

 HARVARD MEDICAL SCHOOL	FACILITIES DESIGN STANDARD CONSTRUCTION/RENOVATION	SOP #: HMS_DS_FIRE ALARM_170527
TITLE: Division 28 Fire Alarm		REVISION: May 27, 2017

28 0520 – Fire Alarm Design Criteria

1. Design Statement

- a. New fire alarm systems shall be an addressable, microprocessor-based system with system cabinets, power supplies, with Central Processing Unit (CPU) and operator’s display with LCD screen and status indicators and controls, standby batteries, peripheral devices, , one-way emergency voice/alarm communications, etc.
- b. The systems supervise related life safety and emergency systems to include the building fire protection systems and sprinklers, Emergency Responder Radio Systems, and campus Mass Notifications.
- c. System events shall be reported to the campus Security and Boston Fire Department via the existing campus alarm reporting system in accordance with the campus Emergency Response Plans.
- d. Where existing systems are to be maintained or modified, the work shall comply with the Design Criteria stated herein. Work shall include all necessary upgrades to the existing Fire Alarm Control equipment to support the scope of work including control unit hardware and firmware upgrades, devices and wiring with temporary reprogramming, final programming and system re-acceptance testing in accordance with NFPA standards and applicable code.
 - i. The system operation, including event annunciation, occupant notification and fire safety functions shall match existing unless otherwise directed by the Project Manager.
 - ii. New strobe appliances within the work area shall be compatibly-listed for use with existing devices. In the event that new and existing devices are not compatible or if the provisions for strobe synchronization stated in NFPA 72 cannot be met, all devices within the affected area shall be replaced to comply with the applicable Codes.
 - iii. All devices and their respective wiring including types, methods, and color-coding shall match existing.
- e. Contractor shall coordinate project phasing and impairment plans with the HMS Project Manager and provide temporary protection and system programming to accommodate the phased construction, alteration and demolition activities.

2. Codes, Standards and References

- a. The system shall comply with all current applicable codes, including the following:



- i. Massachusetts Building Code (780 CMR)
- ii. NFPA 72 – National Fire Alarm and Signaling Code
- iii. 527 CMR and Massachusetts Electrical Code (NEC)
- iv. City of Boston Fire Prevention Order
- v. All applicable UL standards, including UL864, UL268, UL464 and UL 1971
- vi. Americans with Disabilities Act (ADA) and 521 CMR MA Architectural Access Board regulations.
- vii. Harvard Medical School Emergency Management Plan

3. Impairments and Safeguards

- a. Safeguarding of the building during demolition, alteration and construction shall be a joint cooperative effort involving the entire project team, including the fire protection contractor, the fire alarm contractor, the general contractor/construction manager, owner and all authorities having jurisdiction. The fire protection contractor shall coordinate with any and all parties as appropriate in order to achieve proper safeguarding as described in the project documents.
- b. The Contractor shall ensure proper building protection and safeguarding at all times during demolition, alteration, and construction in complete compliance with all applicable codes, regulations, standards, including but not limited to applicable Building and Fire Codes, and the current edition of NFPA 241.
- c. During times when the existing, modified and/or new building fire protection systems are impaired, the contractors shall provide appropriate safeguarding of the renovation work area, to include temporary heat detection or adequate alternate protection throughout the space as coordinated with, and approved by, the tenant’s and owner’s fire prevention program manager, building manager, construction manager, insurance underwriters, and all authorities having jurisdiction.



Safeguarding shall also apply to all related phasing, shut-downs, swing spaces, temporary facilities and relocations, etc. Detection shall be located and installed in accordance with the products' listing and manufacturer's instructions, and shall be tested and maintained until such time that the permanent building protection is restored. Alternative safeguarding such as, but not limited to, fire watch personnel, or temporary fire protection systems, may be considered if acceptable to the tenant/owner and authorities having jurisdiction. Refer to, and coordinate with, fire alarm systems documents, and safeguarding and impairments notes and specifications. Coordinate with fire alarm system contractor and all other trades.

- d. The contractor shall be required to submit a complete demolition, alteration, construction, phasing and impairment plan to include the information above, a schedule of project milestones and related work, and an anticipated schedule for installation, impairments, programming and all phases of final testing and completion of the work. This plan shall be coordinated with all authorities having jurisdiction, the tenant's/owner's fire prevention program manager, construction manager, and shall include any and all information, drawings, and graphics to meet the approval of the authorities having jurisdiction. The contractors shall provide firewatch personnel or temporary protection as required by any authorities having jurisdiction, the tenant/owner, or the tenant's/owner's insurance underwriters.
- e. All costs associated with the above safeguarding during demolition, alteration, construction, phasing, shutdowns, etc. with regard to fire protection systems shall be included in the contractor's base bid.
- f. Temporary Protection
 - i. The Contractor shall provide temporary protection while portions of the existing fire protection sprinkler system or fire alarm system are impaired or out of service for an extended period (generally 8 hours or more) during construction, alteration and demolition activities.
 - ii. Temporary protection shall be installed throughout the affected areas in accordance with the Contractor's impairment plan and Boston Fire Department requirements. Protection shall include, but not be limited, to the following:
 - 1. Automatic fire detection equipment including smoke detectors and/or temporary heat detectors.
 - 2. Notification equipment including, but not limited to, ADA compliant combination audible/visual notification appliances.
 - 3. Manual fire alarm pull stations.
 - iii. Temporary fire protective devices shall be installed in accordance with the product's labeling, manufacturer's listing requirements and applicable codes.



- iv. Installation of temporary fire protective devices shall be coordinated with the construction, alteration and demolition conditions, and shall account for structural members, ductwork, piping and conduit racks as they occur or are encountered during construction.
- v. Temporary fire protective devices shall be connected to the building fire alarm system and shall function as permanent until replaced with final fire protection and fire protective systems.
- vi. Temporary fire device layout shall be changed as necessary during construction in order to maintain proper coverage including spacing and locations of devices as work progresses and building areas are impacted.
- vii. Bagging or the temporary covering of smoke detectors shall not be allowed during construction, unless specifically permitted by the Boston Fire Department. Where detectors are permitted to remain during construction, they shall be cleaned and recalibrated or replaced prior to system reacceptance in accordance with NFPA 72 requirements.

4. Control Panels

- a. The main control panel shall be a solid-state, microprocessor-based, modular fire alarm control panel. The control panel shall communicate with all peripheral initiating devices and each initiating device shall report to the control panel with an individual device point number and message.
- b. The control panel shall receive all alarms from peripheral devices and remote data gathering panels and initiate a pre-recorded voice message throughout the facility followed by the appropriate audible and visual evacuation signal. Evacuation signals are activated throughout the building in low-rise occupancies, and on the floor of incident plus one floor above and one floor below in high rise buildings.

5. Fire Command Center or Fire Command Station (FCS)

- a. A designated fire command station shall be located at the main entrance to each facility to comply with 780 CMR requirements. The FCS shall house the primary operator’s display indicating all system events and control functions, an LCD display to show device type, status and location, and an audio control panel for selective and all-call one-way voice paging.
- b. High rise buildings shall have a fire command center in accordance with 780 CMR Requirements with H-O-A switches for control and status monitoring of HVAC equipment and an event printer to report all system activity.

6. Building Automation Interface



- a. The fire alarm system shall be interfaced with the building automation system (automatic temperature control system) and HVAC systems to send and receive signals from alarm indicating devices and H-O-A switches for operation of fire safety control functions, smoke control systems, and control of related building ventilation systems.
- b. Dedicated smoke control systems shall comply with UL 864 Category UUKL Requirements; all wiring for smoke control systems shall have a minimum Level 2 Survivability.

7. Alarm Initiating Devices

a. Manual Pull Stations

- i. Manual pull stations shall be provided at each floor egress and shall be spaced, such that the travel distance to any pull station is less than 100'-0".
- ii. Pull stations shall be double-action of the non-coded type with a key reset switch.
- iii. Provide an all-call (general evac.) pull station adjacent to each main FACP/FCS.

b. Smoke Detectors

- i. Smoke detectors shall also be located within electric rooms, elevator lobbies and control rooms, and at other locations as required by code. Smoke detectors shall be photoelectric type. Beam detectors or air-sampling smoke detection shall be located in open wells as well as large open areas in lieu of photoelectric smoke detectors.
- ii. Duct-mounted smoke detectors shall be located at each air handling unit with a capacity greater than 2000 CFM to initiate unit shutdown, and at smoke dampers or combination fire/smoke dampers to initiate damper control functions. New duct detectors shall be photoelectric-type and programmed for Supervisory event reporting as permitted by 780 CMR.
- iii. Photoelectric smoke detectors shall be provided in each lab space, except where ambient conditions dictate that another type of early-warning detection be used (such as heat detection or air-sampling smoke detector, etc.)

c. Heat Detectors

- i. Heat detectors shall be provided in all environmental rooms.

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- d. Alarm Verification: Smoke detectors shall be capable of employing alarm verification features whereby the system will confirm through a verification period or the activation of (2) smoke detectors to initiate an alarm condition prior to initiating the occupant notification sequence. Alarm verification is only permitted to be employed where necessary, and shall be subject to the review and approval of the Owner and Fire Official.

8. Alarm Notification Appliances

- a. Visual strobe units shall be provided in all public use and common use areas including work areas, environmental rooms, dark rooms, machine shops, roof tops, and shall meet the public mode signaling requirements of ADA, UL, and NFPA.
- b. Audible units shall be speakers with a peak output of 88 dB at 10'-0", and shall be spaced to produce a minimum of 15dbA above ambient throughout the building.
- c. Audible units in mechanical areas or other areas with high ambient noise shall be trumpet type loudspeakers suitable for such locations to ensure the 15dbA above ambient is achieved.
- d. Devices shall be predominantly red in color; where speakers are used for emergency signaling, the device shall not be labeled "FIRE" or have any other signifying marks to restrict its use for fire alarm only.

28 3100 – Fire Alarm System

1. Fire Alarm Control Panels

- a. Fire alarm control panels shall be located on every third floor to provide fire alarm service termination to the floor on which it's located, the floor above and the floor below. Each panel shall communicate directly with the main fire alarm control panel and fire command center. Each remote panel shall be a fully functional self-contained and self-sufficient unit such that, if the connection to the control processor is severed, (a trouble indication shall sound) the panel will continue to function and sound appropriate alarms based on the last set of programming instructions received.
- b. Terminal cabinets shall be used on all other floors to provide service terminations between the vertical riser (trunk wiring) and horizontal floor circuits (branch wiring).
- c. Systems shall be provided by Simplex Grinnell or approved.
- d. Provide a 120V convenience outlet and Cat-5 TCP/IP Network drop adjacent to each fire alarm panel.



2. Elevator Interface

- a. The fire alarm system shall be interfaced with the elevator equipment and provide emergency elevator functions, to include primary and alternate recall, fire hat indication and hoistway ventilation control.

3. Wiring

- a. All fire alarm wiring shall be Class "A" supervised circuits.
- b. Fault isolation shall be employed to ensure that a single wiring fault will not affect more than one floor or evacuation zone.
- c. All wire and cable shall be suitable for fire alarm use and shall be installed in conduit (Level 1 survivability) as determined by the Project Manager.
- d. Where selective or partial evacuation is employed (such as high rise buildings), all circuits necessary for occupant notification shall have a minimum Level 2 Survivability from their point of origin until they enter the evacuation zone served.

4. Device Labeling and Identification

- a. Each system device shall be labeled and identified using P. Touch Labeling System or equivalent. Nomenclature shall include the programmed device address, and device nomenclature labeling to comply with HMS Standard as follows:
- b. Device Nomenclature Labeling

Building	Address	Facility Letter	Floors, Bsmt, Penthouses, Roof, Mezz.	Fire Detection Devices	Detection Device Acronym
180	180 Longwood	F	3 + L, R	Smoke Detector	SD
641	641 Huntington	J	4 + L, R	Duct Smoke Detector	DSD
158, 160 & 164	160, 164 Longwood	H	4 + L	Heat Detector	HD
Armenise	210 Longwood Ave.	D	6 + L	Audio Visual	AV
C Building	240 Longwood Ave.	C	6 + L, P	Pull Station	MS
Countway	10 Shattuck St.	W	6 + L1, L2, R	Door Holder	DH
Dental	188 Longwood	T	2 + L	Control Module	CM
Goldenson	220 Longwood Ave.	B	5 + L, P	Monitor Module	MM
Gordon Hall	25 Shattuck Street	A	5 + L, M	Remote Indicator	RI
HIM	4 Blackfan Circle	P	10+L+P	Flow Switch	FS
LHRRB	45 Shattuck St.	L	6 + L, R	Tamper Switch	TS
Mudd	250 Longwood Avenue	M	6+1+1	Water Flow	WF
NRB	77 Avenue Louis Pasteur	S	10+L+P	Strobe Light	SL
TMEC	260 Longwood Ave.	E	4 + L, M	Fire Panel	FP
REB	190 Longwood Ave.	K	5 + L, M	Digitizer	D
Vanderbilt Hall	107 Ave. Louis Pasteur	V	6 + L1, L2, P	Smoke Detector w/ Remote	SDR
Warren Albert	200 Longwood Avenue	Q	5+L+P	Duct Smoke Detector w/ Remote	DSDR
<p>Nomenclature Example T-SD3-0001 T Facility SD Smoke Detector 2 Floor 1 Number in Series</p>					



- c. All device labeling shall be coordinated and reflected on the Tier 3 As-Built Record Documents.
5. Record Documents
- a. The Contractor shall provide complete as-built Tier 3 Record Documents in accordance with NFPA 72 and 780 CMR Requirements. Documents shall include electronic and paper copies of the following: (chart deleted; inserted under #4, b.)
 - i. Updated shop drawings showing the final as-built conditions.
 - ii. Battery calculations and notification circuit voltage drop calculations.
 - iii. NFPA Matrix / Sequence of Operation
 - iv. Test and Inspection Report
 - v. Updated NFPA Record of Completion
6. Testing
- a. The entire system shall be tested to the satisfaction of the Owner after which a final acceptance test witnessed by the local authority, the Owner's Building Construction Department, Risk Management Department and Security Department Representatives as follows
 - i. First Party Test: A full and complete test in accordance with NFPA Requirements and applicable code shall be conducted by the Installing Contractor and system supplier.
 - ii. Third Party Test: A full test shall be conducted by the Owner's designated representatives (Service Company of Record – Aetna Alarms), or Commissioning Agent as directed by the Project Manager. The Installing Contractor and system supplier shall participate during these tests and will resolve any outstanding issues to the Owner's satisfaction.
 - iii. Fire Department Acceptance Testing: The Installing Contractor shall be responsible for coordination and final acceptance testing to comply with BFD Requirements.