

SECTION 16721-“FIRE ALARM SYSTEM”

- 1.0 This section is intended to define the general installation and testing requirements for the various fire alarm systems at the University of Pennsylvania. At a minimum, Local and National Codes that govern the layout and installation of the system shall be used during the design process.
- 2.0 References: National Fire Protection Association (NFPA):
 - A. 70 National Electrical Code (NEC).
 - B. 72 National Fire Alarm Code.
 - C. 90A Installation of Air Conditioning and Ventilating systems.
- 3.0 Underwriters’ Laboratories (UL): Construct all fire alarm and fire detection equipment in accordance with the following publications:
 - A. 268 Smoke detectors for Fire protective Signaling Systems.
 - B. Fire Protection Equipment Directory.
 - C. Electrical Construction Materials Directory.
 - D. 38 Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems.
 - E. 464 Audible Signal Appliances.
 - F. 521 Heat Detectors for Fire Protective Signaling Systems.
 - G. National Electrical Manufacturers Association (NEMA): SB4.
 - H. Factory Mutual (FM) System: Approval Guide.
 - I. Local Fire Codes – City of Philadelphia Fire Protection Code.
 - J. Americans With Disabilities Act.
- 4.0 Quality Assurance:
 - A. Existing systems: All items of the fire alarm system shall be listed as a product of

the same manufacturer as the existing system. Substitutes will not be accepted.

- B. New System: All items of the fire alarm system shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories, Inc. and shall bear the "UL" label. All control equipment to be listed under UL as a single control system.

5.0 System Description:

- A. General: Operation shall be such that actuation of any initiating device (manual station, automatic sprinkler system, automatic smoke detector, heat detector, etc.) shall cause the system to enter alarm mode. The system shall be electrically supervised for all initiating circuits, alarm signal sounding circuits and power supply circuits.
- B. Operation: The actuation of any manual or automatic device shall cause a signal to sound at OCC (Operations Control Center) Penn Com, University's Monitoring System. General evacuation shall be initiated automatically.
 - 1. Initiating devices shall provide the appropriate pre-alarm, supervisory, or trouble signals.
- C. All alarm initiating devices shall indicate individually on each alphanumeric display. Devices will have a descriptive message and condition message, and will identify the area causing an alarm or trouble condition, geographically by floor.

6.0 Alarm Zones: Each manual pull station, area or duct smoke detector, heat detector, sprinkler system water flow switch, and tamper switch shall annunciate as an individual point.

7.0 Coordination: Submit design to Factory Mutual for review and approval prior to bidding documents.

- A. At no time shall an existing fire alarm system be put out of service without notifying the University and the Insurance Underwriter. Either a firewatch shall be maintained when an existing system is shut down, or a temporary system installed. The Operations Control Center will notify Factory Mutual and University Police will notify the Philadelphia Fire Department.
- B. The fire alarm system shall be tied into the University's monitoring system at OCC (Operations Control Center) in the Franklin Building. This connection shall include all work (surge suppression devices, wiring, control modules, programming, etc.) to tie into the existing Digitize 3000 System Campus Reporting System via dedicated

(dry) telephone line.

8.0 Products: Manufacturer all system components shall be the standard product of FCI (Fire Control Instruments) or Gamewell. Alternates will not be accepted.

A. Fire Alarm Control Panel:

1. The fire alarm control panel shall be FCI 7200 Series, or Gamewell.

B. The FACP shall be of the addressable type and come equipped with features necessary to perform required functions and as specified as follows:

1. 80 character, backlit liquid crystal display.
2. Individual red system alarm LED.
3. Individual yellow supervisory service LED.
4. Individual yellow trouble LED.
5. Green "power on" LED.
6. Alarm Acknowledge Key.
7. Supervisory Acknowledge Key.
8. Trouble Acknowledge Key.
9. Alarm Silence Key.
10. System Reset Key.
11. LED testing.
12. Alarm verification functions.
13. Alarm trouble and abnormal condition listing.
14. Enabling and disabling of each monitor point separately.

C. Control Panel shall comply with all the applicable requirements of UL 864. The loss of primary power or the sequence of applying primary or emergency power, shall not affect the transmission of alarm supervisory or trouble signals.

9.0 Addressable Devices:

A. Communication with Addressable Devices: The system must provide communication with all initiating and control devices individually. All of these devices are to be individually annunciated at the control panel and the remote annunciator. Annunciation shall include the following conditions for each point.

1. Alarm.
2. Open.
3. Short.
4. Ground.

5. Device fail/or incorrect device.
- B. All addressable devices shall have the capability of being disabled or enabled individually.
- C. Identification of Addressable Devices:
 1. Each addressable device shall be uniquely identified by an address code. The use of jumpers to set address will not be acceptable due to the potential of vibration and poor contact. Device identification schemes that do not use uniquely set addresses but rely on electrical position along the communication channel are unacceptable. The system shall accommodate the addition of an addressable device between existing devices and shall not require reprogramming existing devices.

10.0 Manual Pull Stations:

- A. The stations will be red with painted white, raised lettering. The station will mechanically latch upon operation and remain so until manually reset by opening with a key common to all system locks. Pull stations will be double action.
- B. The front of the station is to be hinged to a backplate assembly and must be opened with a key to reset the station. The key shall be common with the control panels. Stations which use allen wrenches or special tools to reset, will not be accepted.
- C. Each pull station shall be identified with the following sign: “IN CASE OF FIRE SOUND ALARM AND CALL FIRE DEPARTMENT” and shall be provided by the installing Contractor.
- D. ADA Strobe: Strobes shall be of the synchronized type. Candela ratings shall be in accordance with ADA, UL 1971 and NFPA-72 requirements.
- E. Horns shall provide a sound of 96 dBA at 10'. In residential units, the sound level shall be a minimum of 70 dBA at the pillow and field testing shall confirm sound levels prior to installation horns.

11.0 System Expansion:

- A. Provide audible and visual circuit loading such that all devices receive full power and such that no circuit contains more than 60 percent of the manufacturer’s rated capacity of devices.

- B. Provide addressable circuit loading such that no addressable circuit or loop contains more than 75 percent of the manufacturer's rated capacity of devices.
- 12.0 Emergency Power Supply: Power Requirements:
- A. Provide sufficient standby battery capacity to operate the entire system upon loss of normal power for a period of 24 hours in a standby mode plus 10 minutes in alarm mode. In addition, provide an additional 20 percent spare standby battery capacity. All battery charging and recharging operations shall be automatic. Batteries shall be brought from fully discharged to fully charged condition within 48 hours.
 - B. Batteries: Storage batteries shall be sealed, lead calcium type requiring no additional water.
 - C. Battery charger shall be completely automated with high/low charging rate. Charger shall be located in FACP.
 - D. Power supply shall be connected to the building's emergency circuits.
- 13.0 Heat Detectors: Automatic heat detectors shall be of the analog addressable type with fixed temperature/rate-of-rise sensors as required by application.
- 14.0 Smoke Detector: Ceiling mounted smoke detector shall be of the analog addressable photoelectric type with plug-in base and auxiliary relay contacts.
- 15.0 Remote Annunciator: Alphanumeric liquid crystal display (LCD) type.
- 16.0 Identification and Labeling - Conductors:
- A. All circuit conductors shall be identified within each enclosure where a tap, splice or termination is made.
 - B. Each cable shall be identified as to service within each enclosure, pull box and junction box.
 - C. Conductor and cable identification shall be by single piece, plastic coated self-laminating printed markers, or by heat-shrink type sleeves. Markers shall be attached in a manner that will not permit accidental detachment.
 - D. All cables shall be installed in conduit.

17.0 Training:

- A. Training sessions shall be held for University employees. All training shall be held in a classroom type atmosphere. The amount of training and the duration of each training session shall be coordinated with the University. Training manuals shall be provided for all attendees.

18.0 Testing - General:

- A. Testing of the fire alarm system shall meet the requirements set forth in NFPA 72. Testing shall be performed in the presence of N-Tech Company and the University of Pennsylvania.
- B. Each portion of the fire alarm system shall be tested prior to being placed into service.
- C. At the conclusion of the work and prior to final payment, a complete system acceptance test shall be conducted. Tests shall include interfaces from the fire alarm system to the elevator system, door interlocks, and other interconnected systems. The system shall not be accepted until all testing is complete and the entire system is fully functional.

19.0 Software: Three (3) copies of the software shall be given to the University representatives to distribute to OCC, University Engineering Office, and operating personnel.

- A. Locations of devices: According to NFPA 72 and other applicable codes and standards.
- B. In mechanical rooms no smoke detectors shall be installed. Provide only heat detectors and horn strobes..
- C. Minimum amount of smoke detectors required by code. Only photoelectric smoke detectors are permitted in University Buildings.
- D. All devices shall be accessible in lobbies or high reach areas. Beam detectors shall be installed in areas where area smoke detectors cannot be easily reached for service and maintenance.
- E. Horn strobes must be audible or visible in all parts of building including mechanical rooms, etc. The use of horns should be limited in exit stairwells, especially in high rise buildings where building occupants must remain in the stairwells while existing during an emergency. Strobes should be considered as an alternate.

- F. Performance testing is the responsibility of the installer and will be witnessed by the Department of Fire and Emergency Service (OFES). The installer shall provide all equipment required for testing and provide three (3) copies of the point list and set of location plans to OFES.

- G. When connecting to an existing system:
 - 1. During the design process advice and permission shall be obtained from the University Engineering Office.
 - 2. Recertification and testing of the entire building's fire alarm system will be required by the City of Philadelphia.

END OF SECTION