB
	8. Addressable Detector Base with Relay
		1. Potter Electric Signal model ARB
	9. Addressable Detector Base with Isolator Module
		1. Potter Electric Signal model AIB
	10. Addressable Duct Detector
		1. Potter Electric Signal model DDA
	11. Manual Pull Stations
2. Single Action – Potter Electric Signal model APS-SA
3. Dual Action – Potter Electric Signal model APS-DA
	1. Relay output Module
		1. Potter Electric Signal model TRM-4
			1. The TRM-4 shall have 2 sets of Form C relays that are rated for 2 amps at 24VDC.
	2. Single Contact Input Module
		1. Potter Electric Signal model SCM-4
	3. Dual Contact Input Module
		1. Potter Electric Signal model DCM-4
	4. Conventional Initiating Zone Module
		1. Potter Electric Signal model CIZM-4
	5. Monitored Output Module
		1. Potter Electric Signal model MOM-4
	6. Short Circuit Isolator Module
		1. Potter Electric Signal model SCI
4. Conventional Devices

	1. Carbon Monoxide Detector
		1. The carbon monoxide detector shall be the Potter Electric Signal model number CO-12/24.
			1. The CO-12/24 shall be installed with a Potter DCM-4 dual contact module or SCM-4 single contact module to monitor alarm and trouble conditions.
			2. The CO-12/24 shall be installed using resettable 24VDC aux power from a NAC or I/O circuit on the system.
	2. Notification Appliances
		1. Audible Indicating Appliances
			1. All audible sounding devices shall operate on 24 VDC and be UL listed as compatible with the FACP.
			2. All audible devices shall be programmed to sound in the ANSI Temporal 3 sound pattern.
			3. Audible appliances shall be Potter Electric Signal model EH-24.
		2. Visual Indicating Appliances
			1. All visual indicating appliances shall operate on 24VDC and be listed as compatible with the FACP.
			2. All visual indicating appliances shall support an adjustable candela feature that is set for the appropriate coverage area per NFPA 72.
			3. Visual indicating appliances shall meet UL and ADA requirements.
			4. Visual indicating appliances shall be Potter Electric Signal model S-24 for wall mounted applications or model CS-24 for ceiling mounted applications.
		3. Audible/Visual Indicating Appliances
			1. All audible/visual indicating appliances shall operate on 24VDC and be listed as compatible with the FACP.
			2. All audible/visual indicating appliances shall support an adjustable candela feature that is set for the appropriate coverage area per NFPA 72.
			3. All audible/visual appliances shall be programmed to sound in the ANSI Temporal 3 sound pattern.
			4. Visual indicating appliances shall meet UL and ADA requirements.
			5. Audible/Visual indicating appliances shall be Potter Electric Signal model HS-24 for wall mounted applications or CHS-24 for ceiling mounted applications.
	3. Batteries
		1. Batteries used for backup power to the main FACP or remote power supply panels shall be of the sealed lead acid, maintenance free type.
		2. Batteries shall be sized according to the power requirements of the FACP and be capable of operating the system in standby mode for a minimum of 24 hours followed by 5 minutes in alarm condition.
		3. Battery calculations shall be supplied showing the calculated standby battery size after factoring in a minimum 15% efficiency/derating factor.

PART 3.0 – EXECUTION

3.1 INSTALLATION:

1. The entire installation shall be in accordance with NFPA 72, NFPA 70 (NEC), state and local codes, and meet the requirements of the local Authorities Having Jurisdiction.
2. The installation shall be in accordance with manufacturers recommended practices and installation instructions.
3. Smoke detectors shall not be installed until all construction is completed and construction dust and debris are removed. Detectors that were installed in construction areas shall be removed, cleaned, and recalibrated prior to final acceptance.
4. All conduit, junction boxes, and supports shall be concealed in finished areas and may be exposed in unfinished areas.

3.2 ACCEPTANCE TEST:

1. All tests shall be conducted in accordance with NFPA 72
2. Persons conducting fire alarm acceptance tests shall be knowledgeable in fire alarm systems. This is verified by the proper training and recognition from wither the factory, NICET, International Municipal Signal Association, State or locally certified, or trained by a company that is listed by a national testing laboratory.
3. The fire alarm test shall be thorough and test 100% of all circuit, devices, and signals. That test shall include but not be limited to the following:
	1. Prior to powering the system, check for ground faults, short circuits, and continuity.
	2. Test the supervisory valves connected to the fire suppression system for a supervisory signal sent to the panel.
	3. Test all sprinkler waterflow switches. Retard times shall not exceed 90 seconds.
	4. Open and short each SLC circuit and verify a trouble condition occurs.
	5. Open and short each notification appliance circuit and verify a trouble condition occurs.
	6. Ground all circuits and verify a trouble condition occurs.
	7. Verify the installation is in accordance with the approved drawings.
	8. Test audibility of all audible notification appliances and that the output volume is in accordance with NFPA 72.
	9. Test all visual notification appliances for synchronization and proper operation.
	10. Test the operation of every addressable device on the system per manufacturer’s recommendations.
	11. Verify the appropriate outputs are activated when each input device is put into an alarm condition.
	12. Verify the appropriate messages are displayed and LED’s illuminate on the FACP and remote annunciators, corresponding to each point tested.

3.3 OPERATOR INSTRUCTION:

The manufacturer–trained representative shall instruct and demonstrate to the building owner the operation of all system components. An operator’s manual shall be provided and kept with the FACP for future reference. A drawing or list shall be provided to the building owner detailing the device locations, addresses, and programming of each system device. If requested, the installation contractor shall provide a typewritten sequence of operations.