

PART 1 - GENERAL

1.1 ACRONYMS, TERMS, AND DEFINITIONS USED IN THESE SPECIFICATIONS

- A. UW = University of Washington
- B. SFD = City of Seattle Fire Department
- C. AHJ = Authority Having Jurisdiction
- D. Construction Coordinator=University's Representative
- E. Owner = University of Washington
- F. Vendor = The local authorized representative of the manufacturer to sell, install and service the fire alarm system
- G. Local = The main office and service center are located within 50 miles of the job site.
- H. Installer = The installer of conduit, wire and equipment
- I. Emergency = A failure of the installed system which, in the reasonable opinion of the UW or AHJ, creates an unsafe or intolerable condition requiring immediate correction
- J. Shop Drawings = The drawings created by the Contractor (Installer and Vendor) utilizing AUTOCAD, submitted for approval and then used and modified by the Installer and Vendor during construction
- K. As-Built Drawings = A single set of shop drawings which shall be updated daily during construction (See 1.10)
- L. Record Drawings = To include all of the information shown on the as-built drawings. This information shall be added to AUTOCAD Architectural backgrounds. (See Section C-2, 4.01 Documents.)
- M. FACP = A Fire Alarm Control Panel which processes alarm information and controls outputs
- N. FCC-E = SA1007A1 Fire Command Center – East which is located in existing room

1.2 SCOPE OF WORK

- A. Work included: This specification establishes the requirements for the design and installation of modifications and extensions of the existing fire detection and alerting system at the University of Washington Medical Center as described in this specification and the referenced drawings. The scope of work includes involves installation of a fire alarm system that includes but is not limited to the following:

1. Designing and provision of a complete fire detection and alerting system
2. Permanent signs, labels, and operational instructions
3. All necessary conduit and wiring associated with the fire detection and alerting system
4. Smoke detectors, heat detectors, and manual alarm stations
5. Speakers, strobes and remote lamps
6. Electromagnet door holders (coordinate with section 08 71 00, Door Hardware)
7. Installation of wiring and raceway to door closers and holders
8. Remote annunciator panel(s)
9. Provision of a one-way voice communication system as a part of the audio evacuation system
10. Provision of a two-way fireman's telephone system
11. Provision of auxiliary controls and switches including interposing control, monitor relays, and interconnection coordination for the operation of the following systems:
 - a. Door control {Architectural – Access Control CAAMS}
 - b. Fan control, smoke/fire damper interface - {Mechanical – Air Distribution}
 - c. Elevator recall {Architectural – Conveying Systems}
 - d. Sprinkler systems {Mechanical – Fire Protection Systems}
 - e. Commissioning {Electrical and Mechanical}
12. Provision of a pressurization control panel including verification of fan operation.
13. Provision of testing and training as specified in this specification.

1.3 CODES AND STANDARDS

- A. Perform all work in accordance with the requirements of the latest issue of the following codes and standards, unless specifically directed otherwise in this specification in order to allow designs in excess of the code requirements.
 1. International Fire Code with local amendments (including SFD Administrative Rulings)
 2. International Building Code with local amendments (including DPD Director's Rules)
 3. NFPA 72 - National Fire Alarm Code (NFPA 72)
 4. WAC - (Washington Administrative Code) 296-46
 5. NEC - National Electric Code (NFPA 70)
 6. Safety Code for Elevators and Escalators (ANSI A17.1) as amended by DPD Director's Rule 21-97 (Revised)
 7. Americans with Disabilities Act (ADA)
 8. Local rules and interpretations required by the authority having jurisdiction, including Seattle Building and Fire Codes.

1.4 APPROVAL AUTHORITIES

- A. The approval authority for this section of the project shall be the University of Washington Fire Protection Engineer, UWMC Fire Alarm Shop and the Seattle Fire Department. If there is a conflict in requirements, the University of Washington Fire Protection Engineer has final authority for approvals.

1.5 FIRE ALARM VENDOR QUALIFICATIONS

- A. The fire alarm system shall be installed by skilled electricians and mechanics, all of whom are properly trained and qualified for this work. As a minimum, the system must conform to all codes and manufacturer's recommendations.

- B. The vendor shall design, supervise, program, test, and commission the installed system and provide warranty service. The vendor design shall complement the design provided by the A/E.
- C. The vendor shall be the manufacturer or a local authorized representative of the manufacturer with a proven track record of being responsive, providing accurate and complete submittals, meeting project schedules, and being prepared for system testing and acceptance.
- D. The vendor must be able to provide any replacement part on site within 48 hours during the warranty period.
- E. The vendor shall be able to provide a fully equipped and qualified factory-trained repair technician at the job site within 4 hours of request for emergency services. This service shall be available 24 hours a day during the term of warranty.
- F. The vendor shall have successfully completed similar local (Western Washington) jobs in scope and nature, using the proposed product line, fire alarm panel and equipment, in other buildings over the past three years. For new product lines, one system shall have been completed and in service for at least 18 months.
- G. The vendor shall have sufficient means and capacity to provide the required submittals on schedule including, but not limited to, CAD equipment and qualified technicians.
- H. The vendor shall employ factory-trained personnel to program, test, and commission the system.
- I. The vendor shall be UL certified for Vendor Alarm Service (UUJS).
- J. Installers shall have certification (FA-1) from the Seattle Fire Department in accordance with SFC Appendix III-B.

1.6 SITE CONDITIONS

- A. The Contractor is advised that the drawings are diagrammatic in nature and are not intended to show all details.
- B. The Contractor is expected to provide all miscellaneous parts and labor required to install a complete workable system.
- C. The Contractor shall coordinate with the University's Construction Coordinator to define areas where the installer can store tools, equipment and other materials for this project.
- D. The area is to be kept clean and neat at all times. Construction debris shall be removed daily.
- E. The Contractor will be responsible for the security of all items stored in this area.

1.7 FIRE WATCH AND FIRE PROTECTION SYSTEM SHUTDOWNS

- A. A continuous fire watch is required anytime the fire alarm system is impaired, including impairments and outages that affect any area of the building, including non-hospital spaces

(e.g. Group B occupancies such as offices, labs, etc.). The Contractor shall provide a continuous approved fire watch in accordance with Seattle Fire Department Administrative Rule 9.06.04. The fire watch shall include but is not limited to the following:

1. Fire watch shall be performed by licensed security personnel, trained in the use and operation of portable fire extinguishers and instructed in how to contact the UW Police dispatcher by either radio or telephone.
 2. Continuous rounds to cover all areas of the building are required every 30 minutes.
 3. An evacuation plan which includes a method to notify all occupants is required in occupied buildings.
 4. Maintain a log of the rounds and comprehensive notes.
 5. Provide a 30-day notice to the Owner and attend coordination meetings for fire watch approval.
- B. Provide 14 days written notification to the University's Construction Coordinator, requesting approval for fire protection system shutdown or functional impairment; receipt of the approval from the University's Construction Coordinator is required before any system shutdown or functional impairment.

1.8 SUBMITTALS

- A. Conform to Section 01 33 00, Shop Drawings, Product Data, Samples, and UW Drawing Standards.
- B. Submit the following in accordance with the conditions of Contract and Division 1 Specification Sections:
1. Prepare and submit electronic copies of shop drawings and catalog cut sheets and additional information required in this section, via the Construction Coordinator, to the A/E, UW Fire Protection Engineer and Fire Alarm Shop for Owner approval.
 2. Upon receipt of A/E and Owner approval, shop drawings shall then be forwarded to the SFD for their approval.
 3. One copy of Owner-approved shop drawings with SFD approval, and accompanying letter, shall then be submitted to the University's Construction Coordinator. Partial submittals are unacceptable.
 4. The Vendor shall not start any construction nor order any materials prior to acceptance of all submittals by the Owner and the SFD.
 5. Submittals, as a minimum, shall include the following:
 - a. Floor plans drawn with AUTOCAD to same scale as the architectural drawings, showing device layout, raceway routing, riser diagrams, conduit and wire size, wire identification numbers, room and floor identification numbers. These drawings shall be produced as follows:
 - 1) The Owner shall forward a copy of the Architectural backgrounds to the Contractor.
 - 2) The Contractor's drawings will show all equipment locations and all wiring requirements, utilizing the UW wiring standards in Table 3.06.B and UW symbols as illustrated on the plans.
 - 3) With this information and drawings, the Contractor will create a raceway, conduit and riser design meeting the requirements in section 3.06.
 - 4) The Contractor must then ensure completeness, including wire information, room numbers, devices, equipment and all other pertinent information.

6. Typical point-to-point wiring diagrams of the control panels, including but not limited to, all control and annunciator panel components, field devices, relays, fans, elevators, and other auxiliary control(s), and terminal cabinets showing all installed wiring (not factory wiring harnesses) and wiring connections. All variances from typical shall be illustrated in separate diagrams.
 7. Label all components. Identify circuits using identification labels listed in Table 3.06B.
 8. Detailed mounting installation diagrams of the control panel(s), remote annunciator(s), and keyed signal silencing switch
 9. Battery calculations, speaker, and strobe circuit voltage drop and power consumption
 10. Riser diagrams with FACP, terminal cabinets, raceway layout, circuit identification labels per 3.06, riser conduit size, and all devices; horizontal and vertical lines shall be provided to illustrate floors and zones.
 11. Functional response matrix identifying all system responses
 12. Front view of the control panel(s) and all annunciator panels
 13. FACP, labels and labeling schemes for circuits, and field devices; nameplates and messages on the control panel(s) and annunciators shall be provided in actual size.
 14. Wire/circuit legend with circuit identification, color, gauge, wire type, number of conductors, etc.
 15. Raceway size calculations showing % fill in accordance with this specification (see Section 3.06)
 16. Circuit schedules for speakers, strobes, auxiliary controls, and software/advisory code zones
 17. Schedule of addressable circuits and corresponding circuit lengths
 18. A Materials Submittal cover sheet identifying all FACP equipment, model number, and quantities
- C. Within 45 days after Owner approval of shop drawings and catalog cut sheets, submit the following for review and approval via the construction coordinator to the UW Fire Protection Engineer and the UWMC Fire Alarm Shop for Owner approval:
1. A written acceptance test procedure (see Section 4.02)
 2. A complete fire alarm device point list for all circuits to identify the following:
 - a. Device address (initiating only)
 - b. Manufacturer fixed labels (device type)
 - c. Custom labels (conforming to UW standard format)
 - d. Software zone (same as annunciation alarm LED)
 - e. This list shall also include signaling and all other auxiliary circuits.
 - f. Prepare this list on Microsoft Excel using 8½" x 11" or larger sheets.

1.9 AS-BUILT DRAWINGS

- A. While the system installation is in progress, one set of shop drawings will be kept at the job site.
1. This set will be designated as the As-Built Drawings and will be updated regularly to reflect current as-built information.
 2. One set of as-built drawings can be replaced with a fresh updated set of drawings, but there shall never be more than one active set of as-built drawings.
 3. The UW shall be given access to this set of as-built drawings at all times so that progress maybe reviewed and copies maybe made.
 4. At the end of the project, submit these marked-up as-built drawings as part of the as-built drawings (see section 4.01).

1.10 FIRE ALARM SYSTEM DESCRIPTION

- A. Equipment and materials shall include the following:
1. Intelligent (addressable/analog) fire alarm control panel(s), with connections to the existing FCC-E.
 2. Equipment and circuits for the following:
 - a. Alarm initiating devices
 - b. Evacuation notification devices
 - c. Fire alarm system monitored, controlled, and powered equipment
 - d. Communication systems

1.11 SYSTEM OPERATION DESCRIPTION

- A. Fire alarm functions: Activation of a pull station, sprinkler water flow or activation of an automatic sensing device for fire, temperature, flame, or smoke shall result in the following:
1. An audible evacuation alarm signal will continuously sound a "chime" signal until the system is reset, silenced, or the voice override is utilized.
 2. The visual evacuation alarm devices will flash rapidly until the system is reset.
- B. Auxiliary control functions: The fire alarm system shall, during certain alarm conditions, control the following types of equipment: Doors, fans, dampers, elevators, etc. Direct control from detector output contacts is not permissible unless the contacts are fully programmable from the FACP. As a minimum, the controls shall accomplish the following:
1. Automatically restore the signal to the controlled systems to normal operation after FACP is reset from alarm posture
 2. Phase I operation of elevator
 3. Drop all magnetically-held doors following a 10-second time delay.
 4. Release exit stair doors and other electrically secured doors at a switch located in FCC-East.
 5. Magnetically held doors shall not share the same circuit as electrically secured door switches.
 6. Where fire doors separate a fire zone, the doors shall be capable of closing from an alarm on the adjoining zone without affecting magnetically held doors which do not separate the adjoining zone.
- C. Supervisory and System Trouble functions
1. Supervise the 120 VAC circuits supplying the FACP.
 2. Supervise the alarm initiating circuits, building signaling circuits, and auxiliary control circuits, except the door circuits, against grounds, opens, and shorts.
 3. Any equipment trouble or malfunction or activation of a sprinkler system supervisory switch shall sound a local buzzer and turn on an externally visible amber light (LED) in the FACP, and activate a trouble or supervisory signal.
 4. Upon application or reapplication of 120 VAC power, the fire alarm system shall automatically, without any operator intervention, initialize all circuitry and shall be in a normal operating condition. Systems which require operator intervention to reset manual controls following a 120 VAC restoration are not acceptable.
 5. Program duct smoke detector alarms to provide a supervisory signal when in alarm mode.
- D. Annunciation and manual switches

1. Upon alarm, light red lights (LEDs) in the fire alarm panel, one to indicate general system alarm and one for each software zone in alarm. LEDs shall be visible from front of unit with its doors closed. These LEDs shall operate continuously until the alarm is reset from the FACP.
2. For each red zone LED provided above, provide an amber LED to indicate trouble or activation of sprinkler system supervisory switches which are associated with water flow switches (i.e., floor control valves).
3. The trouble buzzer shall be silenced by a silencing switch (amber trouble LED shall remain lit). When the condition causing the trouble or malfunction has been corrected, the buzzer shall again sound until this silencing switch is returned to the normal position.
 - a. Individual, fully supervised, "test and maintenance" switches with amber LEDs shall be mounted inside the door to the FACP and shall bypass the alarm signaling devices (e.g., speakers, horns, strobes); and shall intercept or block fan controls, door controls, elevator controls, dampers and other circuits as specified.
4. In an addressable system, each initiating device shall annunciate at the FACP {and remote annunciator} as a discrete point on an alphanumeric display. In addition, the appropriate software zone LED shall light at the FACP.
5. Provide descriptive alphanumeric program labels for each system-initiating device in accordance with the following format:
 - a. Floor-Zone-Device Type-Specific Information and/or Location (and special access notes) Include device type if not included in standard manufacturer preprogrammed label.
 - b. Examples:
 - 1) 4th Fl, C-Wing, corridor by Room 432
 - 2) 7th Fl, Duct Det, SF-2, in Mech Room 711
 - 3) 3rd Fl, Tower, in Stair No. 2
6. Provide manual switches and status LEDs at the FACP for fans as described herein and on the plans.

E. Graphic Annunciation

1. Provide Simplex TrueSite programming and graphic annunciation of all project zones.

1.12 FIRE CONTROL COMMUNICATION SYSTEMS

- A. The fire alarm speaker system shall incorporate a "one way" fire commander's voice communication or paging system. A microphone shall be placed at the main control panel.
- B. A "two-way" fire fighter's telephone system with phone jacks shall be installed where indicated on the project drawings. A sounder shall activate at the FACP when a handset is plugged in at any field jack for the system.

1.13 INTERFACE WITH EXISTING FIRE ALARM SYSTEM*

- A. The existing fire alarm system shall not be disabled at any time without appropriate coordination with the Owner and fire watch provisions.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. All materials and equipment shall be new. Previously used equipment is not acceptable unless specifically identified elsewhere in this specification.

2.2 MANUFACTURER

- A. The fire alarm control equipment shall consist of a system assembled as an approved unit of regularly manufactured components, by a single manufacturer for the purposes described elsewhere in this specification. The fire alarm control equipment must have a proven track record of service and reliability in projects of similar scope to this project. Interconnecting equipment that has not been listed for interconnection, or the creation of components or system into a nonstandard unit that is not normally available from the manufacturer, is not acceptable.
- B. All equipment shall be listed, cross-listed, and labeled by Underwriters' Laboratories and approved by Factory Mutual.
- C. Providing they meet all specifications, control panels and related equipment shall be manufactured by JCI/SimplexGrinnell, with no exceptions, and no substitutions.

2.3 LOCKS

- A. Locks for cabinets, enclosures, and manual pull stations shall be keyed for Simplex B key.

2.4 FIRE ALARM CONTROL PANELS (FACP)

- A. FACP shall be microprocessor-operated, power limited, modular in design and equipped with a nonvolatile memory that requires no battery backup: Simplex 4100ES no exceptions, no substitutions.
- B. A single FACP shall be able to utilize, in combination, addressable, analog, and 2/4 wire NO/NC detectors. (Plug-in "mix and match" modules or similar architecture are acceptable.)
- C. Software
 - 1. UW personnel shall be able to create and modify control software with an IBM-compatible PC utilizing MS-DOS-based or MS-Windows based, menu-driven, user-friendly programming.
 - 2. UW personnel shall be able to store the programming on a removable computer disk and pre-program a nonvolatile, transportable memory storage device which can be used for replacement in a FACP as the programming backup. All software including proprietary software shall be provided to the UW as necessary to meet the above requirements.
 - 3. Provide software for locations at FCC-East.
- D. Fire alarm system shall be wired for "Class B" operation on alarm initiating and signaling (notification) circuits.
 - 1. All end-of-line devices shall be located in the terminal cabinet or the end of the corridor for the zone served.

2. Tee tapping is not allowed on conventional or addressable systems.
- E. FACP shall incorporate power supplies and all controls for systems except as described elsewhere within the specification.
1. Locate all amplifiers at the head-end (FACP) of the system.
 2. Mount all components within a steel enclosure with locked door(s).
 - a. Door(s) shall incorporate a transparent window for viewing indicator lights, and other pertinent components.
 - b. Mount cabinet(s) as indicated on the drawings.
 - c. Provide additional cabinets if required.
 3. Transponders and other ancillary control panels may only be used where shown on the drawings unless approved by the Owner.
 4. Circuits shall not be loaded to greater than 80% of their rated capacity.
- F. Initiating circuits
1. All initiating and notification circuits shall originate at the FACP that serves the fire zone in which the devices are located.
 2. The FACP shall support independent addressable circuits, originating from FACP-mounted hardware, for each floor and zone. No circuit shall exceed 4000 feet in length.
- G. Notification circuits
1. All initiating and notification circuits shall originate at the FACP that serves the fire zone in which the devices are located.
 2. The FACP shall support independent speaker and visual alarm circuits for each floor and zone of the building.
 - a. Provide a schedule by performing circuit load calculations considering wire length, gauge, number of devices, and FACP specifications.
 - b. Do not use a single circuit for multiple floors or zones; however, a number of circuits maybe required for a single zone.
 3. Visual notification circuits shall be synchronized at each FACP.
 4. No speaker circuit shall exceed 10% voltage loss measured at the end-of-line device. No strobe circuit shall exceed a 2.1-volt line loss measured at the end-of-line device with a 21-volt DC input at the fire alarm panel end of the circuit.
 5. Calculate visual alarm (strobe) circuit capacity and line loss using the strobe's 20-volt DC ratings.
 6. The FACP shall support independent door and {corridor damper} control circuits originating from FACP mounted hardware for each floor and zone of the building.
- H. Power supplies
1. The FACP 24 VDC power supply shall be powered by 120-volt AC power, with a battery backup system regardless of the building's primary or alternate source of power. The system shall also have the following requirements:
 - a. *Sealed gelled cell-type batteries
 - b. 24-hour system backup capability plus 5 minutes of full alarm operation at the end of the 24-hour period. Except in the case where power is backed up by generator, then system backup may be reduced to 4 hours.

- c. Charger shall be able to restore batteries to full charge within 48 hours after a complete discharge.
 - d. The FACP shall supervise battery and charging system. The FACP shall include trouble annunciation of high/low voltage, shorted cell and open circuits.
 - e. A means of disconnecting the 120 VAC feed to the FACP for maintenance shall be provided within the FACP or in a locked enclosure within 10 feet of the FACP.
 - f. No power supply shall be loaded to greater than 80% of its rated capacity.
 - g. Power supplies must be capable of powering all circuits simultaneously (e.g. Door holder power at the same time notification circuits are active.)
 2. Emergency power is not required for the door holders. Doors AUG close upon loss of building power.
- I. Other FACP features
 1. Walk test: A test mode that causes the system's signal to sound, and a report to be printed, when a device is activated, or a trouble or supervisory condition identified, followed by a prompt automatic reset of the FACP.
 - a. The signal sounding shall be capable of being turned off independent of the printing function.
 - b. This feature shall be available for system acceptance testing/commissioning.
 2. History log: Log a history of alarm and trouble events for the system.
- J. Other FACP components shall include the following:
 1. Alarm and trouble lights located to be visible with the door closed
 2. System reset switch
 3. Trouble buzzer with silencing switch inside locked cabinet
 4. Control and time delay relays as required
 5. Supervised switches (one for each listed function) installed to allow a complete test of the system without evacuating the building, recalling elevators, releasing doors and/or posturing for smoke control (i.e. bypass switches)
 6. Supervised control switches or relays for use in interfacing with other devices as required
 7. Permanent printed labels for all interactive equipment, zones, switches, controls, and instruction

2.5 VOICE COMMUNICATION SYSTEM

- A. Audio amplifiers shall be sized to provide ½ Watt minimum per attached audio speaker as shown on the drawings. Each audio amplifier shall have 50% minimum spare capacity when attached to the speakers necessary to meet audio requirements. Amplifiers shall be two channel amplifiers to allow paging to one circuit while playing alarm tone on another.
- B. FACP shall incorporate a spare automatic backup audio amplifier equal in size to the largest individual amplifier or be capable of backing up itself.

2.6 MANUAL PULL STATIONS

- A. Manual pull stations shall be addressable Simplex 4099-9001 single action or approved equal

1. Reset shall be accomplished with a lock and Simplex B key.
2. The station housing shall be fire red factory finish.
3. Exposed back boxes shall be provided by the manual station manufacturer and be designed specifically for the application.

2.7 SMOKE DETECTORS/SENSORS

A. Ceiling or area-type smoke detectors

1. Detectors shall be photoelectric addressable analog with separate base. Part numbers 4098-9762 base and 4098-9714 head.
2. The detectors, complete with terminating equipment, shall be fully supervised and shall not activate alarm due to rapid changes in humidity, or a fan maintenance shutdown, etc.
3. The detector shall be equipped with LED alarm condition indicator light.
4. When exposed back boxes are needed, use 4 square box painted red of the appropriate size.

B. Duct type smoke detectors

1. Detectors shall be addressable analog photoelectric, in an enclosure with remote indicator and reset switch}.
2. The devices shall include necessary sampling tube extensions.
3. The device shall function uniformly in air velocities of 500 FPM through 3000 FPM. A report of the pressure differential between sampling tubes shall be provided to the UWMC fire alarm control shop. Pressure differential between intake and exhaust tubes is required to meet manufacturers specifications.
4. Heat sensor feature is not required.
5. Provide remote indicating light and test station where shown on the drawings and where detector indicating lights are not readily visible.
6. In finished spaces mount remote indicator lights in close proximity to the duct smoke detector. Remote indicating lights shall be located on walls adjacent to detectors in corridor outside of room at a height between 48 and 96 inches. Indicating light location must be approved by UWMC Operations and Maintenance.
7. Device shall be flush or semi-flush mounted with identifying nameplate. Include identification of associated duct smoke detector on the device plate or nameplate.

2.8 HEAT DETECTORS

- A. Heat detectors shall be combination of fixed temperature and rate-of-rise low profile addressable analog type and shall be "ordinary" temperature range in all areas except where located in a high ambient temperature area. Use Simplex Part 4098-9762 base and 4098-9733 detector.
- B. In areas subject to temperature in excess of 140° F, detectors shall be listed for such use.
- C. An indicator on the exposed surface of the detector shall display the actuated condition of the detector.

2.9 ADDRESSABLE INTERFACE MODULE

- A. Provide addressable interface modules to interface with non-addressable initiating devices, i.e. water flow, tamper switches, kitchen, and fume hood suppression systems. Field control modules are not allowed.

2.10 AUDIBLE ALARM DEVICES

- A. Speaker/strobes shall be white with red lettering, have sealed back, metal grill, with multiple wattage taps including $\frac{1}{4}$, $\frac{1}{2}$, 1 watt, and 2 watts, and multiple candela taps including 15, 30, 75, or 110. Indoor speaker/strobes shall be Wheelock E70-24 MCW-FR or approved substitution.
- B. Install all speakers at the $\frac{1}{2}$ -watt setting unless indicated otherwise on the drawings. Speakers located in rest rooms and similar enclosed areas where alarm threshold maybe high should be tapped at $\frac{1}{4}$ watt. Surgery Pavilion and Montlake Tower are 25V systems. Pacific and Cascade are 70V systems.
- C. Speakers shall be flush mounted or ceiling mounted.
 - 1. Where necessary, surface mounting white Wheelock SBB box shall be used.
 - 2. For flush mounting use a 4S deep j-box with an extension ring or the 5S j-box by Randl Industries (note: 5S box allows installations in walls not deep enough to accommodate the 4S box and extension ring).
- D. Outdoor and environmental rooms with high humidity and controlled temperature, including coolers and freezers:
 - 1. Speaker/Strobe: Wheelock ET-70WP-2475-FR speaker with Wheelock 10B-R back box or approved substitution.
 - 2. Provide weatherproof back box with weep hole oriented down, and seal conduit penetration with mastic.
- E. An open circuit in any speaker or horn coil shall not prevent the rest of the audio devices connected to that circuit from operating.
 - 1. If a short circuit occurs, the faulted circuit shall not prevent any other circuit from operating, and trouble shall be indicated.
 - 2. If the shorted circuit clears, signaling operation shall be automatically restored.
- F. The speaker cable shield or drain wire shall remain intact and be spliced through all terminal cabinets, junction boxes and speakers.
 - 1. The drain wire shall not be grounded for terminated except at the main FACP.
 - 2. Wherever the drain wire is exposed, it shall be wrapped with UL approved electrical tape, in order to avoid shorts or grounds.

2.11 STROBES (VISUAL ALARM)

- A. Visual alarm signal shall operate at 24 volts DC and be equipped with a Xenon strobe flashing light which meets requirements outlined in 2.14 above.
 - 1. Use Wheelock series STW or STWC.
 - 2. Use Wheelock series RSSWP-2475W strobe with Wheelock WPSBB-R back box for outdoor and environmental rooms.

3. Flashers shall be combined into one unit with speakers (or horns) where appropriate.

B. All strobe circuits to be synchronized.

2.12 DOOR HOLDERS

A. Refer to Section 08 71 00 Door Hardware, for door closers.

B. Power for door holders shall be 24 VDC and originate from the FACP but shall not transfer to battery power upon loss of 120 VAC.

2.13 AUTO DOORS

A. Doors equipped with operators are required to meet NFPA101 7.2.1.9.

2.14 SPRINKLER SYSTEM ALARM AND SUPERVISORY SWITCHES

A. Shall be provided by Division 21 00 00. Wiring and raceway and final connection to the fire alarm system shall be required by this section.

B. Furnish and connect electric bell for waterflow switch on sprinkler system. Potter Electric PBD-DC or equivalent.

2.15 FAN SHUTDOWN

A. Fire Alarm will have priority over building automation for fan shutdown commands to building HVAC.

B. Building HVAC will restart automatically once the fire alarm system no longer calls for a shutdown.

2.16 SPARES

A. Provide FACP spare equipment for 5% (at least two each) spare fully operational speaker, strobe and auxiliary control circuits.

B. Provide 20% spare capacity for FACP I/O points and mapnet.

C. FACP Auxiliary relays, minimum 3 amp. form "C" contacts.

D. FACP Control/Bypass switches - {insert value}

2.17 SMOKE/FIRE DAMPERS

A. Dampers shall be provided by Division 23 00 00.

B. Interface relays shall be provided to operate 120VAC AC smoke dampers from the 24VDC fire alarm system.

1. Fire alarm contacts shall be rated at 10 amps. Mount in the proximity of the terminal cabinet.

2. The interposing relay is to be normally closed and the damper(s) powered open.

3. Upon alarm or AC power failure, the damper shall close.
4. Interposing relays shall be UL cross-listed with the FACP.
5. Each fire/smoke damper shall be controlled with a single interposing relay.
6. The fire alarm system shall monitor the open, closed, and in between open and closed position of the fire/smoke dampers. Use 4090-9118 relay with T-sense. IAMs shall not be used due to idnet power consumption by the LED on the IAM.

PART 3 - INSTALLATION

3.1 APPROVAL

- A. No equipment shall be provided at the job site until shop drawings have been reviewed and approved by the UW and AHJ. A UW and AHJ approved shop drawing set shall be continuously available at the job site during construction.

3.2 MOUNTING POSITION

- A. FACP: Locate as shown on the drawings.
- B. Evacuation speaker/strobe shall be mounted on the walls, 80 to 96 inches above finish floor, in accordance to NFPA 72.
- C. Pull stations: 4 feet from floor to center of device
- D. Battery cabinet: If shown, locate as illustrated on the drawings. If required due to physical constraints and not shown, consult the Owner.
- E. Duct detectors: Placement must conform to NFPA standards. Coordinate location with mechanical. For assistance consult with UW Fire Protection Engineer or A/E.
- F. Remote annunciator panel: Location shall be as shown on the drawings.
- G. Fireman's telephone jacks: 4 feet from floor to center of device

3.3 MOUNTING METHODS

- A. Conduit, panels, devices and boxes shall be secured by means of expansion shields in concrete, machine screws on metal surfaces, and wood screws on wood construction. Attachment with devices driven in by power charge or nail type nylon anchors is not acceptable in lieu of machine screws.

3.4 AUXILIARY CONTROLS *

- A. Provide all wire ways, wiring, control modules, interposing relays, terminal boxes, and relay cabinets for FACP controlled equipment including fans, dampers, doors, elevators, etc.
- B. Each type of equipment shall be controlled by dedicated double throw relays.
- C. Field control modules AUG be used for addressable systems.

3.5 WIRING

- A. General wiring and raceway system. Raceway installation shall be field reviewed by the owner prior to pulling wire.
1. The manufacturer's recommendations shall only be used as a minimum requirement.
 2. All wire shall be new, UL approved and marked and brought to the job site in original packages.
 3. Wire insulation shall be one of the types required by NEC. All wires shall be sized per NEC for the load serviced. Field wiring for initiation, supervision and signal circuits shall be solid conductor. All wire shall be approved for fire alarm installations.
 4. "Pig tailing" and Tee tapping is prohibited for all system circuits, except door circuits and addressable signaling line circuits.
 - a. Addressable signaling line circuits may be Tee tapped only in the terminal can for the floor which that circuit serves.
 5. Fire alarm system shall be wired "Class B", device to device, with no splicing unless approved by the Owner.
 6. End of line resistors shall be located in the terminal cabinet or the end of the corridor or other unassigned (public) space for the zone served.
 7. Splicing shall be made with Minnesota Mining & Mfg. Co. "Scotchloc" spring connectors with steel cap and PVC insulation, Thomas & Betts or approved equal.
 8. Colors shall match when possible and the conductors shall be mechanically secured to each other so that no stress is applied to the splice.
 9. Aluminum wire and stranded wire are both prohibited.
 10. Wire pulls by powered mechanical means will not be permitted.
 - a. Conduit shall be thoroughly cleaned of all foreign material just prior to pulling the wire or cable.
 - b. Lubricants shall be compounds specifically prepared for cable pulling and shall not contain petroleum or other products which will affect cable insulation.
 11. Wire that has scrapes, nicks, gouges, or crushed insulation shall not be used and must be removed.
 12. All wiring on circuits being modified or demolished shall be removed back to the last operational device.
 13. Do not run low voltage energy limited wiring in the same wire-ways with, or closely parallel to, high voltage and/or switched power wiring.
 14. Interposing relays shall be used for all switched power loads and shall be located such that the switched power conductors do not run in the same raceway as the interposing relay coil power or any other energy-limited low voltage conductors.
 15. All wiring shall be contained in metal conduit or raceways dedicated to fire alarm service.
 16. Conduit size shall be 1/2 inch minimum. Wire mold shall be #700 minimum (also see Section 16A06, Basic Electrical Requirements).
 17. No raceway shall be filled in excess of 40%. The Contractor shall demonstrate by performing fill calculations showing that the designs comply with these criteria. Exceptions are only allowed when use of existing wire ways is approved.
 18. The raceway system shall resemble a branch and tree configuration. Branches shall be provided with sufficient junction boxes so that not more than three unassociated circuits pass through a device back box. Follow manufacturer's instruction for wires in device back boxes (e.g., Wheelock does not allow (used for other than the signaling appliance) through the back box).

19. Metal Clad (MC) cable is allowed where use of EMT conduit is not feasible in difficult retrofit applications with specific approval of the owner. The cable must also be approved by the fire alarm system manufacturer.
20. All raceways shall run parallel or perpendicular to walls, floors, and ceilings.
21. For surface-mounted raceway, runs shall be routed on walls out of visual sight, with vertical drops to wall-mounted devices. Submit routing proposal to A/E for approval prior to installation.
22. Do not encase raceway in concrete unless specifically called for.
23. No wire run or circuit shall be longer than 80% of the maximum allowable length and power consumption for the wire size and application. No output circuit shall exceed 80% of the maximum load capacity specified by the manufacturer.
24. Terminate all wiring for each zone or floor in a terminal cabinet as indicated on the contract drawings prior to running the wires to the fire alarm panel. Provide at least one terminal cabinet for each floor.
25. All solid wire terminations shall be made bare to screw terminals specifically designed for bare wire connection. Make cable shield terminations with T&B "Sta-Kon" (or equivalent) self-insulated spade lugs where connected to screw type terminals.
26. Wiring in all cabinets and terminal boxes shall be neatly arranged and bundled with tie wraps or equivalent.
27. Paint all junction box covers for the fire alarm system red. Paint J-Box covers in finished areas to match the wall or ceiling and put a ½-inch minimum red dot on the cover.
28. All conduit and raceways shall be color-coded by a ¾ -inch red tape band at 10-foot intervals. Use Scotch Brand #35 tape or approved equal.
29. All inductive loads (door holders, interface relays) without integral reverse EMF suppression must have suppression on those circuits.
30. J-Boxes used for pull boxes shall not be installed within finished walls.

B. The following wire will be used unless an alternate is approved by the Owner. Color-coding shall be by wire insulation. Single conductor wires shall be solid.

TABLE 3.06.B
Wire and Cable Requirements

<u>Circuit Type</u>	<u>Quantity/Color</u>	<u>Size</u>	<u>Section</u>	<u>ID</u>
Addressable circuit (Note 1)	West Penn D975, or Belden 5320FJ	#18 #18	0.0450 sq.in. 0.035 sq.in.	L
24 VDC	1 pink (pos.) THHN#14 1 grey (neg)THHN		0.0174 sq.in.	P
Remote Test Switch	1 pair TFN (2 pink)	#16	0.0158 sq.in.	R
Remote Indicator Light	1 white TFN & 1 blue TFN	#16 #16	0.0158 sq.in. 0.0158 sq.in.	R R
Monitor Switch (tamper, flow & pressure)	2 pair TFN (2 yellow, 2 brown)	#16	0.0158 sq.in.	T

Audio Alarm (speakers)	Belden 5220FL	#16	0.0249 sq. in.	A
(Note 1,2)	Belden 5120FL	#14	0.037 sq. in.	
Visual Alarm (strobes)	1 pair THHN 1 brown (negative) 1 blue (positive)	#14	0.0174 sq.in.	V
(Note 3)				
Door Holder & Door Lock	1 black, 1 red THNN	#14	0.0174 sq.in.	D
Smoke Control Damper	1 pair THHN (light blue)	#14	0.0174 sq.in.	Z
Fan Control (simple shutdown)	2 orange THHN	#14	0.0174 sq.in.	H
Fan Control (shutdown,override, and status)	5 orange THHN (3 orange, control) (2 orange, status)	#14	0.0435 sq. in.	Q
Fireman's Phone	Belden 5320FL or Connect-Air W181P- 1608	#18 #18	0.0189 sq.in. 0.0222 sq.in	F
(Note 1)				
Elevator Recall	4 yellow THHN	#14	0.0348 sq.in.	E
Panel Ground	1 green THHN	#10	0.0184 sq.in.	-
Panel Power	See Division 26 Section 26 05 19	#12	0.0234 sq.in.	-

NOTE 1: Cable must conform to FACP system manufacturer's requirements.

NOTE 2: Contractor's option, 14 or 16 gauge (see 2.04.) This is a two conductor shielded cable. The same size cable shall be used for the entire system.

NOTE 3: See 2.05. All circuits shall be 14 gauge; twelve-gauge wire is prohibited. Provide multiple circuits for a single zone as required.

Fire Alarm Circuit Integrity (CI) Cable, 2-hour fire rated per UL 1724 shall be provided for the wiring serving the fire alarm riser and the wiring serving the stair and elevator pressurization fans.

- C. All circuits and conduits shall be identified in accordance with Table 3.06C, with labels to include circuit type, zone, floor, wing, and conduit number. Labels must be provided at the

FACP, annunciator, terminal cabinets, and all junction boxes with more than 5 circuits. Labels shall be produced using an electronic labeler.

TABLE 3.06.C
Wire Labeling

Format: X XX XX XX XX
 ID Z F W C

Example: V 12 6 J 26

Circuit (ID) = Per Wire Table (i.e.. V for Visual)
 Zone (Z) = 1, 2, 3,,,,,,,,,,,,,,,,,,,,, 23, 24
 Floor (F) = M1, 01, 02,,,,,,,,, 10, 11
 Wing (W) = A, B, C,,,,,,,,, NN, EA, SW
 Conduit (C) = 01, 02, 03,,,,,,,,, 10, 11, 12

- D. All initiating and signaling circuit devices shall be externally labeled with a printed adhesive label approximately 1/2" x 1" in size. Identify the node, circuit and zone, consistent with wire labeling scheme, using a 12 to 14 point font, black ink on white. Example: 14:M2-121
 14:SIG15 14:SIG15/22

PART 4 - FINAL ACCEPTANCE REQUIREMENTS

4.1 RECORD DOCUMENTS

- A. As a condition for the project final acceptance, the vendor shall submit the following documents to the UW for approval:
 1. Operation and Maintenance Manuals: See Section 00 17 00
 - a. Submit a copy of the O&M Manual to the UW Signal Shop
 - b. The O&M Manual shall include as-built drawings as listed below catalog cuts, and manufacturer wiring diagrams of all FACP components. Photocopies are not acceptable.
 2. As-built drawings:
 - a. The as-built drawings shall be neatly prepared on AUTOCAD Release 12 (or higher).
 - b. The UW will provide use of a standard template, a library of symbols, colors and layers and one day of support and instruction in the UW protocols.
 - c. Provide 2 sets of prints, one set of fixed line reproducible (size 24" x 36" or 36" x 42") and 2 sets of AutoCAD disks. These drawings shall include the following:
 - 1) All requirements listed for shop drawings per 1.09
 - 2) Changes as a result of final installation, testing, or a change to the system design
 - 3) An accurate depiction of risers, raceway, conduit, all wire runs, cable identification, conduit size, location of junction boxes, terminal boxes, sources of power, devices, sensors, equipment, controlled equipment (motor starters, fans, pumps, valves, dampers, etc.)

4.2 TESTING

- A. The completed system shall be subjected to 2 required tests.
- B. The initial test shall be a preliminary test which will be conducted by the Contractor and commissioned by the UW Fire Protection Engineer, the UW Fire Alarm Shop and the A/E.
 - 1. This test shall be completed after the system is complete and clear of troubles.
 - 2. Should the results not be satisfactory to the Owner's representatives, then corrections will be made and a re-test will be required at the Contractor's expense. The Installer and a factory trained technician for the FACP shall be present for all testing.
 - 3. The preliminary test shall be in accordance with a written Acceptance Test Procedure (ATP) to demonstrate and certify proper system operation.
 - a. The ATP shall be prepared by the Contractor and submitted to the Owner for approval prior to the performance of the ATP.
 - b. As a minimum, the ATP shall provide a detailed method of testing and documenting the following to demonstrate to the Owner that the system functions as intended by the design.
 - c. The document shall be a written test procedure and customized check-off sheets for the following as a minimum:
 - 1) All detectors shall be removed from their base and checked for trouble. Remove one device per addressable circuit from its box and lift a wire to test for supervision and ground. Failure due to improper system wiring will require a comprehensive test of the circuit.
 - 2) Remove one device per signaling circuit from its box and lift a wire to test for supervision and ground. Failure due to improper system wiring will require a comprehensive test of the circuit.
 - 3) All bypass and control switches shall be operated to indicate proper supervision of the switch.
 - 4) All valve and sprinkler supervision switches shall be operated to verify proper response.
 - 5) All valve and sprinkler supervision switches shall have one wire removed to verify proper supervision.
 - 6) Each alarm output, detection or supervision zone AUG be tested for proper response to ground conditions.
 - 7) Test to NDU/Dialer zone.
 - 8) *AC power shall be interrupted for 24 hours (or 4 hours when backed up by generator) and followed by a 5 minute alarm test.
 - 9) Remove all critical fuses to check for proper supervision.
 - 10) Test the firemen's telephone system for supervision of the wiring and for quality of voice transmission.
 - 11) Test all detectors for alarm operation.
 - 12) Test all signaling devices for proper operation. Devices that fail and are replaced will require a retest.
 - 13) Test all alarm sounding devices for proper operation.
 - 14) *Audibility tests will be conducted by the Contractor to determine compliance with the dBA requirements. For replacement systems in occupied buildings, the audibility test shall be conducted after normal working hours.
 - 15) All elevator, fan, door holder, damper and other control functions and circuits shall be tested for proper operation under alarm condition.
 - 16) Test for proper operation of the Public Address portion of the FACP.

- 17) Test fan and damper control, including manual override and priorities. Coordinate with other trades.
 - 18) Test magnetic door closers, holders, locking mechanisms. Verify appropriate priority with security and access control systems.
 - 19) Test elevator recall, Phase I and II and flashing hat.
 - 20) Test transfer to emergency power, where provided.
 - 21) Test alarm verification function. Confirm no delay occurs if two detectors are activated.
 - 22) Confirm analog sensor adjustable sensitivity function is operable and properly set.
 - 23) Demonstrate history log and print port functions.
 - 24) Confirm functional performance test with system response matrix.
- C. Pressure differential report:
- D. A report of the pressure differential between sampling tubes shall be provided to the UW Fire Alarm Shop. Pressure differential between intake and exhaust tubes is required to meet manufacturer specifications.
- E. Smoke sensor sensitivity: Following completion of the preliminary test, the Contractor shall place the FACP online with outputs bypassed for a period of 10 days.
1. A report of all system smoke sensors with sensor high and low readings and recommendations for alarm threshold settings, and device relocation if necessary, shall then be submitted to the Owner.
 2. Smoke detectors with a reading of 95 and higher are considered dirty and will be required to be cleaned or replaced for final acceptance of the system.
 3. The Contractor shall then adjust detector sensitivity as directed by the Owner.
- F. After satisfactory completion of the preliminary testing, the Owner will arrange for the SFD to witness a final Contractor-executed acceptance test of the system.
1. Final acceptance will be granted jointly by the SFD and the UW Fire Protection Engineer or the Owner's designated representative.
 2. Approval of the AHJ shall be evidenced in writing and a copy forwarded to the Owner.
 3. The requirements for final testing shall be as requested by SFD at the final test.

4.3 TRAINING *

- A. The vendor shall, after two weeks (minimum) written notification to the Architect and the UW, conduct a training session during which all maintenance and operational aspects of the system will be described and demonstrated to personnel selected by the Owner. The session(s) shall be conducted by a manufacturer's representative thoroughly familiar with the characteristics of the installed system.

4.4 OTHER ITEMS

- A. At the completion of the installation when the as-built drawings have been submitted and accepted, the Contractor shall submit a letter to the UW certifying that the fire alarm system is completely functional and conforms to all applicable codes, ordinances, and requirements of the contract.
- B. Submit installation permit from the AHJ to the UW Construction Coordinator.

4.5 PROJECT COMPLETION

- A. Project completion and payment will be based on the following:
1. Completion and approval of acceptance tests
 2. Completion of punch list items
 3. Delivery and acceptance of the as-built drawings and operation and maintenance manuals
 4. Cleanup of installation site to the satisfaction of the University's representative

END OF SECTION