

DIVISION 28 ELECTRONIC SAFETY AND SECURITY

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Unless stated otherwise, the standards in this Facilities Design Manual (FDM) are directed to the Design Professional to incorporate into the Project.

Although the Owner encourages improved concept, method and product recommendations by the Design Professional, deviation from these standards, including product requests for “approved equivalent” status, requires written justification from the Design Professional and written approval from the Owner’s Representative before completion of Design Development Documents.

Changes to this Division since the last issuance are indicated with **yellow highlighted text**.

Links to Support Documents, external webpages and other FDM sections are shown in underlined text.

28 10 00 ELECTRONIC ACCESS CONTROL AND INTRUSION DETECTION

A. GENERAL

1. The Owner has a campus wide Hirsch Security/Access System (SAS) that provides door monitoring, intrusion alarm and access control functions.
 - a. The SAS is available to the entire campus community.
 - b. The SAS is currently installed in buildings as needed.
2. The Owner's System Administrator, Margaret (Maggie) Hamilton (294-2572), is responsible for the operation and maintenance of the SAS and will, with the Owner's Representative, work with the Design Professional to ensure design criteria are satisfied.
3. ISU has entered into a competitively bid contract with the Security/Access Contractor, The Baker Group, for materials and installation of all Hirsch security/access equipment at Iowa state University. As part of this contract, The Baker Group has agreed to provide the SAS on capital projects.
4. The contact for the Security/Access Contractor is as follows.

Tom Richards, Project Manager – Control Systems
The Baker Group
Cell: 515-208-1980
Office: 515-299-4032
Email – RichardsT@TheBakerGroup.com

B. DESIGN REQUIREMENTS

1. During the Schematic Design Phase, the Owner's System Administrator and the Owner's Representative will meet with users to determine project requirements.
 - a. A "concept" drawing (usually a hand-colored plat plan) and a budget estimate are created and reviewed.
 - b. The Owner's Representative will then schedule meeting(s) to transfer this information to the Design Professional.
 - c. The Owner's Representative will participate as consultant and reviewer until bid issue documents are completed.
2. Incorporate information developed in the building security/access plans into the Construction Documents.
 - a. The Owner will furnish standard details to the Design Professional as needed for the project.
 - b. Include the following in the Construction Drawings.
 - 1) Location of doors, control panels, raceways and risers plus necessary details and supporting schedules
 - 2) Location of 20 A, 120 VAC circuit(s) for control equipment.
 - c. For mounting control panels, provide wall space in a secure area directly accessible to the Owner's maintenance personnel using a service key.
 - 1) Provide 8 foot by 8 foot minimum wall space.
 - 2) For the wall space needed by the project, consult with the Owner's Representative.
 - d. In the control panel area, provide suitable lighting on emergency power.
 - 1) If emergency power is not available, install battery pack emergency lighting.
 - e. Power the SAS from emergency power, if available.
 - f. Include SAS requirements in the door, frame and hardware specifications.
 - 1) Specify necessary information for door & frame suppliers.
 - 2) Specify electrified locking hardware is 24 VDC.
 - 3) If card readers and keypads are required, include the specification furnished by the Owner.
 - g. Include Specification Section 08 09 00 describing the testing of doors, frames and hardware.

- 1) See paragraphs under Section 08 09 00 in FDM Part 2/[Division 08 Openings.pdf](#).

C. CONSTRUCTION REQUIREMENTS

1. Specify the cost of SAS work is included in the General Contractor's contract price.
2. Electrical Contractors' Work
 - a. Specify the electrical contractor do the following work.
 - 1) Install cable trays & raceways shared with telecom & other services.
 - 2) Install security/access risers separate from telecom risers.
 - 3) Install 120 VAC power where required for security/access equipment.
3. Specify the Security/Access Contractor is subcontracted directly under the General Contractor, not under the Electrical Subcontractor.
 - a. Specify the Security/Access Contractor to do the following work.
 - 1) Install all control equipment, raceways, low-voltage cabling & security access components at each monitored/controlled door.
 - a) This work includes installing door control panels, power supplies and raceways into door frames and to cable trays, but does not normally include installing door hardware.
 - 2) Install central control equipment, gutters and raceways to cable tray.
 - 3) Install power supplies for controlled doors furnished by General Contractor, and connect to the SAS.
 - 4) Install raceways and control equipment for automatically operated doors at accessible entrances.
 - 5) Be responsible for possession and security of all security/access drawings used on the project site during construction.
4. Submittals
 - a. Due to sensitive information contained in these documents, shop drawings and product data for the SAS will not follow the normal submittal process as defined in the Supplementary Conditions; instead, specify the following process.
 - 1) The Security/Access Contractor will submit shop drawings and product data directly to the Owner's System Administrator with a copy of the letter of transmittal sent to the Owner's Representative.
 - 2) The Owner's System Administrator will review and stamp the submittals, retain one copy and return the remaining submittals directly to the Security/Access Contractor.
 - 3) The Owner's System Administrator will create a letter of transmittal and include one copy with the returned submittals and send one copy to the Owner's Representative.
5. Record Documents
 - a. When construction, testing and acceptance procedures are complete, specify the Security/Access Contractor furnish the Owner's System Administrator with the following documentation package.
 - 1) Construction drawing set updated to accurately reflect installation.
 - 2) Cut sheets of special (non-standard) equipment used on the Project.
 - b. Specify the Security/Access Contractor place a paper copy of the documentation package at each control panel location and provide one paper copy and an electronic copy to the Owner's System Administrator.
6. System Tour
 - a. Specify the Security/Access Contractor provide the Owner's System Administrator and selected maintenance personnel with tour of the completed SAS.
 - 1) No formal personnel training is required.

28 20 00 ELECTRONIC SURVEILLANCE

A. VIDEO SECURITY SYSTEM

1. The closed circuit television CCTV video security system is part of the SAS (see Section 28 10 00).
2. Based on requirements of the Building Program, furnish suggested camera types and locations to the Owner's System Administrator during the Design Development Phase.
3. The video security system will be designed and installed by the Security/Access Contractor using components compatible with the Endura network-based video security system by Pelco (<http://www.pelco.com/products/endura/>).

28 31 00 FIRE DETECTION AND ALARM

A. REFERENCE ABBREVIATIONS

1. ASME American Society of Mechanical Engineers
2. NICET National Institute for Certification of Engineering Technologies
3. NFPA National Fire Protection Association

B. DESIGN REQUIREMENTS

1. Specify compliance with the following current codes and standards.
 - a. State Building Code
 - b. Fire Marshal's Rules.
 - c. NFPA 70 (National Electrical Code)
 - d. NFPA 72 (National Fire Alarm Code)
 - e. NFPA 101 (Life Safety Code)
2. Specify addressable systems installed in new buildings and in major remodels of existing buildings.
 - a. Smaller buildings and minor additions to existing systems may have zone type systems.
 - b. Voice systems are required by the Owner in most new construction.
 - c. Discuss the basic system type with the Owner's Representative prior to design.
3. On additions or remodels to existing systems, specify new equipment of the same manufacturer as existing equipment.
4. For new fire alarm systems, specify equipment supplied by a factory-authorized Iowa-based distributor with service personnel located within 50 miles of campus.
 - a. The following are approved manufacturers.
 - 1) Gamewell-FCI E3 Series
 - 2) Notifier (NESCO distributor)
 - 3) Simplex
5. Discuss the following items with the Owner's Representative and Environmental Health and Safety (EH&S) personnel during Schematic Design.
 - a. Location of fire department attack entrances.
 - b. Locations where information is available to emergency responders
 - c. Location of the fire alarm control panel and any annunciators
 - d. Basic system configuration, i.e. addressable, zone, voice
 - e. HVAC fan shutdown
 - f. Fire rated hinged door hold-open system and voltage
 - g. Fire rated coiling door operating system
 - h. Security/access system

- i. Atrium detection system
 - j. Smoke control systems
 - k. Fire extinguishing system
 - l. Chemical spill alert system
 - m. Severe weather warning system
 - n. Elevators
6. Specify fire alarm shop drawings are submitted by the Contractor to the Fire Marshal for review, with notification to the Owner's Representative and fees paid by the Contractor.
- a. Specify the Contractor to pay all fees related to this submittal and to notify the Owner's Representative when submitted.
 - b. Specify device locations and associated addresses shown on the Drawings and information on the fire alarm control panel shown on an Excel spread sheet.

C. CONSTRUCTION REQUIREMENTS

1. When the Contractor is working on operating fire alarm systems, specify that only circuit(s) involved in the work may be bypassed or disconnected and only during working hours.
 - a. Specify that the system must be operational at the end of the work day.
 - b. Specify that disconnections and bypasses are performed only by the Owner's life safety technicians.
2. Specify the Contractor to cover detectors in construction areas during dust producing operations and to uncover detectors at the end of the work day.
3. Specify the final wiring inside the fire alarm control panel is installed by the panel manufacturer's technicians or by the Owner's life safety technicians.
4. Specify the following functions are performed by a NICET level 3 or level 4 fire alarm technician.
 - a. Submittal Information
 - b. Shop Drawings
 - c. Design of Software Programming

D. CERTIFICATION TESTING:

1. Specify start up and certification testing done by a NICET level 2 or higher certified fire alarm technician, with the technician's name and certification number appearing on the certification documents.
2. Specify acceptance testing witnessed by an Owner's life safety technician.
3. Specify testing and documentation in accordance with NFPA 72, or document as acceptable to the regulating authority.
4. Specify notification appliance circuits are measured and recorded on certification documents as follows.
 - a. In the alarm condition, the final system operating current and voltage at the fire alarm control panel and the voltage at end of line for each horn and strobe circuit.
 - 1) The maximum voltage drop must be less than 10%; correct if needed before certification.
 - b. The final system loop resistance of speaker circuits.
 - 1) The maximum loop resistance must be less than 20 ohms; correct if needed before certification.

E. DOCUMENTATION:

1. Specify one set of as-built fire alarm drawings per NFPA 72.
 - a. Provide an electronic record of the fire alarm system superimposed on the building background.
 - b. Show a wiring/connection diagram for fire alarm devices where new fire alarm hardware is connected into an existing system.

2. Specify submitting the completed and signed NFPA 72 certification documents to the Owner's Representative when the fire alarm is commissioned.
 - a. If acceptable to the regulating authority, specify submitting manufacturer's standard documentation instead of the NFPA Certificate

F. CONDUCTORS AND CABLES

1. Design the fire alarm system as a "power limited" system.
 - a. Specify wiring in 3/4 inch minimum raceway or in cable tray.
 - b. Specify cable tray if it can also be used for other services, such as telecom or security/access.
2. Specify minimum size # 18 AWG conductors, with larger sizes as needed.
3. Specify fire alarm cable is plenum rated, even when used in non-plenum areas or in raceway.
4. Specify wire and cable size and type as recommended by the fire alarm manufacturer.
5. Where cable shields and conductors are spliced, specify the splices are soldered and then insulated.
 - a. Wire connectors (wire nuts) are acceptable as insulation.
6. For risers and other splice points with more than three conductors, specify the use of junction boxes with terminal boards to eliminate soldering and allow easy disconnection for isolation.
 - a. Specify wire type, size, and manufacturer recommended by the equipment manufacturer.

G. GROUNDING AND BONDING

1. Specify shields isolated from ground, except at designated points.
2. For proper circuit monitoring, specify that fire alarm enclosures, boxes and raceways are grounded, even if they carry only power limited circuits.

H. IDENTIFICATION

1. Specify junction boxes are marked by painting them red and stenciling "FA" on the cover.
2. Specify that all fire alarm system conduit be red in color.

I. FIRE ALARM CONTROL PANEL

1. Locate in a non-public, low traffic area with an annunciator at the fire department attack entrance.
 - a. Discuss locations with the Owner's Representative and EH&S personnel.
2. Power Supplies
 - a. For the main power source, specify 120 VAC building power with emergency generator backup if available.
 - 1) For a secondary emergency power source, specify an internal battery pack.
 - 2) Do not specify an inverter backup.
 - b. In buildings without emergency generators, specify battery capacity as follows.
 - 1) 24 hours of standby plus 5 minutes in alarm with all notification appliances operating.
 - 2) Additional 50% spare capacity.
 - c. In buildings with emergency generators, specify battery capacity as follows.
 - 1) 4 hours of standby plus 5 minutes in alarm with all notification appliances operating.
 - 2) Additional 50% spare capacity.
 - d. For pre-action sprinkler systems, specify batteries with 90 hour standby capacity.
 - e. For new fire alarm control panels, specify oversize enclosures to have a minimum of 25% spare initiating zone or addressable point capacity and 25% spare notification appliance capacity.
 - f. Specify a dedicated circuit for each fire alarm control panel with the breaker installed with a breaker lock and plainly marked per NFPA 72.

- g. Locate a convenience receptacle for service purposes within 3 feet of the fire alarm control panel.
- 3. Bypass Switches
 - a. Specify switches with an associated light emitting diode (LED) in the control panel programmed for the following bypass functions:
 - 1) Door holder release bypass
 - 2) Air handling unit shutdown bypass
 - 3) Alarm and supervisory signal bypass (city disconnect)
 - 4) Horn and strobe disable
 - 5) Elevator capture bypass
 - b. Specify that enabling any of the above bypass functions will result in a trouble signal.
 - 1) Specify that trouble signals cannot be bypassed.
- 4. Voice Systems
 - a. Specify voice systems for new buildings and major remodelings.
 - 1) Discuss alternative system requirements with the Owner's Representative and EH&S personnel.
- 5. Communication with Campus Emergency Responders
 - a. The Owner has a Johnson Control Building Automation System (BAS) in most campus buildings.
 - 1) Discuss system availability and connection point location with the Owner's Representative before fire alarm design begins.
 - 2) See paragraphs under Section 25 00 00 in FDM Part 2/[Div 25 Building Automation.pdf](#).
 - b. Specify a stand alone fire alarm system in each building that communicates with the BAS.
 - 1) Provide a programmable dry relay contact at the fire alarm control panel for each of the following functions.
 - a) General alarm (evacuation)
 - b) System trouble
 - c) Supervisory alarm (when used)
 - d) Chemical spill (when used)
 - e) Special alarms (when used)
 - c. Specify the fire alarm control panel is configured to provide contacts which open on alarm.
 - d. Specify a 3/4" conduit with 18-2 shielded cables are specified, as required, between the fire alarm control panel and the nearest building automation panel.
 - e. Specify the fire alarm control panel to have a digital alarm communicator installed, which will not be enabled at this time.

J. INITIATING DEVICES AND CIRCUITS:

- 1. General
 - a. Where zoned system detectors are located in elevator shafts, attics, crawl spaces and similar locations, specify a remote LED is installed in an accessible location.
 - 1) Specify a sign which indicates the detector type and location.
 - 2) If access to the detector is not apparent, specify directions are included on the sign.
 - 3) Specify black 1/4 inch upper case characters on a white background on or adjacent to the LED cover.
 - b. Except in special cases, do not specify remote LEDs for addressable systems.
- 2. Pull Stations
 - a. Locate at every entrance to a stair tower.

- b. Wherever possible, locate to satisfy both NFPA 72 requirements and Fire Marshal's Rule 661-5.659(100) 5.659(1) which requires a pull station within 75 feet of any classroom.
 - c. Specify single action type with centerline at 42 inches above finished floor.
 - 1) Discuss the use of double action type with the Owner's Representative and EH&S personnel.
 - 2) Specify pull station covers at child care areas and areas of potential vandalism.
3. Detectors
- a. Specify photoelectric type smoke detectors for general use.
 - b. Do not specify ionization type smoke detectors without first consulting with the Owner's Representative.
 - c. Where the environment allows, specify electronic type heat detectors.
 - d. Specify rate of rise plus fixed heat detectors in laboratories.
 - e. In stair towers, locate the top detector accessible from a ladder placed on the top landing.
 - f. Before specifying, review atrium detection with the Owner's Representative and EH&S personnel.
 - g. Where possible, locate door release smoke detectors to satisfy both NFPA 72 requirements and corridor detector requirements.
 - h. Specify air-sampling duct detectors following NFPA 90A requirements.
 - 1) Locate upstream from humidification equipment.
 - 2) Do not specify air handling unit shut down hard wired to relay bases in detectors.
4. Sprinkler System Devices
- a. Specify to install sprinkler valve tamper switches to initiate a "supervisory" condition.
 - b. Specify tamper switches are provided for post indicator, zone shut off and back flow prevention valves.
 - c. Specify programming of water flow switches to sound the general alarm and provide time delays as necessary for stable system operation.
 - d. Locate a transient voltage surge suppression device just inside the building on wiring to remote post indicator valve(s).

K. NOTIFICATION APPLIANCES AND CIRCUITS:

1. General
- a. Where ceiling height permits, locate the centerlines of wall mounted horns, speakers, strobes, and combination devices at 92 inches above finished floor.
 - 1) In all cases, locate the centerline of the device at least 6 inches below the ceiling.
 - b. Provide adequate circuits for Audible and Visual devices.
 - 1) Give careful attention to wire sizing for voltage drop when specifying high current visual devices.
 - 2) High current devices may require specifying expansion power supplies.
 - c. In an alarm condition, specify to measure and record the circuit current and the voltage at both the fire alarm control panel and at the end of line resistor.
 - 1) If the measured "as built" voltage drop exceeds 10%, make corrections before acceptance.
 - d. Specify to measure the final loop resistance of speaker circuits at the fire alarm control panel.
 - 1) If the maximum resistance is more than 20 ohms, make corrections before acceptance.
 - e. To quickly guide fire fighters to the fire alarm control panel or annunciator panel, locate an outside audio/visual signal device in a weatherproof box mounted on the building face near the attack entrance to sound a general alarm.
 - 1) Specify Wheelock MT Series or approved equivalent (http://www.wheelockinc.com/products/audible_strobe_appliances/electronic_horns.htm).

2. Audible signal appliances
 - a. Do not locate audible devices in stairwells.
 - b. Specify fire resistant, moisture repellent, paper cone type speakers.
 - 1) Ceiling speakers are acceptable.
 - 2) Specify Wheelock ET Series or approved equivalent (http://www.wheelockinc.com/products/speakers/speakers_speaker_strobes.htm).
 - c. Specify strict compliance with NFPA 72 audibility requirements.
 - 1) Specify the standard temporal-three pattern for the general alarm evacuation signal.
3. Visual signal appliances
 - a. Do not locate strobes or other visual devices in stairwells.
 - b. Locate strobes per NFPA 72, NFPA 101 and ADA requirements.
 - c. Specify synchronized strobes where possible.

L. END OF LINE DEVICES:

1. Install inside the last device on the circuit and mark with a 1/4" diameter blue dot on the outside of the device.
2. Show locations on as-built drawings.

M. ANNUNCIATORS

1. Specify a liquid crystal display (LCD) type located at fire department attack entrances as determined by discussion with the Owner's Representative and EH&S personnel.
 - a. Do not specify graphic annunciator panels.
2. Locate to prevent sunlight from washing out the LCD display.
3. Specify operating controls such as reset, acknowledge and smoke control are accessible by key only.

N. HVAC FAN SHUTDOWN:

1. Locate fan shutdowns where required by current code
 - a. Consult with Owner's Representative and EH&S personnel.
2. Where the fire alarm system is addressable, specify HVAC fan shutdown using addressable relay modules.

O. FIRE-RATED HINGED DOORS

1. Where fire rated doors are held open and released when in alarm, specify electromagnetic door holders or closer/holders.
 - a. Where there is a wall to mount a door holders, specify Rixon or approved equivalent (http://www.assaabloydss.com/library/catalogs/RIXSON/pdf/RC_Electromagnetic%20Door%20Rel.pdf).
 - b. Where there is no wall to mount door holders, specify LCN 4040 SE series closer/holders (<http://www.lcnclousers.com/pdfs/4040se.pdf>).
 - c. Where doors are held open in multiple positions with a swing-free arm, specify LCN 4310ME closer/holders (<http://www.lcnclousers.com/pdfs/4310me.pdf>).
2. Specify 24 VDC or 120 VAC as determined by discussion with the Owner's Representative.

P. FIRE RATED COILING DOORS

1. For coiling door systems, obtain approval from the Owner's Representative before specifying.
 - a. Carefully review control and operational power.
 - b. Specify an approved door operator that powers the door both down and up.
 - 1) For information on coiling counter doors, see paragraphs under Section 08 30 00A3 in FDM Part 2/[Division 08 Openings.pdf](#).
 - 2) Do not specify manual door operation unless approved by the Owner's Representative.
2. Specify fire alarm system detectors with auxiliary contacts or fire alarm control panel operated relays on both sides of the door, regardless of ceiling height, to release the door in the event of a fire.
 - a. Specify the sequence of operation as follows.
 - 1) If either door detector alarms, the building fire alarm system will sound a general alarm and the door will close.
 - 2) If a detector elsewhere in the building alarms, it will sound a general alarm, but the doors will not close.

Q. SECURITY/ACCESS SYSTEM (SAS)

1. Specify interfacing with the SAS using addressable relay and monitor modules.
2. For details on the SAS, see paragraphs under Section 28 10 00 in this Division 28 document.

R. SMOKE CONTROL SYSTEM

1. Specify as required by code.
2. Discuss with the Owner's Representative and EH&S personnel prior to design.

S. FIRE EXTINGUISHING SYSTEM

1. On drawings, show wiring between extinguishing systems and the building fire alarm system.
2. Specify contractor(s) responsible for installation.
3. See paragraphs under Section 21 20 00 in FDM Part 2/[Division 21 Fire Suppression.pdf](#).

T. CHEMICAL SPILL STATION

1. Discuss the requirements for, and locations of, chemical spill stations with the Owner's Representative and EH&S personnel prior to design.
2. When required, yellow chemical spill stations will be furnished by the Owner for installation by the Contractor.

U. SEVERE WEATHER WARNING

1. Discuss requirements with the Owner's Representative and EH&S personnel prior to design.
2. When required, specify one additional blue pull station.

V. ELEVATORS

1. Specify relay(s) for recall, shunt trip, and fire fighter's visual indicator as required by ASME A17.1 and NFPA 72.
 - a. Specify means to monitor shunt trip power.
 - b. Locate relays and monitor modules in the elevator equipment room for connection to elevator equipment.
2. Elevator recall and/or shunt trip functions
 - a. In new addressable systems, specify to initiate from the fire alarm control panel; no exceptions.
 - b. In existing buildings, see the Owner's Representative for fire alarm system capabilities and details.

3. For smoke and heat detectors at the top of the hoistway, provide access from the top of the car.
 - a. For non-addressable alarm systems, locate a remote indicator at the top floor elevator lobby.
4. Specify addressable relays for recall.
 - a. Do not specify base relays in the detector.
 - b. For non-addressable alarm systems, discuss alternatives with the owner's Representative and EH&S personnel.
5. Where the fire alarm system is addressable, specify elevator shutdown using addressable relay modules.
6. See paragraphs under Sections 14 20 00 and 14 28 00 in FDM Part 2/[Div 14 Conveying Equipment.pdf](#).
 - a. For elevator shaft vent control details, see FDM Part 2/Support Docs for Div 28/Electronic Safety And Security Details/[Elevator Shaft Vent Control Details.pdf](#)

END OF DIVISION 28 ELECTRONIC SAFETY AND SECURITY