# GENERAL

## RELATED DOCUMENTS

### Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

## SUMMARY

### This section includes fire alarm systems with control panels, manual stations, detectors, signal equipment, controls, and devices.

### Fire alarm system specified in this section, including conduit, LV wiring, and devices, shall be furnished and installed by UNL BSM. Electrical contractor shall provide all conduit, back boxes for 120V connections to fire alarm equipment indicated on the drawings, including but not limited to: fire alarm control panel, NAC panels, fire/smoke dampers, etc.

## DEFINITIONS

### FACP: Fire alarm control panel.

### LED: Light-emitting diode.

### Definitions in NFPA 72 apply to fire alarm terms used in this Section

## SYSTEM DESCRIPTION

### General: Noncoded, analog-addressable system; automatic sensitivity control of certain smoke detectors; and multiplexed signal transmission dedicated to fire alarm service only.

## SUBMITTALS

### Product Data: For each type of product indicated.

### Shop Drawings:

#### Drawings: Prepare project specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed media.

#### Wiring Diagrams: Detail wiring and differentiation between manufacturer-installed and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified.

### Operating Instructions: For mounting at the FACP.

### Submissions to Authorities Having Jurisdiction: Submit to authorities having jurisdiction. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Engineer for review.

### Certificate of Completion: Comply with NFPA 72 and IBC

## QUALITY ASSURANCE

### Installer Qualifications: An experienced installer who is an authorized representative of the FACP manufacturer for both installation and maintenance of units required for this project.

### Manufacturer Qualifications: Has extensive experience in manufacturing systems similar to those indicated for this Project and with a record of successful in-service performance.

### Source Limitations: Obtain fire alarm system components through one source from a single manufacturer.

### Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, and requirements of authorities having jurisdiction.

### Comply with NFPA 72 and IBC.

## EXTRA MATERIALS

### Furnish one of each type of initiating, control, and notification device. Devices shall be provided for owner use at the end of the project. Specialty devices, flame detectors, beam detectors, etc. need not be provided.

# Products

## MANUFACTURERS

### Manufacturers: Subject to compliance with requirements, provide products by the following:

#### Notifier; Div of Honeywell Corp. NFS-3030 ONYX or INSPIRE series intelligent fire panel.

## FUNCTIONAL DESCRIPTION OF THE SYSTEM

### Noncoded, analog-addressable system; automatic sensitivity control of certain smoke detectors; and multiplexed signal transmission dedicated to fire alarm service only.

## PERFORMANCE REQUIREMENTS

### Comply with NFPA 72 and IBC

### Fire alarm signal initiation shall be by one or more of the following devices:

#### Manual stations.

#### Heat detectors.

#### Smoke detectors.

#### Automatic sprinkler system water flow.

### Fire alarm signal shall initiate the following actions:

#### Alarm notification appliances shall operate continuously.

#### Identify alarm at the FACP and remote annunciator.

#### Notify the University Police Department Dispatch. Notification of the UNLPD central station shall be via IP connection and back up cellular. All information on FACP shall be made available to the dispatch and shall be point specific. Provide all equipment required for this function.

#### Transmit an alarm signal to the remote alarm central station.

#### Unlocking of electric door locks in designated egress paths.

#### Release of fire and smoke doors held open by magnetic door holders if alarm was initiated by a detector on either side of the door.

#### Recall of elevators if alarm was initiated by a detector at elevator lobby, elevator shaft, or elevator machine room.

#### Shutdown of fans and other air-handling equipment serving the zone where alarm was initiated.

#### Closing of smoke dampers in air ducts of system serving zone where alarm was initiated by opening a fire alarm relay to interrupt power to smoke dampers located in air supply ducts across smoke partitions in the are of the alarm. Approve zoning of HVAC shutdown with UNL Building Code Officials. A normally closed alarm contact shall be provided and attached to the HVAC monitoring system for alarm status.

#### Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.

#### Record events in the system memory.

### Supervisory signal initiation shall be by one or more of the following devices or actions:

#### Operation of a fire-protection system valve tamper.

#### Activation of a duct detector.

#### Failure of a smoke control component or zone.

#### Fire-pump power failure, including a dead-phase or phase-reversal condition.

#### Low air pressure switch operation on a dry-pipe or pre-action sprinkler system.

### System trouble signal initiation shall be by one or more of the following devices or actions:

#### Open circuits, shorts and grounds of wiring for initiating device, signaling line, and notification appliance circuits.

#### Opening, tampering, or removal of alarm-initiating and supervisory signal-initiating devices.

#### Loss of primary power at the FACP.

#### Ground or a single break in FACP internal circuits.

#### Abnormal AC voltage at the FACP.

#### A break in standby battery circuitry.

#### Failure of battery charging.

#### Abnormal position of any switch at the FACP or annunciator.

### System Trouble and Supervisory Signal Actions: Annunciate at the FACP and remote annunciator. Record the event in system memory.

### Elevator Controls: Operation of a heat detector in elevator shaft or machine room shuts down elevator power by operation a shunt trip in the circuit breaker feeding the elevator.

## MANUAL PULL STATIONS

### Description: Fabricated metal or plastic and finished in red or brushed aluminum with molded operating instructions of contracting color.

#### Dual-action mechanism initiates an alarm. With integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.

#### Station Reset: Key (preferred) or wrench operated.

## SMOKE DETECTORS

### General Description:

#### UL 268 listed, operating at 24Vdc, nominal.

#### Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

#### Piezoelectric sounder rated at 88dBA at 10 feet according to UL 464.

#### Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection of building wiring.

#### Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.

#### Integral Visual-Indicating Light: LED type. Indicating [detector has operated] and [power on] status.

#### Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.

##### Rate-of-rise temperature characteristics shall be selectable at the FACP for 15 or 20 deg F per minute.

##### Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at the FACP to operate at 135 or 155 deg F.

##### Provide multiple levels of detection sensitivity for each sensor.

### Photoelectric Smoke Detectors:

#### Detector Style: Low Profile

#### Sensor: LED or infrared light source with matching silicon-cell receiver.

#### Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

### Duct Smoke Detectors:

#### Photoelectric Smoke Detectors:

##### Sensor: LED or infrared light source with matching silicon-cell receiver.

##### Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

#### UL 268A listed, operating at 24Vdc, nominal.

#### Integral Addressable Module” Arranged to communicate detector status (normal, alarm, or trouble).

#### Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.

#### Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.

#### Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status. Provide remote status and alarm indicator and test station where duct detectors are located in non-accessible locations.

#### The number of FACP settable levels varies among manufacturers and between detector types. Indicate the specific number of levels on Drawings or in the “Remarks” column of a detector schedule.

#### Each sensor shall have multiple levels of detection sensitivity.

#### Sampling Tubes: Design and dimension as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.

#### Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

## OTHER DETECTORS

### Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or rate of rise of temperature that exceeds 15 deg F (8.3 deg C) per minute, unless otherwise indicated.

#### Mounting: Low profile plug-in base, interchangeable with smoke detector bases.

#### Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

## NOTIFICATION APPLIANCES

### Description: Equip for mounting as indicated and have screw terminals for system connections.

#### Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.

#### All alarm devices shall be semi-flush mounted unless otherwise indicated.

### Visible Alarm Devices: Synchronized Xenon or LED strobe lights listed under UL 1971 with clear or nominal white polycarbonate lens. Mount lens on an aluminum faceplate. The word “FIRE” is engraved in minimum 1-inch (25 mm) high letters on the lens.

#### Rated Light Output: Per NFPA.

### Voice/Tone Speakers:

#### UL 1480 Listed.

#### High-Range Units: Rated 2 to 15 W.

#### Low-Range Units: Rated 1 to 2 W.

#### Mounting: Flush, semi recessed.

#### Matching Transformers: Tap range matched to the acoustic environment of the speaker location.

#### Color: White (except on wood ceilings, provide black on wood slat ceiling).

#### Able to generate a low frequency tone of 520hz.

## MAGNETIC DOOR HOLDERS

### Description: Units are equipped for wall mounting and are complete with matching door plate.

#### Electromagnet: Requires no more than 3 W to develop 25-lbf (111-N) holding force.

#### Wall-Mounted Units: Flush mounted, unless otherwise indicated.

#### Rating: 24 Vdc served from fire alarm power supply.

#### Relay: Furnish one relay (or detector auxiliary contact) per door or pair of doors and interrupt power to holder and operate doors only from alarm condition of detectors on either side of the door(s).

#### Floor mounted magnets shall not be permitted.

### Material and Finish: Match door hardware.

### Door holders, which are indicated to be integral with a door closer shall be furnished by the General Contractor. All wiring of door holders shall be furnished by the Electrical Contractor. Door holders shall be normally energized at 24 Vdc from fire alarm power supply.

## CENTRAL FACP

### General Description:

#### Modular, power-limited design with electronic modules, UL 864 listed.

#### Addressable initiating devices that communicate device identity and status.

#### Addressable control circuits for the operation of mechanical equipment.

### Alphanumeric Display and System Controls: Arranged for interface between human operator at the FACP and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

#### Annunciator and Display: Liquid-crystal type.

#### Keypad: Arranged to permit entry and execution of programming, display, and control commands.

### Circuits:

#### Signaling Line Circuits: NFPA 72, Class B.

##### System Layout: Use no more than manufacturers specifications on each signaling line circuit.

##### Furnish system circuits with a minimum of 25% spare device capacity.

##### Notification-Appliance Circuits: NFPA 72, Class B.

##### Actuation of alarm notification appliances, emergency voice communications, annunciation, smoke control, elevator recall, shall occur within 10 seconds after the activation of an initiating device.

### Notification-Appliance Circuit: Operation shall sound in a temporal pattern, complying with ANSI S3.41.

### Elevator controls: Heat detector operation shuts down elevator power by operating a shunt trip in a circuit breaker feeding the elevator.

#### A field-mounted relay actuated by the fire detector or the FACP closes the shunt trip circuit and operates building notification appliances and annunciator.

### Fire-pump power failure, including a dead-phase or phase-reversal condition, initiates the following:

#### A supervisory, audible and visible “fire-pump power failure” signal indication at the FACP and the annunciator(s).

#### Transmission of supervisory signal to remote alarm receiving station.

### Power Supply for Supervision Equipment: Supply for audible and visual equipment for supervision of the AC power shall be from a dedicated DC power supply.

### Alarm Silencing, Trouble, and Supervisory Alarm Reset: Manual reset at the FACP and remote annunciators, after initiating devices are restored to normal.

#### Pressing the silence button halts alarm operation of notification appliances and activates an “alarm silence” light. Display of the identity of the alarm zone or device is retained.

#### Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing button is operated again.

#### Silencing switches are not to be used.

### Walk Test: A test mode to allow one person to test alarm and supervisory features of initiating devices. Enabling of this mode shall require the entry of a password. The FACP and annunciator shall display test indication while the test is underway. If testing ceases while in walk-test mode, after a preset delay, the system shall automatically return to normal.

### Transmission to Remote Central Station:

#### Automatically transmit alarm, trouble, and supervisory signals to a remote cental station by an onboard digital alarm communicator transmitter over ethernet and cellular networks.

#### Provide one monitoring point that will activate a tornado message to be played over the fire alarm system. Equipment to activate this message will be provided by UNL.

### Voice/Alarm Signaling Service: A central emergency communication system with redundant microphones, pre-amplifiers, amplifiers, and tone generators provided a special module that is part of the FACP.

#### Indicated number of alarm channels for automatic, simultaneous transmission of different announcements to different zones, or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall be UL 1711 listed.

##### Allow the application of an evacuation signal to indicated number of zones and, at the same time, allow voice paging to the other zones selectively or in any combination.

###### One (1) alarm message indicating floor with alarm condition.

###### Alarm is recorded on involved, floor above, and floor below.

##### Programmable tone and message sequence selection.

##### Standard digitally recorded messages for “Evacuation” and “All Clear”. Wording as directed by the Owner and approved by the Authority Having Jurisdiction.

##### Alarm tone sounds for a maximum of 10 seconds followed by the automatic voice evacuation message. Sequence shall repeat indefinitely until the signal silence or system reset button is pressed.

#### Notification-Appliance Circuits” NFPA 72, Class B unless otherwise required by NFPA 72.

#### Status annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters’ two-way telephone communication zones.

#### Pre-amplifiers, amplifiers, and tone generators shall automatically transfer to backup units on primary equipment failure.

### Primary Power; 24VDC obtained from 120VAC service and a power supply module. Initiating devices, notification appliances, signaling lines, trouble signal, supervisory and digital alarm communicator transmitter shall be powered by the 24 VDC source.

#### The alarm current draw of the entire fire alarm system shall not exceed 80 percent of the power supply module rating.

#### Power supply shall have a dedicated circuit from a circuit breaker with a breaker lock. The breaker shall be identified as “FACP POWER” for the Fire Alarm Control Panel and “FIRE ALARM NAC POWER” for the Notification Appliance Circuit power supplies with a white on red label next to each breaker.

### Secondary Power: 24 VDC supply system with batteries and automatic battery charger and an automatic transfer switch.

#### Batteries: Sealed lead acid (SLA).

#### Battery and Charger Capacity: Comply with NFPA 72.

### Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

## REMOTE EMERGENCY POWER SUPPLY (WHERE APPLICABLE)

### General: Components include sealed lead acid battery, charger, and an automatic transfer switch.

#### Batteries: Sealed lead acis (SLA).

#### Battery and Charger Capacity: Comply with NFPA 72.

## ADDRESSABLE INTERFACE DEVICE

### Description: Microelectronic monitor module listed for use in providing a system address for listed alarm-initiating devices for wired applications with normally open contacts.

### Integral Relay: Microelectronic relay capable of providing a direct signal to the elevator controller to initiate elevator recall to a circuit-breaker shunt trip for power shutdown, open smoke damper control circuits, open magnetic door holder circuits, etc.

## DIGITAL ALARM COMMUNICATOR TRANSMITTER

### Listed and labeled under UL 864 and NFPA 72.

### Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP and automatically captures one or two communication lines and dials a preset number for a remote central station. When contact is made with the central station(s), the signal is transmitted. The unit supervises up to two communication lines. While supervising two lines, if service on either line is interrupted for longer than 45 seconds, the unit initiates a local trouble signal and transmits a signal indicating loss of the communication line to the remote central station over the remaining line. When communication service is restored, the unit automatically reports that event to the central station. If service is lost on both communication lines, the local trouble signal is initiated.

### Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.

### Self-Test: Conducted Automatically every 24 hours with report transmitted to central station.

### The central station digital alarm receiver equipment needed at the FACP will be provided by UNL.

## REMOTE ANNUNCIATOR

### Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications.

#### Mounting: Flush cabinet, NEBA 250, Class 1.

### Display Type and Functional Performance:

#### Alpha Numeric display for each device, same as the FACP.

#### Control shall permit acknowledging, silencing, resetting, and testing functions.

## WIRE

### NFPA 70, Types FPL, FPLR, or FPLP, as recommended by manufacturer for signaling line circuits.

### Non-Power-Limited Circuits: Solid copper conductors with 600V rated, 75 deg C, color-coded insulation.

### Power-Limited Circuits: #14 or larger THHN Stranded copper conductors with 600V rated, 75 deg C, color-coded insulation per UNL standards.

## CONDUIT

### Conduit is required, conduit and junction box cover shall be red.

### Comply with NFPA 70.

# Execution

## EQUIPMENT INSTALLATION

### Connect the FACP with a disconnect switch or breaker with a breaker lock.

### Mount FACP and annunciator with top of cabinets not more than 72” above the finished floor.

### Manual Pull Stations: Mount semi-flush in recessed back boxes.

### Water-Flow Detectors and Valve Supervisory Switches: Connect for each sprinkler valve station required to be supervised.

### Ceiling Mounted Fire Alarm Devices in Accessible Ceilings: Use flexible metal conduit whip from EMT conduit to ceiling tile to facilitate device relocation in the future and allow device to be mounted flush to ceiling tile.

### Ceiling-Mounted Smoke Detectors: Not less than 4 inches (100 mm) from a sidewall to the near edge.

### Wall-Mounted Smoke Detectors: At least 4 inches (100 mm), but not more than 12 inches (300 mm) below the ceiling.

### Smoke Detectors near Air Registers: Install no closer than 36 inches (1520 mm)

### Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

### Provide raceway connection to fire sprinkler PIV valve.

### Provide documentation box with one set of final as-built drawings, central station report, USB drive containing the latest program, and digital files of the as-builts, OEMs, and central station report. Minimum size 14”x14”x3”, increase size as needed to store documents in an organized manner. This information shall also be stored in the installer’s files for not less than 5 years.

### Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install on flushmounted back boxes with the device-operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.

## INTERCONNECTION TO OTHER SYSTEMS

### Alarm indicating: Provide wiring and conduit as required for alarm and trouble contacts to fire alarm control panel from auxiliary systems. Coordinate with installation contractor.

### Provide 2 CAT 5e or better cables from the IT Network Switch to the main FACP.

### Damper Control: Provide all necessary wiring to smoke dampers.

### Access/Security Control: Provide wiring, conduit, and relay for each access control panel. Connect so relay will interrupt power to the locking device under alarm condition.

## WIRING INSTALLATION

### Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by the manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lase, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system with approved termination devices.

### Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

### Color-Coding: Color code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Coordinate with UNL BSM for standards.

### Install in red conduit.

## IDENTIFICATION

### Identify system components, wiring, cabling, and terminals according to Division 26 Section “Basic Electrical Materials and Methods”.

### Circuit breaker shall be identified as “FACP POWER” for the Fire Alarm Control Panel and “FIRE ALARM NAC POWER” for Notification Appliance Circuit power supplies with a white on red label next to each breaker.

## FIELD QUALITY CONTROL

### Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect field-assembled components and connections and to supervise pre-testing, testing, and adjustment of the system. Report results in writing.

### Final Test Notice: Provide a minimum of 10 days’ notice in writing when the system is ready for final acceptance testing.

### Minimum System Tests: Test the system according to procedures outlined in NFPA 72. Minimum required tests are as follows:

#### Verify the absence of unwanted voltages between circuit conductors and ground.

#### Test all conductors for short circuits using an insulation-testing device.

#### With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on record drawings.

#### Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.

#### Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to the class of wiring used.

#### Test each initiating and indicating device for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.

#### Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiation and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, and signal tones.

#### Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.

### Retesting: Correct deficiencies indicated by tests and complete retest work affected by suck deficiencies. Verify by the system test that the total system meets Specifications and complies with applicable standards.

## CLEANING AND ADJUSTING

### Leaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

## DEMONSTRATION

### Engage a factory-authorized service representative to train Owner’s maintenance personnel as specified below:

#### Train Owner’s maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, adjusting, and maintaining equipment and schedules. Provide a minimum of 4 hours training.

#### Schedule training with Owner at least seven days in advance.

## ON-SITE ASSISTANCE

### Occupancy Adjustments: When requested within one year of the date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit actual occupied conditions. Provide up to two requested visits to Project site for this purpose.