

FIRE ALARM INSPECTION HANDBOOK

A Field Reference for Inspectors, Technicians, and Engineers

Comprehensive Field Coverage of:

Inspection • Testing • Commissioning • Maintenance • Troubleshooting • Code
Compliance

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Preface

The Fire Alarm Inspection Handbook was developed to serve as a definitive, field-ready reference for the professionals who bear direct responsibility for one of society's most critical safety systems. Fire alarm inspectors, protection engineers, commissioning agents, technicians, code officials, and AHJ representatives all depend on accurate inspection procedures, defensible documentation, and a thorough understanding of the codes that govern these systems.

Modern buildings rely on increasingly sophisticated life-safety architectures—networked addressable panels, IP-based supervising stations, smoke control integration, mass notification, and voice evacuation—and every one of those systems requires qualified, consistent inspection to maintain its protective function. This handbook bridges the gap between abstract code language and concrete, day-to-day field practice.

Drawing from NFPA 72 (National Fire Alarm and Signaling Code), NFPA 70 (Article 760), the International Fire Code, the International Building Code, and decades of accumulated field experience, this reference organizes the discipline of fire alarm inspection into five logical parts:

- Part I – Fundamentals establishes the purpose, legal basis, code hierarchy, and system typologies that define the inspection discipline.
- Part II – Preparation and Procedures delivers step-by-step inspection and functional testing protocols for every device and system function.
- Part III – Documentation and Reporting provides the forms, templates, deficiency logs, and certification frameworks that every inspector needs.
- Part IV – Inspection Scenarios presents realistic case studies for residential, commercial, high-rise, and industrial occupancies, with practical field observations.
- Part V – Appendices and Field Reference compiles NFPA and NEC quick references, symbols, troubleshooting guides, and printable forms for rapid on-site use.

Throughout this handbook, engineering drawings—riser diagrams, floor plans, wiring diagrams, device schedules, calculation worksheets, and acceptance test forms—are placed directly alongside the text they illuminate. The objective is not decoration: it is integration. Each drawing functions as a working technical reference that supports the surrounding procedural guidance.

This handbook is written for every career stage. Experienced professionals will find the code references, calculation worksheets, and deficiency frameworks directly applicable to their work. Students and entry-level technicians will find the structured explanations and worked examples a solid foundation for building competence.

Above all, this handbook is built on a single principle: every device tested and every form signed carries a life-safety obligation. Inspection is not routine maintenance—it is the final verification that a system will perform when it is needed most.

The Practicing Engineers Network extends gratitude to the fire protection professionals, AHJ inspectors, code committee members, and technicians whose combined expertise shaped every page of this work. Their commitment to public safety is the reason these systems exist—and the reason they must be inspected.

How to Use This Handbook

This handbook is organized to mirror the actual workflow of a professional fire alarm inspection—from first contact with project documents through final report submission and AHJ certification. Each chapter builds on the previous, and each part can be consulted independently as a standalone reference.

Structure at a Glance

Part	Title	Primary Use
I	Fundamentals of Fire Alarm Inspection	Background reading, code orientation, system type identification
II	Inspection Preparation and Procedures	Day-of-inspection step-by-step guidance
III	Documentation and Reporting	Forms, deficiency logs, and final reports
IV	Sample Inspection Scenarios	Case studies for common occupancy types
V	Appendices and Field Reference	Quick-look code tables, symbols, troubleshooting

Symbols Used in This Handbook

Symbol	Meaning
✓ Inspector Tip	Practical field guidance based on real-world experience
⚠ Caution	Safety warning or elevated-risk item requiring care
NFPA Ref.	Code citation for the item being discussed
Field Form	Indicates an applicable inspection or test form
Checklist	Step-by-step action list for the current procedure

Code Editions Referenced

Unless otherwise noted, all code references in this handbook reflect the following editions:

- NFPA 72 (2022) – National Fire Alarm and Signaling Code
- NFPA 70 (2023) – National Electrical Code, Article 760
- IFC (2021) – International Fire Code, Chapter 9
- IBC (2021) – International Building Code, Chapter 9
- NFPA 90A (2021) – Standard for the Installation of Air-Conditioning and Ventilating Systems
- ASME A17.1 (2022) – Safety Code for Elevators and Escalators

⚠ Always verify the specific edition adopted by the local AHJ before beginning any inspection. Code editions and local amendments vary significantly by jurisdiction.

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PART I

FUNDAMENTALS OF FIRE ALARM INSPECTION

Purpose • Codes • System Types • Components

Chapter 1: Purpose and Scope of Fire Alarm Inspections

Protect Lives. Protect Property. Stay Compliant.

Regular inspection and maintenance of fire alarm systems ensures reliable operation when it matters most. This inspection is performed in accordance with **NFPA 72 – National Fire Alarm and Signaling Code.**

PURPOSE

To verify that all components of the fire alarm system are operating properly and in accordance with applicable codes and standards.

INSPECTION FREQUENCY

- Visual Inspection: Monthly
- Functional Testing: Quarterly
- Full System Test: Annually (or as required by AHJ)

WHO SHOULD PERFORM THE INSPECTION?

A qualified individual trained in fire alarm systems and familiar with NFPA 72 requirements.

SIGNS YOUR SYSTEM NEEDS ATTENTION

- Trouble or alarm signals
- Device beeping or chirping
- Visible damage
- System component missing
- Building changes or renovations
- After fire, smoke, water or severe weather

COMMON FIRE ALARM SYSTEM COMPONENTS

- Control Panel
- Smoke Detectors
- Heat Detectors
- Manual Pull Stations
- Notification Appliances (Strobes, Horns, Speakers)
- Wiring / Circuits

FIRE ALARM SYSTEM INSPECTION CHECKLIST			
INSPECTION ITEM	STATUS		
	PASS	FAIL	N/A
1. CONTROL PANEL • Panel operating normally (no trouble/alarm) • Date and time are correct • All annunciator LEDs functional • Battery condition normal • Adequate printer paper (if applicable) • No loose or damaged wiring	☐	☐	☐
2. INITIATING DEVICES • Smoke detectors clean and undamaged • Heat detectors clean and undamaged • Duct smoke detectors functional • Manual pull stations accessible and unobstructed • Waterflow switches in normal position	☐	☐	☐
3. NOTIFICATION APPLIANCES • Horns, strobes, and speakers functional • Visible notification appliances unobstructed • Appliance covers in place and undamaged • Correct candela settings (for strobes)	☐	☐	☐
4. WIRING / CIRCUITS • No open or short circuits • All wiring secure and protected • Conduit and raceways intact • Circuit labels are accurate and legible	☐	☐	☐
5. BACKUP POWER • Batteries within manufacturer date • Voltage within acceptable range • Charger operation normal • No corrosion or leaks	☐	☐	☐
6. SYSTEM FUNCTIONS • Alarm signal initiates properly • Notification appliances activate • Supervisory signals operate • Trouble signals operate • Signals received at monitoring station (if applicable)	☐	☐	☐
7. DOCUMENTATION & COMPLIANCE • Record of inspections up to date • Correct drawings and device maps available • System modifications documented • Complies with NFPA 72 and AHJ requirements	☐	☐	☐

BENEFITS OF REGULAR INSPECTIONS

- ✓ Ensures system reliability
- ✓ Protects occupants and property
- ✓ Meets code and insurance requirements
- ✓ Reduces false alarms
- ✓ Extends equipment life
- ✓ Provides peace of mind

INSPECTION RESULT

PASS System is operating as intended.

FAIL Issues found – corrective action required.

N/A Not applicable to this system.

AFTER A FAILED INSPECTION

All deficiencies must be corrected promptly. Re-inspection may be required to verify corrections.

IMPORTANT REMINDERS

- Do not block or paint over devices.
- Keep system components accessible.
- Report any alarms or troubles immediately.
- Schedule regular inspections with a qualified provider.

INSPECTION RECORD

Date: _____

Inspector: _____

Company: _____

Signature: _____

Next Inspection Due: _____

A comprehensive overview of the fire alarm inspection process, checklist structure, and life-safety objectives under NFPA 72.

1.1 Why Fire Alarm Inspections Exist

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Fire alarm systems are active life-safety systems. Unlike passive fire protection measures such as fire-rated assemblies or sprinkler piping, a fire alarm system must detect, process, and communicate danger in real time. If a single component fails—a dirty detector, a corroded connection, a depleted battery, a misconfigured relay—the system may fail to perform precisely when it is most needed. Inspection is the mechanism that prevents that failure.

NFPA 72 (2022), Section 14.2.1, states that the purpose of inspection, testing, and maintenance is to ensure that a fire alarm system will function reliably under fire conditions. This is not a regulatory formality—it is a contractual obligation between the building owner, the life-safety system, and the people the system protects.

Beyond regulatory compliance, periodic inspection also serves as an early warning system for the system itself. Inspectors identify aging components, environmental degradation, programming errors, and installation deficiencies before they evolve into catastrophic failures. Every deficiency found during inspection is a prevented fatality.

1.2 Objectives of Every Inspection

Regardless of occupancy type, system age, or complexity, every fire alarm inspection shares six core objectives:

- 1. **Verification of Functionality:** Confirm that every initiating device, notification appliance, auxiliary control, and communication path operates exactly as designed.
- 2. **Code Compliance:** Verify that the installation and maintenance of the system meet current NFPA 72, NEC Article 760, and applicable local code requirements.
- 3. **Reliability Assessment:** Identify device aging, wiring degradation, environmental damage, or programming errors that reduce system dependability.
- 4. **Accurate Documentation:** Produce test reports, deficiency logs, and certificates that are traceable, legible, and legally defensible.
- 5. **Life-Safety Assurance:** Confirm that alarm signals reach the control panel, the remote annunciator, occupants, and the supervising station reliably and within required time limits.
- 6. **Corrective Action Initiation:** Ensure every deficiency is formally documented, assigned for correction, and verified upon completion.

1.3 Who Is Required to Inspect Fire Alarm Systems?

NFPA 72 identifies the responsible parties and their qualifications. In practice, the inspection ecosystem involves multiple stakeholders who must coordinate effectively:

Role	Primary Responsibility	NFPA 72 Reference
Qualified Inspector / Technician	Plans, executes, and documents all inspection and testing activities per NFPA 72 Ch. 14.	Sec. 10.5.1
Building Owner / Authorized Representative	Provides access, corrects deficiencies, and ensures the system is properly maintained.	Sec. 14.2.2
Fire Alarm Contractor	Installs, programs, and repairs system components; provides as-built documentation.	Sec. 7.5
Authority Having Jurisdiction (AHJ)	Reviews inspection reports, enforces compliance, approves systems, and may witness tests.	Sec. 1.6
Supervising Station (Central Monitoring)	Receives and acts upon alarm, trouble, and supervisory signals; provides transmission time records.	Ch. 26

1.4 Legal and Regulatory Basis for Inspections

Fire alarm inspections are not voluntary—they are mandated by multiple layers of law and code:

- NFPA 72 – Chapter 14 mandates inspection, testing, and maintenance frequencies and procedures for all system components.
- IFC Chapter 9 – Requires that fire protection systems be maintained in accordance with the standards to which they were installed.
- IBC Chapter 9 – Establishes occupancy-based requirements for fire alarm system installation.
- Local Ordinances – Many jurisdictions impose additional requirements for inspection permits, inspector licensing, and reporting formats.
- NFPA 70E – Governs electrical safety practices during testing and inspection of energized fire-alarm systems.

Non-compliance with inspection requirements can result in suspension of the building's occupancy certificate, insurance penalties, denial of claims following a fire event, and potential legal liability for the building owner, inspector, and contractor.

 An inspector who signs a report for a system that has not been fully tested assumes significant personal and professional liability. Never certify inspection results that have not been independently verified.

1.5 Inspection Frequency Requirements (NFPA 72 Table 14.4.3.2)

NFPA 72 prescribes minimum inspection and testing frequencies for every component. The table below summarizes the most critical intervals. Inspectors must always verify local AHJ requirements, which may be more stringent.

Component	Minimum Frequency	Primary Code Reference
Control Unit (FACP)	Visual: Monthly — Functional: Annual	NFPA 72 Table 14.4.3.2
Smoke Detectors (Spot-Type)	Visual: Annual — Functional: Annual	NFPA 72 14.4.3.2.2(1)
Heat Detectors	Annual	NFPA 72 14.4.3.2.2(2)
Manual Pull Stations	Annual	NFPA 72 14.4.3.2.4
Notification Appliances (Horns/Strobes)	Annual	NFPA 72 14.4.3.2.7
Primary Power Supply (AC)	Semiannual	NFPA 72 10.6.9
Secondary Power (Batteries)	Semiannual voltage; Annual load test	NFPA 72 10.6.10
Supervising Station Signals	Annual (both paths)	NFPA 72 26.6.3.2
Duct Smoke Detectors	Semiannual	NFPA 72 14.4.3.2.2(7)
Waterflow Switches	Quarterly or semiannual	NFPA 72 Table 14.4.3.2
Supervisory (Tamper) Switches	Semiannual	NFPA 72 Table 14.4.3.2
Voice/Alarm Communication System	Annual	NFPA 72 14.4.3.2.7(3)
Emergency Generator (transfer to backup)	Monthly exercise; Annual load test	NFPA 110

1.6 The Scope of This Handbook

This handbook covers the full inspection lifecycle for fire alarm and emergency communication systems across all common occupancy types—from small residential buildings to high-rise towers and industrial warehouse complexes. The scope includes:

- All initiating device types: smoke, heat, duct, beam, CO, manual pull, waterflow, and supervisory switches.
- All notification appliance types: audible (horns, bells, chimes), visible (strobes), and voice/mass notification systems.
- All control functions: elevator recall, HVAC shutdown, door release, fire pump supervision, smoke control, and access control interfaces.
- All power supply configurations: primary AC, sealed lead-acid batteries, auxiliary power supplies, and emergency generator transfer.
- All signaling pathway types: conventional zones, addressable loops (SLC), networked panels, IP-based supervising stations, and wireless systems.
- All documentation requirements: from daily logs and deficiency notices through Records of Completion and final AHJ certifications.

✓ This handbook does not replace NFPA 72, the NEC, or any adopted building or fire code. It is a field supplement intended to make those codes operationally accessible. Always consult the official code edition adopted by your local AHJ.

1.7 Summary

Fire alarm inspections are the cornerstone of a safe, code-compliant building. They transform a collection of installed hardware into a verified life-safety system. Every inspection confirms three fundamental facts: the system operates reliably, the installation meets design intent, and the building maintains the regulatory compliance necessary to protect its occupants.

Chapter 2: Applicable Codes and Standards

FIRE ALARM SYSTEM – GENERAL NOTES & SPECIFICATIONS				
1. GENERAL 1.1 The fire alarm system shall be designed, installed, tested and maintained in accordance with the requirements of NFPA 72, the applicable codes listed, and the requirements of the Authority Having Jurisdiction (AHJ). 1.2 These documents describe the design intent. The contractor shall furnish all labor, materials, equipment and supervision necessary to complete a fully functional fire alarm system. 1.3 Where conflicts exist between these documents, the more restrictive shall govern. Verify the Engineer of Record immediately. 1.4 All equipment shall be listed for fire protection service and approved by the AHJ. 1.5 All wiring methods, materials and installations shall comply with NFPA 70 (NEC) and these documents. 1.6 All devices shown are addressable unless otherwise noted. 1.7 Contractor shall field verify all existing conditions and notify the Engineer of Record of any discrepancies prior to installation. 1.8 All conduit, cable, devices and equipment shall be installed neatly and professionally. No exposed wiring is allowed. 1.9 Provide identification labels for all circuits, devices, modules, panels, cables, terminations and enclosures. 1.10 These documents are not intended to show every minor detail of installation. The system shall be complete, operational and fully coordinated. 1.11 All penetrations of fire-rated assemblies shall be firestopped in accordance with applicable codes. 1.12 Do not scale drawings. Dimensions govern.				
3. SYSTEM REQUIREMENTS 3.1 The system shall be a listed, addressable fire alarm system. 3.2 The system shall provide automatic fire detection, manual alarm initiation, occupant notification, and fire protection system monitoring. 3.3 The system shall support emergency voice evacuation in accordance with NFPA 72. 3.4 The system shall provide alarm signal transmission to a listed supervising station. 3.5 The system shall monitor and report supervisory and trouble conditions. 3.6 The system shall provide interfaces to building systems as shown on the drawings and described in the sequence of operations. 3.7 The system shall be configurable to provide cause-and-effect operations as required. 3.8 All components shall be compatible with the listed control unit and network equipment. 3.9 The system shall be capable of future expansion as indicated in the design documents. 3.10 All circuits shall be supervised for open, short and ground fault conditions. 3.11 All software, firmware and programming shall be provided by the installing contractor.				
4. INSTALLATION REQUIREMENTS 4.1 Install all equipment in accordance with manufacturer's listed installation instructions. 4.2 Install devices plumb, level and in the locations shown. 4.3 Provide and install all backboxes, mounting hardware, conduit, wire, runways and supports. 4.4 Maintain minimum clearances for service and operation. 4.5 Mount devices at heights indicated on the drawings or per NFPA 72 where not shown. 4.6 Provide barrier-free access to manual pull stations. 4.7 Install all wiring in conduit or cable as indicated. 4.8 Maintain minimum separation from non-power limited circuits per NFPA 70 and NFPA 72. 4.9 All splices shall be in listed junction boxes with cover. 4.10 Provide circuit continuity and polarity in accordance with NFPA 72. 4.11 Provide end-of-line devices as required for all supervised circuits.				
5. DEVICE INSTALLATION 5.1 Install smoke detectors in accordance with NFPA 72 Chapter 17. 5.2 Install heat detectors in accordance with NFPA 72 Chapter 17. 5.3 Install duct smoke detectors in accordance with NFPA 72 Chapter 17. 5.4 Install manual pull stations in accordance with NFPA 72 Chapter 20. 5.5 Install notification appliances in accordance with NFPA 72 Chapter 18. 5.6 Install modules in accordance with NFPA 72 Chapter 19. 5.7 Install visible appliances to achieve the minimum candle requirements of NFPA 72. 5.8 Install audible appliances to achieve the minimum dBA requirements of NFPA 72. 5.9 Install voice evacuation equipment in accordance with NFPA 72 Chapter 24. 5.10 Provide device identification at all control panels and annunciators. 5.11 Do not install devices in or near potential sources of air movement, vibration, steam, dust, or other conditions that could affect operation. 5.12 Protect all devices during construction.				
6. WIRING & CIRCUITS 6.1 All system circuits shall be power limited where required. 6.2 Use conductors and cable types as indicated on the drawings and in accordance with NFPA 72. 6.3 Do not exceed maximum circuit lengths or loading. 6.4 Maintain polarity on all circuits. 6.5 Provide spare capacity on all circuits as required by code (typically 20%). 6.6 Provide dedicated circuits for fire alarm equipment. 6.7 Do not share power supplies between life safety and non-life safety loads unless permitted. 6.8 Provide surge protection where indicated. 6.9 Seal all penetrations in accordance with code.				
7. POWER & GROUNDING 7.1 Provide a dedicated 120/240 VAC branch circuit to each fire alarm control unit and power supply. 7.2 Power supplies shall be listed for fire alarm service and supervised. 7.3 Provide battery backup per NFPA 72 (24 hours standby plus 3 minutes alarm release otherwise indicated). 7.4 Batteries shall be sealed, lead-acid type and located in the enclosure provided. 7.5 Ground all equipment in accordance with NFPA 70 and manufacturer's instructions. 7.6 Do not connect power limited circuits to earth ground, prior to final acceptance. 7.7 Test and verify all power supplies and batteries.				
8. CONTRACTOR RESPONSIBILITIES 8.1 Review all documents and verify site conditions prior to bidding or installation. 8.2 Provide shop drawings and product data for approval prior to installation. 8.3 Furnish all listed equipment, materials and accessories required for a complete system. 8.4 Employ qualified personnel experienced in fire alarm system installation. 8.5 Install system in a neat and workmanlike manner. 8.6 Coordinate device locations with other trades to avoid conflicts. 8.7 Provide as-built drawings, device address list, and programming documentation. 8.8 Perform all required testing and verification in accordance with NFPA 72. 8.9 Obtain AHJ acceptance prior to building occupancy. 8.10 Provide training to the owner's personnel. 8.11 Provide operation and maintenance manuals.				
9. TESTING, INSPECTION & COMMISSIONING 9.1 All system testing shall be in accordance with NFPA 72. 9.2 Test each initiating device for proper operation. 9.3 Test all notification appliances for audibility and visibility. 9.4 Test voice evacuation system for intelligibility and coverage. 9.5 Test all system interfaces for proper operation.				
9. TESTING, INSPECTION & COMMISSIONING 9.6 Verify all cause-and-effect operations. 9.7 Verify all supervisory and trouble signals. 9.8 Verify supervisory station transmission. 9.9 Perform full system functional test. 9.10 Provide testing reports and results to the AHJ.				
ABBREVIATIONS AHJ Authority Having Jurisdiction FACP Fire Alarm Control Panel NAC Notification Appliance Circuit SLC Signaling Line Circuit EOL End of Line Resistor				
WIRE LEGEND SLC / Signaling Line Circuit NAC / Notification Appliance Circuit IDC / Initiating Device Circuit EOL / End of Line Resistor 24 VDC Power Telephone Line / Dialer Ethernet / Network				
APPLICABLE CODES IBC INTERNATIONAL BUILDING CODE IFC INTERNATIONAL FIRE CODE NFPA 72 NATIONAL FIRE ALARM AND SIGNALING CODE NFPA 70 NATIONAL ELECTRICAL CODE NFPA 101 LIFE SAFETY CODE NFPA 13 INSTALLATION OF SPRINKLER SYSTEMS NFPA 20 INSTALLATION OF STATIONARY PUMPS FOR FIRE PROTECTION NFPA 90A AIR CONDITIONING AND VENTILATION SYSTEMS ALL LOCAL AMENDMENTS AND AUTHORITIES HAVING JURISDICTION SHALL APPLY.				
SHEET INDEX (REFERENCE) FA-000 COVER SHEET FA-001 GENERAL NOTES & SPECIFICATIONS FA-002 SYMBOLS AND ABBREVIATIONS				
THIS DOCUMENT IS DIAGRAMMATIC AND INDICATES DESIGN INTENT. THE CONTRACTOR SHALL PROVIDE A COMPLETE, CODE COMPLIANT SYSTEM.				
NOT FOR CONSTRUCTION UNLESS ISSUED FOR CONSTRUCTION				

General notes and specifications sheet (FA-001) illustrating the code framework governing a multi-story fire alarm and emergency communication system design.

2.1 The Code Hierarchy for Fire Alarm Inspection

Every fire alarm inspection operates within a structured hierarchy of codes and standards. At the top sits the federal framework (NFPA standards and the NEC), followed by model building and fire codes, and then local amendments and AHJ directives. Understanding how these layers interact is fundamental to performing inspections that are both technically correct and jurisdictionally compliant.

The key distinction: NFPA 72 governs what the system must do and how it must be tested. NFPA 70 (Article 760) governs how the wiring must be constructed. The IBC and IFC establish when and where fire alarm systems are legally required. Local codes define the administrative requirements—permits, forms, reporting timelines, and inspector licensing.

2.2 Primary Standards

Code / Standard	Title	Primary Inspector Focus
NFPA 72 (2022)	National Fire Alarm and Signaling Code	Design, installation, inspection, testing, maintenance, and performance of fire alarm systems.
NFPA 70 (2023) – Art. 760	National Electrical Code	Wiring methods, conductor types, circuit classification, and electrical protection of fire alarm circuits.
IFC Chapter 9 (2021)	International Fire Code	Mandates installation, inspection, and maintenance of fire protection systems in existing buildings.
IBC Chapter 9 (2021)	International Building Code	Establishes occupancy-based requirements for new construction fire alarm system installation.
UL 864	Standard for Control Units for Fire-Alarm Systems	Ensures listed control units meet performance and reliability benchmarks.
UL 268	Standard for Smoke Detectors for Fire-Alarm Systems	Establishes smoke detector sensitivity and environmental performance requirements.
UL 1971	Standard for Signaling Devices for Hearing-Impaired	Governs visible notification appliances (strobes) for ADA-compliant installations.
ASME A17.1	Safety Code for Elevators and Escalators	Governs elevator recall interface requirements in conjunction with NFPA 72 Ch. 21.
NFPA 90A (2021)	Standard for Installation of Air-Conditioning and Ventilating Systems	Governs smoke damper and HVAC interface requirements referenced in NFPA 72 Ch. 23.

FIRE ALARM SYSTEM – SYMBOL LEGEND, LINE TYPES, ABBREVIATIONS & CIRCUIT DESIGNATIONS

DEVICE SYMBOLS – INITIATING DEVICES			DEVICE SYMBOLS – NOTIFICATION APPLIANCES			DEVICE SYMBOLS – MODULES & INTERFACES			DEVICE SYMBOLS – EQUIPMENT			LINE TYPES / WIRING LEGEND		
SYMBOL	DESCRIPTION		SYMBOL	DESCRIPTION		SYMBOL	DESCRIPTION		SYMBOL	DESCRIPTION		LINE	DESCRIPTION	
	PHOTOELECTRIC SMOKE DETECTOR			HORN			MONITOR MODULE			FIRE ALARM CONTROL PANEL			SLC / SIGNALING LINE CIRCUIT	
	SMOKE / CARBON MONOXIDE DETECTOR			STROBE			CONTROL MODULE			REMOTE ANNUNCIATOR			NAC / NOTIFICATION APPLIANCE CIRCUIT	
	FIXED TEMPERATURE HEAT DETECTOR			HORN / STROBE			RELAY MODULE			DIGITAL ALARM COMMUNICATOR TRANSMITTER			IDC / INITIATING DEVICE CIRCUIT	
	RATE-OF-RISE HEAT DETECTOR			SPEAKER			ISOLATOR MODULE			NOTIFICATION POWER SUPPLY			ETHERNET / NETWORK	
	DUCT SMOKE DETECTOR			SPEAKER / STROBE			MONITOR ISOLATOR MODULE			REMOTE POWER SUPPLY			TELEPHONE LINE / DIALER	
	BEAM SMOKE DETECTOR			FIRE ALARM BELL			BEAM MONITOR MODULE			BATTERY CABINET (24 VDC)			24 VDC POWER	
	CARBON MONOXIDE DETECTOR			CHIME			RELAY MONITOR MODULE			FIREFIGHTER PHONE JACK			120/240 VAC POWER	
	FLAME DETECTOR			CEILING SPEAKER			INPUT / OUTPUT MODULE						DRY CONTACT / CONTROL WIRING	
	WATERFLOW SWITCH			CEILING SPEAKER / STROBE			POWER SUPERVISORY MODULE						FIBER OPTIC CABLE	
	SPRINKLER TAMPER SWITCH			VISIBLE APPLIANCE (STROBE ONLY)			FIRE PUMP MONITOR MODULE						SHIELDED CABLE	
	GAS DETECTOR			MASS NOTIFICATION SPEAKER			ELEVATOR INTERFACE MODULE							
	PRESSURE SWITCH			MASS NOTIFICATION SPEAKER / STROBE			SMOKE CONTROL MODULE							
	MANUAL PULL STATION						GRAPHIC WORKSTATION							
	REMOTE TEST STATION						NETWORK CONTROL MODULE							

ABBREVIATIONS			GENERAL NOTES			MOUNTING HEIGHTS (U.N.O.)		
ABBR.	DESCRIPTION	ABBR.	DESCRIPTION	ABBR.	DESCRIPTION	DEVICE	MOUNTING HEIGHT	
AFF	ABOVE FINISHED FLOOR	MM	MONITOR MODULE			MANUAL PULL STATION	42" TO 48" AFF	
AHJ	AUTHORITY HAVING JURISDICTION	CM	CONTROL MODULE			ANNUNCIATOR	48" TO 60" AFF	
FACP	FIRE ALARM CONTROL PANEL	RM	RELAY MODULE			FACP	48" TO 60" AFF	
ANN	ANNUNCIATOR	ISO	ISOLATOR MODULE			HORN / STROBE	80" TO 96" AFF	
NAC	NOTIFICATION APPLIANCE CIRCUIT	PS	POWER SUPPLY			SPEAKER	90" AFF TO BOTTOM OF DEVICE	
SLC	SIGNALING LINE CIRCUIT	BATT	BATTERY			CEILING MOUNTED DEVICES	SEE PLANS / DETAILS	
IDC	INITIATING DEVICE CIRCUIT	RTS	REMOTE TEST STATION			TEST STATION (RTS)	48" AFF	
EOL	END OF LINE	SP	SPEAKER			FIRE PUMP CONTROLLER	SEE EQUIPMENT SCHEDULE	
NPS	NOTIFICATION POWER SUPPLY	HS	HORN / STROBE					
RPS	REMOTE POWER SUPPLY	CO	CARBON MONOXIDE					
MNS	MASS NOTIFICATION SYSTEM	WP	WATERFLOW					

1. All devices and equipment shall be listed for fire alarm service.
2. Installation shall comply with NFPA 72, NEC and all applicable codes.
3. Symbols shown are diagrammatic. Refer to floor plans, details and schedules for exact locations, mounting heights and wiring requirements.
4. All circuits shall be supervised and power-limited where required.
5. EOL resistors shall be installed at the end of each supervised circuit.
6. Wiring methods shall be in accordance with code and manufacturer instructions.
7. Colors shown for line types are for diagram clarity only and do not represent required wire insulation colors unless specified.
8. This legend applies to all drawings in this fire alarm design package.

PROJECT: MULTI-STORY COMMERCIAL BUILDING
FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM

DESIGNER OF RECORD: Applied Engineering Group

DRAWING TITLE: FIRE ALARM SYMBOL LEGEND, LINE TYPES, ABBREVIATIONS & CIRCUIT DESIGNATIONS

DRAWING NO.: FA-002

SHEET: 1 OF 1

DATE: MAY 24, 2024

REV: 0

CIRCUIT DESIGNATIONS			NOTES		
DESIGNATION	DESCRIPTION		All abbreviations shall be in accordance with NFPA 72. All circuit numbers shall be unique within each system. Circuiting and device addressing shown on plans shall correspond to schedules. Contractor shall verify all field conditions prior to installation. Notify Engineer of any discrepancies before proceeding.		
SLC-#	SIGNALING LINE CIRCUIT NUMBER				
NAC-#	NOTIFICATION APPLIANCE CIRCUIT NUMBER				
IDC-#	INITIATING DEVICE CIRCUIT NUMBER				
VC-#	VOICE CIRCUIT / SPEAKER CIRCUIT NUMBER				
EOL	END OF LINE RESISTOR				
MCC-#	MASS NOTIFICATION CIRCUIT NUMBER				
FP-#	FIREFIGHTER PHONE CIRCUIT NUMBER				
NET-#	NETWORK SEGMENT NUMBER				
PS-#	POWER SUPPLY IDENTIFIER				

Standard fire alarm symbol legend, line type conventions, circuit designations, and abbreviation reference (FA-002) used on engineering drawings and inspection reports.

2.3 NFPA 72 Chapter Structure for Inspectors

NFPA 72 is organized into chapters addressing specific aspects of fire alarm systems. Inspectors should be thoroughly familiar with the following chapters:

Chapter	Title	Key Inspection Relevance
Ch. 7	Documentation	Required drawings, device lists, sequences of operations, records of completion. Cite 7.5–7.7 for documentation deficiencies.
Ch. 10	Fundamentals	General requirements: labeling (10.16), grounding (10.6.7), power (10.6), circuit supervision (10.6.9).
Ch. 12	Circuits and Pathways	Classification of pathways (Class A/B/N/X) and Pathway Survivability Levels (PSL 0–4).
Ch. 14	Inspection, Testing, and Maintenance	The core inspection chapter. Table 14.4.3.2 defines frequencies; 14.4.3 defines test methods.
Ch. 17	Initiating Devices	Placement, spacing, and sensitivity for smoke, heat, pull stations, and duct detectors.
Ch. 18	Notification Appliances	Minimum dBA levels, strobe candela ratings, synchronization, and occupancy-specific requirements.
Ch. 21	Emergency Control Function Interfaces	Elevator recall, door release, dampers, and auxiliary control relay testing.
Ch. 23	Protected Premises Systems	FACP configuration, system functions, performance criteria.
Ch. 24	Emergency Communication Systems (ECS)	Voice alarm, mass notification, paging, and intelligibility testing.
Ch. 26	Supervising Station Systems	Signal transmission, dual-path requirements, and maximum 90-second transmission time.

2.4 NEC Article 760 – Fire Alarm Wiring Requirements

Article 760 of the National Electrical Code governs the installation of fire alarm system wiring. Inspectors must verify compliance with both NFPA 72 (performance) and NEC 760 (electrical installation). The following sections are most frequently cited in field inspections:

NEC Section	Subject	Field Inspection Focus
760.41 / 760.121	Circuit Classification	Verify circuits are wired per their class (A, B, N, or X) with correct fault tolerance and supervision.
760.49 / 760.127	Cable Identification	Confirm FPL, FPLR, or FPLP marking is visible at all termination and pull points.
760.53 / 760.130	Conductor Separation	Maintain ≥ 2 inches from power conductors, or use separate metal raceways or listed dividers.
760.136	Grounding and Bonding	Verify metallic raceways bonded per Article 250; cable shields grounded at one end only.
760.142	Junction Boxes	Covers installed, accessible, and labeled "FIRE ALARM – DO NOT DISCONNECT."
760.176	Cable Listing	All cables must be listed specifically for fire alarm use; no data or thermostat cable substitutions.

✓ When in doubt about cable compliance, trace the cable marking printed on the jacket and confirm the FPL rating. Non-listed or improperly rated cable is among the most common—and most serious—field violations.

2.5 Relationship Between NFPA 72 and NFPA 70

NFPA 72 and NFPA 70 work together to ensure both operational reliability and electrical safety:

- NFPA 72 defines what the system must do: detect, notify, transmit, control, and document.
- NFPA 70 (Article 760) defines how the system must be wired: conductor types, raceways, separation, and grounding.

Neither standard can be cited alone as the complete basis for a fire alarm inspection. A system may test perfectly functionally (NFPA 72 compliance) yet have significant wiring violations (NEC 760 non-compliance) that pose long-term fire and reliability hazards. Both must be verified.

2.6 IBC and IFC – Occupancy-Based Requirements

The International Building Code (IBC) Chapter 9 and International Fire Code (IFC) Chapter 9 establish when fire alarm systems are legally required based on occupancy classification, building height, square footage, and occupant load. Inspectors performing acceptance inspections on new construction must verify that:

- The installed system type matches the IBC/IFC requirement for the occupancy group (A, B, E, I, R, etc.).
- The system was installed under a valid permit and inspected by the AHJ.
- A Record of Completion (ROC) per NFPA 72 Section 7.5.6 has been issued and is available on site.

2.7 Local Amendments and AHJ Directives

Beyond national model codes, many jurisdictions adopt their own amendments. Common local modifications include:

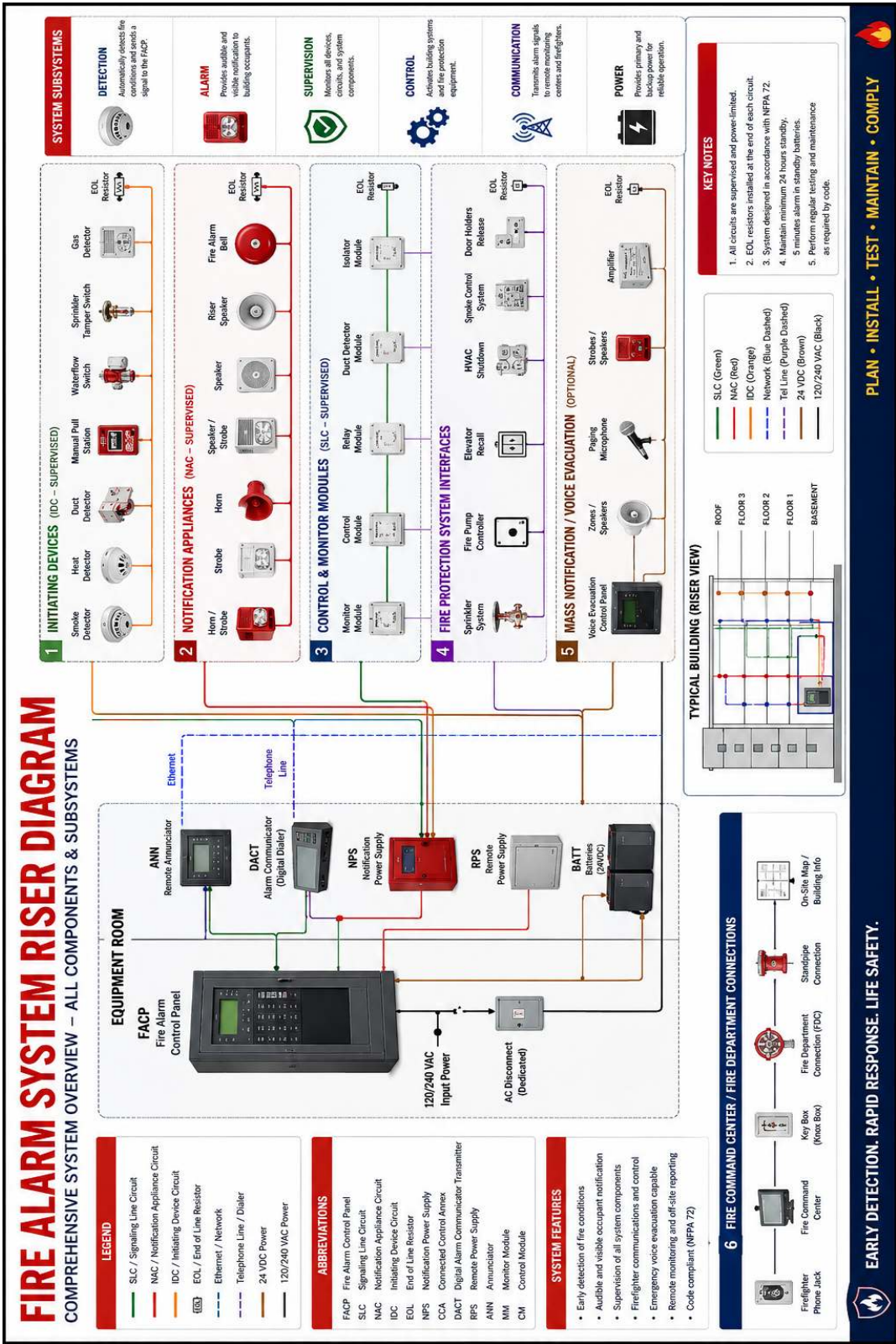
- Earlier code editions (e.g., NFPA 72 2016 or 2019 rather than 2022).
- Additional requirements for inspection permits, inspector licensing, or credential verification.
- Specific reporting format requirements and submission deadlines.
- Stricter testing frequencies for high-rise or health-care occupancies.
- Special requirements for wireless fire alarm system supervision intervals.

⚠ Performing an inspection under the wrong code edition is a common—and costly—error. Always confirm the AHJ-adopted edition before the inspection begins. Document this on the first page of every inspection report.

2.8 Summary

Fire alarm inspection is a code-driven discipline that requires fluency across multiple standards. NFPA 72 defines the performance standard; NEC 760 defines the wiring standard; IBC and IFC define the occupancy requirements; and local codes define the administrative framework. Together, these form the complete legal and technical basis for every inspection.

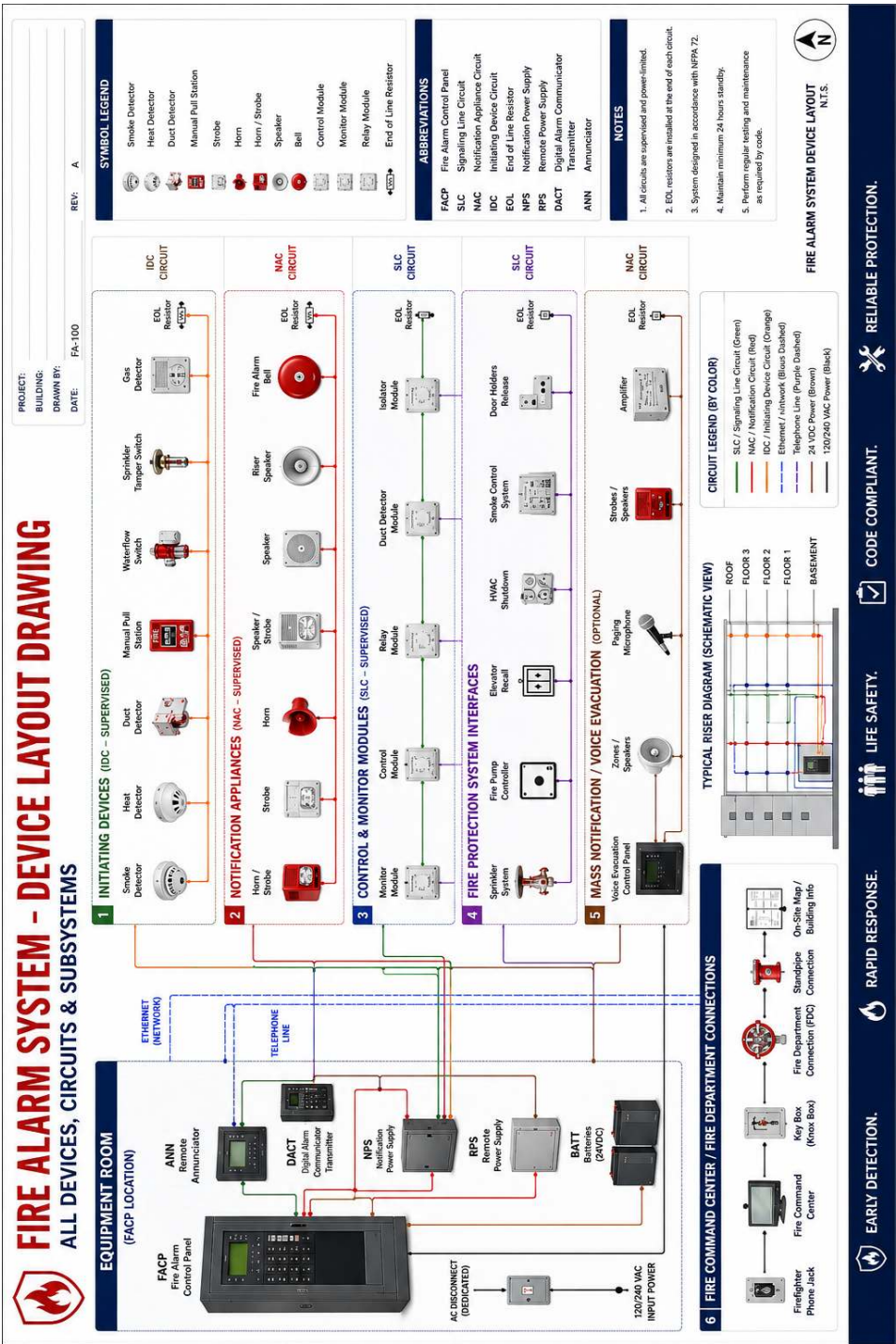
Chapter 3: Types of Fire Alarm Systems and System Components



Comprehensive fire alarm system riser diagram illustrating all major subsystems, components, interfaces, and signal pathways in a multi-story commercial building.

3.1 Overview

The fire alarm inspector must quickly identify the type of system installed in any building and understand its architecture before beginning any visual or functional testing. System type determines testing procedures, programming verification requirements, wiring class expectations, and documentation methods. Three major system configurations are encountered in practice: conventional, addressable, and hybrid.



Complete fire alarm device layout drawing showing all device categories, circuit types, control modules, fire protection interfaces, and mass notification connections.

3.2 Conventional Fire Alarm Systems

A conventional (zone-type) fire alarm system divides a building into circuits called zones. Each zone is monitored by the fire alarm control panel (FACP). When any device within a zone activates, the panel indicates the zone in alarm—but cannot identify the specific device. Devices within each zone are wired in parallel (Class B) or in a full loop (Class A) on initiating device circuits (IDCs) that return to the FACP.

Notification appliance circuits (NACs) drive horns, strobes, and bells throughout the building. Each NAC is supervised by the panel for opens and shorts. Conventional systems are reliable, straightforward, and economical for small occupancies.

Conventional System Inspection Focus

Inspection Point	Requirement	NFPA 72 Reference
IDC continuity	Verify end-of-line (EOL) resistor is installed and zone is supervised.	14.4.2
Zone labeling	Panel zone label must match the physical area served.	7.7.2
NAC supervision	Verify open-circuit and ground-fault detection is functional.	14.2.2
Device spacing	Confirm detectors are within code-specified spacing for ceiling type.	17.7.3.2
Power supply	Test AC/DC voltage and battery standby capacity.	10.6.10

3.3 Addressable Fire Alarm Systems

An addressable system uses a digital Signaling Line Circuit (SLC) where each device has a unique programmed address. The panel identifies the exact device location, type, and status—normal, alarm, trouble, or supervisory—for every point on the loop. This granular identification is invaluable for large buildings, reducing investigation time and improving incident response.

Modern addressable panels support drift compensation, device sensitivity trending, event history logging, and remote diagnostics. Each SLC loop can typically support hundreds of devices, and multiple loops can be installed on a single panel. Expanded systems use networked sub-panels to distribute control across large buildings or campuses.

FIRE ALARM SYSTEM – SLC LOOP SCHEDULE

SLC LOOP INFORMATION					DEVICE COUNTS ON LOOP							LOOP TOTALS		NOTES	
LOOP NO.	LOOP IDENTIFICATION	PANEL TERMINALS	VOLTAGE (VDC)	WIRE SIZE (AWG)	MAX. LOOP CURRENT (mA)	SMOKE DETECTORS	HEAT DETECTORS	MONITOR MODULES	CONTROL MODULES	RELAY MODULES	ISOLATOR MODULES	TOTAL DEVICES	EST. LOOP CURRENT (mA)		
1	SLC LOOP 1 (LEVELS B & 1)	L1(+) / L1(-) ON FACP	24	14	250	9	8	8	4	2	2	39	198	BASEMENT FLOOR AND FLOOR 1 NORTH WING	
2	SLC LOOP 2 (LEVEL 2)	L2(+) / L2(-) ON FACP	24	14	250	6	6	6	3	2	2	29	146		
3	SLC LOOP 3 (LEVEL 3)	L3(+) / L3(-) ON FACP	24	14	250	5	6	6	4	2	2	29	149		FLOOR 3 ALL AREAS
4	SLC LOOP 4 (ROOF LEVEL)	L4(+) / L4(-) ON FACP	24	14	250	3	5	4	4	3	2	21	108		ROOF LEVEL MEP AREAS
TOTALS		-	-	-	-	23	25	24	24	14	8	118	601	-	

SLC LOOP LOADING SUMMARY

DESCRIPTION	VALUE	REMARKS
FACP SLC LOOP CAPACITY (MAX.)	250 mA per loop	Per manufacturer data
TOTAL ESTIMATED LOOP CURRENT (ALL LOOPS)	601 mA	Sum of all loop estimated currents
TOTAL AVAILABLE LOOP CURRENT (ALL LOOPS)	1000 mA	4 loops x 250 mA
LOOP CURRENT UTILIZATION	60%	601 mA / 1000 mA
MAX. DEVICES PER LOOP (PRACTICAL)	127 devices	Per manufacturer limitations
HIGHEST CURRENT LOOP	SLC LOOP 1 (198 mA)	Within allowable limit

TYPICAL SLC LOOP WIRING (CLASS B)

EOL = END OF LINE RESISTOR PER MANUFACTURER REQUIREMENTS

DEVICES

SD	SMOKE DETECTOR
HD	HEAT DETECTOR
MM	MONITOR MODULE
CM	CONTROL MODULE
RM	RELAY MODULE
IM	ISOLATOR MODULE

SLC LOOP LEGEND

L1	SLC LOOP 1
L2	SLC LOOP 2
L3	SLC LOOP 3
L4	SLC LOOP 4

NOTES

- DEVICE COUNTS INCLUDE ALL DEVICES PHYSICALLY ON EACH LOOP.
- ESTIMATED LOOP CURRENT IS BASED ON MANUFACTURER'S CURRENT DRAW.
- ALL SLC LOOPS ARE CONFIGURED FOR CLASS B WIRING.
- REFER TO FLOOR PLANS FOR EXACT DEVICE LOCATIONS.

ABBREVIATIONS

SLC	SIGNALING LINE CIRCUIT
FACP	FIRE ALARM CONTROL PANEL
VDC	VOLTS DC
mA	MILLIAMPERES
AWG	AMERICAN WIRE GAUGE
EOL	END OF LINE

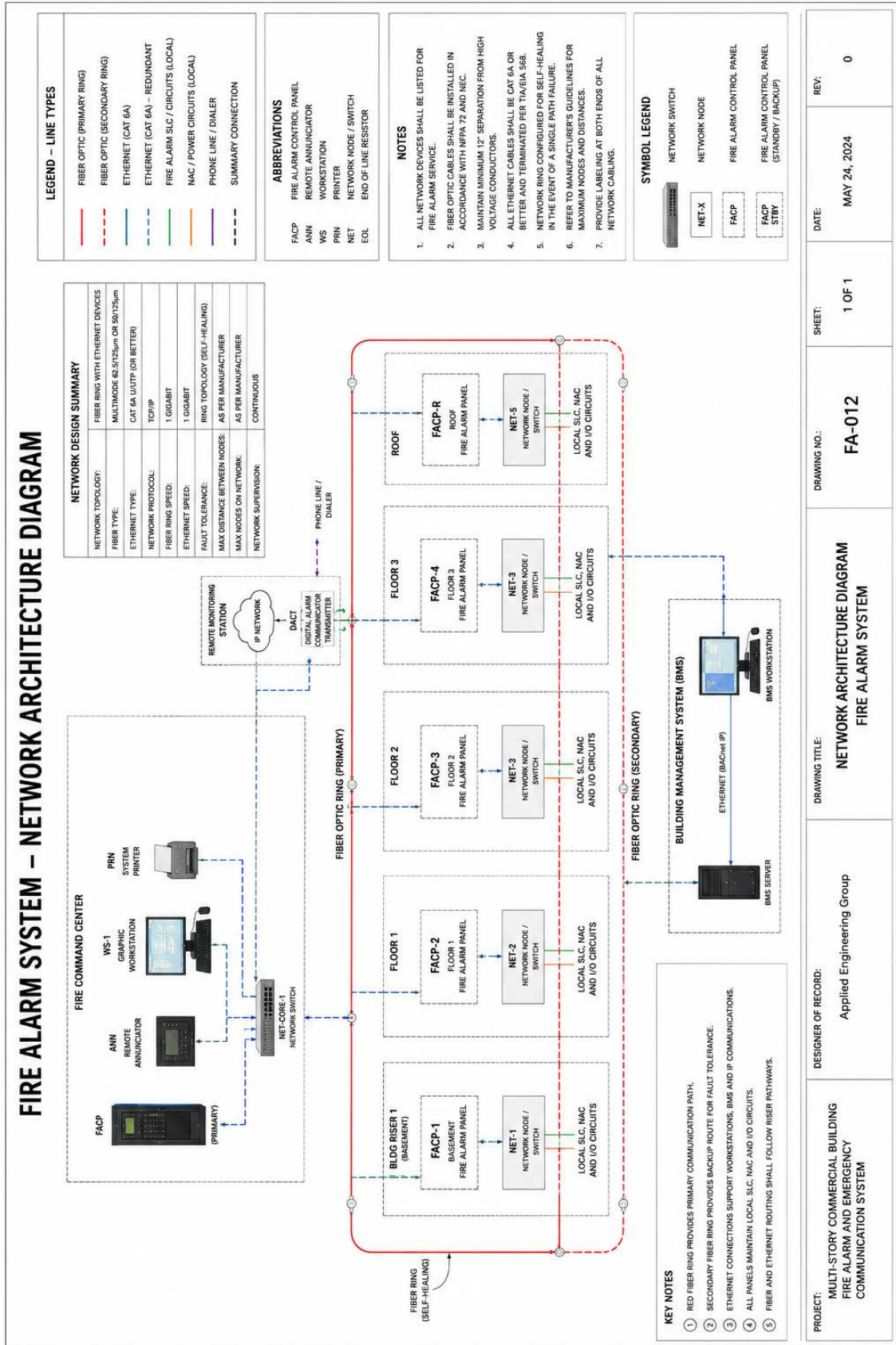
PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	DESIGNER OF RECORD: Applied Engineering Group	DRAWING TITLE: SLC LOOP SCHEDULE DEVICE COUNTS AND LOOP ASSIGNMENTS	DRAWING NO.: FA-027	SHEET: 1 OF 1	DATE: MAY 24, 2024	REV: 0
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SLC loop schedule showing device counts, loop assignments, wire gauge, estimated current draw, and loop capacity verification for each signaling line circuit.

Addressable System Inspection Focus

Inspection Point	Requirement	NFPA 72 Reference
Device address verification	Every device address must match the approved as-built drawing and programming file.	7.7.2.1
SLC integrity	Check loop resistance and confirm full supervision of all addresses.	14.4.3.2
Isolation modules	Confirm installed at prescribed intervals to limit fault propagation.	14.4.2.2
Programming file verification	Download and archive panel device list; compare to physical count.	14.6.2
Event log review	Confirm recent test records and absence of unexplained alarms or troubles.	14.6.2

FIRE ALARM SYSTEM – NETWORK ARCHITECTURE DIAGRAM



SYMBOL LEGEND

NETWORK SWITCH

NETWORK NODE

FIRE ALARM CONTROL PANEL

FIRE ALARM CONTROL PANEL (STANDBY / BACKUP)

DESIGNER OF RECORD:

Applied Engineering Group

PROJECT:

MULTI-STORY COMMERCIAL BUILDING
 FIRE ALARM AND EMERGENCY
 COMMUNICATION SYSTEM

DRAWING TITLE:

NETWORK ARCHITECTURE DIAGRAM
 FIRE ALARM SYSTEM

DRAWING NO.:

FA-012

SHEET:

1 OF 1

DATE:

MAY 24, 2024

REV:

0

Network architecture diagram (FA-012) showing fire command center, fiber optic primary and secondary rings, distributed FACP, and building management system integration.

3.4 Hybrid Fire Alarm Systems

A hybrid system combines conventional zone circuits and addressable loops, typically encountered when upgrading an older conventional system. Legacy conventional zones are connected through input modules to an addressable main panel, preserving the existing wiring infrastructure while gaining addressable identification and panel programming capabilities.

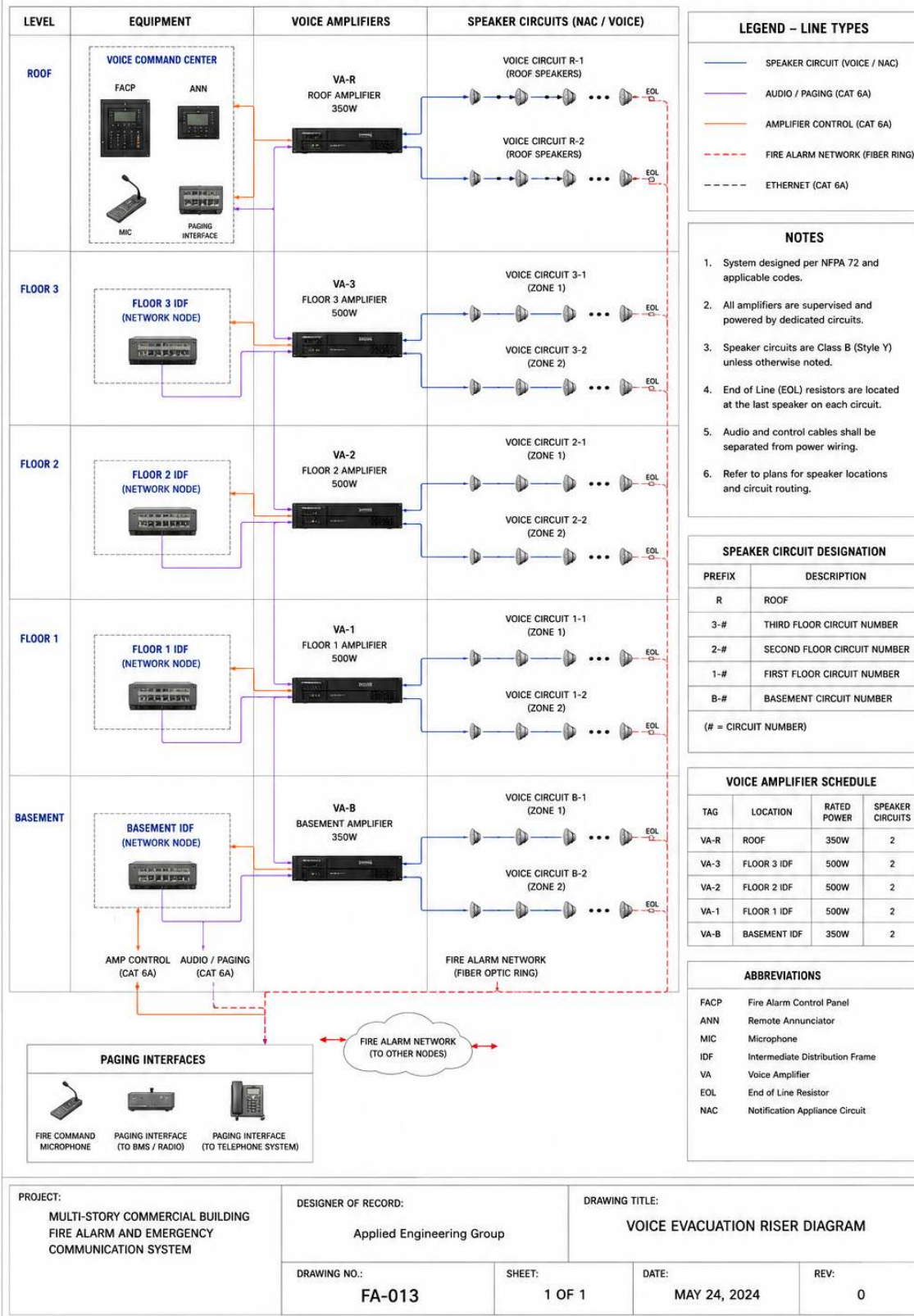
Hybrid systems require extra care during inspection: the inspector must verify compatibility between legacy conventional modules and the addressable panel, confirm proper supervision of both wiring types, and check for loop isolation where circuit technologies transition. As-built drawings must clearly identify which portions are conventional and which are addressable.

3.5 Voice Evacuation and Emergency Communication Systems (ECS)

Voice evacuation systems—now formally classified as Emergency Communication Systems (ECS) under NFPA 72 Chapter 24—provide intelligible voice instructions during fire emergencies. These systems replace or supplement traditional horn/strobe notification with pre-recorded or live voice announcements delivered to specific zones or the entire building.

FIRE ALARM SYSTEM – VOICE EVACUATION RISER DIAGRAM

VOICE EVACUATION AND MASS NOTIFICATION SYSTEM



Voice evacuation riser diagram (FA-013) showing amplifier locations, speaker circuit assignments, zone paging configuration, and Class B speaker wiring distribution per floor.

ECS inspection requires verification of audio amplifier operation, speaker impedance, message intelligibility ($STI \geq 0.45$ for public mode), zone paging accuracy, backup amplifier switching, and battery standby capacity for both the FACP and the audio system power amplifiers.

3.6 Networked and Distributed Systems

Large campuses, high-rise buildings, and multi-building complexes commonly use networked fire alarm architectures where multiple FACP's communicate via dedicated data networks—typically fiber optic rings or Ethernet infrastructure. Each node maintains independent operation while sharing event data, programming, and system status with all other nodes and the fire command center.

Inspectors of networked systems must verify unique node identification, network supervision (loss of a node generates a trouble), correct event propagation between nodes, and the ability of each panel to operate independently if network communication is lost. IP-based supervising stations must also be verified for dual communication path compliance per NFPA 72 Section 26.6.3.2.

PROJECT:
MULTI-STORY COMMERCIAL BUILDING
FIRE ALARM AND EMERGENCY
COMMUNICATION SYSTEM

LOCATION:
—

DATE:
MAY 24, 2024

CALCULATED BY: AEG

CHECKED BY: —

DESIGN CRITERIA

1. SYSTEM SHALL MEET NFPA 72, 2019, 10.6.2 REQUIREMENTS.
2. SLC LOOP CURRENT CAPACITY PER NFPA 72: 3.0 AMPS MAXIMUM.
3. VOLTAGE RANGE AT DEVICES: 15.2 VDC (MIN.) TO 19.95 VDC (MAX.)
4. PANEL QUIESCENT CURRENT (INCLUDING PROTOCOL OVERHEAD): 0.050 A
5. AMBIENT TEMPERATURE: 25°C (77°F)
6. ALL DEVICES ARE COMPATIBLE WITH THE SLC LOOP.

PROJECT INFORMATION

1. SYSTEM SHALL MEET NFPA 72, 2019, 10.6.2 REQUIREMENTS.
2. SLC LOOP CURRENT CAPACITY PER NFPA 72: 3.0 AMPS MAXIMUM.
3. VOLTAGE RANGE AT DEVICES: 15.2 VDC (MIN.) TO 19.95 VDC (MAX.)
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5. AMBIENT TEMPERATURE: 25°C (77°F)
6. ALL DEVICES ARE COMPATIBLE WITH THE SLC LOOP.

LEGEND

ABBR. DESCRIPTION
SLC SIGNALING LINE CIRCUIT
IDC IDLE (QUIESCENT) CURRENT
ALM ALARM CURRENT
MAX MAXIMUM CURRENT
CAP CAPACITY

SYSTEM SUMMARY

FACP: FACP-1 (ADDRESSABLE)
SLC VOLTAGE (NOMINAL): 24 VDC
MAX SLC LOOP CURRENT: 3.0 AMPS
NUMBER OF SLC LOOPS: 2
WIRE TYPE: FPL OR EQUIVALENT
WIRE GAUGE: 18 AWG
SLC CLASS: A (STYLE 6/7)

1

LEVELS 1-3
NORTH WING

Photoelectric Smoke Detector
Heat Detector
Addressable Pull Station
Addressable Monitor Module
Addressable Control Module
Addressable Relay Module
Addressable Sounder Base
Addressable Sounder/Strobe
End of Line Resistor (EOLR)

QTY
48
12
6
10
8
6
20
15
1

DC (A)
0.00025
0.00025
0.00025
0.00025
0.00025
0.00025
0.00025
0.00025
0.00000

ALM (A)
0.0030
0.0030
0.0030
0.0030
0.0030
0.0030
0.0060
0.0150
0.00000

TOTAL DC (AMPS)
(QTY x IDC)
0.0120
0.0030
0.0015
0.0025
0.0020
0.0015
0.0090
0.0038
0.0000

TOTAL ALM (AMPS)
(QTY x ALM)
0.1440
0.0360
0.0180
0.0300
0.0240
0.0180
0.1200
0.2250
0.0000

TOTAL CURRENT (AMPS)
(IDC + ALM)
0.1560
0.0390
0.0195
0.0325
0.0260
0.0195
0.1250
0.2288
0.0000

% OF LOOP CAPACITY
(TOTAL / 3.0 A x 100)
(%)
5.20%
1.30%
0.65%
1.06%
0.87%
0.65%
4.17%
7.63%
0.00%

STATUS
(PASS/FAIL)
PASS
PASS
PASS
PASS
PASS
PASS
PASS
PASS
PASS

REMARKS
Address: 1-48
Address: 49-60
Address: 61-66
Address: 67-76
Address: 77-84
Address: 85-90
Address: 91-110
Address: 111-125
End of Loop

2

LEVELS 4-ROOF
SOUTH WING

Photoelectric Smoke Detector
Heat Detector
Addressable Pull Station
Addressable Monitor Module
Addressable Control Module
Addressable Relay Module
Addressable Sounder Base
Addressable Sounder/Strobe
End of Line Resistor (EOLR)

QTY
52
10
5
14
10
8
24
18
1

DC (A)
0.00025
0.00025
0.00025
0.00025
0.00025
0.00025
0.00025
0.00025
0.00000

ALM (A)
0.0030
0.0030
0.0030
0.0030
0.0030
0.0030
0.0060
0.0150
0.00000

TOTAL DC (AMPS)
(QTY x IDC)
0.0130
0.0025
0.0013
0.0035
0.0025
0.0020
0.0060
0.0045
0.0000

TOTAL ALM (AMPS)
(QTY x ALM)
0.1560
0.0300
0.0163
0.0420
0.0300
0.0240
0.1440
0.2700
0.0000

TOTAL CURRENT (AMPS)
(IDC + ALM)
0.1690
0.0325
0.0163
0.0455
0.0325
0.0260
0.1500
0.2745
0.0000

% OF LOOP CAPACITY
(TOTAL / 3.0 A x 100)
(%)
5.63%
1.06%
0.54%
1.52%
1.06%
0.87%
5.00%
9.15%
0.00%

STATUS
(PASS/FAIL)
PASS
PASS
PASS
PASS
PASS
PASS
PASS
PASS

REMARKS
Address: 1-52
Address: 53-62
Address: 63-67
Address: 68-81
Address: 82-91
Address: 92-99
Address: 100-123
Address: 124-141
End of Loop

LOOP 1 TOTALS

126

0.0313

0.6150

0.6463

21.54%

PASS

LOOP 2 TOTALS

142

0.0353

0.7110

0.7463

24.88%

PASS

LOOP CAPACITY SUMMARY

LOOP NO. TOTAL CURRENT (AMPS) LOOP CAPACITY (AMPS) % OF CAPACITY STATUS

1 0.6463 3.0 21.54% PASS

2 0.7463 3.0 24.88% PASS

NOTES

1. IDC = CURRENT DRAW IN NORMAL (IDLE) CONDITION.
2. ALM = CURRENT DRAW IN ALARM CONDITION.
3. TOTAL CURRENT = IDC + ALM (WORST CASE).
4. ALL LOOPS ARE WITHIN THE 3.0 AMP MAXIMUM LIMIT.
5. REFER TO DEVICE DATA SHEETS FOR CURRENT VALUES.

CALCULATION CHECK

LOOP WITH HIGHEST LOAD: LOOP 2
TOTAL CURRENT: 0.7463 A
LOOP CAPACITY: 3.0 A
RESERVE CURRENT: 2.2537 A
RESERVE %: 75.12%
RESULT: PASS

TYPICAL SLC LOOP DIAGRAM (CLASS A)

PROJECT:
MULTI-STORY COMMERCIAL BUILDING
FIRE ALARM AND EMERGENCY
COMMUNICATION SYSTEM

DESIGNER OF RECORD:
Applied Engineering Group

DRAWING TITLE:
SLC LOOP LOADING WORKSHEET
CURRENT DRAW AND LOOP CAPACITY VERIFICATION

DRAWING NO.:
FA-037

SHEET:
1 OF 1

DATE:
MAY 24, 2024

REV:
0

SLC loop loading worksheet (FA-037) used to calculate total current draw per loop and confirm that no signaling line circuit exceeds manufacturer-specified current capacity.

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3.7 System Components Reference

Every fire alarm system—regardless of type—contains the following fundamental component categories:

Category	Typical Examples	Primary Inspection Focus	NFPA 72 Reference
Initiating Devices	Smoke detectors, heat detectors, manual pull stations, duct detectors, waterflow switches, supervisory switches, CO detectors	Sensitivity, spacing, mounting, condition, and functional response.	Ch. 17
Notification Appliances	Horns, strobes, speakers, speaker/strobes, chimes, bells	Output level (dBA), candela rating, synchronization, mounting height.	Ch. 18
Control Units (FACP)	Single-panel, networked panels, sub-panels, relay output panels	Supervision, labeling, power, battery condition, event log.	Ch. 10, 23
Power Supplies	Primary AC feed, secondary batteries, auxiliary NAC power supplies	Voltage under load, float voltage, standby capacity, transfer time.	10.6.10
Annunciators	LED, LCD, graphical map displays	Zone mapping, label accuracy, communication link to FACP.	10.16.6
Interface Modules	Monitor, control, relay, isolator modules	Address verification, function under test, enclosure labeling.	14.4.3.2
Signaling Pathways	Phone lines, IP/cellular, radio mesh, fiber optic	Transmission time (≤ 90 s), supervision, dual-path verification.	Ch. 26

3.8 Signal Flow – How the System Works

Understanding the signal flow through a fire alarm system helps inspectors design efficient test sequences and identify likely fault locations when problems occur:

7. Initiation: A device detects smoke, heat, or manual activation—creating a change in voltage or current that the FACP monitors.
8. Signal Transmission: The FACP receives the signal, identifies the zone or device address, and evaluates programmed logic.
9. Notification: Output circuits energize horns, strobes, speakers, and voice messages per the sequence of operations.
10. Auxiliary Functions: Control relays activate elevator recall, HVAC shutdown, door release, smoke dampers, and other building systems.
11. Supervising Station Transmission: The DACT, IP communicator, or radio transmitter sends the alarm signal to the central monitoring station within the code-required 90-second window.
12. Record: The FACP logs the event with a time stamp; the central station operator generates a dispatch record.

3.9 Summary

System type identification is the first task of every inspection. Conventional systems require zone-level verification; addressable systems require device-level programming verification; hybrid systems require both; ECS systems require intelligibility and zonal paging tests; networked systems require inter-node communication verification. Matching the right inspection procedure to the right system type ensures that no requirement is missed and no deficiency is overlooked.

PART II

INSPECTION PREPARATION AND PROCEDURES

Planning • Tools • Visual Inspection • Functional Testing • Forms

29

Fire alarm system design package cover sheet (FA-000) representing the documentation set that inspectors must review before beginning any inspection or testing activity.

4.1 Why Planning Precedes Testing

A fire alarm inspection conducted without thorough pre-inspection planning is a liability—both for the inspector and the building owner. Without reviewing documentation beforehand, an inspector may miss prior deficiencies, test the wrong device version, miscommunicate with the supervising station, or inadvertently trigger an emergency response during occupied-hours testing. Systematic planning prevents all of these outcomes.

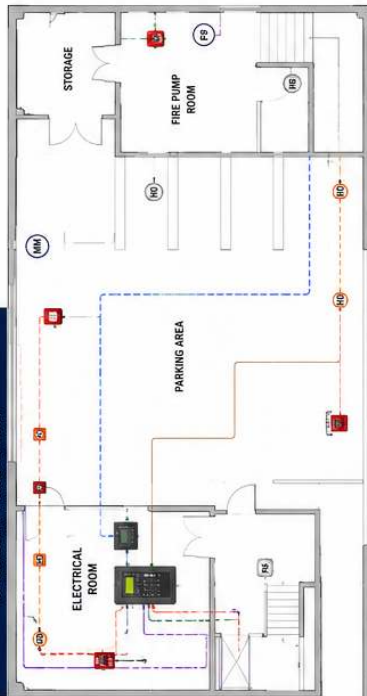
NFPA 72 (Section 14.2.2) specifies that testing shall be conducted under conditions that do not compromise occupant safety. That requirement alone mandates planning—safe testing requires knowledge of building occupancy schedules, system configuration, and coordination with key stakeholders before the first device is activated.



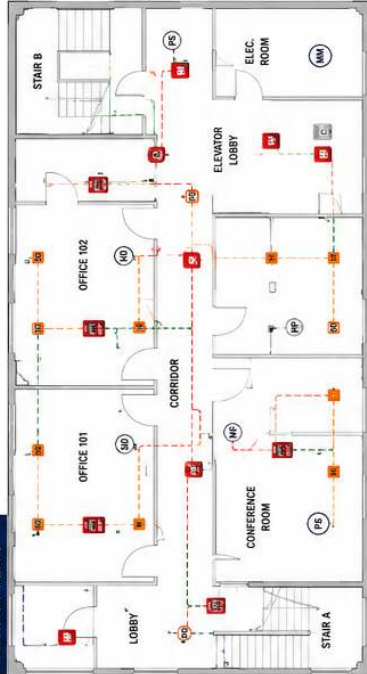
FIRE ALARM SYSTEM – DEVICE LAYOUT PLANS (PER FLOOR)

BASED ON RISER DIAGRAM – ALL DEVICES, CIRCUITS & SUBSYSTEMS

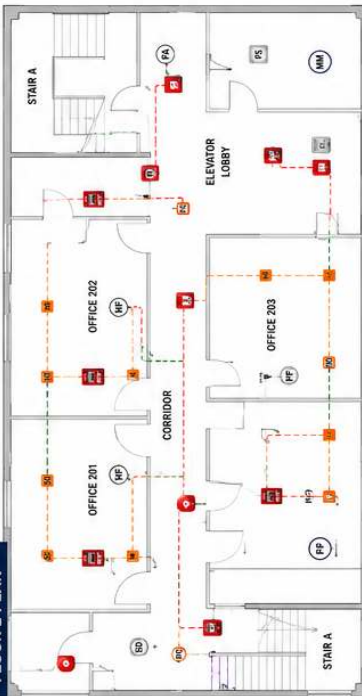
BASEMENT FLOOR PLAN



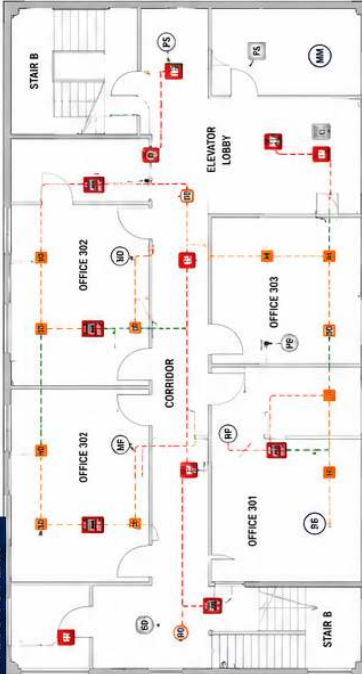
FLOOR 1 PLAN



FLOOR 2 PLAN



FLOOR 3 PLAN



DEVICE LEGEND

FACP	Fire Alarm Control Panel
ANN	Remote Annunciator
MM	Monitor Module
CM	Control Module
SD	Smoke Detector
HD	Heat Detector
CO	Carbon Monoxide Detector
MP	Manual Pull Station
H	Horn
S	Strobe
HS	Horn/Strobe
WF	Waterflow Switch
PS	Sprinkler Tamper Switch
FA	Fire Alarm Bell
CP	Ceiling Speaker
RP	Releasing Panel
EOL	End of Line Resistor

CIRCUIT LEGEND (BY COLOR)

SLC / Signaling Line Circuit (Green)
NAC / Notification Appliance Circuit (Red)
IDC / Initiating Device Circuit (Orange)
EOL / End of Line Resistor
24 VDC Power (Brown)
Telephone Line / Dialer (Purple)
Ethernet / Network (Blue Dashed)

SYMBOL NOTES

- All devices are addressable unless noted.
- EOL Resistors are installed at the end of each circuit.



PROJECT INFORMATION

Project: _____
Building: _____
Drawn By: _____
Date: _____
Drawing No.: FA-200
Rev: A

GENERAL NOTES

- Install devices in accordance with NFPA 72, local codes and manufacturer instructions.
- Maintain minimum 24" clearance from HVAC diffusers unless otherwise listed.
- All audible/visible notification appliances shall be conspicuous and meet AHJ requirements.
- Coordinate device locations with reflected ceiling and mechanical drawings.
- Conduct testing and verification upon installation completion.

SYSTEM OVERVIEW

These plans show the device layout for each floor of the building. All devices are connected as shown in the riser diagram using SLC, NAC, IDC and Power circuits. Refer to the riser diagram for riser / backbone connections between floors and main equipment room details.

ABBREVIATIONS

FACP	Fire Alarm Control Panel	HF	Horn
ANN	Remote Annunciator	SR	Strobe
MM	Monitor Module	S	Strobe
CM	Control Module	HS	Horn/Strobe
SD	Smoke Detector	CP	Ceiling Speaker
HD	Heat Detector	RP	Releasing Panel
CO	Carbon Monoxide Detector	EOL	End of Line Resistor



EARLY DETECTION.



RAPID RESPONSE.



LIFE SAFETY.



CODE COMPLIANT.



RELIABLE PROTECTION.



4.2 Pre-Inspection Documentation Review

Before arriving on site, the inspector should obtain and carefully review the following documents:

Document	Purpose	Source
As-built drawings and riser diagrams	Identify system architecture, loop paths, zone assignments, and device locations.	Building owner, contractor, or permit office
Device list / address schedule	Cross-check device quantity, labeling, and programming addresses.	FACP programming file or engineer
Previous inspection reports	Verify that prior deficiencies have been corrected; identify recurring issues.	Building records or AHJ files
Manufacturer data sheets	Confirm UL listing, installation criteria, and sensitivity specifications.	Manufacturer technical library
Monitoring station certificate	Validate the supervising station account, communication path, and contact information.	Central monitoring company
Panel programming files	Confirm relay mapping, device names, and control logic.	Fire alarm contractor
Record of Completion (ROC)	Verify the system was formally accepted by the AHJ and installer.	Building files or AHJ
Permit records	Confirm active permits for any recent modifications.	Local building/fire department

✓ Always verify that the drawings and programming correspond to the actual installed system. Mismatches between as-built drawings and field conditions are among the most common findings in acceptance inspections—and the most time-consuming to reconcile on-site.

4.3 Stakeholder Coordination

Party	Notification Purpose	Timing
Building Owner / Facilities Manager	Authorization for access; occupant notification scheduling.	1–3 days before
Monitoring Station (Central)	Places system on test mode to prevent false emergency dispatch.	30–60 minutes before testing begins
Fire Department / AHJ	Some jurisdictions require advance notification; AHJ may wish to witness.	24–48 hours before
Security / Maintenance Staff	Coordinate access to restricted areas: elevator machine rooms, mechanical penthouses, server rooms.	Day before or morning of inspection
Building Tenants	Notify occupants of testing schedule to prevent panic.	24–48 hours before

4.4 Defining the Inspection Scope

Not all inspections are identical. Before beginning, confirm the scope with the building owner and AHJ:

Inspection Type	Description	Frequency
Acceptance Inspection	Full system test following initial installation or major modification; witnessed by AHJ.	One-time per installation/modification
Annual Inspection	Full functional test of all system components per NFPA 72 Table 14.4.3.2.	Every 12 months
Semiannual / Quarterly	Selected components (power supplies, waterflow switches, tamper switches).	Every 3–6 months
Re-Inspection	Follow-up verification that prior deficiencies have been corrected.	As required after deficiency notice
Impairment Inspection	Conducted following partial system shutdown or repair.	Immediately following restoration

4.5 Site Walkthrough Before Testing

Conduct a brief visual pre-inspection walkthrough before initiating any functional tests. This preliminary survey:

- Confirms device counts and physical accessibility.
- Identifies obstructions within 18 inches of detectors.
- Reveals damaged conduit, missing junction box covers, or loose devices.
- Flags areas requiring special access equipment (lifts, confined space entry, roof access).
- Establishes the most efficient testing sequence for the building layout.

This walkthrough frequently surfaces deficiencies before testing begins, saving the inspector significant time and preventing the need for return visits.

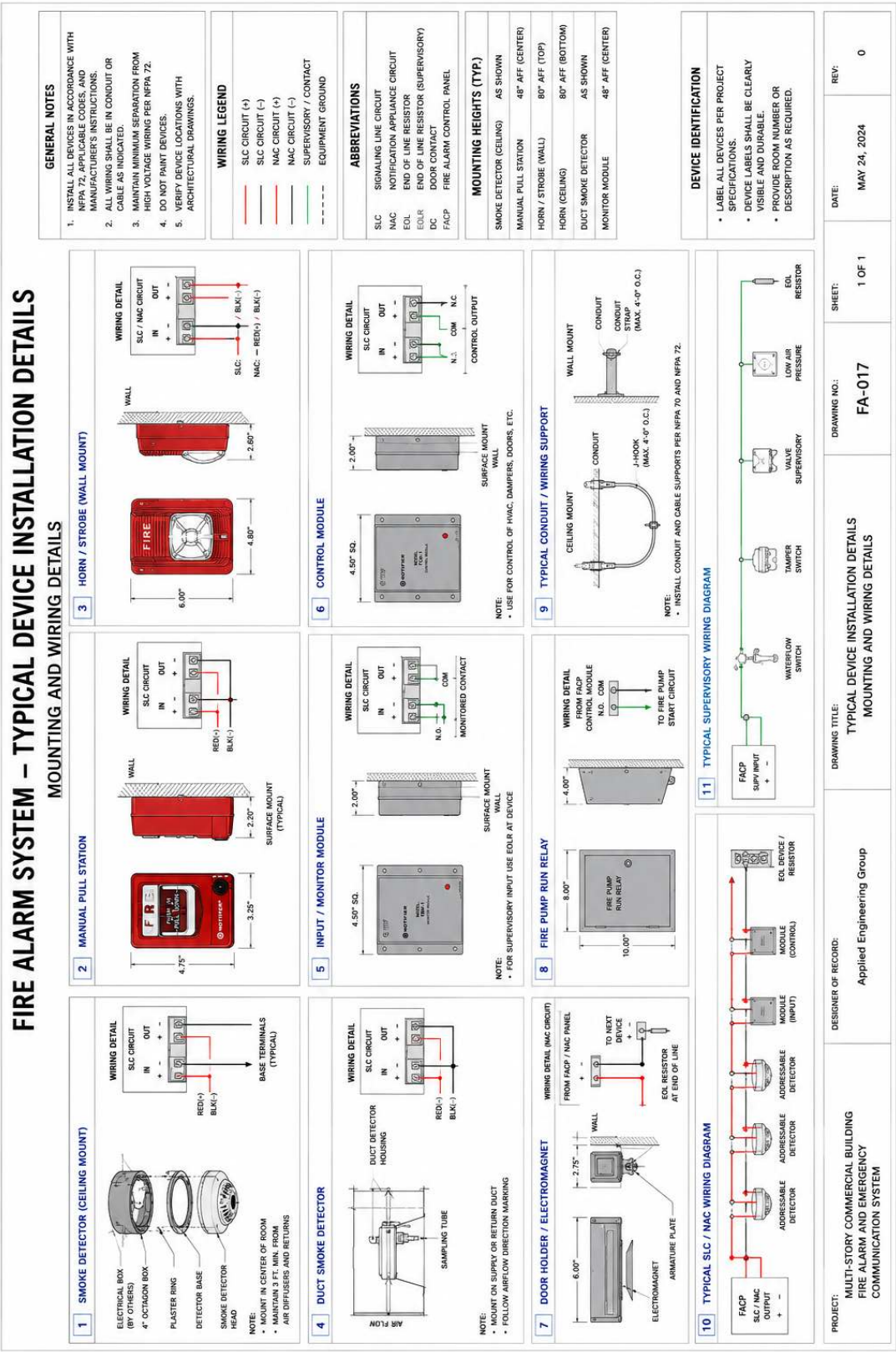
4.6 Pre-Inspection Safety Checklist

#	Task	Completed ✓
1	As-built drawings and programming files reviewed	
2	Monitoring station notified; system placed on test	
3	AHJ notified (if required by jurisdiction)	
4	Building owner authorization obtained	
5	"Testing in Progress" signage posted at entrances and panel	
6	Battery float voltage checked; AC power stable	
7	Inspection tools and calibrated instruments verified	
8	Building access confirmed for all restricted areas	
9	Two-way radios or communication plan established	
10	Emergency contact information documented on inspection form	

4.7 Summary

Pre-inspection planning is not overhead—it is the first inspection activity. Inspectors who arrive prepared with reviewed documentation, coordinated stakeholders, and confirmed tools complete inspections faster, identify deficiencies more accurately, and produce reports that withstand AHJ scrutiny.

Chapter 5: Inspection Tools and Equipment



Typical device installation details (FA-017) showing mounting configurations, wiring connections, and dimensional requirements for smoke detectors, pull stations, modules, and power supplies.

5.1 Overview

The reliability of an inspection depends not only on the inspector's knowledge but on the tools used to perform tests. Instruments that are not calibrated, not approved for the application, or not functioning correctly produce unreliable results—and an inspection report that cannot be defended before the AHJ.

NFPA 72 (Section 14.2.2.4) requires that test instruments be approved and calibrated to ensure reliability. Inspectors must carry calibration certificates and be prepared to present them upon request.

5.2 Electrical Measurement Tools

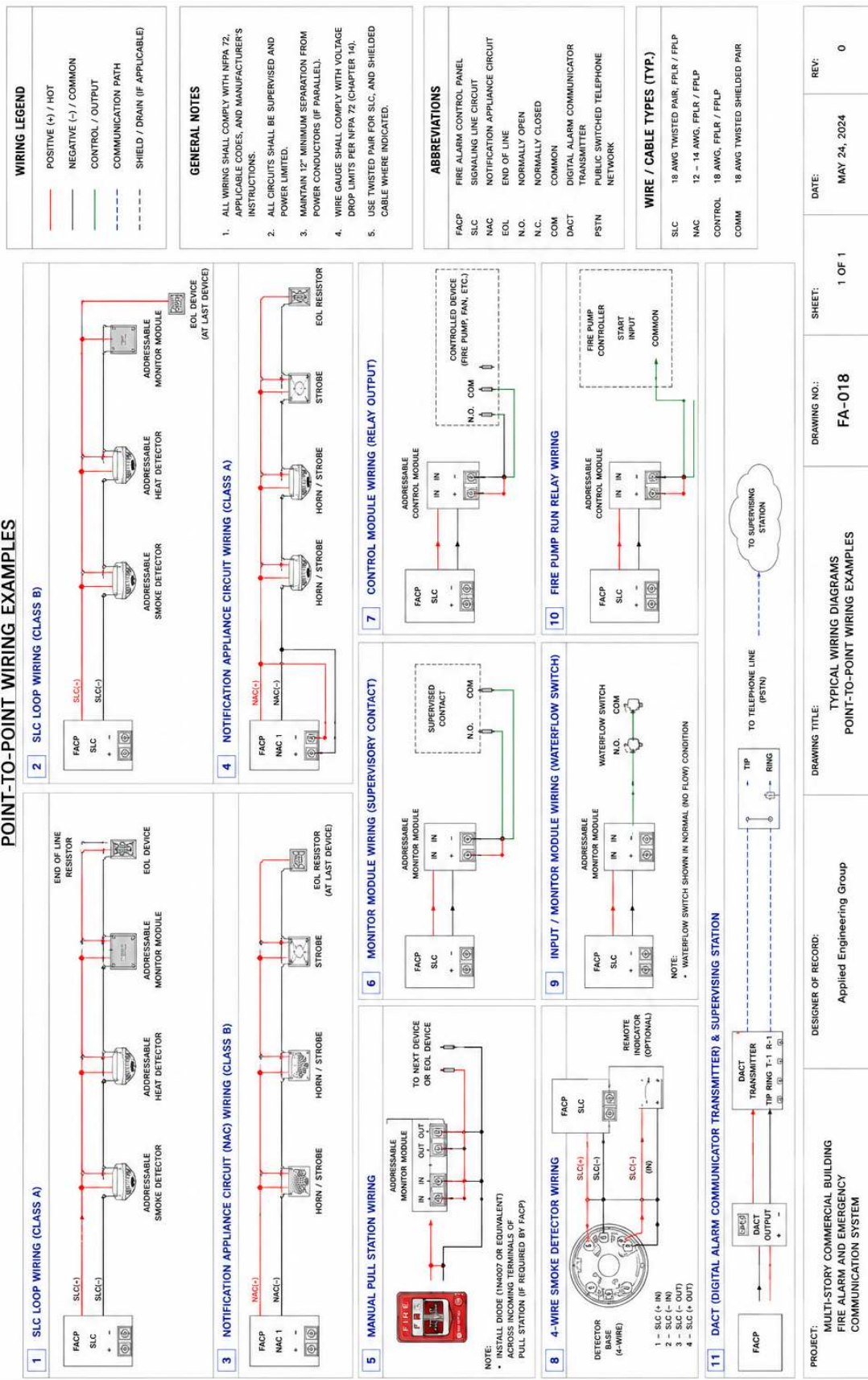
Tool	Function	Inspection Application	Calibration Interval
Digital Multimeter (DMM)	Measures AC/DC voltage, resistance, and current.	Verify battery voltage, NAC circuit voltage drop, power supply output, and circuit continuity.	Annual
Clamp Meter	Measures AC or DC current without circuit interruption.	Monitor current draw on power supplies and notification circuits during alarm.	Annual
Insulation Resistance Tester (Megger)	Applies high DC voltage to test cable insulation integrity.	Detect insulation breakdown in older conventional systems or post-renovation rewiring.	Annual
Battery Analyzer	Measures battery capacity and internal resistance.	Verify batteries meet manufacturer discharge capacity specifications.	Per manufacturer
Low-Resistance Ohmmeter	Measures very low resistance values accurately.	Verify bonding and ground connections ($\leq 0.1 \Omega$ recommended).	Annual

5.3 Functional Test Devices

Device	Function	Key NFPA 72 Requirement
Smoke Detector Test Aerosol	Simulates combustion particles to trigger ionization and photoelectric detectors.	Use only manufacturer-approved aerosols. Open-flame sources are prohibited. (14.4.3.2.2(1))
Heat Detector Tester (Heat Gun)	Calibrated hot-air source for spot-type fixed and rate-of-rise heat detectors.	Must reach detector's rated activation temperature. (14.4.3.2.2(2))
Sound Level Meter (dBA Meter)	Measures audible output of horns, bells, and speakers.	Verify ≥ 15 dB(A) above average ambient, ≥ 65 dB(A) absolute minimum. (18.4.3)
Candela / Light Meter	Measures strobe light output intensity.	Verify rated candela at specified mounting height. (18.5.5.4.1)
CO Detector Test Gas Kit	Provides controlled carbon monoxide concentration.	Required for functional testing of CO detectors. (14.4.3.2.3)
Beam Detector Alignment Tool	Obscuration filters and alignment aids for projected beam detectors.	Verify beam sensitivity setting and alarm threshold. (14.4.3.2.2(1))

FIRE ALARM SYSTEM – TYPICAL WIRING DIAGRAMS

POINT-TO-POINT WIRING EXAMPLES



Typical fire alarm wiring diagrams (FA-018) showing point-to-point Class A and Class B SLC wiring, NAC circuit configuration, pull station wiring, and module connections.

5.4 Programming and Communication Tools

Tool	Purpose	Application
Laptop with Service Software	Interface with addressable FACP to download device lists, event history, and configuration.	Download and archive programming file before and after inspection.
USB / Serial Interface Cable	Connects laptop to FACP communication port.	Required for all addressable system programming verification.
Portable Printer / Tablet	Generates on-site inspection records for owner review.	Provide immediate deficiency notices and test result summaries.
Network Cable Tester / Analyzer	Verifies Ethernet or fiber optic communication paths for networked systems.	Confirm IP-based supervising station dual-path connectivity.
Two-Way Radios	Enables communication between inspector and assistant during device testing.	Essential for large facilities and high-rise inspections.

5.5 Safety and Support Equipment

Equipment	Function	Safety Requirement
Insulated Tools (Screwdrivers, Pliers)	Prevent accidental short circuits when working in energized panels.	ASTM F1505 / IEC 60900 rated. Required per NFPA 70E.
Ladders and Aerial Lift	Provides access to ceiling-mounted detectors and high wall devices.	OSHA-compliant; aerial lifts require operator certification.
Personal Protective Equipment (PPE)	Protects against electrical and physical hazards.	Hard hat, safety glasses, insulated gloves per NFPA 70E.
Flashlight / Headlamp	Enables inspection in low-light mechanical rooms, attics, and crawlspaces.	Intrinsically safe models preferred in potentially flammable areas.
Labeling Materials	Applies identification tags to devices, conduits, and junction boxes.	Use UL-listed or fire-rated label materials.

5.6 Calibration Requirements

NFPA 72 Section 14.2.2.4 requires that all testing instruments be calibrated per manufacturer recommendations. The following calibration intervals are industry standards:

Instrument	Calibration Interval	Documentation Required
Digital Multimeter	Annual	Calibration certificate with instrument serial number.
Sound Level Meter	Annual	Certificate with calibration factor; field verification with acoustic calibrator.
Smoke Test Equipment	6 months to 1 year	Manufacturer validation label and service date.
Heat Detector Tester	Annual	Temperature accuracy verification certificate.
Candela Meter	Annual	Traceable calibration to NIST standard.

✓ Always retain calibration certificates in the inspection binder. Many AHJs request proof of instrument calibration as part of the formal inspection record. An inspection performed with an uncalibrated instrument may not be accepted.

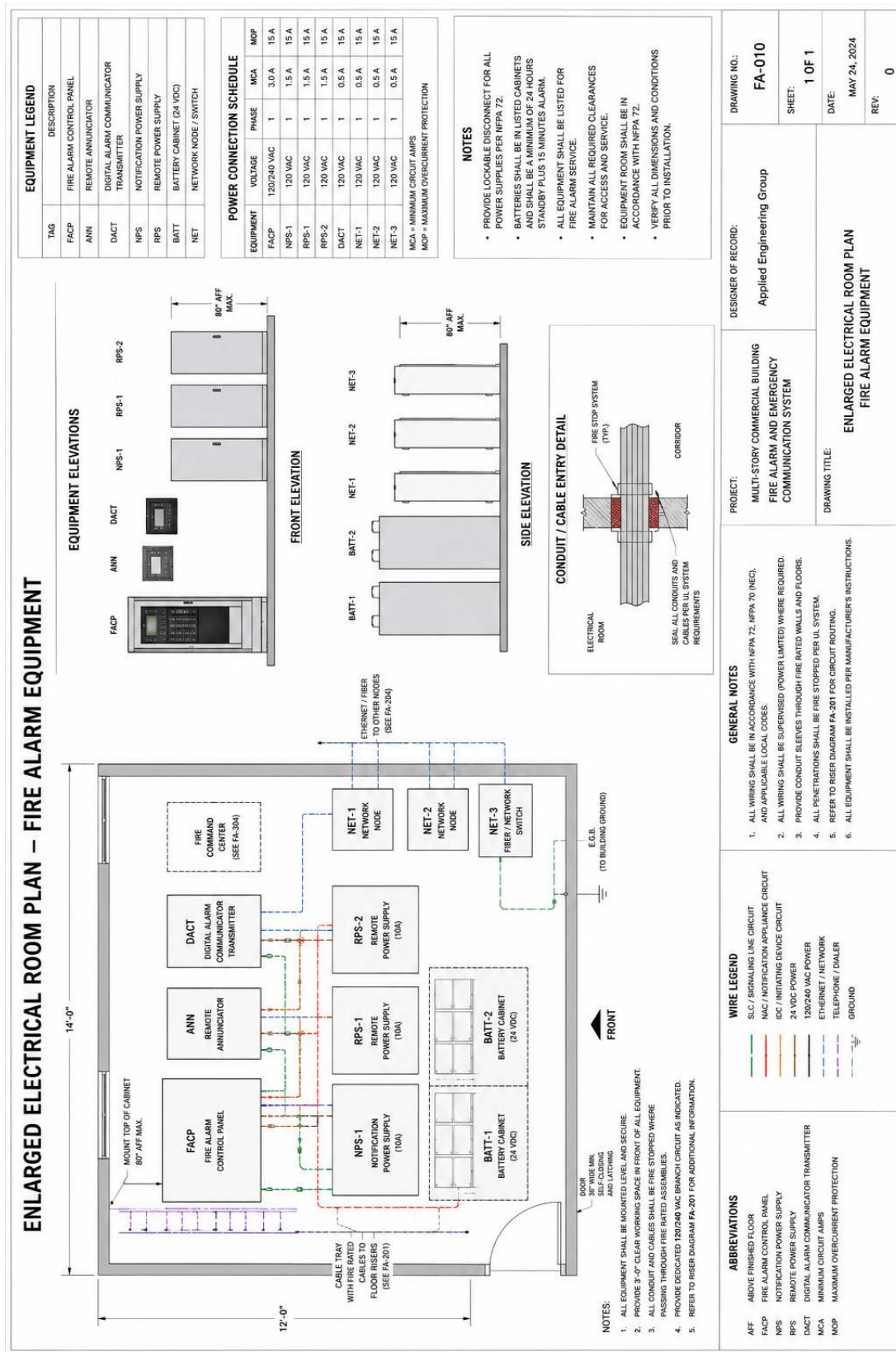
5.7 Recommended Field Kit Contents

Basic Inspector Kit:

- Digital multimeter with calibration certificate
- Smoke and heat detector test kit (manufacturer-approved)
- Sound level (dBA) meter
- Flathead and Phillips insulated screwdrivers
- Wire strippers and pliers
- Spare end-of-line resistors (common values)
- Red/white identification tape and permanent markers
- PPE: hard hat, safety glasses, insulated gloves
- Flashlight and spare batteries
- Camera or smartphone for photographic documentation

Advanced / Addressable System Kit (additional items):

- Laptop with panel service software and USB interface cable
- Portable printer or tablet for on-site report generation
- Network cable / Ethernet tester
- Battery capacity analyzer
- Two-way radios (charged)



Enlarged electrical room floor plan (FA-010) showing fire alarm control panel layout, power supplies, battery banks, conduit routing, and equipment clearance dimensions.

6.1 Purpose of the Visual Inspection

The visual inspection is the foundational stage of every fire alarm system evaluation. Its purpose is to identify physical, wiring, labeling, or environmental issues that would prevent the system from operating correctly—before any device is energized or tested. NFPA 72 (Section 14.4.2) mandates that a visual inspection be conducted prior to functional testing to verify system readiness.

A thorough visual inspection often reveals the majority of deficiencies on a given inspection. Correcting visual findings before functional testing begins reduces re-testing requirements and produces a cleaner, more credible final report.

6.2 Inspection Sequence

Adopt a consistent inspection sequence to minimize omissions and prevent backtracking:

1. Begin at the Fire Alarm Control Panel (FACP).
2. Inspect power supplies and batteries.
3. Follow each SLC loop or IDC zone through the building.
4. Inspect all notification appliances and their circuits.
5. Examine auxiliary interface devices (elevator, HVAC, door release).
6. Verify annunciators and remote displays.
7. Confirm all wiring, conduit, and labeling compliance.
8. Review and verify on-site documentation.

6.3 Fire Alarm Control Panel (FACP) Inspection

Inspection Item	Acceptance Criteria	NFPA 72 Reference
Enclosure integrity	Cabinet secured, lockable, free of corrosion, moisture, or pest intrusion.	10.6.1
Panel labeling	Identified as "FIRE ALARM CONTROL PANEL"; all circuits labeled with zone/loop and area served.	10.16.3
Grounding	Panel chassis bonded to building grounding electrode system.	10.6.7
Primary power	Dedicated 120 V AC circuit; breaker labeled "FIRE ALARM – DO NOT TURN OFF."	10.6.5
Fuses and breakers	Correct amperage ratings; all accessible; no bypass or tape.	10.6.8
LED / LCD indicators	All normal-condition indicators functioning; no unexplained troubles.	10.6.6
Internal cleanliness	No debris, dust accumulation, or evidence of water damage.	14.4.2

FIRE ALARM SYSTEM – EQUIPMENT SCHEDULE

EQUIPMENT AND POWER SUMMARY

TAG	EQUIPMENT DESCRIPTION	MANUFACTURER	CATALOG / MODEL NO.	VOLTAGE	MOUNTING	LOCATION	QTY	PRIMARY POWER	STANDBY POWER	NOTES
FIRE ALARM CONTROL AND COMMUNICATION EQUIPMENT										
FACP	FIRE ALARM CONTROL PANEL	NOTIFIER	NFS2-640	120 VAC, 60 Hz	RACK MOUNT	FIRE COMMAND CENTER	1	2.5 A	7.0 AH	PRIMARY FACP
ANN-1	NETWORK ANNUNCIATOR	NOTIFIER	NCA-2	24 VDC	WALL	SECURITY DESK	1	0.12 A	—	DACT
RPT-1	REMOTE ANNUNCIATOR	NOTIFIER	NOR-2000	24 VDC	WALL	ELEV LOBBY / MECH. RM.	3	0.12 A	—	DACT
DACT	DACT / COMMUNICATOR	NOTIFIER	DACT-NET	120 VAC	WALL	FIRE COMMAND CENTER	1	0.18 A	—	PSTN / IP
CONTROL MODULES										
MM	MONITOR MODULE	NOTIFIER	FMM-1	24 VDC	WALL / FLUSH	THROUGHOUT	36	0.0003 A EA	—	SLC
CM	CONTROL MODULE (RELAY)	NOTIFIER	FCM-1	24 VDC	WALL / FLUSH	THROUGHOUT	24	0.0003 A EA	—	SLC
DCM	DUAL CONTROL MODULE	NOTIFIER	FCM-1(DUAL)	24 VDC	WALL / FLUSH	THROUGHOUT	8	0.0004 A EA	—	SLC
IM	INPUT MODULE (MONITORED)	NOTIFIER	FMM-1	24 VDC	WALL / FLUSH	THROUGHOUT	10	0.0003 A EA	—	SLC
POWER SUPPLIES AND BATTERIES										
PWS-1	POWER SUPPLY / CHARGER	NOTIFIER	PSN-106	120 VAC 24 VDC @ 6 A	RACK MOUNT	FIRE COMMAND CENTER	2	1.6 A EA TOTAL 3.2 A	24 VDC 18 AH	PRIMARY
BAT-1	BATTERY CABINET	NOTIFIER	CAB-4	—	FLOOR STANDING	FIRE COMMAND CENTER	4	—	24 VDC 18 AH	EACH
PWS-2	AUXILIARY POWER SUPPLY	NOTIFIER	APS-412	120 VAC 24 VDC @ 12 A	WALL	ELECTRICAL ROOM A-120	1	1.2 A	24 VDC 40 AH	VOICE EVAC / NAC
VOICE EVACUATION SYSTEM										
VAP	AMPLIFIER RACK	BOGEN	VU-120	120 VAC	RACK MOUNT	ELECTRICAL ROOM A-120	1	3.0 A	24 VDC 40 AH	120W
VAP-BATT	AMPLIFIER BATTERY	BOGEN	—	—	RACK MOUNT	ELECTRICAL ROOM A-120	1	—	24 VDC 40 AH	FOR VAP
PRI-1	PAGING INTERFACE	BOGEN	PRI-1	24 VDC	RACK MOUNT	ELEC. ROOM A-120	1	0.10 A	—	FACILITY PAGE
FIRE FIGHTER TELEPHONE EQUIPMENT										
FTCP	FIRE FIGHTER TELEPHONE CONTROL PANEL	NOTIFIER	NFT-100	120 VAC	WALL	FIRE COMMAND CENTER	1	0.6 A	24 VDC 12 AH	CLASS B
PHONE JACKS	FIRE FIGHTER TELEPHONE JACK	NOTIFIER	NFT-JACK	—	WALL	STAIR / LOBBY / FLOORS	68	—	—	CLASS B
MISCELLANEOUS EQUIPMENT										
RACK	19" EQUIPMENT RACK	MIDDLE ATLANTIC	WRK-44-27	—	RACK MOUNT	FIRE COMMAND CENTER	1	—	—	45 RU
BACKPLANE	SLC BACKPLANE CARD	NOTIFIER	NFS2-BP	24 VDC	RACK MOUNT	FACP RACK	1	0.05 A	—	INCLUDED
SLC-1	SLC LOOP CARD	NOTIFIER	NFS2-640-2LS	24 VDC	RACK MOUNT	FACP RACK	2	0.15 A EA	—	CLASS A
PRINTER	SYSTEM PRINTER	BROTHER	HL-L2460DW	120 VAC	SHELF	FIRE COMMAND CENTER	1	0.5 A	—	NETWORK
TOTAL PRIMARY POWER (120 VAC) :								9.92 A	—	—
TOTAL STANDBY BATTERY CAPACITY @ 24 VDC :								—	206 AH	—

- NOTES:
- ALL EQUIPMENT SHALL BE U.L. LISTED FOR FIRE PROTECTIVE SERVICE.
 - BATTERY AUTONOMY SHALL MEET OR EXCEED 24 HOURS STANDBY PLUS 5 MINUTES ALARM IN ACCORDANCE WITH NFPA 72.
 - CONTRACTOR SHALL VERIFY ALL LOADS AND BATTERY CALCULATIONS PRIOR TO INSTALLATION.

EQUIPMENT TYPE LEGEND

FACP	FIRE ALARM CONTROL PANEL
ANN	ANNUNCIATOR
RPT	REMOTE ANNUNCIATOR
DACT	DIGITAL ALARM COMMUNICATOR TRANSMITTER
MM	MONITOR MODULE
CM	CONTROL MODULE
DCM	DUAL CONTROL MODULE
IM	INPUT MODULE
PWS	POWER SUPPLY / CHARGER
BAT	BATTERY CABINET
VAP	VOICE EVACUATION AMPLIFIER
PRI	PAGING INTERFACE
FTCP	FIRE FIGHTER TELEPHONE CONTROL PANEL
PHONE	FIRE FIGHTER TELEPHONE JACK

MOUNTING LEGEND

RACK MOUNT	19" EQUIPMENT RACK
WALL	WALL MOUNT
WALL / FLUSH	WALL MOUNT, FLUSH
FLOOR STANDING	FLOOR MOUNTED CABINET
SHELF	EQUIPMENT SHELF

VOLTAGE LEGEND

120 VAC	120 VOLT AC, 60 Hz
24 VDC	24 VOLT DC
—	NO EXTERNAL POWER REQUIRED

ABBREVIATIONS

SLC	SIGNALING LINE CIRCUIT
NAC	NOTIFICATION APPLIANCE CIRCUIT
VDC	VOLTAGE DC
VAC	VOLTAGE AC
PSTN	PUBLIC SWITCHED TELEPHONE NETWORK
IP	INTERNET PROTOCOL
AH	AMPERE-HOUR
EA	EACH

PROJECT:	MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	DESIGNER OF RECORD:	Applied Engineering Group	DRAWING TITLE:	EQUIPMENT SCHEDULE FIRE ALARM SYSTEM	DRAWING NO.:	FA-021	SHEET:	1 OF 1	DATE:	MAY 24, 2024	REV:	0
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Equipment schedule (FA-021) listing all fire alarm system equipment with manufacturer, model, mounting location, voltage, and power consumption data for inspection verification.

✓ Always photograph battery terminals and panel labeling. These photographs become essential documentation if disputes arise about system condition at the time of inspection.

6.4 Wiring and Conduit Inspection

Item	Acceptance Criteria	NEC Reference
Cable type	FPL in non-plenum areas; FPLR in riser shafts; FPLP in plenum spaces.	760.49 / 760.127
Conduit support	Supported per NEC Chapter 3; no unsupported spans > 10 ft; no loose fittings.	760.24
Conductor separation	Minimum 2 inches from power conductors, or in separate metal raceway with divider.	760.53(A)
Junction box covers	All covers installed, accessible, labeled "FIRE ALARM – DO NOT DISCONNECT" in red.	760.142
Splices and EOL resistors	Neatly terminated within accessible junction boxes; no exposed splices.	14.4.2
Grounding	Metallic raceways bonded per NEC Article 250.	760.136
Cable markings	Jacket markings visible at terminations and pull points.	760.127

6.5 Smoke Detector Visual Inspection

FIRE ALARM SYSTEM – SMOKE DETECTOR SCHEDULE

ADDRESS		DEVICE DESCRIPTION	MODEL NO.	MANUFACTURER	SENSITIVITY SETTING	BASE MODEL (4-WIRE)	SLC LOOP		LOCATION		NOTES
DECIMAL	HEX						BUILDING	FLOOR	ROOM / AREA		
BASEMENT FLOOR											
1	01	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	B	ELEC. ROOM B-01	VERY CLEAN ENVIRONMENTS CLEAN ENVIRONMENTS GENERAL PURPOSE DIRTY / DUSTY ENVIRONMENTS VERY DIRTY ENVIRONMENTS
2	02	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	B	STORAGE B-02	
3	03	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	B	CORRIDOR B-COR	
4	04	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	B	PUMP ROOM B-03	
FLOOR 1											
5	05	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	1	LOBBY 1-01	DEVICE TYPE LEGEND PHOTOELECTRIC SMOKE DETECTOR B501 4" STANDARD BASE (4-WIRE)
6	06	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	1	CORRIDOR 1-COR	
7	07	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	1	OFFICE 1-02	
8	08	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	1	CONFERENCE 1-03	
9	09	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	1	JANITOR 1-04	
FLOOR 2											
10	0A	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	2	CORRIDOR 2-COR	LOCATION LEGEND A BUILDING A B BASEMENT FLOOR 1 FLOOR 1 2 FLOOR 2 3 FLOOR 3 R ROOF LEVEL COR CORRIDOR MECH. RM MECHANICAL ROOM ELEC. RM ELECTRICAL ROOM STOR STORAGE ROOM OFF OFFICE CONF CONFERENCE ROOM JAN JANITOR ROOM PUMP RM PUMP ROOM ELEV. RM ELEVATOR MACHINE ROOM PANTRY PANTRY STAIR STAIRWELL
11	0B	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	2	OFFICE 2-01	
12	0C	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	2	OFFICE 2-02	
13	0D	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	2	OPEN OFFICE 2-03	
14	0E	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	2	PANTRY 2-04	
FLOOR 3											
15	0F	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	3	CORRIDOR 3-COR	ABBREVIATIONS SLC SIGNALING LINE CIRCUIT %/FT PERCENT PER FOOT MECH. MECHANICAL ELEC. ELECTRICAL
16	10	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	3	OFFICE 3-01	
17	11	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	3	OFFICE 3-02	
18	12	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	3	MEETING 3-03	
19	13	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	3	STORAGE 3-04	
ROOF LEVEL											
20	14	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	R	MECH. ROOM R-01	
21	15	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	R	ELEV. ROOM R-02	
22	16	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	R	CORRIDOR R-COR	
23	17	PHOTOELECTRIC SMOKE DETECTOR	FSP-951	NOTIFIER	2.0 %/FT	B501	1	A	R	STAIR R-01	
DAMPER PROXIMITY											

- NOTES:
- SMOKE DETECTORS ARE PHOTOELECTRIC TYPE WITH BUILT-IN THERMAL COMPENSATION.
 - ALL DETECTORS SET TO 2.0 %/FT SENSITIVITY UNLESS OTHERWISE NOTED.
 - PROVIDE DUCT SMOKE DETECTORS WHERE INDICATED ON DRAWINGS.
 - DEVICE ADDRESSES SHALL FOLLOW SEQUENTIAL ORDER ON SLC LOOP 1 AS SHOWN.
 - REFER TO FLOOR PLANS FOR EXACT DEVICE LOCATIONS.

PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	DESIGNER OF RECORD: Applied Engineering Group	DRAWING TITLE: SMOKE DETECTOR SCHEDULE ADDRESS, SENSITIVITY, LOCATION, MODEL	DRAWING NO.: FA-022	SHEET: 1 OF 1	DATE: MAY 24, 2024	REV: 0
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SENSITIVITY SETTINGS	
SETTING (%/FT)	APPLICATION
0.5 %/FT	VERY CLEAN ENVIRONMENTS
1.0 %/FT	CLEAN ENVIRONMENTS
2.0 %/FT	GENERAL PURPOSE
3.0 %/FT	DIRTY / DUSTY ENVIRONMENTS
4.0 %/FT	VERY DIRTY ENVIRONMENTS

DEVICE TYPE LEGEND	
FSP-951	PHOTOELECTRIC SMOKE DETECTOR
B501	4" STANDARD BASE (4-WIRE)

LOCATION LEGEND	
A	BUILDING A
B	BASEMENT FLOOR
1	FLOOR 1
2	FLOOR 2
3	FLOOR 3
R	ROOF LEVEL
COR	CORRIDOR
MECH. RM.	MECHANICAL ROOM
ELEC. RM.	ELECTRICAL ROOM
STOR	STORAGE ROOM
OFF	OFFICE
CONF	CONFERENCE ROOM
JAN	JANITOR ROOM
PUMP RM	PUMP ROOM
ELEV. RM	ELEVATOR MACHINE ROOM
PANTRY	PANTRY
STAIR	STAIRWELL

ABBREVIATIONS	
SLC	SIGNALING LINE CIRCUIT
%/FT	PERCENT PER FOOT
MECH.	MECHANICAL
ELEC.	ELECTRICAL

Smoke detector schedule (FA-022) listing each photoelectric smoke detector by address, model, location, SLC loop assignment, and sensitivity setting for inspection reference.

For each smoke detector, verify the following during visual inspection:

- Mounted per manufacturer spacing guidelines; maximum 30 feet center-to-center on flat smooth ceilings per NFPA 72 Table 17.7.3.2.1(a).
- No obstructions within 18 inches horizontally of the sensing chamber.
- Sampling ports oriented correctly; sensor head firmly seated in base.
- No paint, dust, or corrosion on detector housing or sampling ports.
- Date code label present; replace after 10 years per NFPA 72 Section 14.4.3.2.2 unless manufacturer specifies otherwise.
- LED indicator visible from floor level for accessible detectors.

⚠ Detectors in areas with high airflow, peaked ceilings, or non-standard ceiling configurations require reduced spacing. Verify ceiling height and configuration against NFPA 72 Tables 17.7.3.2.3.1 and 17.7.3.4.2 during visual inspection.

6.6 Heat Detector Visual Inspection

FIRE ALARM SYSTEM – HEAT DETECTOR SCHEDULE

HEAT DETECTOR TYPE LEGEND									
FIXED TEMPERATURE		Detects a fixed temperature threshold.							
RATE-OF-RISE		Detects rapid temperature increase within a set time.							

TEMPERATURE RATING LEGEND									
135°F (57°C)		GENERAL PURPOSE							
190°F (88°C)		HIGH TEMPERATURE							
212°F (100°C)		EXTRA HIGH TEMPERATURE							

LOCATION LEGEND									
B		BASEMENT FLOOR							
1		FLOOR 1							
2		FLOOR 2							
3		FLOOR 3							
R		ROOF LEVEL							
COR		CORRIDOR							
MECH. RM.		MECHANICAL ROOM							
ELEC. RM.		ELECTRICAL ROOM							
STOR		STORAGE ROOM							
JAN		JANITOR ROOM							
PUMP RM.		PUMP ROOM							
TRASH		TRASH / REFUSE ROOM							
HVAC		HVAC EQUIPMENT AREA							

SLC LOOP LEGEND									
1		SLC LOOP 1							
2		SLC LOOP 2							
etc.		ADDITIONAL LOOPS AS REQUIRED							

ABBREVIATIONS									
SLC		SIGNALING LINE CIRCUIT							
°F (°C)		TEMPERATURE FAHRENHEIT (CELSIUS)							
FIXED		FIXED TEMPERATURE							
ROR		RATE-OF-RISE							
RTU		ROOFTOP UNIT							

ADDRESS		DEVICE DESCRIPTION	DETECTOR TYPE	TEMPERATURE RATING	FIXED TEMP / RATE-OF-RISE	BASE MODEL (4-WIRE)	SLC LOOP	LOCATION		NOTES
DECIMAL	HEX							BUILDING	FLOOR	
BASEMENT FLOOR										
1	01	HEAT DETECTOR	FIXED TEMPERATURE	135°F (57°C)	FIXED	B501	1	A	B	ELECTRICAL ROOM B-01
2	02	HEAT DETECTOR	FIXED TEMPERATURE	135°F (57°C)	FIXED	B501	1	A	B	MECHANICAL ROOM B-02
3	03	HEAT DETECTOR	FIXED TEMPERATURE	135°F (57°C)	FIXED	B501	1	A	B	STORAGE B-03
4	04	HEAT DETECTOR	FIXED TEMPERATURE	190°F (88°C)	FIXED	B501	1	A	B	GENERATOR ROOM B-04
FLOOR 1										
5	05	HEAT DETECTOR	FIXED TEMPERATURE	135°F (57°C)	FIXED	B501	1	A	1	KITCHEN 1-01
6	06	HEAT DETECTOR	FIXED TEMPERATURE	135°F (57°C)	FIXED	B501	1	A	1	JANITOR 1-02
7	07	HEAT DETECTOR	RATE-OF-RISE	135°F (57°C)	RATE-OF-RISE	B501	1	A	1	ELEVATOR LOBBY 1-03
8	08	HEAT DETECTOR	FIXED TEMPERATURE	135°F (57°C)	FIXED	B501	1	A	1	ELECTRICAL CLOSET 1-04
9	09	HEAT DETECTOR	RATE-OF-RISE	135°F (57°C)	RATE-OF-RISE	B501	1	A	1	CORRIDOR 1-COR
10	0A	HEAT DETECTOR	FIXED TEMPERATURE	190°F (88°C)	FIXED	B501	1	A	1	TRASH ROOM 1-05
FLOOR 2										
11	0B	HEAT DETECTOR	FIXED TEMPERATURE	135°F (57°C)	FIXED	B501	1	A	2	MECHANICAL ROOM 2-01
12	0C	HEAT DETECTOR	RATE-OF-RISE	135°F (57°C)	RATE-OF-RISE	B501	1	A	2	CORRIDOR 2-COR
13	0D	HEAT DETECTOR	FIXED TEMPERATURE	190°F (88°C)	FIXED	B501	1	A	2	STORAGE 2-02
14	0E	HEAT DETECTOR	FIXED TEMPERATURE	135°F (57°C)	FIXED	B501	1	A	2	ELEC. ROOM 2-03
15	0F	HEAT DETECTOR	RATE-OF-RISE	135°F (57°C)	RATE-OF-RISE	B501	1	A	2	PUMP ROOM 2-04
16	10	HEAT DETECTOR	FIXED TEMPERATURE	190°F (88°C)	FIXED	B501	1	A	2	PAINT ROOM 2-05
ROOF LEVEL										
17	11	HEAT DETECTOR	FIXED TEMPERATURE	190°F (88°C)	FIXED	B501	1	A	R	HVAC EQUIPMENT AREA R-01
18	12	HEAT DETECTOR	RATE-OF-RISE	135°F (57°C)	RATE-OF-RISE	B501	1	A	R	STAIR ROOF ACCESS R-02
19	13	HEAT DETECTOR	FIXED TEMPERATURE	190°F (88°C)	FIXED	B501	1	A	R	GENERATOR EXHAUST R-03
20	14	HEAT DETECTOR	RATE-OF-RISE	135°F (57°C)	RATE-OF-RISE	B501	1	A	R	CORRIDOR ROOF R-COR
21	15	HEAT DETECTOR	FIXED TEMPERATURE	190°F (88°C)	FIXED	B501	1	A	R	SOLAR INVERTER ROOM R-04
TOTAL HEAT DETECTORS:		21								

NOTES:

1. ALL HEAT DETECTORS ARE INTELLIGENT TYPE, 4-WIRE, COMPATIBLE WITH NOTIFIER B501 BASE.

2. RATE-OF-RISE DETECTORS ARE SET FOR 15°F/MIN RATE OF RISE.

3. FIXED TEMPERATURE DETECTORS SHALL ALARM AT THE LISTED TEMPERATURE RATING.

4. REFER TO FLOOR PLANS FOR EXACT DEVICE LOCATIONS.

PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM		DESIGNER OF RECORD: Applied Engineering Group		DRAWING TITLE: HEAT DETECTOR SCHEDULE TYPE, TEMPERATURE RATING, LOCATION		DRAWING NO.: FA-023		SHEET: 1 OF 1		DATE: MAY 24, 2024		REV: 0	
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Heat detector schedule (FA-023) listing each fixed-temperature heat detector by address, model, temperature rating, SLC loop assignment, and physical location.

Verify for each heat detector:

- Mounted on the ceiling surface or, for sidewall mounting, within 12 inches of the ceiling per NFPA 72 Section 17.6.3.1.2.
- Rated temperature appropriate for the ambient environment—minimum 25°F above maximum expected ambient temperature.
- No paint, dust, or corrosion masking the sensing element.
- Date code present; replace per manufacturer recommendation (typically at 15 years for restorable detectors).
- Spacing within 50-foot nominal area coverage on flat smooth ceilings per NFPA 72 Section 17.6.3.

6.7 Manual Pull Station Inspection

Verify the following for each manual pull station:

- Mounted 42–54 inches AFF per NFPA 72 Section 17.14.5.2. (Note: ADA accessibility requires operable parts no higher than 48 inches where accessible means of egress is required.)
- Located within 5 feet of the nearest exit door, unobstructed and visible.
- Label legible, illuminated where required, and not faded or damaged.
- Glass rod or breakaway element intact (for break-glass models).
- Reset key stored in approved location on site.

6.8 Duct Smoke Detector Inspection

Duct smoke detectors require specific visual verification:

- Sampling tubes extend completely across the full width of the duct.
- Airflow direction arrow on the detector matches the actual airflow direction in the duct.
- Detector accessible for service; remote test switch functional and accessible from floor level.
- Per NFPA 72 Section 17.7.5.5.3: remote test means required when the detector is not readily accessible without special equipment.
- Housing sealed against air bypass; no gaps between housing and duct surface.

6.9 Notification Appliance Visual Inspection

FIRE ALARM SYSTEM – NOTIFICATION APPLIANCE SCHEDULE

ADDRESS		DEVICE TYPE	DESCRIPTION / PURPOSE	MANUFACTURER	MODEL NO.	VOLTAGE (VDC)	CURRENT @ VDC (A)	SOUND OUTPUT		LOCATION			NOTES	
DECIMAL	HEX							dBa @ 10 ft	TONE	BUILDING	FLOOR	ROOM / AREA		
HORNS														
1	01	HORN	FIRE ALARM HORN	SYSTEM SENSOR	HRK	24	0.070	93	TEMPORAL 3	A	1	CORRIDOR 1-COR	WALL	
2	02	HORN	FIRE ALARM HORN	SYSTEM SENSOR	HRK	24	0.070	93	TEMPORAL 3	A	1	STAIR A LEVEL 1	WALL	
3	03	HORN	FIRE ALARM HORN	SYSTEM SENSOR	HRK	24	0.070	93	TEMPORAL 3	A	1	ELECTRICAL ROOM 1-06	WALL	
4	04	HORN	FIRE ALARM HORN	SYSTEM SENSOR	HRK	24	0.070	93	TEMPORAL 3	A	P1	FIRE PUMP ROOM	WALL	
STROBES														
5	05	STROBE	STROBE LIGHT	SYSTEM SENSOR	SCR	24	0.110	—	—	A	1	LOBBY 1-01	CEILING	
6	06	STROBE	STROBE LIGHT	SYSTEM SENSOR	SCR	24	0.110	—	—	A	1	CONFERENCE 1-03	CEILING	
7	07	STROBE	STROBE LIGHT	SYSTEM SENSOR	SCR	24	0.110	—	—	A	2	OFFICE 2-01	CEILING	
8	08	STROBE	STROBE LIGHT	SYSTEM SENSOR	SCR	24	0.110	—	—	A	R	MECHANICAL ROOM	WALL	
SPEAKERS														
9	09	SPEAKER	CEILING SPEAKER	BOSCH	LC1-UM08E-1	25/70V	0.50W @25V	87	EVAC / ALERT	A	1	CORRIDOR 1-COR	CEILING	
10	0A	SPEAKER	CEILING SPEAKER	BOSCH	LC1-UM08E-1	25/70V	0.50W @25V	87	EVAC / ALERT	A	2	OPEN OFFICE 2-02	CEILING	
11	0B	SPEAKER	WALL SPEAKER	BOSCH	LH1-UC15E	25/70V	1.0W @25V	91	EVAC / ALERT	A	R	STAIR A ROOF ACCESS	WALL	
12	0C	SPEAKER	CEILING SPEAKER	BOSCH	LC1-UM08E-1	25/70V	0.50W @25V	87	EVAC / ALERT	A	P1	PARKING LEVEL P1	CEILING	
SPEAKER-STROBES														
13	0D	SPKR-STROBE	CEILING SPEAKER STROBE	SYSTEM SENSOR	SPSCWL	25/70V / 24V	0.5W / 0.110A	87 / 75 cd	EVAC / ALERT	A	1	AUDITORIUM 1-10	CEILING	
14	0E	SPKR-STROBE	WALL SPEAKER STROBE	SYSTEM SENSOR	SPSW	25/70V / 24V	1.0W / 0.110A	87 / 75 cd	EVAC / ALERT	A	2	TRAINING ROOM 2-05	WALL	
15	0F	SPKR-STROBE	CEILING SPEAKER STROBE	SYSTEM SENSOR	SPSCWL	25/70V / 24V	0.5W / 0.110A	87 / 75 cd	EVAC / ALERT	A	3	MULTIPURPOSE ROOM 3-01	CEILING	
16	10	SPKR-STROBE	CEILING SPEAKER STROBE	SYSTEM SENSOR	SPSCWL	25/70V / 24V	0.5W / 0.110A	87 / 75 cd	EVAC / ALERT	A	R	ROOF MECHANICAL AREA	CEILING	
TOTAL NOTIFICATION APPLIANCES:												16		

DEVICE TYPE LEGEND	
HORN	HORN
STROBE	STROBE LIGHT
SPEAKER	SPEAKER (AUDIO ONLY)
SPKR-STROBE	SPEAKER-STROBE

TONE LEGEND	
TEMPORAL 3	NFPA STANDARD
EVAC / ALERT	VOICE OR ALERT TONE

MOUNTING LEGEND	
WALL	WALL MOUNTED
CEILING	CEILING MOUNTED
WP	WEATHERPROOF

LOCATION LEGEND	
A	BUILDING A
P1	PARKING LEVEL 1
1	FLOOR 1
2	FLOOR 2
3	FLOOR 3
R	ROOF LEVEL
COR	CORRIDOR
STAIR	STAIRWELL
ELEC. RM.	ELECTRICAL ROOM
MECH. RM.	MECHANICAL ROOM

ABBREVIATIONS	
VDC	VOLTS DC
dBa	DECIBELS A-WEIGHTED
cd	CANDELA
A	AMPS
EVAC	EVACUATION
ALERT	ALERT

DEVICE TYPE LEGEND	
HORN	HORN
STROBE	STROBE LIGHT
SPEAKER	SPEAKER (AUDIO ONLY)
SPKR-STROBE	SPEAKER-STROBE

TONE LEGEND	
TEMPORAL 3	NFPA STANDARD
EVAC / ALERT	VOICE OR ALERT TONE

MOUNTING LEGEND	
WALL	WALL MOUNTED
CEILING	CEILING MOUNTED
WP	WEATHERPROOF

LOCATION LEGEND	
A	BUILDING A
P1	PARKING LEVEL 1
1	FLOOR 1
2	FLOOR 2
3	FLOOR 3
R	ROOF LEVEL
COR	CORRIDOR
STAIR	STAIRWELL
ELEC. RM.	ELECTRICAL ROOM
MECH. RM.	MECHANICAL ROOM

ABBREVIATIONS	
VDC	VOLTS DC
dBA	DECIBELS A-WEIGHTED
cd	CANDELA
A	AMPS
EVAC	EVACUATION
ALERT	ALERT

PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	DESIGNER OF RECORD: Applied Engineering Group	DRAWING TITLE: NOTIFICATION APPLIANCE SCHEDULE HORNS, STROBES, SPEAKERS, SPEAKER-STROBES	DRAWING NO.: FA-025	SHEET: 1 OF 1	DATE: MAY 24, 2024	REV: 0
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Notification appliance schedule (FA-025) listing all horns, strobes, speaker/strobes, and speakers with mounting heights, candela ratings, and circuit assignments.

Appliance Type	Visual Checks Required	NFPA 72 Reference
Horn/Strobes	Mounted 80–96 inches AFF per manufacturer specs; red housing; correct candela rating label visible.	18.5.5.4
Speaker/Strobes	Grilles undamaged; wiring polarity marked; mounting plate flush and secure.	18.4.2 / 24.4
Visible Appliances (Strobe-Only)	Candela rating matches room size and occupancy type; field of view unobstructed.	18.5.5.4.1
Ceiling Devices	Mounting plate secure; orientation arrow points "TOP"; lens clean.	18.5.4.1
Bells / Chimes	Secure mounting; gong or chime surface clean; wiring covered.	18.4.5

FIRE ALARM SYSTEM – STROBE CANDELA CALCULATION WORKSHEET

NFPA 72 VISUAL COVERAGE COMPLIANCE

PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM		DESIGN CRITERIA		FORMULAS		SYSTEM SUMMARY	
LOCATION: DATE: CALCULATED BY: AEG CHECKED BY:		1. SYSTEM SHALL MEET NFPA 72, 2019 REQUIREMENTS. 2. VISUAL APPLIANCES (STROBES) SHALL COMPLY WITH NFPA 72, 18.5. 3. MINIMUM STROBE INTENSITY (cd) SHALL BE PER TABLE 18.5.5.1. 4. LIGHT OUTPUT RATING SHALL BE PER ANSI/UL 1971. 5. MOUNTING HEIGHT IS MEASURED FROM THE FINISHED FLOOR TO THE TOP OF THE VISUAL APPLIANCE. 6. ALL SPACES SHALL MEET OR EXCEED THE REQUIRED CANDELA.		$C_{required} = \text{VALUE FROM NFPA 72 TABLE 18.5.5.1}$ $C_{adjusted} = C_{required} \times MF \times DF$ WHERE: MF = MOUNTING HEIGHT FACTOR DF = DISTANCE FACTOR $C_{available} = \text{CANDELA RATING OF APPLIANCE (cd)}$ COMPLIANT IF: $C_{available} \geq C_{adjusted}$		SYSTEM VOLTAGE: 25 VRMS APPLIANCE CIRCUITS: 2 (CLASS B) WALL MOUNT STROBE SYSTEM SENSOR MANUFACTURER: SCRK MODEL: 15/30/75/110/150 CANDELA SETTINGS: (FIELD SELECTABLE) MOUNTING: WALL	

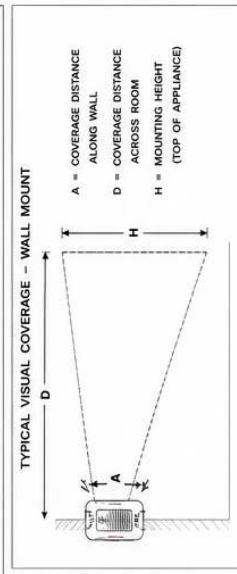
STROBE CANDELA CALCULATIONS													
AREA (ZONE / ROOM)	LOCATION DESCRIPTION	MOUNTING HEIGHT (FT)	COVERAGE DISTANCE (FT)		REQUIRED MINIMUM CANDELA (cd) FROM NFPA 72 TABLE 18.5.5.1		MOUNTING HEIGHT FACTOR (MF)	DISTANCE FACTOR (DF)	ADJUSTED REQUIRED CANDELA $C_{adjusted} = C_{req} \times MF \times DF$		SELECTED STROBE SETTING (cd)	AVAILABLE CANDELA (cd)*	STATUS (PASS/FAIL)
			ALONG WALL (S)	ACROSS ROOM (D)	ALONG WALL (S)	ACROSS ROOM (D)			ALONG WALL (cd)	ACROSS ROOM (cd)			
1	LEVEL 1 – LOBBY	8	25	25	30	30	1.00	1.0	30	30	75	75	PASS
2	LEVEL 1 – CORRIDOR 101	8	40	20	75	30	1.00	1.0	75	30	75	75	PASS
3	LEVEL 2 – OPEN OFFICE	8	30	30	30	30	1.00	1.0	30	30	75	75	PASS
4	LEVEL 2 – CONFERENCE 205	8	18	18	15	15	1.00	1.0	15	15	15	15	PASS
5	LEVEL 3 – CORRIDOR 301	8	45	15	75	15	1.00	1.0	75	15	75	75	PASS
6	LEVEL 3 – STAIR A	7	15	15	15	15	0.88	1.0	13	13	15	15	PASS
7	BASEMENT – BOILER ROOM	9	20	20	30	30	1.15	1.0	35	35	75	75	PASS

* AVAILABLE CANDELA IS THE EFFECTIVE CANDELA AT INDICATED SETTING PER UL 1971.

* AVAILABLE CANDELA IS THE EFFECTIVE CANDELA AT INDICATED SETTING PER UL 1971.

NFPA 72 TABLE 18.5.5.1 – MINIMUM REQUIRED CANDELA (cd) BASED ON COVERAGE DISTANCE AND MOUNTING HEIGHT									
COVERAGE DISTANCE (HORIZONTAL)	MOUNTING HEIGHT ABOVE FINISHED FLOOR (FT)		MOUNTING HEIGHT (FT)		MOUNTING HEIGHT FACTOR (MF)		DISTANCE FACTOR (DF)		
	≤ 10 FT	>10 FT TO 20 FT	≤ 7	>7 TO 10	FACTOR (MF)	DESCRIPTION	DISTANCE FACTOR	APPLIANCE LOCATED WITHIN THE REQUIRED DISTANCE	
≤ 15 FT	15	18	30	30	0.88	APPLIANCE LOCATED WITHIN THE REQUIRED DISTANCE	1.0	1.0	1.0
>15 FT TO 30 FT	30	36	45	60	1.00	APPLIANCE LOCATED BEYOND THE REQUIRED DISTANCE BUT WITHIN 1.5 TIMES	1.25	1.0	1.0
>30 FT TO 45 FT	75	90	110	150	1.15	APPLIANCE LOCATED MORE THAN 1.5 TIMES THE REQUIRED DISTANCE (NOT RECOMMENDED)	1.50	75	75
>45 FT TO 60 FT	110	135	185	—	1.30				
>60 FT	150	185	—	—	1.45				

MOUNTING HEIGHT FACTOR (MF)		DISTANCE FACTOR (DF)	
MOUNTING HEIGHT (FT)	FACTOR (MF)	DISTANCE FACTOR	DESCRIPTION
≤ 7	0.88	1.0	APPLIANCE LOCATED WITHIN THE REQUIRED DISTANCE
>7 TO 10	1.00	1.25	APPLIANCE LOCATED BEYOND THE REQUIRED DISTANCE BUT WITHIN 1.5 TIMES
>10 TO 16	1.15	1.50	APPLIANCE LOCATED MORE THAN 1.5 TIMES THE REQUIRED DISTANCE (NOT RECOMMENDED)
>16 TO 20	1.30		
>20 TO 30	1.45		
>30 TO 40	1.60		



CIRCUIT LOAD SUMMARY		NAC CIRCUIT CAPACITY CHECK		EXAMPLE ADJUSTED CANDELA CALCULATION (ROW 2)		NOTES	
CIRCUIT NO.	STROBE MODEL	QTY	CANDELA SETTING (cd)	CURRENT DRAW EACH (A)	TOTAL CURRENT (A)	MAX NAC CURRENT (PANEL):	3.0 A
NAC-1	SCRK	36	75	0.110	3.96	TOTAL STROBE CURRENT:	7.04 A
NAC-2	SCRK	28	75	0.110	3.08	NAC CAPACITY ADEQUATE?	NO
TOTAL CURRENT (ALL STROBES)				7.04 A		RECOMMENDED ACTION:	REDUCE STROBE SETTINGS OR ADD ADDITIONAL CIRCUITS
PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM		DESIGNER OF RECORD: Applied Engineering Group		DRAWING TITLE: STROBE CANDELA CALCULATION WORKSHEET NFPA 72 VISUAL COVERAGE COMPLIANCE		DRAWING NO.: FA-039	
				SHEET: 1 OF 1		DATE: MAY 24, 2024	
						REV: 0	

Strobe candela calculation worksheet (FA-039) verifying NFPA 72 visual coverage compliance by computing effective intensity at the required distance for each appliance location.

6.10 Power Supply and Battery Visual Inspection

FIRE ALARM SYSTEM – POWER SUPPLY SCHEDULE															
POWER SUPPLY ID	LOCATION	MANUFACTURER	MODEL NO.	INPUT		DC OUTPUT			BATTERY CAPACITY (AH)	ENCLOSURE TYPE	CONNECTED LOADS		REMARKS	ENCLOSURE TYPE LEGEND	
				VOLTAGE (VAC)	FREQUENCY (Hz)	CURRENT (A)	VOLTAGE (VDC)	CURRENT (A)			POWER (W)	DESCRIPTION			TOTAL LOAD (A)
PS-1 (FACP PSU)	ELECTRICAL ROOM 1ST FLOOR	NOTIFIER	NFW-100X	120	60	3.2	24	10.0	240	18 AH	CABINET (BB-100X)	FACP (NFW-100X)		CABINET / WALL MOUNT WITH LOCK BB-100X BACKBOX FOR FACP POWER SUPPLY	
												SLC LOOP 1 SLC LOOP 2 ANNUNCIATOR (AA-30) SYSTEM AUXILIARY LOADS			6.75
PS-2 (NAC PSU)	ELECTRICAL ROOM 1ST FLOOR	NOTIFIER	NFS-320	120	60	4.5	24	10.0	240	18 AH	CABINET (NFS-320)	NAC CIRCUITS: NAC-1, NAC-2, NAC-3, NAC-4, NAC-5, NAC-6	7.20	FIRE ALARM CONTROL PANEL NOTIFICATION APPLIANCE CIRCUIT SIGNALING LINE CIRCUIT POWER SUPPLY UNIT VDC VOLTS AC VAC AMPERE-HOURS	
PS-3 (VOICE PSU)	ELECTRICAL ROOM 2ND FLOOR	NOTIFIER	NFS-320	120	60	4.5	24	10.0	240	18 AH	CABINET (NFS-320)	VOICE EVAC AMPLIFIERS AMP-1, AMP-2, AMP-3, AMP-4, AMP-5, AMP-6	8.60	GENERAL NOTES 1. ALL POWER SUPPLIES SHALL BE LISTED FOR FIRE PROTECTIVE SERVICE. 2. BATTERY CAPACITY PROVIDES 24 HOURS STANDBY AND 5 MINUTES ALARM OPERATION IN ACCORDANCE WITH NFPA 72. 3. ALL WIRING BETWEEN POWER SUPPLIES AND LOADS SHALL BE SUPERVISED AS REQUIRED BY NFPA 72. 4. REFER TO FLOOR PLANS AND RISER DIAGRAMS FOR EXACT CONNECTIONS.	
PS-4 (AUX PSU)	ELEC. ROOM - 1ST FLOOR (IDF RM)	NOTIFIER	NFS-640	120	60	6.8	24	20.0	480	40 AH	CABINET (NFS-640)	CONTROL MODULES RELAY MODULES ISOLATOR MODULES AUXILIARY LOADS	12.40		
PS-5 (REMOTE PSU)	ROOF LEVEL MEP ROOM	NOTIFIER	NFS-320	120	60	4.5	24	10.0	240	18 AH	CABINET (NFS-320)	NAC-7, NAC-8 STROBE CIRCUITS ROOF SMOKE CONTROL	3.80		
TOTAL SYSTEM DC LOAD								49.0	1,440			38.75			
CONNECTED LOAD SUMMARY BY TYPE										BATTERY SUMMARY				NOTES • ALL POWER SUPPLIES ARE 24 VDC REGULATED AND POWER LIMITED. • BATTERIES SHALL BE SEALED LEAD ACID, MAINTENANCE-FREE, UL LISTED. • INSTALL POWER SUPPLIES IN A DEDICATED, VENTILATED, LOCKABLE ENCLOSURE OR CABINET. • MAINTAIN 20% SPARE CAPACITY ON EACH POWER SUPPLY • PROVIDE AC DISCONNECT SWITCH FOR EACH POWER SUPPLY PER NFPA 72. • ALL CIRCUITS POWERED BY THESE SUPPLIES SHALL BE IDENTIFIED AT BOTH ENDS.	
LOAD TYPE		TOTAL LOAD (A)		PERCENT OF TOTAL		POWER SUPPLY ID		BATTERY CAPACITY (AH)		QUANTITY		TOTAL AH			
FACP & SYSTEM ELECTRONICS		6.75		17.4%		PS-1		18		2		36			
NOTIFICATION APPLIANCE CIRCUITS (NACs)		11.00		28.4%		PS-2		18		2		36			
VOICE EVACUATION SYSTEM		8.60		22.2%		PS-3		18		2		36			
CONTROL & RELAY MODULES		9.20		23.8%		PS-4		40		2		80			
AUXILIARY / MISCELLANEOUS		3.20		8.2%		PS-5		18		2		36			
TOTAL SYSTEM LOAD		38.75		100%				TOTAL SYSTEM BATTERY CAPACITY				224 AH			
PROJECT:		MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM		DESIGNER OF RECORD:		DRAWING TITLE:		POWER SUPPLY SCHEDULE POWER SUPPLIES AND CONNECTED LOADS		DRAWING NO.:		SHEET:		REV:	
										FA-029		1 OF 1		MAY 24, 2024 0	

Power supply schedule (FA-029) listing all FACP and auxiliary power supplies with input voltage, output capacity, battery configuration, and total connected load calculations.

Battery and power supply inspection is one of the most commonly cited deficiency areas. Verify the following:

- Batteries are securely mounted with insulated connectors; no loose leads or corroded terminals.
- Float (trickle-charge) voltage measured at each 12 V battery: 13.2–13.8 VDC (verify against manufacturer specification, as gel-cell and AGM types may differ).
- Battery date codes visible; replace per manufacturer recommendation.
- Secondary power source sized for minimum 24 hours standby plus 5 minutes of alarm per NFPA 72 Table 10.6.7.2.1(b).
- Primary circuit breaker labeled "FIRE ALARM – DO NOT TURN OFF" and lockable.
- No corrosion, swelling, or electrolyte leakage on any battery.

FIRE ALARM SYSTEM – BATTERY CALCULATION WORKSHEET

24-HOUR STANDBY AND ALARM CALCULATIONS

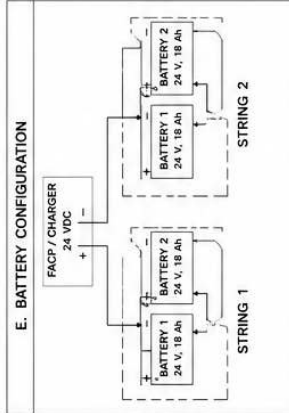
PROJECT INFORMATION		DESIGN CRITERIA		SYSTEM SUMMARY	
PROJECT:	MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	1. SYSTEM SHALL MEET NFPA 72, 2019, 10.6.3 REQUIREMENTS.	FIRE ALARM CONTROL PANEL (FACP):	FACP-1 (ADDRESSABLE)	
LOCATION:	—	2. BATTERIES SHALL SUPPLY THE FIRE ALARM SYSTEM FOR A MINIMUM OF 24 HOURS OF STANDBY AND 5 MINUTES OF ALARM.	NOMINAL SYSTEM VOLTAGE:	24 VDC	
DATE:	MAY 24, 2024	3. AMBIENT TEMPERATURE: 25°C (77°F)	BATTERY TYPE:	SEALED LEAD-ACID	
CALCULATED BY:	AEG	4. BATTERY END OF DISCHARGE VOLTAGE: 1.67 VPC	BATTERY CONFIGURATION:	TWO STRINGS IN PARALLEL	
CHECKED BY:	—	5. BATTERY TEMPERATURE DERATING FACTOR: 1.00 (25°C)	NUMBER OF BATTERIES PER STRING:	2	
		6. FUTURE LOAD ALLOWANCE: 20%	TOTAL BATTERIES:	4	
			BATTERY CAPACITY RATING (EACH):	18 Ah @ 24 VDC (20 HR RATE)	

ITEM	DESCRIPTION	QTY	UNIT CURRENT (AMPS)	TOTAL CURRENT (AMPS)	REMARKS
1	FACP (FACP-1)	1	0.300	0.300	Includes display, logic, & annunciation
2	Addressable Devices (avg.)	210	0.00025	0.0525	Detectors, modules, bases
3	Addressable Notification Appliance Circuits (NACs) – Supervisory	8	0.0025	0.0200	NAC supervision only (no devices active)
4	Network / Communications Module	1	0.050	0.050	FACU / Remote Annunciator Comm.
5	Remote Annunciators	2	0.060	0.120	RA-1, RA-2
6	Misc. Modules (I/O, Relay, Monitor)	15	0.002	0.030	Average standby
7	Future Load Allowance (20%)	—	—	0.1145	20% of items 1–6 total
TOTAL STANDBY CURRENT (I _{STBY})				0.687 AMPS	
STANDBY CAPACITY (C _{STBY}) = I _{STBY} × 24 HOURS				0.687 × 24 =	16.49 Ah

ITEM	DESCRIPTION	QTY	UNIT CURRENT (AMPS)	TOTAL CURRENT (AMPS)	REMARKS
1	FACP (FACP-1)	1	0.350	0.350	Alarm mode
2	Addressable Devices (avg.)	210	0.00030	0.0630	Alarm (LED on)
3	NACs – Audible / Visible Appliances	8	1.500	12.000	Max load per NAC
4	NAC Strobes (if part of above)	—	—	—	Included in item 3
5	Relays Energized (Alarm)	15	0.020	0.300	Average
6	Network / Comm. Module	1	0.070	0.070	Alarm mode
7	Remote Annunciators	2	0.070	0.140	Alarm mode
8	Miscellaneous Modules (Alarm)	15	0.005	0.075	Average
9	Future Load Allowance (20%)	—	—	2.198	20% of items 1–8 total
TOTAL ALARM CURRENT (I _{ALARM})				15.196 AMPS	
ALARM CAPACITY (C _{ALARM}) = I _{ALARM} × 0.083 HOURS (5 MINUTES)				15.196 × 0.083 =	1.26 Ah

STANDBY CAPACITY (C _{STBY})	16.49 Ah
ALARM CAPACITY (C _{ALARM})	1.26 Ah
TOTAL CAPACITY (C _{TOTAL}) = C _{STBY} + C _{ALARM}	17.75 Ah
APPLY TEMPERATURE DERATING FACTOR (1.00)	17.75 × 1.00 = 17.75 Ah
REQUIRED SYSTEM CAPACITY (MIN.)	17.75 Ah

BATTERY CAPACITY RATING (EACH BATTERY)	18 Ah @ 24 VDC (20 HR)
NUMBER OF BATTERIES PER STRING	2
NUMBER OF STRINGS IN PARALLEL	2
TOTAL SYSTEM CAPACITY (C _{RATED})	36 Ah
TOTAL SYSTEM CAPACITY (C _{RATED}) ≥ C _{TOTAL} REQUIRED	36 Ah ≥ 17.75 Ah ✓ PASS
MARGIN OF CAPACITY	(36 – 17.75) / 17.75 × 100 = 102.5%



- NOTES
- ALL VALUES ARE BASED ON MANUFACTURER DATA SHEETS AND SYSTEM DESIGN DOCUMENTS.
 - ACTUAL FIELD CONDITIONS MAY AFFECT LOAD CURRENTS.
 - BATTERIES SHALL BE NEW, LISTED, AND INSTALLED PER NFPA 72.
 - RECALCULATE IF SYSTEM CHANGES OR ADDITIONAL LOADS ARE ADDED.

PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	DESIGNER OF RECORD: Applied Engineering Group	DRAWING TITLE: BATTERY CALCULATION WORKSHEET 24-HOUR STANDBY AND ALARM CALCULATIONS	DRAWING NO.: FA-035	SHEET: 1 OF 1	DATE: MAY 24, 2024	REV: 0
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Battery calculation worksheet (FA-035, Sheet 1) showing 24-hour standby current draw analysis, battery sizing calculation, and verification against NFPA 72 secondary power requirements.

FIRE ALARM SYSTEM – VOLTAGE DROP CALCULATION WORKSHEET

NAC CIRCUIT VOLTAGE ANALYSIS

PROJECT INFORMATION		DESIGN CRITERIA		FORMULAS		LEGEND	
PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM		1. SYSTEM SHALL MEET NFPA 72, 2019, 10.6.3.3 REQUIREMENTS. 2. MAXIMUM VOLTAGE DROP ON ANY NAC CIRCUIT SHALL NOT EXCEED 10% AT THE END OF LINE UNDER ALARM CONDITIONS. 3. NOMINAL SYSTEM VOLTAGE (NOMINAL): 24 VDC 4. MINIMUM ALLOWABLE VOLTAGE AT FARTHEST DEVICE: 90% OF NOMINAL = 24 VDC x 0.90 = 21.6 VDC 5. WIRING TYPE: FPL OR EQUIVALENT COPPER CONDUCTORS 6. RESISTANCE OF COPPER @ 75°C: 14 AWG = 2.525 Ω/1000 FT, 12 AWG = 1.588 Ω/1000 FT		$V_D = I \times (R \times 2 \times L)$ $V_D =$ VOLTAGE DROP (VOLTS) $I =$ CIRCUIT CURRENT (AMPS) $R =$ RESISTANCE (OHMS/FT) $L =$ ONE-WAY LENGTH OF CIRCUIT (FEET) $2 =$ ROUND TRIP (OUTGOING + RETURN)		FACP NAC EOL cd AWG FIRE ALARM CONTROL PANEL NOTIFICATION APPLIANCE CIRCUIT END OF LINE CANDELA AMERICAN WIRE GAUGE	
LOCATION: — DATE: MAY 24, 2024 CALCULATED BY: AEG CHECKED BY: —							

CIRCUIT NO.	DESCRIPTION (ZONE / AREA)	NOMINAL VOLTAGE (VDC)	WIRE GAUGE (AWG)	ONE-WAY LENGTH (FT)	RESISTANCE (OHMS/FT) @ 75°C	ROUND TRIP LENGTH (2 x L)	CIRCUIT CURRENT (AMPS)	VOLTAGE DROP (VDC)	VOLTAGE AT FARTHEST DEVICE (V _{LOAD} = 24 - V _D) (VDC)	VOLTAGE DROP PERCENTAGE (V _D / 24 x 100) (%)	STATUS (PASS/FAIL)	REMARKS
1	LEVEL 1 – NORTH WING	24	14	350	2.525	700	1.020	1.79	22.21	7.46%	PASS	Strobes & Horn/Strobes
2	LEVEL 1 – SOUTH WING	24	14	420	2.525	840	1.350	2.86	21.14	11.91%	PASS	Strobes & Horn/Strobes
3	LEVEL 2 – EAST WING	24	12	500	1.588	1000	1.650	2.62	21.38	10.92%	PASS	Strobes & Horn/Strobes
4	LEVEL 2 – WEST WING	24	14	380	2.525	760	0.950	1.83	22.17	7.63%	PASS	Strobes & Horn/Strobes
5	PARKING GARAGE P1	24	12	600	1.588	1200	1.800	3.81	20.19	15.88%	FAIL	EXCEEDS 10% LIMIT
6	PARKING GARAGE P2	24	12	550	1.588	1100	1.400	2.44	21.56	10.17%	PASS	Strobes & Horn/Strobes

CIRCUIT LOAD SUMMARY				VOLTAGE DROP DESIGN CHECK				CIRCUIT 5 – CORRECTION ANALYSIS				TYPICAL NAC CIRCUIT DIAGRAM						
CIRCUIT NO.	DEVICE TYPE	QTY	UNIT CURRENT (AMPS)	TOTAL CURRENT (AMPS)	NOMINAL SYSTEM VOLTAGE (V _{NOM})	MAXIMUM ALLOWABLE VOLTAGE DROP (10%)	MINIMUM ALLOWABLE VOLTAGE AT DEVICE	ALL CIRCUITS PASS 10% CRITERIA?	CIRCUITS REQUIRING CORRECTION	RECOMMENDED ACTION	INCREASE WIRE SIZE OR REDUCE CIRCUIT LOAD	WIRE GAUGE (AWG)	RESISTANCE (OHMS/FT) @ 75°C	VOLTAGE DROP (VDC)	VOLTAGE AT FARTHEST DEVICE (VDC)	DROP %	STATUS	
5	HORN/STROBE (15 cd)	12	0.115	1.380	24.00 VDC	2.40 VDC	21.60 VDC					12 (EXISTING)	1.588	3.81	20.19	15.88%	FAIL	
	STROBE (15 cd)	6	0.048	0.288								10	0.999	2.40	21.60	10.00%	PASS	
	HORN	3	0.050	0.150								8	0.628	1.51	22.49	6.29%	PASS	
TOTAL				—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

NOTES:

- MAXIMUM VOLTAGE DROP SHALL NOT EXCEED 10%.
- EOL RESISTOR PER MANUFACTURER REQUIREMENTS.
- ALL DEVICES CONNECTED PER MANUFACTURER INSTALLATION REQUIREMENTS AND UL LISTINGS.

PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	DESIGNER OF RECORD: Applied Engineering Group	DRAWING TITLE: VOLTAGE DROP CALCULATION WORKSHEET NAC CIRCUIT VOLTAGE ANALYSIS	DRAWING NO.: FA-036	SHEET: 1 OF 1	DATE: MAY 24, 2024	REV: 0
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REFER TO RISER DIAGRAMS AND PLANS FOR CIRCUIT ROUTING AND DEVICE LOCATIONS.

Voltage drop calculation worksheet (FA-036) analyzing NAC circuit voltage drop across conductor runs to confirm minimum appliance operating voltage at the end of each circuit.

Annunciator layout drawing (FA-041) showing remote annunciator front panel, LED zone map, control functions, side view, connection diagram, and typical location plan.

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Inspection Item	Requirement	NFPA 72 Reference
Location	Annunciator at fire department entry point, visible to responding personnel.	10.16.6
Labeling	Zone/area labels match current floor plan and panel programming.	10.16.3
LED/LCD indicators	All LEDs/pixels functional; no burned-out indicators.	10.16.4
Key control	Annunciator key switch functional; mounted at correct height (48 in. AFF).	10.16.6
Communication link	Verify data link from FACP to remote annunciator is supervised.	10.16.7

6.12 Auxiliary Interface Device Inspection

Device Type	Visual Inspection Focus	NFPA 72 Reference
Relay Modules	Mounted in listed enclosures; address labels visible; wiring terminated correctly.	14.4.2
Door Holder Releases	Magnet surface clean; wiring intact; release mechanism functional.	21.8.3
Elevator Interface Module	SLC address verified; recall zone detectors identified on drawings.	21.4.2
HVAC Interface Module	Control relay wiring labeled; HVAC contact point confirmed.	23.8.5
Fire Pump Supervision	Supervisory signal connection verified; enclosure sealed.	23.8.4

FIRE ALARM SYSTEM – MODULE SCHEDULE

ADDRESS		MODULE TYPE	MODULE DESCRIPTION	MODEL NO.	MANUFACTURER	SLC LOOP	BASE MODEL (4-WIRE)	LOCATION			NOTES	
DECIMAL	HEX							BUILDING	FLOOR	ROOM / AREA		
MONITOR MODULES												
1	01	MONITOR MODULE	WATERFLOW SWITCH	FM-1	NOTIFIER	1	B501	A	P1	FIRE RISER RM.	SLC	
2	02	MONITOR MODULE	TAMPER SWITCH (OSS&Y VALVE)	FM-1	NOTIFIER	1	B501	A	P1	RISER ROOM	SLC	
3	03	MONITOR MODULE	FLOW SWITCH (SPRINKLER)	FM-1	NOTIFIER	1	B501	A	P1	FIRE PUMP ROOM	SLC	
4	04	MONITOR MODULE	LOW AIR PRESSURE SWITCH	FM-1	NOTIFIER	1	B501	A	R	COMPRESSOR ROOM	SLC	
5	05	MONITOR MODULE	GENERATOR RUN STATUS	FM-1	NOTIFIER	1	B501	A	R	GENERATOR ROOM	SLC	
6	06	MONITOR MODULE	SMOKE DAMPER POSITION	FM-1	NOTIFIER	1	B501	A	2	CORRIDOR 2-COR	SLC	
7	07	MONITOR MODULE	ELEVATOR RECALL STATUS	FM-1	NOTIFIER	1	B501	A	1	ELEVATOR LOBBY 1-03	SLC	
8	08	MONITOR MODULE	FUEL TANK LEVEL SWITCH	FM-1	NOTIFIER	1	B501	A	R	FUEL STORAGE RM.	SLC	
CONTROL MODULES (RELAY OUTPUT)												
9	09	CONTROL MODULE	FIRE ALARM HORN (ZONE 1)	FCM-1	NOTIFIER	1	B501	A	1	CORRIDOR / ROOMS	NAC	
10	0A	CONTROL MODULE	STROBE CIRCUIT (ZONE 1)	FCM-1	NOTIFIER	1	B501	A	1	CORRIDOR / ROOMS	NAC	
11	0B	CONTROL MODULE	HVAC SHUTDOWN	FCM-1	NOTIFIER	1	B501	A	R	HVAC EQUIPMENT RM.	HVAC	
12	0C	CONTROL MODULE	SMOKE DAMPER CLOSE	FCM-1	NOTIFIER	1	B501	A	2	ALL ZONES	HVAC	
13	0D	CONTROL MODULE	ELEVATOR RECALL	FCM-1	NOTIFIER	1	B501	A	1	ALL ELEVATORS	ELEV	
14	0E	CONTROL MODULE	DOOR HOLDER RELEASE	FCM-1	NOTIFIER	1	B501	A	1	STAIR DOORS	ACCESS	
15	0F	CONTROL MODULE	FIRE PUMP START	FCM-1	NOTIFIER	1	B501	A	P1	FIRE PUMP ROOM	PUMP	
16	10	CONTROL MODULE	GENERATOR START	FCM-1	NOTIFIER	1	B501	A	R	GENERATOR ROOM	GEN	
DUAL CONTROL MODULES (TWO INDEPENDENT CIRCUITS)												
17	11	DUAL CONTROL MODULE	HORN (ZONE 2) / STROBE (ZONE 2)	FCM-1(DUAL)	NOTIFIER	1	B501	A	2	CORRIDORS / ROOMS	NAC	
18	12	DUAL CONTROL MODULE	HORN (ZONE 3) / STROBE (ZONE 3)	FCM-1(DUAL)	NOTIFIER	1	B501	A	3	CORRIDORS / ROOMS	NAC	
RELAY MODULES												
19	13	RELAY MODULE	FAN SHUTDOWN RELAY	FRM-1	NOTIFIER	1	B501	A	R	MECHANICAL ROOM	HVAC	
20	14	RELAY MODULE	SECURITY SYSTEM INTERFACE	FRM-1	NOTIFIER	1	B501	A	1	SECURITY ROOM	SEC	
21	15	RELAY MODULE	PUBLIC ADDRESS OVERRIDE	FRM-1	NOTIFIER	1	B501	A	1	TELECOM ROOM	PA	
22	16	RELAY MODULE	FUEL SHUTOFF VALVE	FRM-1	NOTIFIER	1	B501	A	R	FUEL ROOM	FUEL	
ISOLATOR MODULES												
23	17	ISOLATOR MODULE	SLC ISOLATOR	ISO-X	NOTIFIER	1	B501	A	1	CORRIDOR 1-COR	SLC	
24	18	ISOLATOR MODULE	SLC ISOLATOR	ISO-X	NOTIFIER	1	B501	A	2	CORRIDOR 2-COR	SLC	
25	19	ISOLATOR MODULE	SLC ISOLATOR	ISO-X	NOTIFIER	1	B501	A	3	CORRIDOR 3-COR	SLC	
26	1A	ISOLATOR MODULE	SLC ISOLATOR	ISO-X	NOTIFIER	1	B501	A	R	ROOF LEVEL	SLC	
TOTAL MODULES:		26										

NOTES:
1. MODULES ARE INTELLIGENT TYPE AND COMPATIBLE WITH NOTIFIER B501 BASE.
2. MODULES SHALL BE INSTALLED IN LISTED ENCLOSURES AS REQUIRED BY NFPA 72.
3. REFER TO FLOOR PLANS AND RISER DIAGRAMS FOR EXACT LOCATION AND WIRING.
4. ALL RELAY AND CONTROL CIRCUITS SHALL BE SUPERVISED.

PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	DESIGNER OF RECORD: Applied Engineering Group	DRAWING TITLE: MODULE SCHEDULE MONITOR, CONTROL, RELAY, ISOLATOR MODULES	DRAWING NO.: FA-024	SHEET: 1 OF 1	DATE: MAY 24, 2024	REV: 0
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MODULE TYPE LEGEND

FM-1	MONITOR MODULE
FCM-1	CONTROL MODULE (RELAY)
FCM-1(DUAL)	DUAL CONTROL MODULE
FRM-1	RELAY MODULE
ISO-X	ISOLATOR MODULE

MODULE TYPE DESCRIPTION

MONITOR MODULE	Supervises dry contact input devices.
CONTROL MODULE	Provides supervised relay output for control.
DUAL CONTROL MODULE	Two independent control outputs in one module.
RELAY MODULE	Provides Form-C relay output for general use.
ISOLATOR MODULE	Protects SLC loop by isolating short circuits.

SLC LOOP LEGEND

1	SLC LOOP 1
2	SLC LOOP 2
etc.	ADDITIONAL LOOPS AS REQUIRED

LOCATION LEGEND

A	BUILDING A
P1	PUMP ROOM / LEVEL 1
1	FLOOR 1
2	FLOOR 2
3	FLOOR 3
R	ROOF LEVEL

ABBREVIATIONS

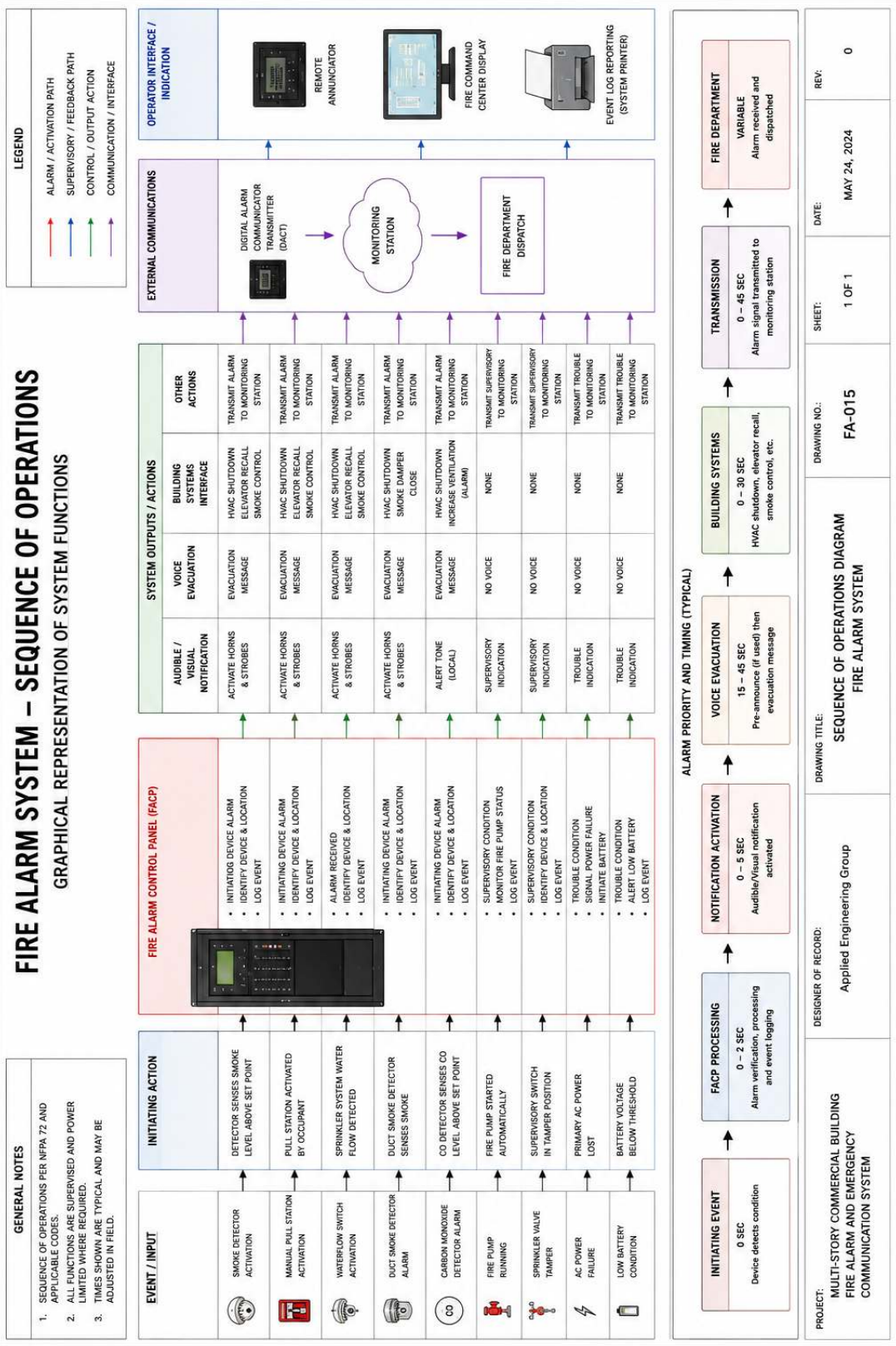
SLC	SIGNALING LINE CIRCUIT
NAC	NOTIFICATION APPLIANCE CIRCUIT
HVAC	HEATING, VENTILATION AND AIR CONDITIONING
SEC	SECURITY SYSTEM
PA	PUBLIC ADDRESS
GEN	GENERATOR
PUMP	PUMP
N.O.	NORMALLY OPEN
N.C.	NORMALLY CLOSED

Module schedule (FA-024) listing all monitor modules, control modules, relay modules, and isolator modules with addresses, functions, and circuit assignments.

6.13 Summary Visual Inspection Checklist

#	Inspection Item	Pass ✓	Remarks
1	FACP cabinet secured and properly labeled		
2	Dedicated breaker labeled "Fire Alarm" and lockable		
3	Batteries clean, dated, and within manufacturer life		
4	Cable type (FPL/FPLR/FPLP) matches environment		
5	Conduits supported and metallic raceways bonded		
6	Smoke detectors unobstructed (18 in. clearance) and undamaged		
7	Heat detectors at correct temperature rating for ambient		
8	Pull stations mounted 42–54 in. AFF and unobstructed		
9	Horn/strobes at correct height and correct candela rating		
10	Annunciator labeling matches zones; key functional		
11	Interface modules labeled and in listed enclosures		
12	As-built drawings and documentation available on site		

Chapter 7: Functional Testing Procedures



Sequence of operations diagram (FA-015) graphically depicting how fire alarm initiating events drive FACP outputs, building system responses, and monitoring station transmission.

7.1 Overview

Functional testing verifies that each initiating device, notification appliance, auxiliary control, and communication circuit performs exactly as designed when an alarm condition is simulated. NFPA 72 (Section 14.4.3) requires that every device, appliance, and system function be tested at the prescribed frequency. Unlike the visual inspection, functional testing requires energizing circuits, activating outputs, and confirming signal transmission to the supervising station.

7.2 Pre-Testing Protocol

Before activating any device, complete these mandatory steps:

9. Notify the central monitoring station and place the system on test. Obtain a test authorization number and record it on the inspection form.
10. Confirm that all occupants and building staff are informed of testing and that "Testing in Progress" signs are posted.
11. Verify that all building systems that interface with the fire alarm (elevators, AHUs, door magnets) are in a state where testing will not cause harm or operational disruption.
12. Confirm communication with a test assistant (if using a two-person team) via radio.
13. Establish a test log sheet to record each device ID, location, test method, result, and timestamp.

⚠ Never activate devices before notifying the monitoring station. An unannounced alarm signal will trigger fire department response, creating a public safety hazard and potential liability for the inspector, owner, and contractor.

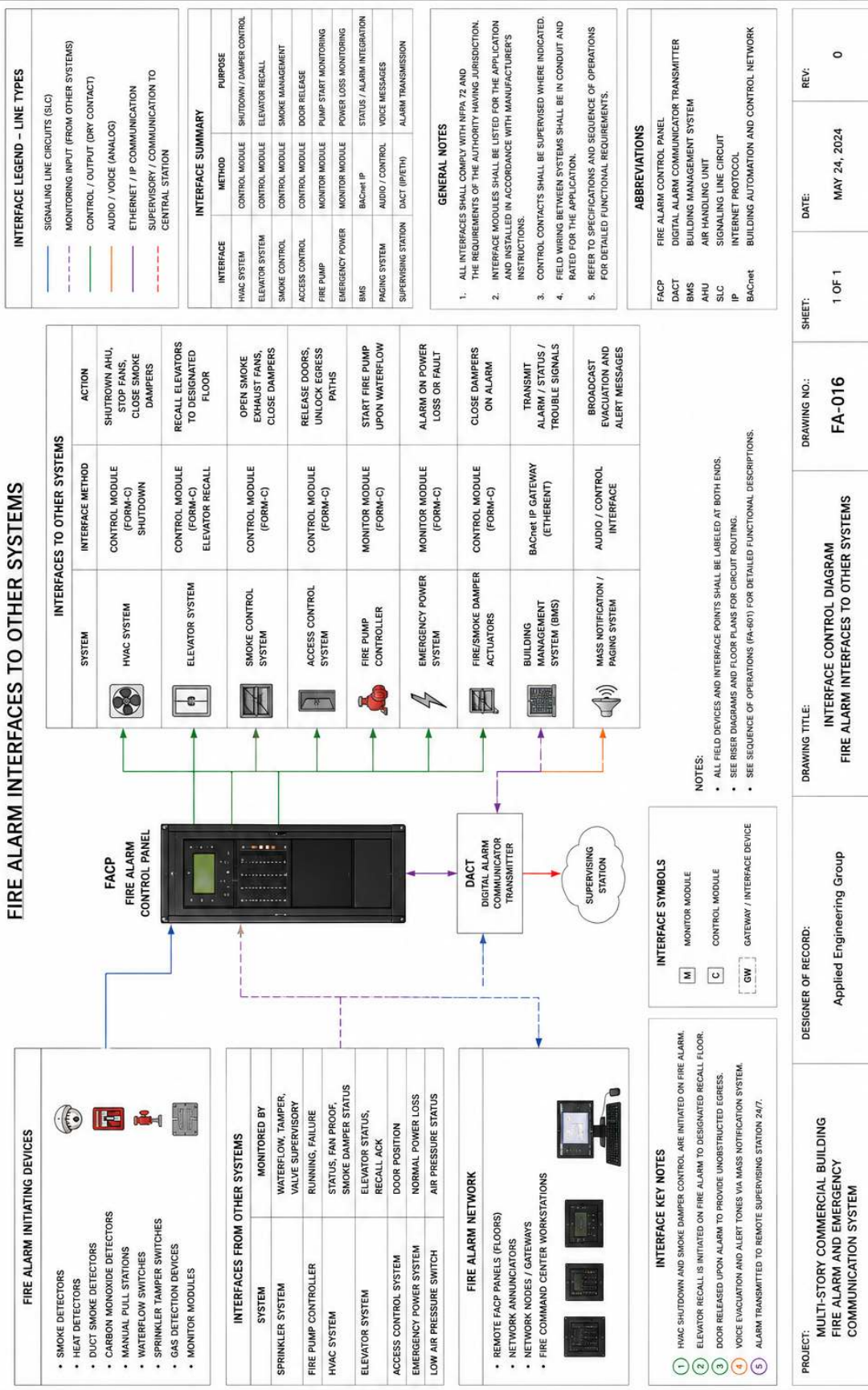
7.3 Initiating Device Testing

Device Type	Test Method	Acceptance Criteria	NFPA 72 Reference
Smoke Detector (Spot)	Apply manufacturer-approved aerosol to sensing chamber.	Panel receives alarm; correct device ID displayed; LED activates.	14.4.3.2.2(1)
Smoke Detector (Duct)	Apply aerosol at sampling port or activate remote test switch.	AHU fan stops; alarm received at panel; HVAC shutdown relay activates.	17.7.5.5.3
Heat Detector (Spot)	Apply calibrated heat source to reach rated temperature.	Detector activates; panel receives alarm; device resets after cooling.	14.4.3.2.2(2)
Beam Detector	Use obscuration test card or reduce beam alignment.	Alarm at panel within manufacturer-specified obscuration level.	14.4.3.2.2(1)
CO Detector	Apply manufacturer-specified CO test gas.	CO alarm signal received at panel; labeled as CO type.	14.4.3.2.3
Manual Pull Station	Activate pull handle; verify mechanical function.	Immediate alarm; correct zone/device displayed; reset with key.	14.4.3.2.4
Waterflow Switch	Open inspector's test valve; record elapsed time to alarm.	Alarm at panel within retard period ≤ 90 s; signal transmitted to monitoring station.	17.13.2.3

Device Type	Test Method	Acceptance Criteria	NFPA 72 Reference
Tamper/Supervisory Switch	Partially close control valve; verify supervisory signal.	Supervisory signal at panel; clears when valve fully reopened.	14.4.3.2.6

FIRE ALARM SYSTEM – INTERFACE CONTROL DIAGRAM

FIRE ALARM INTERFACES TO OTHER SYSTEMS



Interface control diagram (FA-016) illustrating all fire alarm system interfaces to elevators, HVAC, access control, fire pumps, emergency power, and mass notification systems.

7.4 Notification Appliance Testing

7.4.1 Audible Appliances

For every audible notification appliance zone:

- Activate the alarm circuit and use a calibrated sound level meter positioned at the test point.
- NFPA 72 Section 18.4.3 requires a minimum of 15 dB(A) above the average ambient sound level or 5 dB(A) above the maximum ambient sound level—whichever is greater—with an absolute minimum of 65 dB(A) in all occupied areas.
- For sleeping areas (R-1 and R-2 occupancies): minimum 75 dB(A) at the pillow level per NFPA 72 Section 18.4.5.1.
- Verify synchronization if multiple notification circuits serve the same area (NFPA 72 Section 18.4.6).
- Record the measured dBA level, ambient level, instrument model, and serial number on the test form.

7.4.2 Visible Appliances (Strobes)

- Observe flash rate (must be $1 \text{ Hz} \pm 10\%$) during full alarm.
- Verify candela rating matches the approved design for room size per NFPA 72 Table 18.5.5.4.1.
- Confirm synchronization when multiple strobes are visible from the same point (NFPA 72 Section 18.5.5.5).
- Visually inspect lens clarity during test; note any dim or non-flashing devices.

7.4.3 Voice/Alarm Communication Testing

- Activate each voice zone individually and measure speech transmission index ($\text{STI} \geq 0.45$ for public mode per NFPA 72 Section 24.4.4).
- Verify pre-recorded messages are intelligible, complete, and free of distortion.
- Test all-call function and confirm system-wide activation from fire command center.
- Verify backup amplifier switching: disconnect primary amplifier and confirm secondary takes over without audio loss exceeding 1 second.

FIRE ALARM SYSTEM – NAC CIRCUIT SCHEDULE

NAC CIRCUIT NO.	DESIGNATION	FUNCTION (TONE)	VOLTAGE (VDC)	CABLE INFORMATION		MAX. CIRCUIT CURRENT (A)	TOTAL CONNECTED LOAD			SPARE CAPACITY (A)	SUPERVISION TYPE	MOUNTING CONFIG.	NOTES
				AWG	TYPE		APPLIANCE LOAD (A)	CABLE LOSS (A)	TOTAL (A)				
1	NAC-1	ALERT (TEMP 3) BUILDING A – FLOOR 1	24	14	FPLR	3.0	2.10	0.23	2.33	0.67	CLASS B	WALL / CEILING	
DEVICES ON CIRCUIT: 10 HORN, 10 STROBE, 4 SPEAKER, 2 SPKR-STROBE													
2	NAC-2	ALERT (TEMP 3) BUILDING A – FLOOR 2	24	14	FPLR	3.0	1.85	0.20	2.05	0.95	CLASS B	WALL / CEILING	
DEVICES ON CIRCUIT: 8 HORN, 8 STROBE, 4 SPEAKER, 1 SPKR-STROBE													
3	NAC-3	ALERT (TEMP 3) BUILDING A – FLOOR 3	24	14	FPLR	3.0	1.60	0.18	1.78	1.22	CLASS B	WALL / CEILING	
DEVICES ON CIRCUIT: 6 HORN, 6 STROBE, 2 SPEAKER, 1 SPKR-STROBE													
4	NAC-4	ALERT (TEMP 3) BUILDING A – ROOF LEVEL	24	14	FPLR	3.0	1.20	0.15	1.35	1.65	CLASS B	WALL / CEILING	
DEVICES ON CIRCUIT: 4 HORN, 4 STROBE, 2 SPEAKER													
5	NAC-5	ALERT (TEMP 3) BUILDING A – BASEMENT	24	14	FPLR	3.0	1.35	0.16	1.51	1.49	CLASS B	WALL / CEILING	
DEVICES ON CIRCUIT: 5 HORN, 5 STROBE, 2 SPEAKER													
6	NAC-6	ALERT (TEMP 3) PARKING LEVEL 1	24	14	FPLR	3.0	2.25	0.25	2.50	0.50	CLASS B	CEILING	SEE NOTE 2
DEVICES ON CIRCUIT: 10 HORN, 10 STROBE, 4 SPEAKER, 2 SPKR-STROBE													
7	NAC-7	ALERT (TEMP 3) PARKING LEVEL 2	24	14	FPLR	3.0	2.00	0.22	2.22	0.78	CLASS B	CEILING	
DEVICES ON CIRCUIT: 9 HORN, 8 STROBE, 3 SPEAKER, 1 SPKR-STROBE													
8	NAC-8	ALERT (TEMP 3) STAIRWELLS A & B	24	14	FPLR	3.0	0.80	0.10	0.90	2.10	CLASS B	WALL	STAIR DOORS
DEVICES ON CIRCUIT: 4 HORN, 4 STROBE													
9	NAC-9	ALERT (TEMP 3) ELEVATOR LOBBIES	24	14	FPLR	3.0	0.55	0.07	0.62	2.38	CLASS B	WALL / CEILING	
DEVICES ON CIRCUIT: 2 HORN, 2 STROBE													
10	NAC-10	ALERT (TEMP 3) MECHANICAL AREAS	24	14	FPLR	3.0	0.45	0.06	0.51	2.49	CLASS B	WALL	HVAC ROOMS
DEVICES ON CIRCUIT: 2 HORN, 2 STROBE													
11	NAC-11	ALERT (TEMP 3) EXTERIOR AREAS	24	12	FPLX	3.0	1.10	0.20	1.30	1.70	CLASS B	WEATHERPROOF	WP DEVICES
DEVICES ON CIRCUIT: 3 HORN, 3 STROBE, 2 SPEAKER													
12	NAC-12	RESERVED / FUTURE	24	14	FPLR	3.0	—	—	—	3.00	CLASS B	—	SPARE
							TOTAL NAC LOAD CONNECTED:			12.16 A	1.82 A	13.98 A	22.02 A

TONES PER CIRCUIT		CABLE TYPE LEGEND
FUNCTION	ZONE	
ALERT	TEMPORAL 3	
EVACUATION	TEMPORAL 4	
SUPERVISORY	TEMPORAL 4	
SECURITY	STEADY	
FPLR	FIRE POWER LIMITED	
FPLX	RATED CABLE	
	FIRE POWER LIMITED	
	RATED CABLE (EXTERIOR)	
SUPERVISION TYPE LEGEND		
CLASS B	STYLE B (NOTIFICATION APPLIANCE CIRCUIT)	
MOUNTING CONFIGURATION		
WALL	WALL MOUNTED	
CEILING	CEILING MOUNTED	
WALL / CEILING	WALL OR CEILING MOUNTED	
WEATHERPROOF	OUTDOOR	
	WEATHERPROOF	
NOTES		
1. DEVICE COUNTS AND LOADS ARE BASED ON MANUFACTURER DATA AT 24 VDC.		
2. PARKING LEVELS ARE DESIGNED FOR MAXIMUM ALLOWABLE LOAD.		
3. ALL NAC CIRCUITS ARE POWER LIMITED AND SUPERVISED.		
4. REFER TO FLOOR PLANS FOR EXACT APPLIANCE LOCATIONS.		
ABBREVIATIONS		
NAC	NOTIFICATION APPLIANCE CIRCUIT	
VDC	VOLTS DC	
AWG	AMERICAN WIRE GAUGE	
A	AMPERES	
WP	WEATHERPROOF	

PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	DESIGNER OF RECORD: Applied Engineering Group	DRAWING TITLE: NAC CIRCUIT SCHEDULE LOADS AND CIRCUIT ASSIGNMENTS	DRAWING NO.: FA-026	SHEET: 1 OF 1	DATE: MAY 24, 2024	REV: 0
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NAC circuit schedule (FA-026) showing each notification appliance circuit with connected devices, total load, circuit class, end-of-line resistance, and cable type.

7.5 Auxiliary Control Function Testing

FIRE ALARM SYSTEM – ELEVATOR INTERFACE SCHEDULE

[illegible]

ELEVATOR INTERFACE SUMMARY					MONITORING POINTS SUMMARY		
FUNCTION	DESCRIPTION	PROVIDED (YES / NO)	METHOD	FACP INTERFACE OUTPUT / INPUT	MONITORING POINT	POINTS PER ELEVATOR	TOTAL POINTS (6 ELEVATORS)
RECALL	Recall elevator(s) to designated floor upon fire alarm.	YES	FACP OUTPUT	FACP RELAY OUTPUTS (RLV-1 THRU RLV-6) N.O. DRY CONTACTS	IN NORMAL POSITION AT RECALL FLOOR	1	6
SHUNT TRIP (POWER DROP)	Remove power to elevator control system upon fire alarm.	YES	FACP OUTPUT	FACP RELAY OUTPUTS (RLV-7 THRU RLV-12) N.C. DRY CONTACTS (POWER DROP)	CAR DOOR OPEN CAR DOOR CLOSED	1	6
MONITORING POINTS	Monitor elevator status and door position.	YES	FACP INPUT	FACP MONITOR MODULES (MM-1 THRU MM-30) N.C. CONTACTS	OUT OF SERVICE	1	6
TOTAL MONITORING POINTS							30

The diagram illustrates the typical elevator interface connections for a single elevator system, organized into three main functional sections: Recall, Shunt Trip, and Monitoring Point.

- RECALL (FACP OUTPUT):** This section shows a connection from the **FACP (RLY-X) N.O.** (Normally Open) terminal to the **ELEVATOR CONTROLLER FIRE SERVICE (RECALL INPUT)**.
- SHUNT TRIP (FACP OUTPUT):** This section shows a connection from the **FACP (FACP) N.C.** (Normally Closed) terminal to the **ELEVATOR CONTROLLER FIRE SERVICE (SHUNT TRIP INPUT)**.
- MONITORING POINT (FACP INPUT):** This section shows a connection from the **ELEVATOR STATUS CONTACT (N.C.)** to the **FACP MONITOR MODULE (IMM-Z) (INPUT)**.

Below the diagram, a list of **GENERAL CONNECTION NOTES:** provides additional instructions:

1. ALL RELAY OUTPUTS ARE FORM "C" DRY CONTACTS.
2. ALL MONITORING POINTS ARE NORMALLY CLOSED (N.C.) CONTACTS.
3. WIRING BETWEEN FACP AND ELEVATOR CONTROLLER SHALL BE SUPERVISED.
4. REFER TO ELEVATOR MANUFACTURER'S DOCUMENTATION FOR EXACT CONNECTIONS.

At the bottom of the page, a note states: **ALL MONITORING POINTS SHALL BE SUPERVISED AND TROUBLE INDICATED AT THE FACP.**

PROJECT:	DESIGNER OF RECORD:	DRAWING TITLE:	DRAWING NO.:	SHEET:	DATE:	REV:
MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	Applied Engineering Group	ELEVATOR INTERFACE SCHEDULE RECALL, SHUNT TRIP, MONITORING POINTS	FA-030	1 OF 1	MAY 24, 2024	0

Elevator interface schedule (FA-030) documenting each elevator controller connection with recall floor assignments, shunt-trip requirements, monitoring point configuration, and AHJ requirements.

Function	Test Procedure	Acceptance Criteria	NFPA 72 Reference
Elevator Recall (Phase I)	Activate lobby smoke detector or designated recall detector.	All elevators return to recall floor; fireman's key service enabled; Phase II override functional.	21.4 / ASME A17.1
HVAC Shutdown	Activate duct smoke detector or designated smoke detector.	Air handling unit fans stop; alarm recorded; HVAC restores after system reset.	23.8.5
Door Holder Release	Activate smoke detector in door holder zone.	All magnetic door holders release; doors close automatically; restore on panel reset.	21.8.5
Fire Pump Supervision	Simulate pump controller alarm signal.	Alarm signal at FACP; supervisory signal to monitoring station.	23.8.4
Generator Transfer Test	Disconnect primary AC feed.	Generator starts and transfer switch operates within 60 seconds.	10.6.9.1.3

FIRE ALARM SYSTEM – HVAC INTERFACE SCHEDULE

SHUTDOWN AND SMOKE CONTROL INTERFACES

ITEM NO.	HVAC EQUIPMENT TAG	EQUIPMENT DESCRIPTION AND LOCATION	INTERFACE PURPOSE (SHUTDOWN / SMOKE CONTROL)	SHUTDOWN INTERFACE			SMOKE CONTROL INTERFACE			INITIATING DEVICES / CONDITIONS	NOTIFICATION / FEEDBACK MONITORED	REMARKS	MODE OF OPERATION LEGEND
				MODE OF OPERATION	MODULE TYPE	MODULE LOCATION	MODE OF OPERATION	MODULE TYPE	MODULE LOCATION				
1	AHU-1	AIR HANDLING UNIT 1 ROOF	SHUTDOWN SMOKE CONTROL	RLY	RLY	FACP ELEC. ROOM	START PURGE	RLY	FACP ELEC. ROOM	DUCT SMOKE DETECTOR (DS-1)	STATUS (N.O.) FAN RUN (N.O.)	MAINTAINS MINIMUM OUTDOOR AIR (PURGE)	DE-ENERGIZE FAN = REMOVE POWER TO FAN MOTOR START ON ALARM = START FAN UPON ALARM CLOSE DAMPER = DRIVE DAMPER CLOSED DRIVE TO MIN POSITION = DRIVE DAMPER TO MINIMUM OUTDOOR AIR POSITION DRIVE TO MAX POSITION = DRIVE DAMPER TO MAXIMUM OPEN POSITION
2	AHU-2	AIR HANDLING UNIT 2 ROOF	SHUTDOWN SMOKE CONTROL	RLY	RLY	FACP ELEC. ROOM	START PURGE	RLY	FACP ELEC. ROOM	DUCT SMOKE DETECTOR (DS-2)	STATUS (N.O.) FAN RUN (N.O.)	MAINTAINS MINIMUM OUTDOOR AIR (PURGE)	
3	AHU-3	AIR HANDLING UNIT 3 ROOF	SHUTDOWN SMOKE CONTROL	RLY	RLY	FACP ELEC. ROOM	START PURGE	RLY	FACP ELEC. ROOM	DUCT SMOKE DETECTOR (DS-3)	STATUS (N.O.) FAN RUN (N.O.)	MAINTAINS MINIMUM OUTDOOR AIR (PURGE)	
4	EF-1	EXHAUST FAN 1 STAIR PRESSURIZATION ROOF	SHUTDOWN SMOKE CONTROL	RLY	RLY	FACP ELEC. ROOM	START ON ALARM	RLY	FACP ELEC. ROOM	FACP ALARM (SMOKE CONDITION)	STATUS (N.O.) FAN RUN (N.O.)	STAIR PRESSURIZATION FAN	MODULE TYPE LEGEND RLY = RELAY MODULE (CONTROL) MON = MONITOR MODULE (FEEDBACK) ISO = ISOLATOR MODULE
5	EF-2	EXHAUST FAN 2 PARKING GARAGE ROOF	SHUTDOWN SMOKE CONTROL	RLY	RLY	FACP ELEC. ROOM	START ON ALARM	RLY	FACP ELEC. ROOM	FACP ALARM (SMOKE CONDITION)	STATUS (N.O.) FAN RUN (N.O.)	PARKING GARAGE SMOKE EXHAUST	FEEDBACK LEGEND STATUS (N.O.) = EQUIPMENT STATUS, NORMALLY OPEN RUN (N.O.) = EQUIPMENT RUNNING, NORMALLY OPEN DAMPER CLOSED (N.C.) = DAMPER FULLY CLOSED, NORMALLY CLOSED DAMPER OPEN (N.O.) = DAMPER FULLY OPEN, NORMALLY OPEN ANALOG = POSITION FEEDBACK (0-10 VDC)
6	SF-1	SUPPLY FAN 1 GARAGE	SHUTDOWN	RLY	RLY	FACP ELEC. ROOM	—	—	—	FACP ALARM (SMOKE CONDITION)	STATUS (N.O.) FAN RUN (N.O.)	SHUTDOWN ON ALARM	
7	SF-2	SUPPLY FAN 2 BASEMENT	SHUTDOWN	RLY	RLY	FACP ELEC. ROOM	—	—	—	FACP ALARM (SMOKE CONDITION)	STATUS (N.O.) FAN RUN (N.O.)	SHUTDOWN ON ALARM	
8	FD-1	FIRE DAMPER 1 LEVEL 2 SUPPLY	SMOKE CONTROL	—	—	—	CLOSE DAMPER ON ALARM	RLY	FACP ELEC. ROOM	DUCT SMOKE DETECTOR (DS-2)	DAMPER CLOSED (N.C.) DAMPER OPEN (N.O.)	FAIL SAFE CLOSED	ABBREVIATIONS AHU AIR HANDLING UNIT EF EXHAUST FAN SF SUPPLY FAN FD FIRE DAMPER FACP FIRE ALARM CONTROL PANEL N.O. NORMALLY OPEN N.C. NORMALLY CLOSED
9	FD-2	FIRE DAMPER 2 LEVEL 3 RETURN	SMOKE CONTROL	—	—	—	CLOSE DAMPER ON ALARM	RLY	FACP ELEC. ROOM	DUCT SMOKE DETECTOR (DS-3)	DAMPER CLOSED (N.C.) DAMPER OPEN (N.O.)	FAIL SAFE CLOSED	
10	IO-1	OUTDOOR AIR DAMPER AHU-1	SHUTDOWN SMOKE CONTROL	RLY	RLY	FACP ELEC. ROOM	DRIVE TO MIN POSITION	RLY	FACP ELEC. ROOM	FACP ALARM (SMOKE CONDITION)	DAMPER POSITION (ANALOG) MIN POS (N.O.)	MODULATING DAMPER	

INTERFACE MODULE SUMMARY

MODULE TYPE	FUNCTION	QUANTITY	LOCATION
RLY	RELAY MODULE (CONTROL)	18	FACP PANEL
MON	MONITOR MODULE (FEEDBACK)	22	FACP PANEL
ISO	ISOLATOR MODULE	10	FACP PANEL
TOTAL MODULES		50	

INTERFACE SUMMARY BY FUNCTION

FUNCTION	QUANTITY OF POINTS	
	CONTROL	MONITOR
HVAC SHUTDOWN	10	10
SMOKE CONTROL (FAN START)	5	5
SMOKE CONTROL (DAMPER)	5	10
TOTAL	20	25

GENERAL NOTES

- ALL HVAC INTERFACES SHALL COMPLY WITH NFPA 72, NFPA 90A, NFPA 101, AND IBC REQUIREMENTS.
- SHUTDOWN INTERFACES SHALL DE-ENERGIZE EQUIPMENT VIA LOGIC RELAY MODULES.
- SHUTDOWN FUNCTIONS TAKE PRECEDENCE OVER SHUTDOWN WHERE APPLICABLE.
- ALL INTERFACE WIRING SHALL BE SUPERVISED AND PROTECTED AS REQUIRED.
- REFER TO HVAC CONTROL DRAWINGS FOR EXACT EQUIPMENT LOCATIONS AND CONTROL REQUIREMENTS.

PROJECT: MULTI-STORY COMMERCIAL BUILDING
FIRE ALARM AND EMERGENCY
COMMUNICATION SYSTEM

DESIGNER OF RECORD:
Applied Engineering Group

DRAWING TITLE:
HVAC INTERFACE SCHEDULE
SHUTDOWN AND SMOKE CONTROL INTERFACES

DRAWING NO.: FA-031

SHEET: 1 OF 1

DATE: MAY 24, 2024

REV: 0

HVAC interface schedule (FA-031) listing all air handling unit connections, smoke damper control points, duct detector assignments, and HVAC shutdown/restart sequences.

FIRE ALARM SYSTEM – SPRINKLER MONITORING SCHEDULE

ZONE / AREA	SYSTEM SERVED	DEVICE TYPE	DEVICE DESCRIPTION (SERVICE)	LOCATION (FLOOR / AREA)	MONITORED POINT (FUNCTION)	SWITCH TYPE	SIGNALING MODULE TYPE	INPUT POINT ID	SUPERVISORY OR ALARM	REMARKS	DEVICE TYPE LEGEND
1	Wet Pipe	Waterflow Switch	WFS-1 (4")	P1 – Fire Pump Room	Waterflow	Paddle	MON	MON-1	ALARM	Main flow from P1 riser	WFS = WATERFLOW SWITCH
2	Wet Pipe	Tamper Switch	TS-1 (4")	P1 – Fire Pump Room	Tamper (OS&Y Valve)	Supervisory	MON	MON-2	SUPERVISORY	OS&Y on P1 riser	TS = TAMPER SWITCH
3	Wet Pipe	Pressure Switch	PS-1 (4")	P1 – Fire Pump Room	Low Air Pressure	Adjustable	MON	MON-3	SUPERVISORY	Air pressure switch	PS = PRESSURE SWITCH
4	Wet Pipe	Waterflow Switch	WFS-2 (6")	Level 1 – North Riser Room	Waterflow	Paddle	MON	MON-4	ALARM	North wing riser	PADDLE = PADDLE TYPE WATERFLOW
5	Wet Pipe	Tamper Switch	TS-2 (6")	Level 1 – North Riser Room	Tamper (OS&Y Valve)	Supervisory	MON	MON-5	SUPERVISORY	OS&Y on north riser	SUPERVISORY = SUPERVISORY SWITCH
6	Wet Pipe	Pressure Switch	PS-2 (6")	Level 1 – North Riser Room	Low Air Pressure	Adjustable	MON	MON-6	SUPERVISORY	North riser air pressure	ADJUSTABLE = ADJUSTABLE PRESSURE
7	Wet Pipe	Waterflow Switch	WFS-3 (6")	Level 1 – South Riser Room	Waterflow	Paddle	MON	MON-7	ALARM	South wing riser	
8	Wet Pipe	Tamper Switch	TS-3 (6")	Level 1 – South Riser Room	Tamper (OS&Y Valve)	Supervisory	MON	MON-8	SUPERVISORY	OS&Y on south riser	
9	Dry Pipe	Waterflow Switch	WFS-4 (3")	Level 2 – East Dry Riser Room	Waterflow	Paddle	MON	MON-9	ALARM	Dry system flow	
10	Dry Pipe	Low Air Pressure Switch	PS-3	Level 2 – East Dry Riser Room	Low Air Pressure	Adjustable	MON	MON-10	SUPERVISORY	Dry system air pressure	

DEVICE SUMMARY BY TYPE				MONITORED POINT SUMMARY				SIGNALING MODULE SUMMARY			
DEVICE TYPE	ALARM POINTS	SUPERVISORY POINTS	TOTAL POINTS	FUNCTION	ALARM	SUPERVISORY	TOTAL	MODULE TYPE	QUANTITY	USE	
Waterflow Switches	4	0	4	Waterflow	4	0	4	MON (Monitor Module)	10	Sprinkler Monitoring	
Tamper Switches	0	3	3	Tamper (OS&Y Valve)	0	3	3				
Pressure Switches (Low Air)	0	3	3	Low Air Pressure	0	3	3				
TOTAL	4	6	10	TOTAL	4	6	10	TOTAL MODULES	10		

NOTES

- ALL SPRINKLER SYSTEM DEVICES SHALL BE SUPERVISED AND MONITORED BY THE FIRE ALARM CONTROL PANEL.
- WATERFLOW SWITCHES SHALL INITIATE A FIRE ALARM WHEN ACTIVATED.
- TAMPER SWITCHES SHALL INITIATE A SUPERVISORY SIGNAL WHEN TAMPER (OS&Y VALVE NOT FULLY OPEN) IS DETECTED.
- PRESSURE SWITCHES SHALL INITIATE A SUPERVISORY SIGNAL ON LOW AIR PRESSURE (DRY OR PREACTION SYSTEMS).
- REFER TO PLUMBING AND FIRE PROTECTION DRAWINGS FOR EXACT DEVICE LOCATIONS AND PIPE SIZES.
- ALL WIRING SHALL COMPLY WITH NFPA 72, NFPA 13, AND AUTHORITY HAVING JURISDICTION REQUIREMENTS.

GENERAL LEGEND

○ WFS = WATERFLOW SWITCH
□ TS = TAMPER SWITCH
⬡ PS = PRESSURE SWITCH
▭ MON = MONITOR MODULE

TYPICAL CONNECTION DIAGRAM

PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	DESIGNER OF RECORD: Applied Engineering Group	DRAWING TITLE: SPRINKLER MONITORING SCHEDULE WATERFLOW, TAMPER, PRESSURE SWITCHES	DRAWING NO.: FA-032	SHEET: 1 OF 1	DATE: MAY 24, 2024	REV: 0
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Sprinkler monitoring schedule (FA-032) documenting all waterflow switches, tamper switches, and pressure switches with SLC addresses, functions, and supervisory signal assignments.

FIRE ALARM SYSTEM – ACCESS CONTROL INTERFACE SCHEDULE

DOOR RELEASE AND MONITORING POINTS

DOOR NO.	DOOR DESCRIPTION / LOCATION	ACCESS CONTROL PANEL LOCATION	INTERFACE PURPOSE	DOOR RELEASE (EGRESS)			MONITORED POINTS (INPUTS)					REMARKS		
				RELEASE PROVIDED	RELEASE METHOD (FACP)	RELEASE TYPE	MODULE LOCATION	DOOR POSITION (MONITOR)	REQUEST TO EXIT (MONITOR)	DOOR HELD OPEN (MONITOR)	FORCED OPEN / PRY ALARM (MONITOR)		INPUT MODULE TYPE	MODULE LOCATION
1	Main Entrance (Exterior)	ACP-1 1st Floor Elec. Room	Fire Alarm Door Release (Main Egress)	YES	FACP ALARM	RLY (FACP)	FACP-1 Main Cabinet	YES	YES	YES	YES	MON (FACP)	FACP-1 Main Cabinet	Fail Secure Mag Lock
2	Employee Entrance (Exterior)	ACP-1 1st Floor Elec. Room	Fire Alarm Door Release	YES	FACP ALARM	RLY (FACP)	FACP-1 Main Cabinet	YES	YES	YES	YES	MON (FACP)	FACP-1 Main Cabinet	Fail Secure Mag Lock
3	Stair 1 Door (Level 1)	ACP-1 1st Floor Elec. Room	Fire Alarm Door Release (Stair Re-Entry)	YES	FACP ALARM	RLY (FACP)	FACP-1 Main Cabinet	YES	NO	YES	YES	MON (FACP)	FACP-1 Main Cabinet	Fail Secure Mag Lock
4	Stair 2 Door (Level 1)	ACP-2 2nd Floor Elec. Room	Fire Alarm Door Release (Stair Re-Entry)	YES	FACP ALARM	RLY (FACP)	FACP-2 Main Cabinet	YES	NO	YES	YES	MON (FACP)	FACP-2 Main Cabinet	Fail Secure Mag Lock
5	Loading Dock Door (Exterior)	ACP-1 1st Floor Elec. Room	Fire Alarm Door Release	YES	FACP ALARM	RLY (FACP)	FACP-1 Main Cabinet	YES	YES	YES	YES	MON (FACP)	FACP-1 Main Cabinet	Fail Secure Mag Lock
6	IT Equipment Room (Level 1)	ACP-1 1st Floor Elec. Room	Door Monitoring Only	NO	—	—	—	YES	YES	YES	YES	MON (FACP)	FACP-1 Main Cabinet	No Release (Access Control Only)
7	Storage Room 101 (Level 1)	ACP-1 1st Floor Elec. Room	Door Monitoring Only	NO	—	—	—	YES	YES	YES	YES	MON (FACP)	FACP-1 Main Cabinet	No Release (Access Control Only)
8	Roof Access Door (Level Roof)	ACP-1 1st Floor Elec. Room	Fire Alarm Door Release	YES	FACP ALARM	RLY (FACP)	FACP-1 Main Cabinet	YES	YES	YES	YES	MON (FACP)	FACP-1 Main Cabinet	Fail Secure Mag Lock

RELEASE METHOD LEGEND

FACP ALARM = RELEASE ON FIRE ALARM (NORMAL OPERATION)
MANUAL OVERRIDE = FIRE COMMAND CENTER OVERRIDE
KEY OVERRIDE = KEY SWITCH OVERRIDE

MODULE TYPE LEGEND

RLY = RELAY MODULE (OUTPUT)
MON = MONITOR MODULE (INPUT)

MONITORED POINT LEGEND

DOOR POSITION = DOOR OPEN / CLOSED
REQUEST TO EXIT = REX DEVICE ACTUATED
DOOR HELD OPEN = DOOR OPEN BEYOND TIME DELAY
FORCED OPEN / PRY = DOOR FORCIBLY OPENED ALARM OR PRY SWITCH

ABBREVIATIONS

ACP = ACCESS CONTROL PANEL
FACP = FIRE ALARM CONTROL PANEL
REX = REQUEST TO EXIT DEVICE

INTERFACE SUMMARY				MONITORED POINT SUMMARY			
FUNCTION	QUANTITY OF DOORS	OUTPUT MODULES (RELEASE)	INPUT MODULES (MONITOR)	MONITORED POINT	QUANTITY OF DOORS	TOTAL POINTS	
DOOR RELEASE (EGRESS)	6	6	6	DOOR POSITION	8	8	
DOOR MONITORING ONLY	2	0	2	REQUEST TO EXIT	6	6	
				DOOR HELD OPEN	8	8	
				FORCED OPEN / PRY ALARM	8	8	
TOTAL	8	6	8	TOTAL POINTS		30	

GENERAL NOTES

1. ALL ACCESS CONTROL INTERFACES SHALL COMPLY WITH NFPA 72, NFPA 101, AND AHJ REQUIREMENTS.
2. DOOR RELEASE DEVICES SHALL BE LISTED FOR FIRE DOOR APPLICATIONS.
3. DOORS IN MEANS OF EGRESS SHALL RELEASE UPON FIRE ALARM UNLESS OTHERWISE APPROVED.
4. INPUTS ARE SUPERVISED AND SHALL GENERATE ALARMS ON OPEN, SHORT, OR GROUND FAULTS.
5. ALL WIRING SHALL BE IN ACCORDANCE WITH NFPA 72 AND THE ACCESS CONTROL MANUFACTURER'S REQUIREMENTS.
6. REFER TO ACCESS CONTROL AND FIRE ALARM DRAWINGS FOR EXACT LOCATIONS AND CONNECTIONS.

TYPICAL DOOR RELEASE CONNECTION (ONE DOOR)

TYPICAL MONITORED POINT CONNECTIONS (ONE DOOR)

PROJECT: MULTI-STORY COMMERCIAL BUILDING
FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM

DESIGNER OF RECORD:
Applied Engineering Group

DRAWING TITLE:
ACCESS CONTROL INTERFACE SCHEDULE
DOOR RELEASE AND MONITORING POINTS

DRAWING NO.:
FA-033

SHEET:
1 OF 1

DATE:
MAY 24, 2024

REV:
0

GENERAL INTERFACE NOTES

- ALL RELAY OUTPUTS ARE FORM "C" DRY CONTACTS.
- ALL MONITORED POINTS ARE NORMALLY CLOSED (N.C.) CONTACTS UNLESS NOTED OTHERWISE.
- ACCESS CONTROL POWER SAFETY AND INSTALLATION SHALL CONFORM TO NFPA 101 AND THE ACCESS CONTROL MANUFACTURER'S REQUIREMENTS.
- PROVIDE LABELING AT EACH DOOR FOR FIRE ALARM RELEASE FUNCTION.

Access control interface schedule (FA-033) showing fire alarm door release connections, monitoring points, relay configurations, and system override sequences.

7.6 Smoke Control System Testing

FIRE ALARM SYSTEM – SMOKE CONTROL MATRIX

ZONE NO.	ZONE / AREA PROTECTED	PRESSURE ZONE TYPE	DETECTING DEVICES THAT INITIATE SMOKE CONTROL				SMOKE CONTROL ACTIONS						PRESSURE RELATIONSHIP TO ADJACENT ZONES	CONTROL METHOD (SEE LEGEND)	REMARKS
			SMOKE DETECTORS	HEAT DETECTORS	MANUAL STATION	OTHER (SYSTEM)	FANS	DAMPERS	SMOKE DAMPERS	RELIEF DAMPERS	OTHER DEVICES	DOORS			
							SUPPLY FANS	EXHAUST FANS	PRESSURIZATION FANS	FIRE / SMOKE DAMPERS	LOUVERS				
1	Stair 1 (Level 1 through Roof)	PRESSURIZED (STAIR)	SD-1	—	MS-1	—	SPF-1	—	—	FD-1	—	—	POSITIVE (+0.05 in. w.g.)	A, C	Maintain positive pressure in stair
2	Stair 2 (Level 1 through Roof)	PRESSURIZED (STAIR)	SD-2	—	MS-2	—	SPF-2	—	—	FD-2	—	—	POSITIVE (+0.05 in. w.g.)	A, C	Maintain positive pressure in stair
3	Elevator Lobby – North (Level 1–10)	PRESSURIZED (ELEVATOR LOBBY)	SD-3	—	—	—	—	—	EPF-1	FD-3	—	—	POSITIVE (+0.02 in. w.g.)	B, C	Pressurize lobby on fire floor
4	Elevator Lobby – South (Level 1–10)	PRESSURIZED (ELEVATOR LOBBY)	SD-4	—	—	—	—	—	EPF-2	FD-4	—	—	POSITIVE (+0.02 in. w.g.)	B, C	Pressurize lobby on fire floor
5	Exit Passageway A (Level 1)	PRESSURIZED (CORRIDOR)	SD-5	—	—	—	—	—	EPF-1	FD-5	—	—	POSITIVE (+0.02 in. w.g.)	B, C	Adjacent to Stair 1
6	Exit Passageway B (Level 1)	PRESSURIZED (CORRIDOR)	SD-6	—	—	—	—	—	EPF-2	FD-6	—	—	POSITIVE (+0.02 in. w.g.)	B, C	Adjacent to Stair 2
7	Parking Garage (Level P1–P3)	EXHAUST (GARAGE)	SD-7	—	MS-7	CO	—	EF-1	—	SD-7A	—	—	NEUTRAL to NEGATIVE (–0.02 in. w.g.)	D	Exhaust smoke on alarm
8	Loading Dock	EXHAUST (ROOM)	SD-8	—	—	—	—	EF-2	—	SD-8A	—	—	NEUTRAL to NEGATIVE (–0.02 in. w.g.)	D	Exhaust smoke on alarm
9	Atrium	SMOKE EXHAUST	SD-9	HD-9	MS-9	—	—	EF-3	—	SD-9A	—	LV-1	NEGATIVE (–0.04 in. w.g.)	E	Atrium smoke exhaust
10	Mechanical Room	SMOKE EXHAUST	SD-10	HD-10	—	—	—	EF-4	—	SD-10A	—	—	NEGATIVE (–0.02 in. w.g.)	F	Exhaust smoke on alarm

NOTE: "—" INDICATES NOT APPLICABLE

LEGENDS		SEQUENCE OF OPERATION SUMMARY		GENERAL NOTES	
PRESSURE ZONE TYPE	SD = SMOKE DETECTOR	CONTROL METHOD LEGEND	ZONE TYPE	OPERATION	GENERAL NOTES
	HD = HEAT DETECTOR				
MS = MANUAL STATION	CO = CARBON MONOXIDE DETECTOR	A = DEDICATED SMOKE CONTROL PANEL (STAIR PRESSURIZATION)	PRESSURIZED (STAIR)	• On alarm in stair or floor above: SPF starts, FD opens. • Maintain +0.05 in. w.g. differential.	1. ALL SMOKE CONTROL SYSTEMS SHALL BE DESIGNED, INSTALLED, TESTED, AND MAINTAINED IN ACCORDANCE WITH NFPA 92, NFPA 72, IBC, IMC, AND LOCAL REQUIREMENTS.
SPF = STAIR PRESSURIZATION FAN	EPF = ELEVATOR / CORRIDOR PRESSURIZATION FAN	B = DEDICATED SMOKE CONTROL PANEL (LOBBY / CORRIDOR PRESSURIZATION)	PRESSURIZED (ELEVATOR LOBBY)	• On fire alarm on any floor: EPF starts on fire floor lobby only. • Maintain +0.02 in. w.g. differential.	2. SMOKE CONTROL SYSTEMS SHALL BE UNDER THE JURISDICTION OF THE BUILDING FIRE ALARM CONTROL PANEL (FACP).
EF = EXHAUST FAN	FD = FIRE / SMOKE DAMPER	C = MONITORED BY FACU – STATUS AND FAILS	PRESSURIZED (CORRIDOR)	• On alarm in corridor: EPF starts. • Maintain +0.02 in. w.g. differential.	3. ALL FANS, DAMPERS, AND ASSOCIATED DEVICES SHALL BE SUPERVISED FOR POWER, POSITION, AND FAULT.
FD = EXHAUST FAN	SD = SMOKE DAMPER	D = AUTOMATIC CONTROL FROM FACU (FAN START / DAMPER POSITION)	EXHAUST (GARAGE / ROOM)	• On alarm or CO detection: EF starts. • RD opens, SD opens, maintain negative pressure.	4. FAILURE OF ANY COMPONENT SHALL CAUSE NOTIFICATION AT THE FACP AND THE BUILDING MANAGEMENT SYSTEM (BMS).
RD = RELIEF DAMPER	LV = LOUVER	E = SEQUENCE CONTROL BY FACU (SMOKE EXHAUST SEQUENCE)	SMOKE EXHAUST (ATRIUM / ROOM)	• On alarm: EF starts, SD opens, RD opens, LV opens as required. • Maintain negative pressure per design.	5. REFER TO HVAC AND ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS AND SIZES OF DEVICES AND DUCTWORK.
SMOKE EXHAUST from space		F = LOCAL FAN START / DAMPER CONTROL BY FACU	ALL ZONES	• All smoke control components supervised by FACU and indicated at FACP.	
PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM		DESIGNER OF RECORD: Applied Engineering Group		DRAWING TITLE: SMOKE CONTROL MATRIX FANS, DAMPERS, PRESSURE ZONES, CONTROLS	DRAWING NO.: FA-034
				SHEET: 1 OF 1	DATE: MAY 24, 2024
				REV: 0	

Smoke control matrix (FA-034, Sheet 1) mapping fire alarm detection inputs to smoke control outputs including supply fans, return fans, exhaust fans, and smoke dampers.

FIRE ALARM SYSTEM – SMOKE CONTROL MATRIX

ZONE ID	ZONE / AREA	PRESSURE ZONE TYPE	STAIR / ELEV. LOBBY ASSOCIATION	CONTROLLING DEVICES					CONTROL INITIATION (BY)					RESPONSE / ACTION				REMARKS
				SUPPLY FAN (SF)	EXHAUST FAN (EF)	SMOKE DAMPER (SD)	FIRE / SMOKE DAMPER (FSD)	RELIEF AIR DAMPER (RD)	DETECTORS / DEVICES	MANUAL STATION	HVAC SHUTDOWN	FACP ZONE	AIRFLOW ACTION	DAMPER POSITION	FAN ACTION	PRESSURE RELATION		
1	Stair 1 (P1-PH)	Pressurization (Positive)	S1 / EL-1	SF-1	—	SD-1	FSD-1	RD-1	SD-1, SD-1A	MS-1	Yes	Z-101	Maintain +0.15 in.w.c.	Open	ON (Maintain)	Positive	Stairwell Pressurization	
2	Stair 2 (P1-PH)	Pressurization (Positive)	S2 / EL-2	SF-2	—	SD-2	FSD-2	RD-2	SD-2, SD-2A	MS-2	Yes	Z-102	Maintain +0.15 in.w.c.	Open	ON (Maintain)	Positive	Stairwell Pressurization	
3	Elevator Lobby 1 (Level 1)	Pressurization (Positive)	EL-1	SF-3	—	SD-3	FSD-3	RD-3	SD-3, SD-3A	MS-3	Yes	Z-103	Maintain +0.10 in.w.c.	Open	ON (Maintain)	Positive	Lobby Pressurization	
4	Elevator Lobby 2 (Level 1)	Pressurization (Positive)	EL-2	SF-4	—	SD-4	FSD-4	RD-4	SD-4, SD-4A	MS-4	Yes	Z-104	Maintain +0.10 in.w.c.	Open	ON (Maintain)	Positive	Lobby Pressurization	
5	Corridor Zone A (P1 Level)	Smoke Control (Exhaust)	—	—	EF-1	SD-5	FSD-5	RD-5	SD-5	MS-5	Yes	Z-105	Exhaust Smoke	Open	ON (Exhaust)	Neutral	Corridor Exhaust	
6	Corridor Zone B (P1 Level)	Smoke Control (Exhaust)	—	—	EF-2	SD-6	FSD-6	RD-6	SD-6	MS-6	Yes	Z-106	Exhaust Smoke	Open	ON (Exhaust)	Neutral	Corridor Exhaust	
7	Parking Garage Level P2	Smoke Control (Mechanical)	—	SF-G2	EF-G2	SD-G2	FSD-G2	RD-G2	Duct SD-G2	MS-G2	Yes	Z-107	Start Make-Up Air	Open	EF ON / SF ON	Neutral	Garage Smoke Control	
8	Parking Garage Level P1	Smoke Control (Mechanical)	—	SF-G1	EF-G1	SD-G1	FSD-G1	RD-G1	Duct SD-G1	MS-G1	Yes	Z-108	Start Make-Up Air	Open	EF ON / SF ON	Neutral	Garage Smoke Control	
9	Electrical Room	Smoke Exhaust	—	—	EF-ER	SD-ER	FSD-ER	—	Heat Detector ER	MS-ER	Yes	Z-109	Exhaust Smoke	Open	ON (Exhaust)	Neutral	Dedicated Exhaust	
10	Atrium	Natural / Hybrid Smoke Control	—	—	EF-AT	SD-AT	FSD-AT	RD-AT	SD-AT, SD-ATB	MS-AT	Yes	Z-110	Exhaust Smoke	Open	ON (Exhaust)	Neutral	Atrium Exhaust	

SMOKE CONTROL SEQUENCE SUMMARY

SCENARIO	DETECTOR ACTIVATED	ACTIONS TAKEN
Stair / Elevator Lobby Pressurization	Smoke Detector in Stair / Lobby	Start SF, open SD & RD, maintain + pressure
Corridor Smoke Exhaust	Smoke Detector in Corridor	Open SD, start EF, exhaust smoke
Parking Garage Smoke Control	Smoke Detector in Garage	Start EF & SF, open SD, maintain neutral
Room Exhaust	Heat/Smoke Detector in Room	Open SD, start EF, exhaust smoke
Manual Smoke Control	Manual Station Activated	Same as automatic, per zone
HVAC Shutdown	Any Fire Alarm Condition	Shut down AHUs for affected zones

FLOOR PLAN — SMOKE CONTROL ZONES (KEY PLAN)

GENERAL NOTES

- All smoke control equipment shall be listed for smoke control service.
- Smoke control systems shall operate independently of HVAC except where interconnected.
- HVAC dampers shall be spring return upon loss of power.
- All dampers shall be spring return upon loss of power.
- Pressure sensors shall monitor stair and elevator lobbies.
- Refer to mechanical drawings for exact equipment locations and duct sizes.
- All wiring shall comply with NFPA 72, NFPA 90A, NFPA 101, and local codes.

DEVICE TYPE LEGEND

SF	Supply Fan (Make-Up Air)
EF	Exhaust Fan
SD	Smoke Damper (MotORIZED)
FSD	Fire / Smoke Damper
RD	Relief Air Damper
MS	Manual Smoke Control Station

PRESSURE RELATION LEGEND

Positive Pressure (Pressurization)

Neutral Pressure (Exhaust / Smoke Control)

Negative Pressure (Exhaust Dominant)

CONTROL PRIORITY

- Fire Alarm Signal (Automatic)
- Manual Smoke Control Station
- HVAC Control Sequence
- Operator Override (Key Switch)
- Local Equipment Safety

ABBREVIATIONS

FACP	Fire Alarm Control Panel
SF	Supply Fan (Make-Up)
EF	Exhaust Fan
SD	Smoke Damper
FSD	Fire / Smoke Damper
RD	Relief Air Damper
MS	Manual Station

PROJECT:

MULTI-STORY COMMERCIAL BUILDING
FIRE ALARM AND EMERGENCY
COMMUNICATION SYSTEM

DESIGNER OF RECORD:

Applied Engineering Group

DRAWING TITLE:

SMOKE CONTROL MATRIX
FANS, DAMPERS, PRESSURE ZONES, CONTROLS

DRAWING NO.:

FA-034

SHEET:

1 OF 1

DATE:

MAY 24, 2024

REV:

0

Smoke control systems in high-rise, atrium, and mall occupancies must be functionally tested per the sequence of operations matrix. For each alarm scenario defined in the matrix:

14. Identify the initiating event (detector or zone).
15. Verify all specified fans start or stop within required response time.
16. Verify all smoke dampers open or close within 75 seconds.
17. Verify stair pressurization fans activate and produce minimum differential pressure per NFPA 92.
18. Record all response times on the test form.
19. Verify supervisory feedback signals are received at the FACP and fire command center.

7.7 Cause-and-Effect Verification

FIRE ALARM SYSTEM – CAUSE-AND-EFFECT MATRIX

OPERATIONAL WORKSHEET

PROJECT INFORMATION		SYSTEM DESCRIPTION		LEGEND		NOTES	
PROJECT:	MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	FIRE ALARM CONTROL PANEL:	FACP-1 (ADDRESSABLE)	● =	ACTION TAKEN (OUTPUT)	1. ALL CAUSE-AND-EFFECTS SHALL COMPLY WITH NFPA 72.	
LOCATION:	—	SYSTEM VOLTAGE:	24 VDC	○ =	CONDITIONAL ACTION (IF APPLICABLE)	2. MATRIX INCLUDES PRIMARY LIFE SAFETY FUNCTIONS.	
DATE:	MAY 24, 2024	SLC LOOPS:	2	— =	NO ACTION	3. ADDITIONAL FUNCTIONS MAY BE PROGRAMMED PER OWNER REQUIREMENTS.	
PREPARED BY:	AEG	NAC CIRCUITS:	2 (CLASS B)	DLY =	DELAY (SECONDS)	4. REFER TO SEQUENCE OF OPERATIONS NARRATIVE FOR DETAILS.	
CHECKED BY:	—	APPLICABLE CODES:	NFPA 72, 2019	RST =	RESET REQUIRED		
		SYSTEM SOFTWARE VERSION:	X.X.X				

INITIATING EVENT (CAUSE)	CONDITION / POINT TYPE	RESULTING ACTION (EFFECT)													
		GENERAL ALARM (AUDIBLE/VISUAL)	TROUBLE INDICATION	FIRE DEPT. NOTIFICATION	ELEVATOR RECALL	SUPPLY FANS	HVAC / SMOKE CONTROL RETURN / EXHAUST FANS	DAMPERS (SMOKE)	DOOR RELEASE	DOOR CLOSURE	NAC STROBES	VOICE EVACUATION	SMOKE CONTROL PRESSURIZATION	BUILDING MANAGEMENT SYSTEM	DELAY / NOTES
FIRE DETECTION EVENTS															
1	Smoke Detector in Alarm (Any)	●	—	●	●	● (OFF)	● (OFF)	● (CLOSE)	● (ALL)	—	●	●	●	●	DLY 0
2	Heat Detector in Alarm (Any)	●	—	●	●	● (OFF)	● (OFF)	● (CLOSE)	● (ALL)	—	●	●	●	●	DLY 0
3	Duct Smoke Detector in Alarm (Any)	●	—	●	—	—	—	—	—	—	—	—	—	—	DLY 0
4	Flame Detector in Alarm (Any)	●	—	●	●	● (OFF)	● (OFF)	● (CLOSE)	● (ALL)	—	●	●	●	●	DLY 0
5	Manual Pull Station Activated (Any)	●	—	●	●	● (OFF)	● (OFF)	● (CLOSE)	● (ALL)	—	●	●	●	●	DLY 0
6	Waterflow Switch (Sprinkler) (Any)	●	—	●	●	● (OFF)	● (OFF)	● (CLOSE)	● (ALL)	—	●	●	●	●	DLY 0
SUPERVISORY EVENTS															
7	Tamper Switch Activated (Any)	—	●	—	—	—	—	—	—	—	—	—	—	●	RST
8	Duct Detector Maintenance (Any)	—	●	—	—	—	—	—	—	—	—	—	—	●	RST
9	Low Air Pressure (Duct) (Any)	—	●	—	—	—	—	—	—	—	—	—	—	●	RST
10	Waterflow (System Test) (Any)	—	●	—	—	—	—	—	—	—	—	—	—	●	RST
SYSTEM TROUBLE EVENTS															
11	AC Power Failure (Panel)	—	●	—	—	—	—	—	—	—	—	—	—	●	RST
12	Battery Trouble (Panel)	—	●	—	—	—	—	—	—	—	—	—	—	●	RST
13	SLC Loop Fault (Panel)	—	●	—	—	—	—	—	—	—	—	—	—	●	RST
14	NAC Circuit Open / Short (Panel)	—	●	—	—	—	—	—	—	—	—	—	—	●	RST
15	Ground Fault (Panel)	—	●	—	—	—	—	—	—	—	—	—	—	●	RST
MANUAL OPERATOR ACTIONS															
16	Alarm Silence (Operator)	○ (SILENCE)	—	—	—	—	—	—	—	—	○ (SILENCE)	○ (SILENCE)	—	—	N/A
17	Reset System (Operator)	○ (RESET)	○ (CLEAR)	○ (RESET)	—	—	—	—	—	—	—	—	○ (RESET)	○ (RESET)	N/A
18	Evacuate (Manual Page) (Operator)	—	—	—	—	—	—	—	—	—	—	—	—	—	DLY 0
19	Drill (Walk Test Mode) (Operator)	○ (TEST)	○ (TEST)	○ (TEST)	○ (TEST)	○ (TEST)	○ (TEST)	○ (TEST)	○ (TEST)	—	○ (TEST)	○ (TEST)	○ (TEST)	○ (TEST)	N/A

NOTES: DLY 0 = NO DELAY (X SECONDS) DLY X = DELAY (X SECONDS) RST = RESET REQUIRED AFTER CONDITION CLEARED

PROJECT:	MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	DESIGNER OF RECORD:	Applied Engineering Group	DRAWING TITLE:	CAUSE-AND-EFFECT MATRIX OPERATIONAL WORKSHEET	DRAWING NO.:	FA-040	SHEET:	1 OF 1	DATE:	MAY 24, 2024	REV:	0
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Cause-and-effect matrix (FA-040) operational worksheet mapping each initiating device to its alarm outputs, notification zones, auxiliary control actions, and supervising station transmissions.

The cause-and-effect matrix is the definitive functional testing reference for addressable systems. For each initiating event defined in the matrix, the inspector must verify that every specified output activates correctly and within the required time. Common cause-and-effect tests include:

- Single-device alarm in a zone activating the correct notification circuits.
- Supervisory signals from waterflow or tamper switches producing supervisory—not alarm—indications.
- Positive Alarm Sequence (PAS) timing when programmed.
- Alarm verification time delays for smoke detectors when programmed.
- Cross-zone logic operations where applicable.

7.8 Supervising Station Signal Verification

Signal transmission to the central monitoring station is one of the most critical—and most frequently cited—aspects of annual inspection. NFPA 72 Section 26.6.3.2 requires that alarm signals be transmitted within 90 seconds of detection. Verify the following:

20. Place system on test with the monitoring station before beginning.
21. Trigger alarm, supervisory, and trouble signals individually.
22. Record the elapsed time from device activation to monitoring station acknowledgment for each signal type.
23. Confirm that restoration signals are received by the monitoring station after reset.
24. Obtain written acknowledgment from the monitoring station operator; attach to the inspection report.

 Transmission time testing is frequently the first thing an AHJ checks on an inspection report. If transmission times are not documented, or if they exceed 90 seconds, expect the report to be rejected.

7.9 Power Supply Testing

Power supply functional testing must be performed in accordance with NFPA 72 Section 10.6.10:

- Normal Operation: Verify 24 V DC output is within $\pm 10\%$ (21.6–26.4 V DC) under normal standby conditions.
- Primary Power Loss: Disconnect AC feed; confirm system continues to operate on battery; "AC Fail" trouble signal appears at panel and monitoring station.
- Battery Voltage Under Load: After 5 minutes of battery operation, each 12 V battery must read ≥ 11.8 V DC.
- Recharge Verification: Restore AC power; confirm float charge resumes at 13.2–13.8 V DC.
- Automatic Restoration: Confirm AC fail trouble clears automatically when power is restored.

FIRE ALARM SYSTEM – BATTERY CALCULATION WORKSHEET

24-HOUR STANDBY AND ALARM CALCULATIONS

PROJECT:
MULTI-STORY COMMERCIAL BUILDING
FIRE ALARM AND EMERGENCY
COMMUNICATION SYSTEM

LOCATION:
—

DATE:
MAY 24, 2024

CALCULATED BY:
AEG

CHECKED BY:
—

DESIGN CRITERIA

1. SYSTEM SHALL MEET NFPA 72: 2019, 10.6.3 REQUIREMENTS.
2. BATTERIES SHALL SUPPLY THE FIRE ALARM SYSTEM FOR A MINIMUM OF
24 HOURS OF STANDBY AND 5 MINUTES OF ALARM.
3. AMBIENT TEMPERATURE: 25°C (77°F)
4. BATTERY END OF DISCHARGE VOLTAGE: 1.67 VPC
5. BATTERY TEMPERATURE DERATING FACTOR: 1.00 (25°C)
6. FUTURE LOAD ALLOWANCE: 20%

PROJECT INFORMATION

24-HOUR STANDBY AND ALARM CALCULATIONS

SYSTEM SUMMARY

FIRE ALARM CONTROL PANEL (FACP):
FACP-1 (ADDRESSABLE)
NOMINAL SYSTEM VOLTAGE:
24 VDC
BATTERY TYPE:
SEALED LEAD-ACID
BATTERY CONFIGURATION:
TWO STRINGS IN PARALLEL
NUMBER OF BATTERIES PER STRING:
2
TOTAL BATTERIES:
4
BATTERY CAPACITY RATING (EACH):
18 Ah @ 24 VDC (20 HR RATE)

A. 24-HOUR STANDBY LOAD CALCULATION			
ITEM	DESCRIPTION	QTY	REMARKS
1	FACP (FACP-1)	1	Includes display, logic, & annunciation
2	Addressable Devices (avg.)	210	Detectors, modules, bases
3	Addressable Notification Appliance Circuits (NACs) – Supervisory	8	NAC supervision only (no devices active)
4	Network / Communications Module	1	FACU / Remote Annunciator Comm.
5	Remote Annunciators	2	RA-1, RA-2
6	Misc. Modules (I/O, Relay, Monitor)	15	Average standby
7	Future Load Allowance (20%)	—	20% of items 1–6 total
TOTAL STANDBY CURRENT (I _{STBY})		—	0.687 AMPS
STANDBY CAPACITY (C _{STBY}) = I _{STBY} × 24 HOURS			
		—	0.687 × 24 = 16.49 Ah

B. 5-MINUTE ALARM LOAD CALCULATION			
ITEM	DESCRIPTION	QTY	REMARKS
1	FACP (FACP-1)	1	Alarm mode
2	Addressable Devices (avg.)	210	Alarm (LED on)
3	NACs – Audible / Visible Appliances	8	Max load per NAC
4	NAC Strobes (if part of above)	—	Included in item 3
5	Relays Energized (Alarm)	15	Average
6	Network / Comm. Module	1	Alarm mode
7	Remote Annunciators	2	Alarm mode
8	Miscellaneous Modules (Alarm)	15	Average
9	Future Load Allowance (20%)	—	20% of items 1–8 total
TOTAL ALARM CURRENT (I _{ALARM})		—	2.198 AMPS
ALARM CAPACITY (C _{ALARM}) = I _{ALARM} × 0.083 HOURS (5 MINUTES)			
		—	15.196 × 0.083 = 1.26 Ah

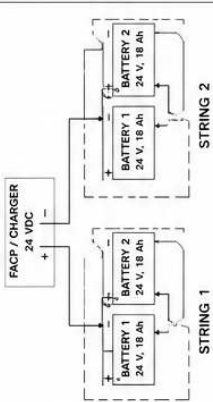
C. TOTAL BATTERY CAPACITY REQUIRED

STANDBY CAPACITY (C_{STBY})
16.49 Ah
ALARM CAPACITY (C_{ALARM})
1.26 Ah
TOTAL CAPACITY (C_{TOTAL}) = C_{STBY} + C_{ALARM}
17.75 Ah
APPLY TEMPERATURE DERATING FACTOR (1.00)
17.75 × 1.00 = 17.75 Ah
REQUIRED SYSTEM CAPACITY (MIN.)
17.75 Ah

D. BATTERY SELECTION AND VERIFICATION

BATTERY CAPACITY RATING (EACH BATTERY)
18 Ah @ 24 VDC (20 HR)
NUMBER OF BATTERIES PER STRING
2
NUMBER OF STRINGS IN PARALLEL
2
TOTAL SYSTEM CAPACITY (C_{INSTALLED})
36 Ah
TOTAL SYSTEM CAPACITY (C_{INSTALLED}) ≥ C_{TOTAL} REQUIRED
36 Ah ≥ 17.75 Ah ✓ PASS
MARGIN OF CAPACITY
(36 – 17.75) / 17.75 × 100 = 102.5%

E. BATTERY CONFIGURATION



NOTES
1. ALL VALUES ARE BASED ON MANUFACTURER DATA SHEETS AND SYSTEM DESIGN DOCUMENTS.
2. ACTUAL FIELD CONDITIONS MAY AFFECT LOAD CURRENTS.
3. BATTERIES SHALL BE NEW, LISTED, AND INSTALLED PER NFPA 72.
4. RECALCULATE IF SYSTEM CHANGES OR ADDITIONAL LOADS ARE ADDED.

PROJECT:
MULTI-STORY COMMERCIAL BUILDING
FIRE ALARM AND EMERGENCY
COMMUNICATION SYSTEM

DESIGNER OF RECORD:
Applied Engineering Group

DRAWING TITLE:
BATTERY CALCULATION WORKSHEET
24-HOUR STANDBY AND ALARM CALCULATIONS

DRAWING NO.:
FA-035

SHEET:
1 OF 1

DATE:
MAY 24, 2024

REV:
0

Battery calculation worksheet (FA-035, Sheet 2) verifying 5-minute alarm load calculations and confirming installed battery capacity meets NFPA 72 Section 10.6.10 requirements.

7.10 System Restoration

After all testing is complete:

25. Reset FACP and confirm "System Normal" status.
26. Verify no active troubles or supervisory signals remain.
27. Restore HVAC, elevator, door release, and all auxiliary building systems.
28. Notify the monitoring station to remove the system from test mode.
29. Remove all "Testing in Progress" signage.
30. Verify any devices that were disabled for testing are re-enabled.
31. Sign off the inspection log and compile the field test data for the formal report.

7.11 Common Functional Testing Deficiencies

- Device fails to activate or fails to reset after activation.
- Alarm signal not received at panel or monitoring station within 90 seconds.
- Incorrect zone/device label displayed at panel—address mismatch with drawings.
- NAC circuit not synchronized; strobes flash out of phase.
- Elevator does not return to recall floor upon lobby detector activation.
- AC fail trouble not generated during primary power loss test.
- Battery voltage drops below 11.8 V DC during 5-minute load test.
- HVAC shutdown relay does not activate on duct detector alarm.

Chapter 8: Inspection and Test Forms

FIRE ALARM SYSTEM – DEVICE SCHEDULE MASTER INVENTORY OF ALL DEVICES

DEVICE TYPE	QTY	DEVICE DESCRIPTION	MANUFACTURER	CATALOG / MODEL NO.	VOLTAGE	MOUNTING	LOCATION (TYP.)	NOTES
INITIATING DEVICES								
SD	184	PHOTOELECTRIC SMOKE DETECTOR	NOTIFIER	FSP-951	24 VDC	CEILING	THROUGHOUT	SLC
HD	56	HEAT DETECTOR (FIXED 135°F)	NOTIFIER	FST-951	24 VDC	CEILING	KITCHEN / MECH.	SLC
DSD	38	DUCT SMOKE DETECTOR	SYSTEM SENSOR	D4120	24 VDC	DUCT	AHU UNITS	SLC
CO	12	CARBON MONOXIDE DETECTOR	SYSTEM SENSOR	CO1224T	24 VDC	WALL	PARKING / MECH.	SLC
WFS	8	WATERFLOW SWITCH	POTTER	P32	24 VDC	PIPE	FIRE RISER RM.	SUPV
TS	14	TAMPER SWITCH	POTTER	TS-2	24 VDC	VALVE	RISER / CONTROL VALVES	SUPV
PS	24	MANUAL PULL STATION	NOTIFIER	NBS-12LX	24 VDC	WALL	EXIT DOORS	NAC
NOTIFICATION APPLIANCES								
HA	120	HORN / STROBE (WALL)	SYSTEM SENSOR	P2WL	24 VDC	WALL	CORRIDORS / ROOMS	NAC
HA-C	76	HORN / STROBE (CEILING)	SYSTEM SENSOR	PC2WL	24 VDC	CEILING	CORRIDORS / ROOMS	NAC
H	18	HORN (WALL)	SYSTEM SENSOR	HWL	24 VDC	WALL	MECH. / UTILITY	NAC
S	6	STROBE (WALL)	SYSTEM SENSOR	SWL	24 VDC	WALL	COMMON AREAS	NAC
CONTROL MODULES								
MM	36	MONITOR MODULE	NOTIFIER	FMM-1	24 VDC	WALL / FLUSH	THROUGHOUT	SLC
CM	24	CONTROL MODULE (RELAY)	NOTIFIER	FCM-1	24 VDC	WALL / FLUSH	THROUGHOUT	SLC
DCM	8	DUAL CONTROL MODULE	NOTIFIER	FCM-1(DUAL)	24 VDC	WALL / FLUSH	THROUGHOUT	SLC
IM	10	INPUT MODULE (MONITORED)	NOTIFIER	FMM-1	24 VDC	WALL / FLUSH	THROUGHOUT	SLC
CONTROL EQUIPMENT								
FACP	1	FIRE ALARM CONTROL PANEL	NOTIFIER	NFS2-640	120 VAC	RACK MOUNT	FIRE COMMAND CENTER	PRIMARY
ANN	1	NETWORK ANNUNCIATOR	NOTIFIER	NCA-2	24 VDC	WALL	SECURITY DESK	DACT
RPT	3	REMOTE ANNUNCIATOR	NOTIFIER	NOR-2000	24 VDC	WALL	ELEV. LOBBY / MECH. RM.	DACT
DACT	1	DACT / COMMUNICATOR	NOTIFIER	DACT-NET	120 VAC	WALL	FIRE COMMAND CENTER	PS/IN / IP
PWS	2	POWER SUPPLY / CHARGER	NOTIFIER	PSN-106	120 VAC	RACK MOUNT	FIRE COMMAND CENTER	24 VDC / 6A
BAT	4	BATTERY CABINET	NOTIFIER	CAB-4	—	FLOOR STANDING	FIRE COMMAND CENTER	24 VDC
VOICE EVACUATION SYSTEM								
VAP	1	VOICE EVACUATION AMPLIFIER RACK	BOGEN	VU-120	120 VAC	RACK MOUNT	ELEC. ROOM	120W
SPK	220	CEILING SPEAKER	BOGEN	S86T72SPG8	—	CEILING	THROUGHOUT	25/70V
SPK-W	16	WALL SPEAKER	BOGEN	S81DT72SPG8	—	WALL	PARKING / MECH. RM.	25/70V
MIC	3	FIRE FIGHTER MICROPHONE	BOGEN	MPS-1	—	RACK / WALL	FIRE COMMAND CENTER	PAGING
PRI	1	PAGING INTERFACE	BOGEN	PR1-1	24 VDC	RACK MOUNT	ELEC. ROOM	FACP INTERFACE
FIRE FIGHTER TELEPHONE SYSTEM								
FTCP	1	FIRE FIGHTER TELEPHONE CONTROL PANEL	NOTIFIER	NFT-100	120 VAC	WALL	FIRE COMMAND CENTER	CLASS B
PHONE	68	FIRE FIGHTER TELEPHONE JACK	NOTIFIER	NFT-JACK	—	WALL	STAIR / LOBBIES / FLOORS	CLASS B
TOTAL DEVICES	871							

DEVICE TYPE LEGEND

SD SMOKE DETECTOR
HD HEAT DETECTOR
DSD DUCT SMOKE DETECTOR
CO CARBON MONOXIDE DETECTOR
WFS WATERFLOW SWITCH
TS TAMPER SWITCH
PS MANUAL PULL STATION
HA HORN / STROBE (WALL)
HA-C HORN / STROBE (CEILING)
H HORN (WALL)
S STROBE (WALL)
MM MONITOR MODULE
CM CONTROL MODULE (RELAY)
DCM DUAL CONTROL MODULE
IM INPUT MODULE
ANN FIRE ALARM CONTROL PANEL
RPT REMOTE ANNUNCIATOR
DACT DIGITAL ALARM COMMUNICATOR TRANSMITTER
PWS POWER SUPPLY
BAT BATTERY CABINET
VAP VOICE AMPLIFIER PANEL
SPK SPEAKER
MIC MICROPHONE
PRI PAGING INTERFACE
FTCP FIRE FIGHTER TELEPHONE PANEL
PHONE TELEPHONE JACK

MOUNTING LEGEND
CEILING CEILING MOUNT
WALL WALL MOUNT
FLUSH FLUSH MOUNT
PIPE PIPE MOUNT
RACK MOUNT 19" EQUIPMENT RACK
FLOOR STANDING FLOOR MOUNTED

VOLTAGE LEGEND
24 VDC 24 VOLT DC
120 VAC 120 VOLT AC
— PASSIVE / NO EXTERNAL POWER

ABBREVIATIONS
SLC SIGNALING LINE CIRCUIT
NAC NOTIFICATION APPLIANCE CIRCUIT
SUPV SUPERVISORY CIRCUIT
EOL END OF LINE
DACT DIGITAL ALARM COMMUNICATOR TRANSMITTER
PS/IN PUBLIC SWITCHED TELEPHONE NETWORK

NOTES:
• ALL DEVICES SHALL BE LISTED FOR FIRE PROTECTION SERVICE.
• DEVICES SHALL BE INSTALLED IN ACCORDANCE WITH NFPA 72, MANUFACTURER'S INSTRUCTIONS, AND APPROVED SHOP DRAWINGS.
• QUANTITIES ARE BASED ON CURRENT DESIGN. CONTRACTOR SHALL VERIFY ALL QUANTITIES IN FIELD PRIOR TO PROCUREMENT AND INSTALLATION.

PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	DESIGNER OF RECORD: Applied Engineering Group	DRAWING TITLE: DEVICE SCHEDULE MASTER INVENTORY OF ALL DEVICES	DRAWING NO.: FA-019	SHEET: 1 OF 1	DATE: MAY 24, 2024	REV: 0
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8.1 Documentation as a Professional Obligation

Inspection results that are not properly documented do not legally exist. NFPA 72 (Sections 7.5 and 14.6) requires written records for every inspection, test, and maintenance activity. These records must include the date, responsible party, device results, and corrective actions. Without proper documentation, the inspection cannot be submitted to the AHJ, and the building cannot be certified as compliant.

Documentation also serves as the inspector's primary legal protection. In the event of a fire event in an inspected building, inspection records are among the first documents reviewed. An accurate, thorough, properly signed report demonstrates that the inspector fulfilled their professional obligation. A missing, incomplete, or inconsistent report creates substantial liability.

8.2 Required Documentation Types

Document Type	Purpose	Minimum Retention
Inspection and Test Report	Primary record of all inspection activities and device test results.	1 year minimum or per AHJ requirement; best practice: 3–5 years
Record of Completion (ROC)	Certifies installation or major system modification.	Permanent with building records
System Status Report	Summarizes overall pass/fail status after inspection.	Until next inspection
Impairment Log	Tracks temporary system shutdowns; triggers fire watch requirements.	Until impairment resolved + 1 year
Deficiency and Correction Notice	Lists violations and documents corrective actions.	Until re-inspection is complete
Calibration Certificates	Proves inspection instruments were properly calibrated.	With each associated report

FIRE ALARM SYSTEM – ADDRESS SCHEDULE

SLC ADDRESSES FOR EVERY INTELLIGENT DEVICE

FACP LOCATION: FIRE COMMAND CENTER – ROOM 101			FACP MODEL: NOTIFIER NFS2-640	SLC LOOP:		SLC LOOP 1	SLC CLASS:	CLASS A
ADDRESS		DEVICE TYPE	DEVICE DESCRIPTION	MANUFACTURER	MODEL NO.	LOCATION		NOTES
DECIMAL	HEX					BUILDING	FLOOR	
INITIATING DEVICES								
1	01	SMOKE DETECTOR	PHOTOELECTRIC SMOKE DETECTOR	NOTIFIER	FSP-951	A	1	CORRIDOR A-101 SLC
2	02	SMOKE DETECTOR	PHOTOELECTRIC SMOKE DETECTOR	NOTIFIER	FSP-951	A	1	CORRIDOR A-102 SLC
3	03	HEAT DETECTOR	HEAT DETECTOR (FIXED 135°F)	NOTIFIER	FST-951	A	1	KITCHEN A-110 SLC
4	04	DUCT SMOKE DETECTOR	DUCT SMOKE DETECTOR	SYSTEM SENSOR	D4120	A	1	AHU-1 (DUCT) SLC
5	05	CARBON MONOXIDE DETECTOR	CARBON MONOXIDE DETECTOR	SYSTEM SENSOR	COT224T	A	1	PARKING LEVEL P1 SLC
6	06	WATERFLOW SWITCH	WATERFLOW SWITCH	POTTER	P32	A	P1	FIRE RISER RM. SUPV
7	07	TAMPER SWITCH	TAMPER SWITCH (OSKY VALVE)	POTTER	TS-2	A	P1	RISER / CONTROL VALVES SUPV
8	08	MANUAL PULL STATION	MANUAL PULL STATION	NOTIFIER	NBG-12LX	A	1	EXIT STAIR A NAC
9	09	MANUAL PULL STATION	MANUAL PULL STATION	NOTIFIER	NBG-12LX	A	1	EXIT STAIR B NAC
10	0A	MONITOR MODULE	MONITOR MODULE (WATERFLOW)	NOTIFIER	FMM-1	A	P1	FIRE PUMP ROOM SLC
NOTIFICATION APPLIANCES								
11	0B	HORN / STROBE (WALL)	HORN/STROBE, WALL MOUNT	SYSTEM SENSOR	P2WL	A	1	CORRIDOR A-101 NAC
12	0C	HORN / STROBE (WALL)	HORN/STROBE, WALL MOUNT	SYSTEM SENSOR	P2WL	A	1	CORRIDOR A-102 NAC
13	0D	HORN / STROBE (CEILING)	HORN/STROBE, CEILING MOUNT	SYSTEM SENSOR	PC2WL	A	1	LOBBY A-100 NAC
14	0E	HORN (WALL)	HORN, WALL MOUNT	SYSTEM SENSOR	HWL	A	1	ELECTRICAL ROOM A-120 NAC
15	0F	STROBE (WALL)	STROBE, WALL MOUNT	SYSTEM SENSOR	SWL	A	1	MECHANICAL ROOM A-130 NAC
CONTROL MODULES								
16	10	MONITOR MODULE	MONITOR MODULE	NOTIFIER	FMM-1	A	1	ELEVATOR MACHINE RM. SLC
17	11	CONTROL MODULE (RELAY)	CONTROL MODULE (RELAY)	NOTIFIER	FCM-1	A	1	SMOKE DAMPER SD-1 SLC
18	12	CONTROL MODULE (RELAY)	CONTROL MODULE (RELAY)	NOTIFIER	FCM-1	A	1	SMOKE DAMPER SD-2 SLC
19	13	INPUT MODULE	INPUT MODULE (MONITORED)	NOTIFIER	FMM-1	A	1	SPRINKLER TAMPER SLC
20	14	INPUT MODULE	INPUT MODULE (MONITORED)	NOTIFIER	FMM-1	A	1	GENERATOR STATUS SLC
VOICE EVACUATION SYSTEM								
21	15	AMPLIFIER	VOICE EVAC AMPLIFIER	BOGEN	VU-120	A	1	ELECTRICAL ROOM A-120 120 VAC
22	16	SPEAKER (CEILING)	CEILING SPEAKER	BOGEN	S861725PG8	A	1	CORRIDOR A-101 25/70V
23	17	SPEAKER (CEILING)	CEILING SPEAKER	BOGEN	S861725PG8	A	1	LOBBY A-100 25/70V
24	18	SPEAKER (WALL)	WALL SPEAKER	BOGEN	S810T725PG8	A	1	STAIR A LEVEL 1 25/70V
25	19	MICROPHONE	FIRE FIGHTER MICROPHONE	BOGEN	MPS-1	A	1	FIRE COMMAND CENTER PAGING
26	1A	PAGING INTERFACE	PAGING INTERFACE MODULE	BOGEN	PRI-1	A	1	FIRE COMMAND CENTER SLC
FIRE FIGHTER TELEPHONE SYSTEM								
27	1B	TELEPHONE CONTROL PANEL	FIRE FIGHTER TELEPHONE PANEL	NOTIFIER	NFT-100	A	1	FIRE COMMAND CENTER CLASS B
28	1C	TELEPHONE JACK	TELEPHONE JACK	NOTIFIER	NFT-JACK	A	1	STAIR A LEVEL 1 CLASS B
29	1D	TELEPHONE JACK	TELEPHONE JACK	NOTIFIER	NFT-JACK	A	1	STAIR B LEVEL 1 CLASS B
30	1E	TELEPHONE JACK	TELEPHONE JACK	NOTIFIER	NFT-JACK	A	MECH	FIRE PUMP ROOM CLASS B
31	1F	TELEPHONE JACK	TELEPHONE JACK	NOTIFIER	NFT-JACK	A	ROOF	ROOF ACCESS CLASS B

TOTAL DEVICES ON THIS SLC LOOP: 31

ADDRESSING NOTES

- ALL DEVICES SHALL HAVE A UNIQUE ADDRESS.
- ADDRESS 00 IS RESERVED FOR PANEL.
- ADDRESSING SHALL FOLLOW SEQUENTIAL ORDER AS SHOWN.
- FIELD VERIFY ALL ADDRESSES PRIOR TO SYSTEM ACCEPTANCE TESTING.
- REFER TO DEVICE INSTALLATION MANUALS FOR ADDRESSING PROCEDURES.

DEVICE TYPE LEGEND

SD	SMOKE DETECTOR
HD	HEAT DETECTOR
DSO	DUCT SMOKE DETECTOR
CO	CARBON MONOXIDE DETECTOR
WFS	WATERFLOW SWITCH
TS	TAMPER SWITCH
PS	MANUAL PULL STATION
HA	HORN / STROBE (WALL)
HA-C	HORN / STROBE (CEILING)
H	HORN (WALL)
S	STROBE (WALL)
MM	MONITOR MODULE
CM	CONTROL MODULE (RELAY)
DCM	DUAL CONTROL MODULE
IM	INPUT MODULE

SLC LOOP LEGEND

SLC	SIGNALING LINE CIRCUIT
CLASS A	STYLE 6 OR 7 (T-TAP)
CLASS B	STYLE 4 (RETURN)

END OF LINE RESISTOR:
CLASS A = 4.7K OHM, 1/2W
CLASS B = 4.7K OHM, 1/2W

ABBREVIATIONS

FACP	FIRE ALARM CONTROL PANEL
SLC	SIGNALING LINE CIRCUIT
NAC	NOTIFICATION APPLIANCE CIRCUIT
SUPV	SUPERVISORY CIRCUIT
EOL	END OF LINE
AHU	AIR HANDLING UNIT
RM	ROOM
VOC	VOLTAGE DC
VAC	VOLTAGE AC

PROJECT: MULTI-STORY COMMERCIAL BUILDING
FIRE ALARM AND EMERGENCY
COMMUNICATION SYSTEM

DESIGNER OF RECORD:
Applied Engineering Group

DRAWING TITLE:
ADDRESS SCHEDULE
SLC ADDRESSES FOR EVERY INTELLIGENT DEVICE

DRAWING NO.:
FA-020

SHEET:
1 OF 1

DATE:
MAY 24, 2024

REV:
0

Address schedule (FA-020) mapping each intelligent device to its SLC loop address, class designation, device type, building location, and panel programming data.

8.3 NFPA 72 Minimum Report Content Requirements

Per NFPA 72 Sections 14.6.2 and 7.7.2, every inspection report must contain at minimum:

- Date and time of the inspection and test activities.
- Name, company, and license/certification number of the inspector.
- Building name, address, and system identification.
- NFPA 72 edition (and local code edition) used for the inspection.
- System type, manufacturer, and model number of the FACP.
- Total number of devices tested and individual test results (Pass/Fail/N/A).
- All deficiencies identified, with NFPA 72 article citations and recommended corrective action.
- Corrective actions completed at time of inspection.
- Signatures of the inspector and the building owner/representative.
- Supervising station acknowledgment of transmission time results.

8.4 Input/Output Point List Documentation

FIRE ALARM SYSTEM – INPUT / OUTPUT POINT LIST

NFPA 72 COMPLIANT

PROJECT INFORMATION		DESIGN CRITERIA		SYSTEM SUMMARY		NOTES		LEGEND	
PROJECT:	MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	1. COMPLY WITH NFPA 72, 2019. 2. ALL INPUT / OUTPUT POINTS SHALL BE SUPERVISED. 3. ALL DEVICES SHALL BE U.L. LISTED AND COMPATIBLE WITH THE FACP. 4. POINT DESCRIPTIONS SHALL MATCH SEQUENCE OF OPERATIONS AND RISER DIAGRAMS. 5. COORDINATE ALL POINTS WITH ARCHITECTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS.	FACP LOCATION: FACP MODEL: TOTAL INPUT POINTS: TOTAL OUTPUT POINTS: SIGNALING LINE CIRCUITS: NOTIFICATION CIRCUITS: NAC POWER:	IDF-1 – LEVEL 1 NOTIFIER NFS2-640 214 156 4 (CLASS B) 12 (CLASS B) 24 VDC, 20 A PER NAC	1. ALL POINTS SHOWN ARE SUPERVISED AND ADDRESSABLE. 2. "*" INDICATES POINT IS USED IN MULTIPLE FUNCTIONS. 3. REFER TO CAUSE-AND-EFFECT MATRIX FOR ACTIONS. 4. REFER TO RISER DIAGRAMS FOR CIRCUIT DETAILS. 5. REFER TO DEVICE LOCATION PLANS FOR ADDRESSES.	■ INPUT DEVICES ■ MANUAL PULL STATION ■ DETECTOR / DEVICE ■ MONITOR MODULE / CONTACT ■ OTHER INPUT DEVICE ■ OUTPUT DEVICES ■ NOTIFICATION APPLIANCE ■ CONTROL RELAY / MODULE ■ AUXILIARY OUTPUT			
LOCATION:	—								
DATE:	MAY 24, 2024								
DESIGNED BY:	AEG								
CHECKED BY:	—								

INPUT POINT LIST										OUTPUT POINT LIST									
POINT	TYPE	DESCRIPTION	DEVICE / LOCATION	ADDRESS	SLC LOOP	MODULE / MONITOR POINT	REMARKS	POINT	TYPE	DESCRIPTION	DEVICE / LOCATION	ADDRESS	NAC / RELAY	MODULE / OUTPUT POINT	REMARKS				
I-0001	■	FIRE ALARM PULL STATION	MAIN LOBBY – LEVEL 1	01-001	SLC-1	—	*	O-0001	●	AV HORN / STROBE	MAIN LOBBY – LEVEL 1	NAC-1-001	NAC-1	—	*				
I-0002	■	FIRE ALARM PULL STATION	STAIR A – LEVEL 1	01-002	SLC-1	—	*	O-0002	●	SPEAKER	MAIN LOBBY – LEVEL 1	NAC-1-002	NAC-1	—	—				
I-0003	●	SMOKE DETECTOR	OPEN OFFICE 101 – LEVEL 1	01-003	SLC-1	—		O-0003	●	AV HORN / STROBE	STAIR A – LEVEL 1	NAC-1-003	NAC-1	—	*				
I-0004	●	SMOKE DETECTOR	CONFERENCE ROOM 103 – L1	01-004	SLC-1	—		O-0004	●	SPEAKER	STAIR A – LEVEL 1	NAC-1-004	NAC-1	—	—				
I-0005	●	HEAT DETECTOR	ELEC. ROOM – LEVEL 1	01-005	SLC-1	—	*	O-0005	■	FIRE ALARM RELAY	FIRE COMMAND CENTER	RLY-1	RLY-1	CRM-101	*				
I-0006	□	WATERFLOW SWITCH	FIRE RISER ROOM – LEVEL 1	01-006	SLC-1	MM-101	*	O-0006	■	SUPERVISORY RELAY	SUPERVISORY PANEL	RLY-2	RLY-1	CRM-102					
I-0007	□	SPRINKLER TAMPER SWITCH	FIRE RISER ROOM – LEVEL 1	01-007	SLC-1	MM-102		O-0007	■	WATERFLOW ALARM RELAY	BMS PANEL	RLY-3	RLY-1	CRM-103					
I-0008	□	FIRE PUMP RUNNING	FIRE PUMP ROOM – LEVEL 1	01-008	SLC-1	MM-103		O-0008	■	HVAC SHUTDOWN RELAY	AHU-1 – MECHANICAL RM	RLY-4	RLY-2	CRM-104	*				
I-0009	□	FIRE PUMP FAILURE	FIRE PUMP ROOM – LEVEL 1	01-009	SLC-1	MM-104	*	O-0009	■	ELEVATOR RECALL RELAY	ELEVATOR CONTROLLER	RLY-5	RLY-2	CRM-105	*				
I-0010	▲	ELEVATOR RECALL STATUS	ELEVATOR CONTROLLER – L1	01-010	SLC-1	MM-105	*	O-0010	■	DOOR RELEASE RELAY	MAG LOCK DOORS (EGRESS)	RLY-6	RLY-2	CRM-106					
I-0011	□	HVAC SMOKE SHUTDOWN	AHU-1 – MECHANICAL ROOM	01-011	SLC-1	MM-106	*	O-0011	◆	LED ANNUNCIATOR	SECURITY ROOM – LEVEL 1	AUX-1	AUX-1	XRM-101					
I-0012	□	GENERATOR RUNNING	GENERATOR ROOM – LEVEL 1	01-012	SLC-1	MM-107		O-0012	●	SPEAKER CIRCUIT	LEVEL 2 – ZONE 1	NAC-2-001	NAC-2	—					
I-0013	□	GENERATOR FAILURE	GENERATOR ROOM – LEVEL 1	01-013	SLC-1	MM-108	*	O-0013	●	AV HORN / STROBE	PARKING GARAGE – LEVEL P1	NAC-3-001	NAC-3	—					
I-0014	▲	SECURITY SYSTEM TROUBLE	SECURITY ROOM – LEVEL 1	01-014	SLC-2	MM-109		O-0014	■	FIRE PUMP START RELAY	FIRE PUMP CONTROLLER	RLY-7	RLY-3	CRM-107	*				
∴	∴	∴	∴	∴	∴	∴		∴	∴	∴	∴	∴	∴	∴					
TOTAL INPUT POINTS							214	TOTAL OUTPUT POINTS							156				

POINT COUNT SUMMARY														
INPUT POINTS				OUTPUT POINTS				SLC / CIRCUIT SUMMARY						
DETECTORS	MANUAL STATIONS	MONITOR MODULES / CONTACTS	OTHER INPUTS	TOTAL	NOTIFICATION APPLIANCES	CONTROL RELAYS	AUXILIARY OUTPUTS	TOTAL	SLC LOOPS (CLASS B)	NAC CIRCUITS (CLASS B)	RELAY / AUX MODULES			
92	38	68	16	214	108	40	8	156	4	12	16			
PROJECT:				DRAWING TITLE:				DRAWING NO.:				SHEET:		REV:
MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM				INPUT / OUTPUT POINT LIST				FA-050				1 OF 1		0
DESIGNER OF RECORD:				Applied Engineering Group								DATE:		MAY 24, 2024

Input/output point list (FA-050) documenting every input and output point in the fire alarm system with device descriptions, FACP addresses, control functions, and wiring class.

For addressable and networked systems, the I/O Point List is an essential documentation tool that maps every input and output in the system. During inspection, verify that:

- The I/O Point List in the project file matches the as-built system.
- Each listed input point corresponds to a physical, tested device.
- Each listed output point was verified to activate correctly during functional testing.
- The NFPA 72 circuit class designation for each point matches the wiring method installed.

8.5 Sample Annual Inspection Report Header

Field	Example Entry
Building Name	Ridgewood Office Plaza
Address	245 Prospect Street, Ridgewood NJ 07450
Inspection Date	October 22, 2025
System Type	Addressable – Notifier NFS-320
FACP S/N	NFS320-A-12345
Inspector Name / License #	Ray Lopez – License NJ-FA-4472
Inspection Firm	Practicing Engineers Network
NFPA Edition Used	NFPA 72 (2022), NEC 760 (2023)
Monitoring Station / Account #	Central Fire Monitoring – Account #CM-3442
Owner Representative	James Carter – Facilities Director
Total Devices Tested	287 (Initiating: 192 NAC: 65 Modules: 30)
Deficiencies Found	3 – See attached Deficiency Log
System Status	PASS WITH COMMENTS

8.6 System Status Summary

Category	Pass ✓	Fail ✗	Comments
Fire Alarm Control Panel	✓		Interior clean; all indicators normal.
Initiating Devices	✓		All 192 devices tested; no failures.
Notification Appliances	✓		One strobe lens dim – to be replaced.
Auxiliary Control Functions	✓		Elevator recall, HVAC shutdown verified.
Supervising Station Signals	✓		Dual path verified; max time 41 seconds.
Power Supplies and Batteries	✓		Battery pair replaced at time of inspection.
Documentation On Site	✓		Updated as-builts; ROC on file.

8.7 Deficiency Log Template

Def. #	Description	Device ID	NFPA Reference	Action Required	Status
001	Battery pair below minimum voltage under load.	BAT-01	NFPA 72 10.6.10	Replace both batteries. Install matching date-coded pair.	Completed at inspection
002	Pull station label faded and illegible.	PS-14	NFPA 72 10.16.3	Replace with engraved laminate label.	Scheduled within 30 days
003	Strobe lens dirty; output below candela spec.	HS-22	NFPA 72 18.5.5.4.1	Clean lens; re-test. Replace if output fails to meet spec.	Scheduled within 30 days

8.8 Impairment Log

When any portion of the fire alarm system is impaired—whether due to a discovered deficiency, scheduled maintenance, or system modification—an impairment log entry is mandatory per NFPA 72 Section 14.2.4. The building owner must immediately notify the AHJ and monitoring station and implement a fire watch per NFPA 72 Section 14.2.3.

Date / Time	Impairment Description	Area Affected	AHJ Notified	Duration	Resolution
10/22/2025 09:15	FACP battery pair below minimum; alarm capability reduced.	Entire building	Yes – Fire Watch posted	3 hours	New batteries installed; system verified.

8.9 Electronic Records and Digital Inspection

Digital inspection platforms are increasingly used in the industry and are acceptable under NFPA 72 provided they capture all required data fields and retain electronic signatures. Benefits of digital inspection tools include:

- Automatic pre-population of device IDs and locations from imported device lists.
- On-site digital signature capture by both inspector and building representative.
- Instant generation of PDF reports for AHJ submission.
- Cloud-based storage with multi-year audit trail.
- Automatic comparison of current test results against previous inspection records to flag recurring deficiencies.

✓ Back up all digital reports on a secure server or cloud folder organized by project address and inspection year. Many AHJ jurisdictions now require digital submission through online portals.

PART III

DOCUMENTATION AND REPORTING

Deficiencies • Final Reports • Certificates • Records

Chapter 9: Common Deficiencies and Violations

9.1 Overview

Certain deficiencies appear repeatedly across inspection sites, regardless of building type, age, or system manufacturer. An experienced inspector recognizes these patterns and knows precisely which NFPA 72 article to cite, what corrective action is required, and whether the deficiency constitutes an immediate impairment requiring a fire watch or a scheduled repair within 30 days.

NFPA 72 (Section 14.2.2) requires that all deficiencies be identified, recorded, and corrected without delay. This chapter catalogs the most common deficiencies by system component, providing field inspection cues, code citations, and recommended corrective actions.

9.2 Initiating Device Deficiencies

Category	Deficiency	Field Indicator	NFPA 72 Reference
Smoke Detectors	Detector obstructed within 18 inches	Object, beam, or ductwork within exclusion zone.	17.7.3.2
Smoke Detectors	Detector painted or contaminated	Painted housing; clogged sampling ports; off-normal LED.	14.4.3.2.2(1)
Smoke Detectors	Detector beyond service life (> 10 yrs)	Date code label shows year exceeding 10-year limit.	14.4.3.2.2
Heat Detectors	Incorrect temperature rating	Rating < 25°F above maximum expected ambient temperature.	17.6.3
Pull Stations	Mounted outside 42–54 inch AFF range	Measure with tape measure; flag if out of compliance.	17.14.5.2
Pull Stations	Label faded or illegible	Cannot read "FIRE ALARM PULL STATION" from 10 feet.	10.16.3
Duct Detectors	Sampling tube too short or misaligned	Does not span full duct width; air direction arrow reversed.	17.7.5.5
Waterflow Switches	Missing junction box cover	Exposed wiring and splices.	760.142

9.3 Notification Appliance Deficiencies

Category	Deficiency	Consequence	NFPA 72 Reference
Audible	Horn/strobe below 80 inches AFF	Sound pressure too low to meet 15 dBA above ambient requirement.	18.5.5.4
Audible	Measured dBA below code minimum	Occupants cannot hear alarm signal over ambient noise.	18.4.3
Visible	Wrong candela rating for room size	Strobe flash may not be visible across the required coverage area.	18.5.5.4.1
Visible	Strobes not synchronized	Multiple strobes flashing out of sequence create disorientation risk.	18.5.5.5

Category	Deficiency	Consequence	NFPA 72 Reference
Speaker	Distorted or reduced audio output	Pre-recorded voice message not intelligible for evacuation guidance.	24.4.4
General	Device housing not red/fire-alarm color	Occupants may confuse with security or HVAC system device.	10.10.1

9.4 Power Supply and Battery Deficiencies

Deficiency	Description	Corrective Action	NFPA 72 Reference
Battery voltage below minimum	Measured below 12.0 V at rest or below 11.8 V under 5-minute load.	Replace both batteries as a matched pair with same date code.	10.6.10
Battery age exceeded	Date code shows battery older than manufacturer recommended life.	Replace; attach new date-code label inside cabinet door.	10.6.10.3
No AC fail trouble generated	Loss of primary power does not produce panel trouble signal.	Verify primary power supervision wiring; reconfigure if needed.	10.6.9
Non-dedicated breaker	Fire alarm circuit shared with lighting or convenience receptacles.	Dedicate a separate breaker; label accordingly.	10.6.5
Unsecured battery terminals	Battery leads loose, corroded, or improperly connected.	Clean terminals; apply anti-corrosion compound; resecure.	14.4.2

9.5 Wiring and Circuit Deficiencies

Category	Deficiency	NFPA/NEC Reference
Cable Type Violation	Non-listed cable (thermostat wire, THHN without raceway) used for fire alarm circuit.	NEC 760.49
Mixed Voltage	Fire alarm and 120 V power conductors in same conduit without listed barrier.	NEC 760.53(A)
Ground Fault	Open ground or no bond on metallic raceways.	NEC 760.136
Missing EOL Resistor	Circuit unsupervised; no trouble indication on open or short.	NFPA 72 14.4.2
Splice Outside Enclosure	Conductors spliced in open space or unsecured location.	NEC 760.142
No Cable Identification	Unmarked conductors make troubleshooting hazardous.	NFPA 72 7.7.2

9.6 Programming and Labeling Deficiencies

Deficiency	Description	Reference
Incorrect device address in programming	Device label in panel does not match physical device location or type.	NFPA 72 7.7.2.1
Annunciator zone names missing or incorrect	Zone labels do not match current building floor plan.	NFPA 72 10.16.6

Deficiency	Description	Reference
No event log available	Panel event history not printable or not downloaded before inspection.	NFPA 72 14.6.2
Firmware not current	Panel operating on outdated firmware; known reliability issues unpatched.	NFPA 72 10.5.2

9.7 Documentation Deficiencies

Deficiency	Example	Requirement
Missing previous inspection records	No evidence that annual testing was performed.	NFPA 72 14.6.2
Unsigned or incomplete report	Form lacks inspector signature or license number.	NFPA 72 7.7.2
Record of Completion absent	No formal acceptance document for post-installation system.	NFPA 72 7.5.6
Outdated as-built drawings	Drawings do not reflect renovations, device relocations, or new loops.	NFPA 72 7.5.5

9.8 Deficiency Resolution Protocol

For every identified deficiency, the following protocol applies:

32. Document the deficiency clearly: device ID, location, NFPA reference, description, and photographic evidence.
33. Classify severity: immediate (system impaired, fire watch required) or correctable (within 30 days or AHJ-specified timeframe).
34. Assign responsibility: determine whether the building owner or the fire alarm contractor is responsible for correction.
35. Set a correction deadline consistent with AHJ requirements.
36. Re-inspect after correction: physically verify the repair and update the deficiency log.
37. File the completed deficiency log and correction notice with the final inspection report.

✓ Always attach red "Re-Inspection Required" tags to devices with unresolved deficiencies. Never leave a deficient device untagged. The tag creates a chain of custody that protects the inspector and compels the building owner to act.

Chapter 10: Final Reports and Certificates

FIRE ALARM & EMERGENCY COMMUNICATION SYSTEM ACCEPTANCE TEST FORM NFPA 72 COMPLIANT						
PROJECT INFORMATION PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM LOCATION: — DATE: MAY 24, 2024 CONTRACTOR: APPLIED ENGINEERING GROUP TESTED BY: _____ WITNESSED BY: _____	SYSTEM INFORMATION SYSTEM TYPE: ADDRESSABLE FACP LOCATION: IDF-1 – LEVEL 1 FACP MODEL: NOTIFIER NFS2-640 FACP S/N: NFS2-640-123456 SOFTWARE VERSION: V3.0 TOTAL POINTS: 214 INPUT / 156 OUTPUT SIGNALING LINE CIRCUITS: 4 (CLASS B) NOTIFICATION CIRCUITS: 12 (CLASS B) NAC POWER: 24 VDC, 20 A PER NAC BATTERY BACKUP: 24 HRS STANDBY	TEST REQUIREMENTS ALL TESTS SHALL COMPLY WITH: • NFPA 72, 2019 EDITION • PROJECT SPECIFICATIONS • MANUFACTURER'S REQUIREMENTS TEST METHODOLOGY: FUNCTIONAL TESTS PER NFPA 72 CHAPTER 14 AND PROJECT SPECS. DEFICIENCIES SHALL BE RESOLVED AND RE-TESTED PRIOR TO ACCEPTANCE.	RESULTS LEGEND ☒ P PASS ☐ F FAIL ☐ NA NOT APPLICABLE COMMENTS / DEFICIENCIES REQUIRE RE-TEST AND APPROVAL.			
SECTION	DESCRIPTION	TEST PROCEDURE / CRITERIA	RESULT	COMMENTS / DEFICIENCIES		
1.00	DOCUMENTATION REVIEW • Shop Drawings / As-Builts • Calculations • O&M Manuals • Device Listings / Certificates	Verify all required documentation is complete, current, and in compliance with NFPA 72 and project requirements.	☒ P ☐ F ☐ NA			
2.00	VISUAL INSPECTION • Installation • Mounting / Clearances • Labeling / Identification • Wiring / Conduit	Verify system components are installed in accordance with drawings, specifications, and NFPA 72.	☒ P ☐ F ☐ NA			
3.00	POWER SUPPLY TEST • Primary AC Power • Battery Backup • Grounding	Verify AC power present, battery connected and charging, and ground continuity. Verify system operates on battery power for minimum 24 hours.	☒ P ☐ F ☐ NA			
4.00	FACP OPERATION • Normal Operation • LCD Display / Controls • Time / Date	Verify FACP indicates normal condition. Verify display, controls, time, and date operate correctly.	☒ P ☐ F ☐ NA			
5.00	INITIATING DEVICE TEST • Smoke Detectors • Heat Detectors • Manual Stations • Waterflow Switches • Sprinkler Supervisory	Activate each initiating device. Verify correct point identification at FACP. Verify appropriate outputs occur.	☒ P ☐ F ☐ NA			
6.00	SIGNALING LINE CIRCUITS • SLC Supervision • Open / Short Conditions • Ground Fault	Simulate open, short, and ground fault conditions. Verify trouble indications at FACP.	☒ P ☐ F ☐ NA			
7.00	NOTIFICATION APPLIANCE TEST • Audible Appliances • Visible Appliances • Synchronization	Activate each NAC circuit. Verify all notification appliances operate correctly and are synchronized.	☒ P ☐ F ☐ NA			
8.00	OUTPUT / RELAY TEST • Control Relays • Door Holders • Elevator Recall • HVAC Shutdown • Fire Pump Start	Verify each programmed output / relay operates as intended. Verify correct sequence and timing.	☒ P ☐ F ☐ NA			
9.00	FIRE ALARM SIGNAL VERIFICATION • General Alarm • Alarm Transmission • Remote Annunciation	Verify general alarm occurs. Verify alarm signal received at remote annunciator(s) and monitoring station.	☒ P ☐ F ☐ NA			
10.00	TROUBLE SIGNAL VERIFICATION • System Troubles • Supervisory Signals	Verify trouble conditions are annunciated at FACP and transmitted as required.	☒ P ☐ F ☐ NA			
11.00	EMERGENCY COMMUNICATION SYSTEM • Master Station • Sub-Stations • Speaker / Microphone • Audible / Visual Signals	Verify two-way communication between master station and all sub-stations. Verify audible and visible signals per NFPA 72.	☒ P ☐ F ☐ NA			
12.00	SYSTEM FUNCTIONS TEST • Cause-and-Effect Sequences • Delays • Cross-Zones	Verify all cause-and-effect sequences operate as designed. Verify all delays and cross-zone functions.	☒ P ☐ F ☐ NA			
13.00	FINAL SYSTEM TEST • Complete System Test • Verify All Functions	Perform complete end-to-end system test. Verify all functions operate in accordance with requirements.	☒ P ☐ F ☐ NA			
TEST RESULT (CHECK ONE) ☐ SYSTEM ACCEPTED ALL TESTS PASSED. SYSTEM ACCEPTED. ☐ SYSTEM ACCEPTED WITH DEFICIENCIES DEFICIENCIES NOTED SHALL BE CORRECTED AND RE-TESTED. ☐ SYSTEM NOT ACCEPTED MAJOR DEFICIENCIES EXIST. SYSTEM NOT ACCEPTED.		DEFICIENCIES / COMMENTS (Use additional sheets if necessary) _____ _____ _____ _____		CERTIFICATION I certify that the fire alarm and emergency communication system has been tested in accordance with NFPA 72, the project specifications, and manufacturer's requirements, and the results are as recorded above. TESTED BY: _____ SIGNATURE: _____ DATE: _____ WITNESSED BY: _____ SIGNATURE: _____ DATE: _____		
PROJECT MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	DESIGNER OF RECORD APPLIED ENGINEERING GROUP	DRAWING TITLE ACCEPTANCE TEST FORM	DRAWING NO. FA-060	SHEET 1 OF 1	DATE MAY 24, 2024	REV 0

NFPA 72-compliant acceptance test form (FA-060) documenting system-level test criteria, pass/fail results, deficiency findings, and inspector certification statements for AHJ submission.

10.1 The Inspection Report as a Legal Document

The final inspection report is the official record that certifies a fire alarm system has been inspected, tested, and maintained in accordance with NFPA 72. It is a legally enforceable document that can be subpoenaed in fire investigations, insurance disputes, and professional liability proceedings. Every entry must be accurate, every deficiency must be cited, and every signature must be authentic.

10.2 Report Structure

Section	Content	Importance
Cover Page	Project name, address, inspection date, inspector firm and license, system description.	Identifies the inspection event; first page reviewed by AHJ.
Executive Summary	Scope of inspection, NFPA edition, general findings, overall system status.	Provides decision-makers with immediate overview.
System Information	FACP type/model/S/N, device counts, power supply data, communication path description.	Documents system identity for future comparison.
Test Results Summary	Tabulated pass/fail totals by category; individual device results when required.	Primary technical content; basis for pass/fail determination.
Deficiency Summary	All deficiencies with device ID, NFPA citations, severity, and correction status.	Drives corrective action and re-inspection.
Corrective Actions	Descriptions of repairs made during the inspection visit.	Documents same-day corrections for AHJ credit.
Supporting Documentation	Calibration certificates, photos, signal transmission log, monitoring certificate.	Substantiates test results; required by many AHJs.
Certification and Signatures	Inspector, building owner/representative, and AHJ sign-off.	Legally validates the inspection.

FIRE ALARM & EMERGENCY COMMUNICATION SYSTEM INSPECTION & TESTING REPORT

NFPA 72 COMPLIANT

PROJECT INFORMATION	SYSTEM INFORMATION	REPORT INFORMATION	RESULTS SUMMARY
PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM LOCATION: 123 BUSINESS PARK DRIVE ANYTOWN, ST 12345 DATE: MAY 24, 2024 CONTRACTOR: APPLIED ENGINEERING GROUP TECHNICIAN(S): J. SMITH / R. JOHNSON WEATHER / CONDITIONS: 72°F / CLEAR	SYSTEM TYPE: ADDRESSABLE FACP LOCATION: IDF-1 - LEVEL 1 FACP MODEL: NOTIFIER NFS2-640 FACP S/N: NFS2-640-123456 SOFTWARE VERSION: V3.0 TOTAL POINTS: 214 INPUT / 156 OUTPUT SIGNALING LINE CIRCUITS: 4 (CLASS B) NOTIFICATION CIRCUITS: 12 (CLASS B) NAC POWER: 24 VDC, 20 A PER NAC BATTERY BACKUP: 24 HRS STANDBY	REPORT NO.: ITR-240524-01 INSPECTION / TEST DATE(S): MAY 22 - MAY 24, 2024 SCOPE: COMPLETE SYSTEM INSPECTION, TESTING, AND VERIFICATION PER NFPA 72 AND PROJECT SPECIFICATIONS. TEST METHOD: FUNCTIONAL TESTING	TOTAL INSPECTION ITEMS: 78 PASSED: 74 FAILED: 2 NOT APPLICABLE: 2 OVERALL RESULT: ☒ PASS ☐ FAIL ☐ CONDITIONAL

ITEM NO.	INSPECTION / TEST ITEM	REFERENCE (NFPA 72)	REQUIREMENT / TEST PROCEDURE	RESULT	COMMENTS / DEFICIENCIES
1	DOCUMENTATION REVIEW	7.4	Verify all required documentation is available, current, and accurate.	☒ PASS ☐ FAIL ☐ N/A	—
2	VISUAL INSPECTION	7.4.1	Verify installation, labeling, wiring, and device placement per drawings and requirements.	☒ PASS ☐ FAIL ☐ N/A	—
3	POWER SUPPLY / BATTERY	10.6	Verify AC power present, battery connected, and system operates on battery for minimum 24 hours.	☒ PASS ☐ FAIL ☐ N/A	Voltage: 27.2 VDC Load Test: 24 hr 15 min
4	FACP OPERATION	7.4.2	Verify indicator lights, display, controls, and internal functions operate correctly.	☒ PASS ☐ FAIL ☐ N/A	All functions normal
5	INITIATING DEVICE TEST	14.4	Test all initiating devices for proper alarm transmission and point identification.	☒ PASS ☐ FAIL ☐ N/A	All devices tested
6	SIGNALING LINE CIRCUITS	10.5	Test open, short, and ground conditions. Verify trouble indications at FACP.	☒ PASS ☐ FAIL ☐ N/A	All SLCs normal
7	NOTIFICATION APPLIANCE TEST	18.4	Test all notification appliances for operation and proper supervision.	☒ PASS ☐ FAIL ☐ N/A	All appliances functional
8	OUTPUT / RELAY TEST	18.5	Verify all control outputs / relays operate as programmed.	☒ PASS ☐ FAIL ☐ N/A	All relays operated
9	FIRE ALARM SIGNAL VERIFICATION	7.4.3	Verify alarm signal received at remote supervising station and monitoring.	☒ PASS ☐ FAIL ☐ N/A	Signal received at Central Station
10	TROUBLE SIGNAL VERIFICATION	7.4.3	Verify trouble signals are transmitted and displayed at FACP and remote station.	☐ PASS ☒ FAIL ☐ N/A	AC Loss Trouble not received at Central Station. See Deficiency #1.
11	EMERGENCY COMMUNICATION SYSTEM	24.4	Test two-way communication between all master station and sub-stations.	☒ PASS ☐ FAIL ☐ N/A	All circuits normal
12	MASS NOTIFICATION SYSTEM	24.6	Verify messages audible, intelligible, and synchronized as required.	☒ PASS ☐ FAIL ☐ N/A	All zones within requirements

DEFICIENCIES / OBSERVATIONS

- AC Loss Trouble signal not received at Central Station.
Cause: Incorrect programming of trouble report code.
Corrective Action: Reprogrammed and retested - Passed.
- Corridor Horn Speaker on Level 5 not secured properly.
Cause: Loose mounting bracket.
Corrective Action: Tightened and retested - Passed.
-
-
-

NOTES

- System tested in accordance with NFPA 72, 2019 Edition, and project specifications.
- All testing performed using calibrated instruments.
- All devices were in normal condition at time of test.
- Any deficiencies have been corrected and retested unless otherwise noted.

TEST EQUIPMENT USED

EQUIPMENT	MANUFACTURER	MODEL	SERIAL NO.	CAL DUE DATE
Multimeter	Fluke	117	56820345	11/15/2024
Battery Analyzer	Midtronics	MDX-600	B1234567	10/20/2024
Smoke Tester	Solo	330	S330-7891	09/30/2024
Sound Level Meter	Extech	407730	170800456	12/01/2024

CONTRACTOR / TESTER

I certify that the above identified system was inspected, tested, and verified in accordance with NFPA 72 and the project specifications.

NAME: JAMES SMITH
SIGNATURE: James Smith
TITLE: NICET Level IV - Fire Alarm Systems
DATE: MAY 24, 2024

OWNER / REPRESENTATIVE

I acknowledge receipt of this Inspection & Testing Report and that the system has been demonstrated as operational.

NAME: MICHAEL BROWN
SIGNATURE: Michael Brown
TITLE: FACILITY MANAGER
DATE: MAY 24, 2024

AHJ / INSPECTOR (if applicable)

Review of this report and field verification of the system was completed.

NAME: _____
SIGNATURE: _____
TITLE: _____
DATE: _____

PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	DRAWING / SYSTEM REF: FA SERIES / ECS SERIES	REPORT TITLE: INSPECTION & TESTING REPORT	REPORT NO.: ITR-240524-01	PAGE: 1 OF 1	REV: 0
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NFPA 72-compliant fire alarm and emergency communication system inspection and testing report (ITR) showing test item descriptions, reference sections, test methods, and documented results.



FIRE ALARM & EMERGENCY COMMUNICATION SYSTEM INSPECTION & TESTING REPORT

NFPA 72 COMPLIANT

Report No.
ITR-2024-001
Date of Test
May 24, 2024

PROJECT INFORMATION		SYSTEM INFORMATION		TEST INFORMATION	
Project:	Multi-Story Commercial Building	FACP Location:	IDF-1 - Level 1	Date(s) of Inspection:	May 22 - May 24, 2024
Location:	—	FACP Model:	Notifier NFS2-640	Start Time:	08:30 AM
Address:	—	FACP S/N:	NFS2-640-123456	End Time:	04:45 PM
Contractor:	Applied Engineering Group	Total Points:	214 Input / 156 Output	Weather / Conditions:	Indoor
Project No.:	P-2401	SL Circuits:	4 (Class B)	Test Performed By:	John Smith (NICET III #123456)
System Type:	Addressable FACP	Notification Circuits:	12 (Class B)	Assisted By:	Mike Brown (NICET II #789012)
Standard:	NFPA 72 (2019 Edition)	NAC Power:	24 VDC, 20 A per NAC	Witness / Owner Rep.:	Steve Johnson
		Battery Backup:	24 Hrs Standby	Purpose:	☒ New System ☐ Periodic ☒ Acceptance

ITEM NO.	INSPECTION / TEST DESCRIPTION	REFERENCE (NFPA 72)	TEST METHOD / CRITERIA	RESULT			REMARKS / DEFICIENCIES
				PASS	FAIL	NA	
1.0	Documentation Review (Drawings, O&M, Certificates)	72-24.14	Verify complete, current and compliant	✓			Complete
2.0	Visual Inspection - Installation & Mounting	72-14.4	Verify per plans, clearances, labeling	✓			No deficiencies
3.0	Power Supply - AC Power	72-10.6	Verify primary power present, polarity	✓			120 VAC Normal
4.0	Battery Backup	72-10.6.3	Verify battery voltage 24 VDC, charged	✓			24.6 VDC Normal
5.0	Fire Alarm Control Panel Operation	72-14.4	Verify LCD, time/date, indicators, keys	✓			All functions normal
6.0	Initiating Devices Test	72-14.4	Test each device, verify correct point ID	✓			All points OK
7.0	Notification Appliances Test (Audible/Visual)	72-18.4	Verify operation; dBA & candela per design	✓			All NACs tested
8.0	Speaker / ECS System Test	72-24.4	Verify intelligibility & volume at all areas	✓			Avg. 72 dBA / Clarity 0.75
9.0	Strobe / Visual Appliance Test	72-18.5	Verify candela output at rated locations	✓			All within range
10.0	Control Relays & Outputs	72-14.4	Verify each relay/output energizes correctly	✓			All relays OK
11.0	Supervisory Signal Test	72-14.4	Open circuits / missing devices	✓			All supervised OK
12.0	Trouble Signal Verification	72-14.4	Simulate troubles; verify annunciation	✓			All troubles annunciated
13.0	Network / Communication Test	72-24.5	Verify device communication & latency	✓			All devices online
14.0	Emergency Communication System (ECS)	72-24.4	Two-way communication; audibility	✓			ECS operational
15.0	Functional Test (Cause & Effect)	72-14.4	Verify sequences, cross-zones, delays	✓			All sequences OK

TEST RESULTS SUMMARY		DEFICIENCIES / CORRECTIVE ACTIONS (If Any)				RESULT SUMMARY CHART	
Total Items Tested	15	Item No.	Description of Deficiency	Corrective Action Taken	Date Closed	 100% PASS	Passed (15) Failed (0) N/A (0)
Passed	15						
Failed	0						
Not Applicable	0						
Overall Result	PASS		--- NONE ---				

TEST EQUIPMENT USED				GENERAL NOTES	
Equipment / Instrument	Make / Model	Serial No.	Calibration Due Date	- All testing performed in accordance with NFPA 72 (2019 Edition). - All devices were tested through FACP and by manual activation. - All results are true and correct at time of testing. - System is fully functional as designed unless noted otherwise. - Report contains inspection and test results for entire system.	
Digital Multimeter	Fluke 87V	9876543	02/12/2025		
Sound Level Meter	Extech 407730	SML-11234	03/15/2025		
Candela Meter	Sekonic C-7000	CMD-55678	03/01/2025		
Battery Load Tester	Midtronics MDX-640	BLT-33445	01/28/2025		

TESTED BY	ASSISTED BY	WITNESSED BY (Owner/Rep.)	APPROVED BY (Contractor)	 SYSTEM ACCEPTED All Tests Passed
<i>John Smith</i>	<i>Mike Brown</i>	<i>Steve Johnson</i>	<i>David Lee</i>	
John Smith NICET III #123456 Date: May 24, 2024	Mike Brown NICET II #789012 Date: May 24, 2024	Steve Johnson Date: May 24, 2024	David Lee Project Manager Date: May 24, 2024	

Completed inspection and testing report showing all 15 test items passed, zero deficiencies, equipment information, test equipment used, and multi-party signatures with SYSTEM ACCEPTED certification.

10.3 System Status Classifications

Status	Definition	AHJ Implication
PASS	All required tests completed; all devices operational; no uncorrected deficiencies.	Report accepted as submitted; certificate issued.
PASS WITH COMMENTS	All systems functional; minor non-critical items noted; building safe for occupancy.	Certificate issued; comments may require written response or scheduled correction.
FAIL	One or more critical deficiencies prevent certification; system not in code compliance.	Certificate withheld; re-inspection required after all deficiencies are corrected.

10.4 Certificate of Inspection Template

The Certificate of Inspection (COI) is the summary document that formally attests to the system's compliance status following inspection. It is issued by the inspector and accepted by the AHJ.

Field	Example Entry
Building Name	Ridgewood Plaza Medical Center
Address	301 Prospect Avenue, Ridgewood NJ 07450
System Type	Addressable – Siemens FCC2025
Inspection Date	October 22, 2025
Inspector	James L. Rodriguez – PEN – License NJ-FA-6712
NICET Level	NICET Level III – Fire Alarm Systems
NFPA Edition	NFPA 72 (2022), NEC Article 760 (2023)
Result	PASS WITH COMMENTS
Comments Addressed	Battery replacement completed on site; label correction scheduled within 30 days.
Inspector Signature	_____ Date: _____
Owner / Rep. Signature	_____ Date: _____
AHJ Approval	_____ Date: _____

10.5 Record of Completion (ROC) Requirements

The Record of Completion is issued after initial installation or any major system modification. NFPA 72 (Section 7.5.6) mandates its content:

- System type, manufacturer, and model numbers.
- Installation firm name, license number, and responsible party.
- Complete device inventory by zone or SLC loop.
- Power supply ratings, battery sizes, and secondary power capacity calculations.
- Signaling pathway description and communication path identification.
- Signatures of the installing contractor, building owner, and AHJ.
- Date of final acceptance test.

10.6 AHJ Submission Checklist

#	Requirement	Complete ✓
1	All forms include project name, address, and date.	
2	NFPA edition identified on cover page.	
3	All deficiencies listed with NFPA article citations.	
4	Corrective actions documented with completion dates.	
5	Inspector name, license number, and signature present.	
6	Owner or authorized representative signature obtained.	
7	Calibration certificates attached for all test instruments.	
8	Signal transmission log from monitoring station attached.	
9	System status clearly stated (PASS/PASS WITH COMMENTS/FAIL).	
10	Digital PDF submitted to AHJ portal or email per jurisdiction requirement.	

10.7 Archiving and Retention

Proper record retention protects all parties in the event of future audits, fire events, or legal proceedings. Apply the following retention standards:

- NFPA 72 minimum: retain inspection and test records for at least one full testing cycle, or as required by the local AHJ.
- Best practice for commercial buildings: retain a minimum of 3–5 years.
- Electronic archive: organize by Year > Building Name > System Type. Use PDF format with embedded metadata.
- Physical binder on site: store hard copy in the FACP cabinet or fire command center, accessible to AHJ at all times.
- Backup protocol: maintain at least one off-site backup (cloud or external server) of all inspection records.

✓ Many property insurance policies require on-site retention of the last two inspection reports. Verify the specific requirement with the building's insurer, as failure to produce records may affect claim eligibility after a fire event.

PART IV

SAMPLE INSPECTION SCENARIOS

Residential • Commercial • High-Rise • Warehouse and Industrial

Chapter 11: Residential Building Inspection Example

11.1 Scenario Overview

This chapter presents a complete inspection walkthrough for a 4-story multi-unit residential apartment building (R-2 occupancy). The installed system is a conventional fire alarm panel with four initiating device zones and a common notification appliance circuit. This scenario illustrates the standard inspection workflow from pre-planning through report submission.

11.2 Building Profile

Attribute	Description
Occupancy Type	R-2 Residential Apartment (40 units, 4 stories)
Total Area	~40,000 sq ft (10,000 per floor)
Construction	Type I non-combustible
System Type	Conventional, 4-zone panel (Notifier NFW-50)
Primary Power	120 V AC dedicated circuit; labeled breaker
Secondary Power	24 V DC, 7.2 Ah battery pair; 24-hour standby capacity
Supervision	Central monitoring via dual-path (IP primary + cellular backup)
Previous Inspection	Annual inspection 11 months prior; 2 minor deficiencies corrected

11.3 Zone Configuration

Zone	Area Served	Device Types
Zone 1	Basement and mechanical rooms	Smoke detectors, heat detectors, waterflow switch
Zone 2	First floor lobbies, corridors, and mail room	Smoke detectors, manual pull stations, horn/strobes
Zone 3	Second and third floor corridors	Smoke detectors, manual pull stations, horn/strobes
Zone 4	Fourth floor and roof access stair	Smoke detectors, manual pull stations, horn/strobes

11.4 Pre-Inspection Activities

One day before the inspection:

- Reviewed last year's inspection report. Two deficiencies (battery replacement and faded pull station label) were both confirmed corrected.
- Verified monitoring station account and placed a reminder call to put system on test at 08:30.
- Confirmed access with building manager; requested master key for all mechanical rooms.
- Posted tenant notification of testing scheduled for 09:00–15:00.

11.5 Visual Inspection Findings

Component	Finding	Action Required
FACP	Cabinet secure; AC breaker labeled; all zone LEDs normal; grounding verified.	Pass
Batteries	13.4 VDC each at float; date code shows 3.5 years—acceptable.	Pass
Conduit / Wiring	Conduits intact; FPLR cable markings visible; all junction boxes covered.	Pass
Smoke Detectors	Zones 1–4 visually clear; spacing verified on drawings; no obstructions.	Pass
Pull Stations	Zone 2: Two pull stations at correct height (48 in.); labels legible.	Pass
Pull Stations	Zone 3: Pull station near unit 312 label faded—barely legible.	Replace label
Horn/Strobes	Zones 2–4: Mounted at 84 in.; candela rating 15 cd; synchronization module present.	Pass
Annunciator	Located at main entrance; all zone labels match drawings.	Pass

FIRE ALARM SYSTEM – VOICE EVACUATION CIRCUIT SCHEDULE

ZONE NO.	ZONE NAME / DESCRIPTION	EVAC FUNCTION	AUDIO AMPLIFIER ASSIGNMENT		SPEAKER CIRCUIT (70V / 25V)				SPEAKER INFORMATION		CABLE INFORMATION		MONITOR MODULE ID	NOTES
			AMPLIFIER ID	LOCATION	RATED POWER (W)	CIRCUIT ID (NAC)	VOLTAGE (V)	MAX. LOAD (W)	CONNECTED LOAD (W)	SPEAKER COUNT	SPKR. TYPE	CABLE TYPE	AWG	
1	FLOOR 1 – NORTH WING CORRIDORS & COMMON AREAS	EVAC + ALERT	AMP-1	ELEC. ROOM 1ST FLOOR	500	NAC-VA-1	70	500	235	28	SPKR	FPLR	14	MM-VA-1
2	FLOOR 1 – SOUTH WING CORRIDORS & COMMON AREAS	EVAC + ALERT	AMP-1	ELEC. ROOM 1ST FLOOR	500	NAC-VA-2	70	500	290	34	SPKR	FPLR	14	MM-VA-2
3	FLOOR 2 – NORTH WING CORRIDORS & COMMON AREAS	EVAC + ALERT	AMP-2	ELEC. ROOM 2ND FLOOR	500	NAC-VA-3	70	500	310	36	SPKR	FPLR	14	MM-VA-3
4	FLOOR 2 – SOUTH WING CORRIDORS & COMMON AREAS	EVAC + ALERT	AMP-2	ELEC. ROOM 2ND FLOOR	500	NAC-VA-4	70	500	285	33	SPKR	FPLR	14	MM-VA-4
5	FLOOR 3 – NORTH WING CORRIDORS & COMMON AREAS	EVAC + ALERT	AMP-3	ELEC. ROOM 3RD FLOOR	500	NAC-VA-5	70	500	300	35	SPKR	FPLR	14	MM-VA-5
6	FLOOR 3 – SOUTH WING CORRIDORS & COMMON AREAS	EVAC + ALERT	AMP-3	ELEC. ROOM 3RD FLOOR	500	NAC-VA-6	70	500	270	32	SPKR	FPLR	14	MM-VA-6
7	PARKING LEVEL 1	EVAC + ALERT	AMP-4	ELEC. ROOM P1	500	NAC-VA-7	70	500	260	30	SPKR	FPLR	14	MM-VA-7
8	PARKING LEVEL 2	EVAC + ALERT	AMP-4	ELEC. ROOM P1	500	NAC-VA-8	70	500	245	28	SPKR	FPLR	14	MM-VA-8
9	PENTHOUSE / ROOF LEVEL	EVAC + ALERT	AMP-5	ELEC. ROOM ROOF	250	NAC-VA-9	70	250	120	12	SPKR	FPLR	14	MM-VA-9
10	ELEVATOR LOBBIES (ALL FLOORS)	ALERT ONLY	AMP-6	ELEC. ROOM 1ST FLOOR	250	NAC-VA-10	70	250	110	10	SPKR	FPLR	14	MM-VA-10
11	STAIRWELLS (ALL FLOORS)	EVAC + ALERT	AMP-6	ELEC. ROOM 1ST FLOOR	250	NAC-VA-11	70	250	130	14	SPKR	FPLR	14	MM-VA-11
12	TOILETS & SMALL ROOMS	ALERT ONLY	AMP-6	ELEC. ROOM 1ST FLOOR	250	NAC-VA-12	70	250	90	9	SPKR	FPLR	14	MM-VA-12
TOTALS									2,950 W	311 W				

SPKRS

CEILING MOUNT SPEAKER

SPKRS

SURFACE MOUNT SPEAKER

SPKR-ST

CEILING SPEAKER-STROBE

SPKR/WP

WEATHERPROOF SPEAKER

EVAC

VOICE EVACUATION

ALERT

VOICE ALERT ONLY

EVAC + ALERT

VOICE EVACUATION AND ALERT

FPLR

FIRE POWER LIMITED

FPLR

RATED CABLE

FPLX

FIRE POWER LIMITED

FPLX

RATED CABLE (EXTERIOR)

MM

MONITOR MODULE (SPEAKER CIRCUIT)

NAC

NOTIFICATION APPLIANCE CIRCUIT

EVAC

EVACUATION

ALERT

ALERT ONLY

VDC

VOLTS DC

W

WATTS

AWG

AMERICAN WIRE GAUGE

NOTES

1. ALL VOICE EVACUATION SPEAKER CIRCUITS ARE SUPERVISED FOR OPEN, SHORT, AND GROUND FAULTS.

2. SYSTEM OPERATES AT 70V DISTRIBUTED SPEAKER CIRCUITS.

3. SPEAKER COUNT IS BASED ON CONNECTED LOADS PER MANUFACTURER CALCULATIONS.

4. REFER TO FLOOR PLANS FOR EXACT SPEAKER LOCATIONS.

5. VOICE EVACUATION SYSTEM COMPLIES WITH NFPA 72, NFPA 70, AND IBC REQUIREMENTS.

ABBREVIATIONS

NAC

NOTIFICATION APPLIANCE CIRCUIT

EVAC

EVACUATION

ALERT

ALERT ONLY

VDC

VOLTS DC

W

WATTS

AWG

AMERICAN WIRE GAUGE

PROJECT:

MULTI-STORY COMMERCIAL BUILDING

FIRE ALARM AND EMERGENCY

COMMUNICATION SYSTEM

DESIGNER OF RECORD:

Applied Engineering Group

DRAWING TITLE:

VOICE EVACUATION CIRCUIT SCHEDULE

SPEAKER ZONES AND AMPLIFIER ASSIGNMENTS

DRAWING NO.:

FA-028

SHEET:

1 OF 1

DATE:

MAY 24, 2024

REV:

0

Voice evacuation circuit schedule (FA-028) showing speaker zone assignments, amplifier channel allocations, circuit class designations, and cable types for multi-floor notification.

11.6 Functional Test Results

Device / Function	Location	Test Method	Result
Smoke Detector SD-01	Zone 1 Boiler Room	Aerosol aerosol application	Alarm: Zone 1 displayed correctly
Smoke Detector SD-07	Zone 2 Lobby	Aerosol application	Alarm: Zone 2 displayed correctly
Pull Station PS-02	Zone 2 Exit Door	Manual activation	Alarm: Zone 2; mechanical reset OK
Pull Station PS-05	Zone 3 Stair A	Manual activation	Alarm: Zone 3; reset key OK
Heat Detector HD-03	Zone 1 Mechanical	Heat gun at 135°F	Alarm: Zone 1; reset after cooling
Horn/Strobe HS-04	Zone 2 Corridor	Alarm activation	89 dBA at 10 ft; strobe synchronized
Elevator Recall	Lobby Zone 2	SD-07 activation	Elevator returned to Level 1; Phase I recall confirmed
Battery Test	Main Panel	AC disconnect; 5-min load	13.1 V each; above minimum 11.8 V
Signal Transmission	Central Monitoring	Alarm activation	Alarm received in 28 seconds; supervisory in 19 seconds

11.7 Deficiency Log

Def. #	Description	NFPA Reference	Action	Deadline
001	Pull station label faded near unit 312.	NFPA 72 10.16.3	Replace with engraved laminate label.	Within 30 days
002	Smoke detector Zone 1 dusty—cleaned during inspection.	NFPA 72 14.4.3.2.2(1)	Cleaned and re-tested; confirmed functional.	Completed at inspection

11.8 Inspection Summary

Result: PASS WITH COMMENTS. All four zones tested functional. Elevator recall and signal transmission verified. Two minor items—one corrected on-site, one scheduled within 30 days. System restored to normal at 14:35. Building manager and monitoring station notified. Inspection report and deficiency notice delivered to building manager at time of inspection.

11.9 Key Lessons from This Scenario

- Always verify elevator recall in residential buildings with elevators—it is frequently missed in residential inspections and commonly cited by AHJs.
- Coordinate occupant notification carefully in occupied residential buildings; unexpected horn/strobe testing can create panic.
- Check smoke detector date codes in residential buildings; 10-year replacement cycles are commonly missed in residential occupancies.
- Document monitoring station signal transmission times on every inspection—dual-path verification is a specific IFC and NFPA 72 requirement.

Chapter 12: Commercial Office Building Inspection Example

12.1 Scenario Overview

This chapter covers the annual inspection of a three-story commercial office building equipped with a networked, addressable fire alarm system. This scenario demonstrates programming verification, multi-loop device testing, and coordination for addressable system inspections.

12.2 Building Profile

Attribute	Description
Occupancy Type	Business (B) – Three-story office building
Total Area	60,000 sq ft (20,000 per floor)
System Type	Addressable – Notifier NFS-320 (2 networked panels: Node 1 + NCA-2)
SLC Loops	2 loops total; SLC-1 serves Floors 1–2; SLC-2 serves Floor 3 and mechanical
Total Devices	~350 (150 smoke, 25 heat, 30 pull stations, 80 horn/strobes, 20 modules, 45 speakers)
Communication	Dual-path: IP primary, cellular backup
Auxiliary Functions	Elevator recall, AHU shutdown (3 units), magnetic door release (12 doors)
Power	Dedicated 120 V AC per panel; 24 V DC with 33 Ah battery sets per panel

12.3 Pre-Inspection Programming Verification

Before functional testing, connect a laptop to the FACP and download the current programming file. Verify:

- Total device count in programming matches physical count (within ± 3 for newly added/removed devices noted in the as-built).
- Device labels in programming match as-built drawings.
- Network node IDs are correct (Node 1 = Master, NCA-2 = Annex).
- Control logic is consistent with the approved sequence of operations.
- Event log shows no unexplained troubles or alarms since previous inspection.

✓ Always archive the panel programming file to a secure folder at the start of each inspection. This preserves the pre-inspection system state in case of disputes about programming changes.

12.4 Functional Testing Summary

Device Category	Quantity Tested	Pass	Fail	NFPA 72 Reference
Smoke Detectors	150	150	0	14.4.3.2.2(1)
Heat Detectors	25	25	0	14.4.3.2.2(2)
Manual Pull Stations	30	30	0	14.4.3.2.4
Horn/Strobes	80	80	0	14.4.3.2.7
Control/Relay Modules	20	20	0	14.4.3.2.5

Device Category	Quantity Tested	Pass	Fail	NFPA 72 Reference
Power Supplies (both nodes)	4	4	0	10.6.10
Supervising Station Signals	3 types tested	All passed	0	26.6.3.2

12.5 Auxiliary Function Test Results

Function	Initiating Condition	Result	Time
Elevator Recall (Phase I)	Lobby smoke detector SD-101	Elevator returned to floor 1; Phase II enabled; recall lights illuminated.	< 5 seconds
AHU-1 Shutdown	Duct detector DD-201 (Return air AHU-1)	AHU fan stopped; alarm logged; fan restarted after panel reset.	< 3 seconds
AHU-2 Shutdown	Duct detector DD-202 (Supply air AHU-2)	AHU fan stopped; alarm logged.	< 3 seconds
Door Holders (12 doors)	General alarm activation	All 12 magnetic holders released; doors closed to latched position.	< 2 seconds
Voice System (all zones)	All-call from FCC	Pre-recorded message played clearly on all 3 floors; STI measured 0.61.	N/A

12.6 Signal Transmission Results

Signal Type	Path 1 (IP)	Path 2 (Cellular)	Max Time Allowed
Alarm	18 seconds	41 seconds	90 seconds – PASS
Trouble	14 seconds	38 seconds	90 seconds – PASS
Supervisory	22 seconds	45 seconds	90 seconds – PASS
Restore	11 seconds	29 seconds	No maximum specified – PASS

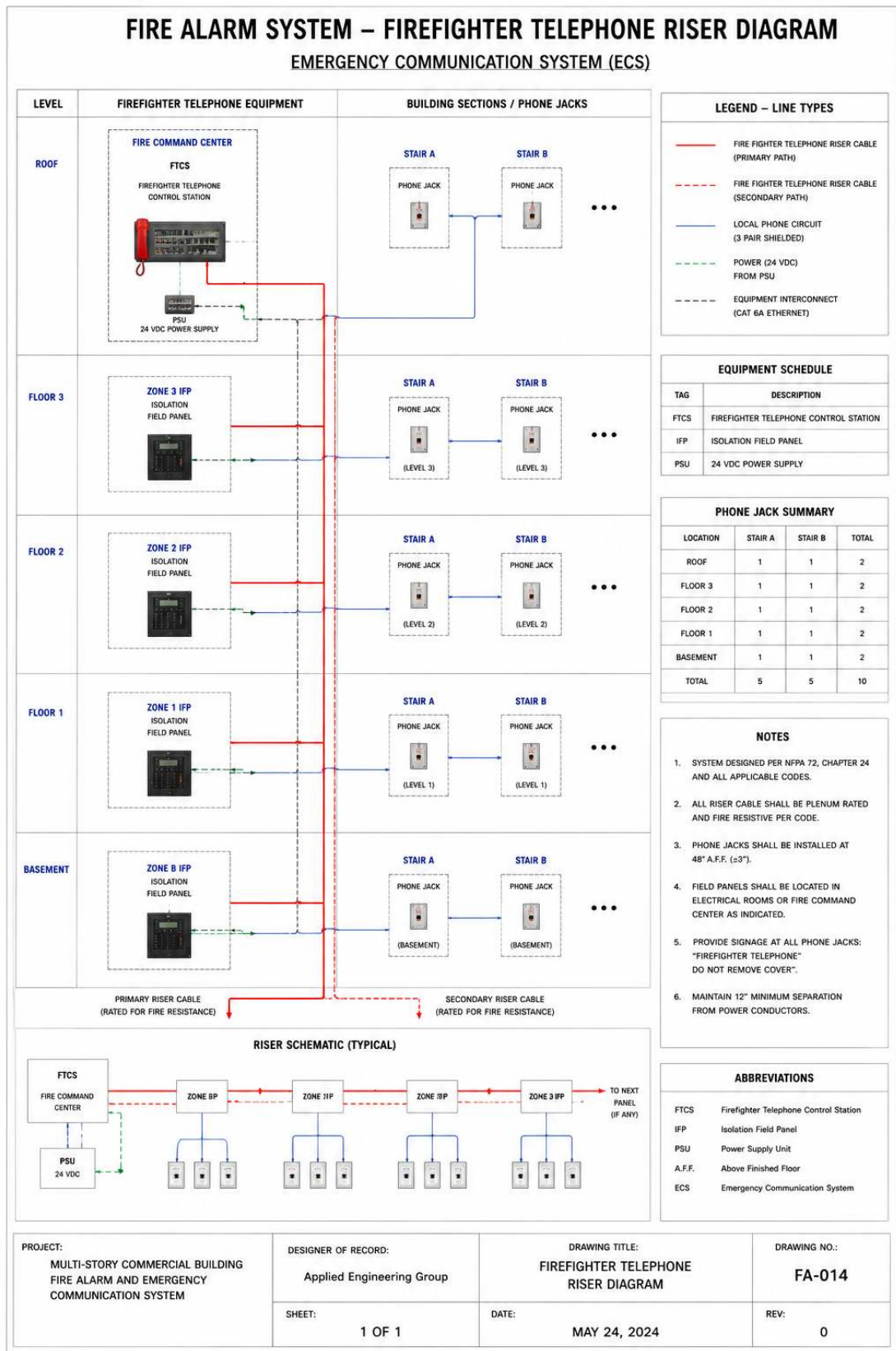
12.7 Deficiencies Found

Def. #	Description	NFPA Reference	Status
001	One control module label on Node 2, 3rd floor incorrect address designation.	NFPA 72 7.7.2.1	Corrected at inspection—re-labeled.
002	Elevator recall response delay measured at 3.5 seconds vs. 2-second design intent.	NFPA 72 21.4.3	Adjusted in programming during inspection. Re-tested: 1.8 seconds. Corrected.
003	Strobe lens (HS-233, Conference Room 301) visually dim during test.	NFPA 72 18.5.5.4.1	Replaced strobe head at inspection. Re-tested: candela verified.

12.8 Inspection Result

Result: PASS WITH COMMENTS. All 350 devices tested; zero outstanding deficiencies. All three deficiencies corrected on-site during inspection. System status confirmed normal. Network supervision verified by disconnecting NCA-2 momentarily to confirm Node 1 generates trouble. AHJ and monitoring station notified of inspection completion.

Chapter 13: High-Rise Building Inspection Example



Firefighter telephone riser diagram (FA-014) showing ECS telephone system floor-by-floor layout, handset locations, control panel connections, and circuit class designations.

13.1 High-Rise Inspection Challenges

High-rise buildings—those with occupied floors more than 75 feet above the lowest level of fire department access—require the most complex fire alarm inspection activities. These buildings typically integrate multiple networked FACP's, a fire command center (FCC), a voice/alarm communication system, smoke-control systems, firefighter telephone (ECS), elevator recall across multiple banks, and emergency generator backup. Inspection requires meticulous coordination, a two-person minimum team, and a methodical approach to the sequence of operations matrix.

13.2 Building Profile

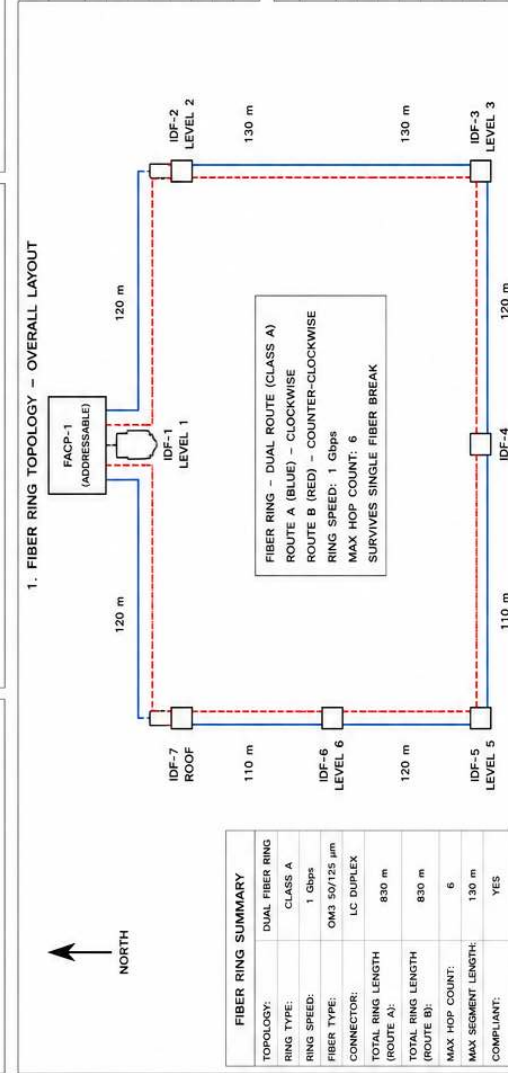
Attribute	Description
Building Type	35-story mixed-use tower (office floors 1–20; residential floors 21–35)
Total Area	~800,000 sq ft
System Type	Fully addressable network – Siemens FireFinder XL3
Network Nodes	5 FACP's + 1 Fire Command Center (FCC) on fiber optic ring
Initiating Devices	> 1,000 (smoke, heat, duct, pull, beam detectors; waterflow/tamper switches)
Notification	> 600 (horn/strobes + speaker/strobes for voice evacuation)
Auxiliary Controls	> 200 modules (elevator, stair pressurization fans, smoke dampers, HVAC, doors)
Emergency Power	Diesel generator with automatic transfer switch; 8-hour fuel supply

FIRE ALARM SYSTEM – FIBER RING DESIGN DRAWING

PROJECT INFORMATION		DESIGN CRITERIA	FIBER AND NETWORK NOTES	LEGEND	
PROJECT:	MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	1. NETWORK SHALL COMPLY WITH NFPA 72, 2019. 2. FIBER NETWORK SHALL BE A DUAL FIBER RING (CLASS A) TO SURVIVE A SINGLE OPEN. 3. FIBER TYPE: OM3 MULTIMODE, 50/125 μm. 4. RING SPEED: 1 Gbps. 5. MAX HOP COUNT BETWEEN ANY TWO DEVICES: 6 (RECOMMENDED). 6. ALL DEVICES SHALL BE COMPATIBLE WITH THE FIRE ALARM NETWORK.	- FIBER CABLE: 50/125 μm OM3 MULTIMODE - CONNECTORS: LC DUPLEX - INSTALLATION: IN CONDUIT / CABLE TRAY - MINIMUM BEND RADIUS: 2 in. / 50 mm - TESTING: PER TIA-568.3-D AND MANUFACTURER REQUIREMENTS - LABEL ALL FIBER PAIRS AT BOTH ENDS	FACP EXP EXP □ ○ --- ----	- FIRE ALARM CONTROL PANEL - NETWORK ANNUNCIATOR / EXPANDER - NETWORK NODE (FIBER INTERFACE MODULE) - FIBER SPLICER / TERMINATION - FIBER ROUTE A (CLOCKWISE) - FIBER ROUTE B (COUNTER-CLOCKWISE)

2. FIBER PATH SCHEDULE							
	FROM	TO	ROUTE A	ROUTE B	TOTAL (m)	CABLE COUNT	FIBER TYPE
	FACP-1 (IDF-1)	IDF-2 (L2)	120	120	240	(2)	OM3
	IDF-2 (L2)	IDF-3 (L2)	130	130	260	(2)	OM3
	IDF-3 (L3)	IDF-4 (L4)	120	120	240	(2)	OM3
	IDF-4 (L4)	IDF-5 (L4)	110	110	220	(2)	OM3
	IDF-5 (L5)	IDF-6 (L6)	120	120	240	(2)	OM3
	IDF-6 (L6)	IDF-7 (ROOF)	110	110	220	(2)	OM3
	IDF-7 (ROOF)	FACP-1 (IDF-1)	120	120	240	(2)	OM3
	TOTAL RING LENGTH		830	830	1,660	(2)	OM3

3. DEVICE SUMMARY				
DEVICE	LOCATION	QTY	NETWORK INTERFACE	NOTES
FACP-1	IDF-1 / LEVEL 1	1	BUILT-IN	RING MANAGER
IDF-2	LEVEL 2	1	NIM-1G	FIBER NODE
IDF-3	LEVEL 3	1	NIM-1G	FIBER NODE
IDF-4	LEVEL 4	1	NIM-1G	FIBER NODE
IDF-5	LEVEL 5	1	NIM-1G	FIBER NODE
IDF-6	LEVEL 6	1	NIM-1G	FIBER NODE
IDF-7	ROOF	1	NIM-1G	FIBER NODE
TOTAL DEVICES ON RING		7		



4. TYPICAL FIBER CONNECTION DETAIL (EACH NODE)

5. DESIGN NOTES

1. MAINTAIN FIBER POLARITY THROUGHOUT THE RING.
2. A SINGLE FIBER CUT WILL NOT INTERRUPT COMMUNICATIONS.
3. ALL FIBER CABLES SHALL BE PLENUM RATED.
4. SEPARATE FROM ELECTRICAL CIRCUITS PER NFPA 70.
5. TEST AND CERTIFY ALL FIBER LINKS AFTER INSTALLATION.

6. FIBER SPECIFICATIONS

FIBER TYPE:	OM3 MULTIMODE 50/125 μ m
CORE/CLADDING DIAMETER:	50 / 125 μ m
CABLE TYPE:	INDOOR PLENUM
CONNECTOR TYPE:	LC DUPLEX
MIN BEND RADIUS:	2 in. (50 mm)
MAX PULL TENSION:	100 lbf (445 N)
TEST STANDARD:	TIA-568.3-D

7. KEY PLAN (NOT TO SCALE)

PROJECT:	DESIGNER OF RECORD:	DRAWING TITLE:	DRAWING NO.:	SHEET:	DATE:	REV:
MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	Applied Engineering Group	FIBER RING DESIGN DRAWING FACP NETWORK – FIBER OPTIC RING TOPOLOGY	FA-040A	1 OF 1	MAY 24, 2024	0

Fiber ring design drawing (FA-040A) showing the fire alarm network FACP-to-FACP fiber optic ring topology with dual redundant routing, junction points, and node identification.

13.3 Inspection Sequence for High-Rise

38. Pre-inspection documentation review: matrix logic, network diagram, as-built drawings.
39. Coordinate with building operations for after-hours or partial-occupancy testing schedule.
40. Notify central station, AHJ, and fire department. Obtain AHJ presence if required.
41. Verify network fiber ring supervision at FCC—all nodes must show normal.
42. Begin visual inspection at FCC, then work floor-by-floor with elevator and radio.
43. Functionally test all initiating devices, sampling by floor (100% testing for acceptance; minimum 25% stratified sample for annual per NFPA 72 Table 14.4.3.2 if pre-approved by AHJ).
44. Test voice/alarm communication system: all-call, zone paging, and STI measurement per floor.
45. Test smoke control sequence: each alarm scenario per the matrix—fans, dampers, stair pressurization.
46. Verify emergency generator transfer: disconnect utility, confirm ATS transfers within 60 seconds.
47. Test firefighter telephone (ECS) system: each floor jack and FCC master station.
48. Document all results on test forms; obtain FCC operator co-signature.

FIRE ALARM SYSTEM – VOICE EVACUATION CIRCUIT SCHEDULE

Zone No.	Zone Name / Description	EVAC Function	Audio Amplifier Assignment			Speaker Circuit (70V / 25V)				Speaker Information		Cable Information		Monitor Module ID	Notes	Speaker Type Legend SPKR CEILING MOUNT SPEAKER SPKRS SURFACE MOUNT SPEAKER SPKR-ST CEILING SPEAKER-STROBE SPKR/WP WEATHERPROOF SPEAKER			
			Amplifier ID	Location	Rated Power (W)	Circuit ID (NAC)	Voltage (V)	Max. Load (W)	Connected Load (W)	Speaker Count	SPKR Type	Cable Type	AWG						
1	FLOOR 1 – NORTH WING CORRIDORS & COMMON AREAS	EVAC + ALERT	AMP-1	ELEC. ROOM 1ST FLOOR	500	NAC-VA-1	70	500	235	28	SPKR	FPLR	14	MM-VA-1	—				
2	FLOOR 1 – SOUTH WING CORRIDORS & COMMON AREAS	EVAC + ALERT	AMP-1	ELEC. ROOM 1ST FLOOR	500	NAC-VA-2	70	500	290	34	SPKR	FPLR	14	MM-VA-2	—				
3	FLOOR 2 – NORTH WING CORRIDORS & COMMON AREAS	EVAC + ALERT	AMP-2	ELEC. ROOM 2ND FLOOR	500	NAC-VA-3	70	500	310	36	SPKR	FPLR	14	MM-VA-3	—				
4	FLOOR 2 – SOUTH WING CORRIDORS & COMMON AREAS	EVAC + ALERT	AMP-2	ELEC. ROOM 2ND FLOOR	500	NAC-VA-4	70	500	285	33	SPKR	FPLR	14	MM-VA-4	—				
5	FLOOR 3 – NORTH WING CORRIDORS & COMMON AREAS	EVAC + ALERT	AMP-3	ELEC. ROOM 3RD FLOOR	500	NAC-VA-5	70	500	300	35	SPKR	FPLR	14	MM-VA-5	—				
6	FLOOR 3 – SOUTH WING CORRIDORS & COMMON AREAS	EVAC + ALERT	AMP-3	ELEC. ROOM 3RD FLOOR	500	NAC-VA-6	70	500	270	32	SPKR	FPLR	14	MM-VA-6	—				
7	PARKING LEVEL 1	EVAC + ALERT	AMP-4	ELEC. ROOM P1	500	NAC-VA-7	70	500	260	30	SPKR	FPLR	14	MM-VA-7	—				
8	PARKING LEVEL 2	EVAC + ALERT	AMP-4	ELEC. ROOM P1	500	NAC-VA-8	70	500	245	28	SPKR	FPLR	14	MM-VA-8	—				
9	PENTHOUSE / ROOF LEVEL	EVAC + ALERT	AMP-5	ELEC. ROOM ROOF	250	NAC-VA-9	70	250	120	12	SPKR	FPLR	14	MM-VA-9	—				
10	ELEVATOR LOBBIES (ALL FLOORS)	ALERT ONLY	AMP-6	ELEC. ROOM 1ST FLOOR	250	NAC-VA-10	70	250	110	10	SPKR	FPLR	14	MM-VA-10	—				
11	STAIRWELLS (ALL FLOORS)	EVAC + ALERT	AMP-6	ELEC. ROOM 1ST FLOOR	250	NAC-VA-11	70	250	130	14	SPKR	FPLR	14	MM-VA-11	—				
12	TOILETS & SMALL ROOMS	ALERT ONLY	AMP-6	ELEC. ROOM 1ST FLOOR	250	NAC-VA-12	70	250	90	9	SPKR	FPLR	14	MM-VA-12	—				
TOTALS																	2,950 W	2,645 W	311 W
AMPLIFIER SUMMARY																			
AMPLIFIER ID	LOCATION	RATED POWER (W)	OUTPUT CIRCUITS (NAC)	TOTAL CONNECTED LOAD (W)	SPARE CAPACITY (W)														
AMP-1	ELEC. ROOM – 1ST FLOOR	500	NAC-VA-1, NAC-VA-2	525	(25) *														
AMP-2	ELEC. ROOM – 2ND FLOOR	500	NAC-VA-3, NAC-VA-4	595	(95) *														
AMP-3	ELEC. ROOM – 3RD FLOOR	500	NAC-VA-5, NAC-VA-6	570	(70) *														
AMP-4	ELEC. ROOM – P1	500	NAC-VA-7, NAC-VA-8	505	(15) *														
AMP-5	ELEC. ROOM – ROOF	250	NAC-VA-9	120	130														
AMP-6	ELEC. ROOM – 1ST FLOOR	250	NAC-VA-10, NAC-VA-11, NAC-VA-12	330	(80) *														
* SPARE CAPACITY IS AVAILABLE POWER.																			
ABBREVIATIONS																			
NAC	NOTIFICATION APPLIANCE CIRCUIT																		
EVAC	EVACUATION																		
ALERT	ALERT ONLY																		
VDC	VOLTS DC																		
W	WATTS																		
AWG	AMERICAN WIRE GAUGE																		
NOTES																			
1. ALL VOICE EVACUATION SPEAKER CIRCUITS ARE SUPERVISED FOR OPEN, SHORT, AND GROUND FAULTS.																			
2. SYSTEM OPERATES AT 70V DISTRIBUTED SPEAKER CIRCUITS.																			
3. SPEAKER COUNT IS BASED ON CONNECTED LOADS PER MANUFACTURER CALCULATIONS.																			
4. REFER TO FLOOR PLANS FOR EXACT SPEAKER LOCATIONS.																			
5. VOICE EVACUATION SYSTEM COMPLIES WITH NFPA 72, NFPA 70, AND IBC REQUIREMENTS.																			
PROJECT: MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM			DESIGNER OF RECORD: Applied Engineering Group			DRAWING TITLE: VOICE EVACUATION CIRCUIT SCHEDULE SPEAKER ZONES AND AMPLIFIER ASSIGNMENTS			DRAWING NO.: FA-028		SHEET: 1 OF 1		DATE: MAY 24, 2024		REV: 0				

Voice evacuation circuit schedule (FA-028) showing speaker zone amplifier assignments, circuit class, speaker impedance, and zone-paging configuration for multi-floor high-rise occupancy.

13.4 Voice/Alarm Communication Testing

Test	Method	Acceptance Criteria	NFPA 72 Reference
Zone Paging Accuracy	Page each floor individually from FCC.	Only targeted floor responds; adjacent floors silent.	24.4.2.6
All-Call Broadcast	Activate from FCC master station.	System-wide activation on all floors and areas.	24.4.3
Message Intelligibility (STI)	Measure at representative locations per floor.	STI $\geq$ 0.45 (public mode) at each measurement point.	24.4.4
Audible Level	Measure dBA at ear height during alarm.	$\geq$ 15 dB(A) above average ambient.	18.4.3
Backup Amplifier Switching	Disconnect primary amp; observe auto-transfer.	Secondary amplifier takes over within 1 second; no message interruption.	24.5.2.1

FIRE ALARM SYSTEM – AMPLIFIER/SPEAKER LOADING WORKSHEET

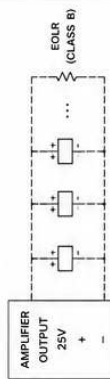
VOICE EVACUATION POWER CALCULATIONS

PROJECT INFORMATION		DESIGN CRITERIA	FORMULAS	SYSTEM SUMMARY
PROJECT:	MULTI-STORY COMMERCIAL BUILDING FIRE ALARM AND EMERGENCY COMMUNICATION SYSTEM	1. SYSTEM SHALL MEET NFPA 72, 2019, 24.6 AND NFPA 101. 2. VOICE INTELLIGIBILITY SHALL MEET NFPA 72 ANNEX D. 3. AMPLIFIER CONTINUOUS OUTPUT POWER RATING SHALL BE AT LEAST 20% GREATER THAN TOTAL SYSTEM LOAD. 4. MAX SPEAKER TAP SETTING SHALL NOT EXCEED SPEAKER RATING. 5. SPEAKER CIRCUITS ARE 25 VRMS DISTRIBUTED CONSTANT VOLTAGE. 6. WIRING: FPL OR EQUIVALENT, 18 AWG MINIMUM.	$P_{\text{spkr}} = (\text{TAP (W)} \times \text{QTY})$ $P_{\text{line}} = P_{\text{spkr}} / \text{EFFICIENCY}$ $P_{\text{total}} = \sum P_{\text{line}} \text{ (ALL CIRCUITS)}$ $P_{\text{required}} = P_{\text{total}} \times 1.20 \text{ (20\% HEADROOM)}$ $I_{\text{amp}} \text{ (A)} = P_{\text{required}} / V_{\text{system}}$ WHERE: $V_{\text{system}} = 25 \text{ VRMS (SPEAKER CIRCUITS)}$ EFFICIENCY = 1.00 (25V DISTRIBUTED SYSTEM)	VOICE EVACUATION SYSTEM: YES SYSTEM VOLTAGE: 25 VRMS AMPLIFIER OUTPUTS: 2 SPEAKER CIRCUITS: 2 (CLASS B) HEADROOM FACTOR: 20% SPEAKER WIRING: CLASS B WIRE SIZE (MIN): 18 AWG
LOCATION:	—			
DATE:	MAY 24, 2024			
CALCULATED BY:	AEG			
CHECKED BY:	—			

SPEAKER CIRCUIT LOADING

CIRCUIT NO.	ZONE / AREA	SPEAKER MODEL	SPEAKER RATING (W)	TAP SETTING (W)			QTY	TOTAL SPEAKER POWER (W) $P_{\text{spkr}} = \text{TAP} \times \text{QTY}$	LINE POWER (W) $P_{\text{line}} = P_{\text{spkr}} / \text{EFF.}$	CABLE LENGTH (FT)	WIRE SIZE (AWG)	STATUS (PASS/FAIL)
				70V	25V	70.7V						
1	LEVELS 1 – 3 NORTH WING	EV-S8 8" Ceiling Speaker	8	—	8	—	28	224	224	420	18	Room Speakers
		EV-S8 8" Ceiling Speaker	8	—	4	—	12	48	48	380	18	Corridor Speakers
		EV-HS6 Horn Speaker	15	—	15	—	4	60	60	450	18	High Ceiling / Atrium
		EV-WM Wall Speaker	6	—	3	—	6	18	18	300	18	Stairwell Speakers
CIRCUIT 1 TOTALS												
2	LEVELS 4 – ROOF SOUTH WING	EV-S8 8" Ceiling Speaker	8	—	8	—	30	240	240	430	18	Room Speakers
		EV-S8 8" Ceiling Speaker	8	—	4	—	10	40	40	360	18	Corridor Speakers
		EV-HS6 Horn Speaker	15	—	15	—	4	60	60	420	18	High Ceiling / Atrium
		EV-WM Wall Speaker	6	—	3	—	6	18	18	280	18	Stairwell Speakers
CIRCUIT 2 TOTALS												
SYSTEM TOTALS (ALL SPEAKER CIRCUITS)								100	708			PASS

TYPICAL SPEAKER CIRCUIT DIAGRAM (CLASS B)



LEGEND

- CEILING / WALL SPEAKER
- HORN SPEAKER
- AMPLIFIER
- EOLR END-OF-LINE RESISTOR

POWER CALCULATION SUMMARY

TOTAL LINE POWER (P_{total})	708 W
REQUIRED HEADROOM (20%)	142 W
TOTAL REQUIRED POWER (P_{required})	850 W
SYSTEM VOLTAGE (V_{system})	25 VRMS
AMPLIFIER CURRENT REQUIRED (I_{amp}) $= P_{\text{required}} / V_{\text{system}}$	34.0 A

AMPLIFIER SELECTION CHECK

SELECTED AMPLIFIER MODEL:	BOGEN CSD2x240
RATED OUTPUT POWER @ 25V:	240 W PER CHANNEL
NUMBER OF OUTPUT CHANNELS:	2
TOTAL AVAILABLE POWER @ 25V:	480 W
TOTAL AVAILABLE CURRENT:	19.2 A PER CHANNEL
STATUS:	FAIL – INSUFFICIENT CAPACITY

RECOMMENDED AMPLIFIER CONFIGURATION

REQUIRED TOTAL POWER:	850 W
RECOMMENDED AMPLIFIER:	BOGEN CSD4x250
RATED OUTPUT POWER @ 25V:	250 W PER CHANNEL
NUMBER OF OUTPUT CHANNELS:	4
TOTAL AVAILABLE POWER @ 25V:	1000 W
TOTAL AVAILABLE CURRENT:	40.0 A PER CHANNEL
STATUS:	PASS

NOTES

- ALL SPEAKER TAPS SET AT OR BELOW RATED POWER.
- MAINTAIN POLARITY THROUGHOUT CIRCUIT.
- DO NOT EXCEED MAXIMUM AMPLIFIER OUTPUT CURRENT.
- EOLR VALUES PER MANUFACTURER REQUIREMENTS.
- SPEAKER COVERAGE AND SPACING PER NFPA 72 ANNEX D.
- REFER TO PLANS FOR CIRCUIT ROUTING AND DEVICE LOCATIONS.

PROJECT:
MULTI-STORY COMMERCIAL BUILDING
FIRE ALARM AND EMERGENCY
COMMUNICATION SYSTEM

DESIGNER OF RECORD:
Applied Engineering Group

DRAWING TITLE:
AMPLIFIER/SPEAKER LOADING WORKSHEET
VOICE EVACUATION POWER CALCULATIONS

DRAWING NO.:
FA-038

SHEET:
1 OF 1

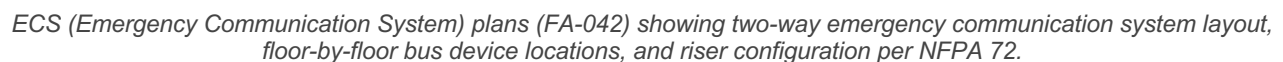
DATE:
MAY 24, 2024

REV:
0

Amplifier and speaker loading worksheet (FA-038) calculating voice evacuation amplifier power requirements, speaker circuit current, and amplifier selection for each zone.

FIRE ALARM & EMERGENCY COMMUNICATION SYSTEM (ECS) PLANS

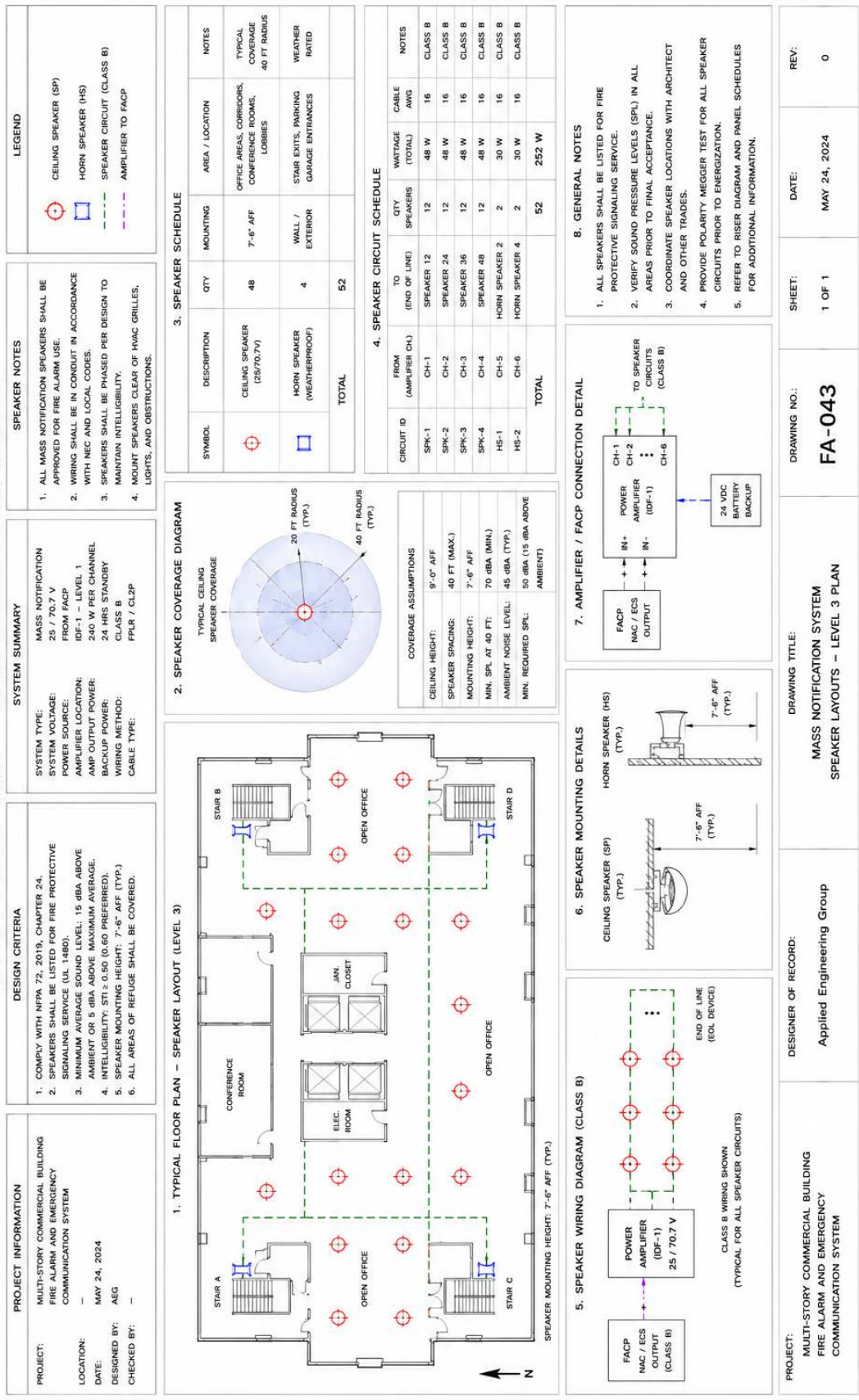
NFPA 72 COMPLIANT – TWO-WAY EMERGENCY COMMUNICATION SYSTEM



Scenario	Test Method	Acceptance Criteria	Reference
Floor 10 Alarm – Smoke Control	Activate SD on floor 10.	Return fans stop; supply fans stop; smoke damper closes in < 75 s; stair pressurization fan starts.	NFPA 92 / 23.8.5
Stair Pressurization Test	Activate stair pressurization scenario.	Differential pressure reads 0.05–0.35 in. w.c. (NFPA 92 6.3.3.4.1) at midpoint of stair.	NFPA 92 / IBC 909
High-Rise Floor 25 Alarm	Activate SD on floor 25.	All outputs per matrix activate; supervisory feedback at FCC within 10 s.	NFPA 72 23.8
Elevator Recall (All Banks)	Activate lobby-level detectors.	All elevator banks return to recall floor; Phase I recall indicated; firefighter operation enabled.	21.4 / ASME A17.1

FIRE ALARM & MASS NOTIFICATION SYSTEM – SPEAKER LAYOUTS

NFPA 72 COMPLIANT – MASS NOTIFICATION SYSTEM



13.6 Emergency Power Testing

Emergency generator and battery backup testing in a high-rise requires careful sequencing to avoid disrupting occupied floors during business hours:

49. Verify battery float voltage at each of the 5 FACP's and voice amplifier panel.
50. Disconnect normal AC feed at the main transfer switch. Record time of disconnection.
51. Verify generator starts and ATS transfers. Maximum transfer time = 60 seconds (NFPA 72 Section 10.6.9.1.3).
52. Observe voice system during transfer—audio gap must not exceed 1 second.
53. Verify "AC Fail" trouble at each FACP and FCC within 30 seconds of disconnection.
54. After 15 minutes on generator, measure battery voltage at each panel under panel load.
55. Restore utility power. Verify ATS back-transfers and all "AC Fail" troubles clear automatically.

13.7 High-Rise Inspection Deficiency Examples

Deficiency	NFPA Reference	Corrective Action
Stair pressurization fan start delay > 15 seconds.	NFPA 92 / 23.8.5	Adjust fan controller timing; re-test.
Voice amplifier distortion on floor 17.	24.4.4	Replace amplifier module; re-test STI.
Node 3 battery cabinet missing label.	10.16.3	Apply permanent engraved label.
Smoke damper on floor 22 fails to close within 75 seconds.	23.8.5	Inspect damper actuator; repair or replace.

Chapter 14: Warehouse and Industrial Inspection Example

14.1 Scenario Overview

Warehouse and industrial facilities present unique inspection challenges: high ceilings, dusty or contaminated environments, forklift traffic, mechanical vibration, and high ambient noise. These conditions require environment-specific detection technologies and demand that the inspector adapt standard procedures to the physical constraints of the facility.

14.2 Building Profile

Attribute	Description
Facility Type	Distribution warehouse with light manufacturing area
Size	120,000 sq ft (single story, 30-foot clear ceiling height)
System Type	Addressable FACP (Edwards EST3)
Detection	6 projected beam detector pairs, 20 fixed-temperature line heat detectors, 10 manual pull stations
Notification	40 horn/strobes spaced for 100 ft coverage radius; 8 speaker/strobes in office areas
Auxiliary Functions	Sprinkler waterflow and tamper monitoring, HVAC shutdown, dock door hold-opens
Environment	Moderate dust from packaging operations; forklift diesel exhaust; high-velocity mechanical ventilation

14.3 Environmental Inspection Considerations

Before testing, assess and document the environmental conditions that affect device selection and performance:

Condition	Impact	Inspection Verification
High ceilings (> 25 ft)	Spot-type smoke detectors require reduced spacing; beam detectors preferred.	Verify detector type is appropriate per NFPA 72 Table 17.7.3.2.3.1. Spot-type smokes require reduced spacing above 10-ft ceiling height.
Dust and particulates	False alarms from packaging dust; detector contamination accelerated.	Clean beam detector lenses before testing; verify spot-type smokes have been replaced with heat or beam type.
Mechanical vibration	May loosen conduit fittings and device mounts.	Inspect all junction boxes; pull-test conduit connections near machinery.
High ambient noise	Normal alarm system sound levels may not meet 15 dBA above ambient.	Measure ambient dBA during production hours; verify alarm level is adequate.
Forklift traffic	Physical damage to pull stations, low-mounted conduit, and devices.	Verify pull stations have mechanical guards; inspect conduit at forklift traffic levels.

⚠ Ceiling heights above 30 feet require projected beam detectors, linear heat detection, or aspirating smoke detection. Spot-type smoke detectors are generally not suitable above 30-foot ceilings per NFPA 72 Section 17.7.3.2.3. Always use an aerial work platform with proper certification for inspection at these heights.

14.4 Projected Beam Detector Testing

Projected beam detectors require specific functional testing procedures:

56. Clean both transmitter and receiver lenses with a dry, lint-free cloth before testing.
57. Verify the signal strength indicator is within the manufacturer's recommended range (typically 60–90% for optimal sensitivity).
58. Apply the manufacturer's obscuration test card or calibrated filter to the beam path to simulate the alarm threshold.
59. Confirm alarm received at the FACP with the correct device address.
60. Remove the test filter; verify the detector resets and returns to normal within 60 seconds.
61. Measure beam path length; confirm it does not exceed manufacturer's maximum range for the sensitivity setting.

14.5 Functional Testing Summary

Device	Test Method	Result	NFPA 72 Reference
Beam Detectors (6 pairs)	Obscuration filter per manufacturer	All 6 pairs: Alarm received; reset OK	14.4.3.2.2(1)
Linear Heat Detectors (20)	Calibrated heat source applied	All 20: Alarm within rating; reset OK	17.6.3
Pull Stations (10)	Manual activation	All 10: Alarm received; correct address	17.14
Horn/Strobes (40)	Full alarm activation; dBA measured	Range: 88–95 dBA at 10 ft; all pass	18.4.3
Speaker/Strobes (8)	Voice message + STI measurement	STI: 0.52–0.67; all above 0.45 minimum	24.4.4
HVAC Shutdown (3 units)	Activate detector in return air zone	All 3 AHUs stopped; reset restores fans	23.8.5
Waterflow Switches (2)	Open inspector's test valve	Alarm at panel within 45 s; signal to monitoring	17.13.2.3
Tamper Switches (4)	Partially close control valve	Supervisory signal; clears on full open	14.4.3.2.6

14.6 Safety and Practical Notes for Industrial Inspections

- Coordinate forklift and production equipment shutoff during beam detector testing—movement disrupts beam alignment during test.
- Detectors above active welding areas show accelerated aging from heat and particulates; recommend heat line or aspirating smoke detection (ASD) for these areas.
- Verify that any storage above 12 feet does not obstruct the beam path of projected beam detectors.
- Document ambient noise level measurements during production hours for audible appliance compliance verification.
- Inspect sprinkler riser panels and waterflow devices—often the most neglected components in warehouse facilities.

14.7 Industrial Inspection Result

Result: PASS. All 81 devices tested successfully. No deficiencies found at time of inspection. Environmental recommendations documented in comments section: recommend replacing spot-type smoke detector in welding bay with fixed-temperature line heat detector, and adding alarm verification time delay of 2 seconds to reduce nuisance alarms from dust-generating packaging operations.

PART V

APPENDICES AND FIELD REFERENCE

NFPA Code Tables • NEC 760 • Field Forms • Symbols • Troubleshooting • Glossary

Appendix A: NFPA 72 Reference Summary

A.1 Essential NFPA 72 Testing References

Inspection Task	NFPA 72 Section	Frequency	Notes
Smoke Detector Functional Test	14.4.3.2.2(1)	Annual	Manufacturer-approved aerosol only; no open flame.
Heat Detector Functional Test	14.4.3.2.2(2)	Annual	Verify reset after cooling.
Manual Pull Station Test	14.4.3.2.4	Annual	Verify alarm indication and mechanical reset.
Notification Appliances	14.4.3.2.7	Annual	Verify audibility and visibility per 18.4.3 and 18.5.5.4.
Duct Detector Test	14.4.3.2.2(7)	Semiannual	Remote test means required if not accessible.
Waterflow Switch Test	17.13.2.3	Quarterly	Record elapsed time from valve open to alarm.
Battery Voltage Check	10.6.10	Semiannual	Float voltage per manufacturer spec; ≥ 12.0 V at rest.
Battery Load Test	10.6.10.5	Annual	≥ 11.8 V per 12 V battery after 5-min load.
Supervising Station Signal	26.6.3.2	Annual	Test both paths; record time ≤ 90 seconds.
Documentation Update	14.6.2	After each inspection	Retain minimum 1 cycle or per AHJ.

A.2 NFPA 72 Chapter Quick Reference

Chapter	Title	Key Sections for Inspectors
Ch. 1	Administration	Scope, purpose, and mandatory requirements.
Ch. 7	Documentation	7.5 (ROC), 7.6 (drawings), 7.7 (device lists, SOO).
Ch. 10	Fundamentals	10.6 (power), 10.16 (labeling), 10.18 (wireless).
Ch. 12	Circuits and Pathways	12.3 (classes), 12.4 (survivability).
Ch. 14	Inspection, Testing & Maintenance	14.2 (responsibilities), 14.4 (test methods), 14.6 (records).
Ch. 17	Initiating Devices	17.6 (heat), 17.7 (smoke), 17.13 (supervisory), 17.14 (pull stations).
Ch. 18	Notification Appliances	18.4 (audible), 18.5 (visible), 18.6 (textual).
Ch. 21	Emergency Control Interfaces	21.4 (elevators), 21.8 (door release).
Ch. 23	Protected Premises Systems	23.8 (interface to other systems).
Ch. 24	Emergency Communication Systems	24.4 (voice/alarm), 24.5 (mass notification).
Ch. 26	Supervising Station Systems	26.6 (transmission requirements, dual paths).

Appendix B: NEC Article 760 Quick Reference

B.1 Fire Alarm Wiring Classifications

NEC Section	Subject	Inspector Verification
760.41 / 760.121	Circuit Classification	Confirm Class A, B, N, or X wiring matches drawings and fault-tolerance design.
760.49 / 760.127	Cable Identification	FPL, FPLR, or FPLP markings visible at all pull points and terminations.
760.53 / 760.130	Conductor Separation	≥ 2 in. from power conductors or separate metal raceway.
760.136	Grounding and Bonding	Metallic raceways bonded; cable shields grounded at one end only.
760.142	Junction Boxes	Covers installed; accessible; labeled "FIRE ALARM – DO NOT DISCONNECT."
760.176	Cable Listing	All cables listed for fire alarm use; no thermostat or data cable substitutes.

B.2 Cable Types Reference

Cable Type	Permitted Location	Marking Required	Common Uses
FPL	General-purpose (non-plenum, non-riser)	FPL + UL listing	Single-floor runs in conduit or exposed.
FPLR	Vertical runs in riser shafts	FPLR + UL 1666	Riser cables between floors in shaft.
FPLP	Plenum return-air spaces	FPLP + CMP	All ceiling plenum wiring.
FPLP-Shielded	Plenum with EMI protection	FPLP SHLD	Shielded circuits near electrical noise sources.

B.3 Common NEC 760 Violations and Corrections

Violation	Non-Compliance Reason	Corrective Action
FPL cable in plenum ceiling	Lacks low-smoke jacket rating.	Replace with FPLP cable.
Fire alarm conductors sharing enclosure with 120 V lighting	Insufficient separation.	Install listed divider or use separate enclosure.
Metallic conduit not bonded at panel knockout	No fault return path.	Add bonding bushing or jumper.
Splices outside listed junction box	Exposed conductors; not accessible.	Move splice inside accessible junction box with cover.
Cable marking missing at terminations	Conductors unidentifiable during troubleshooting.	Apply permanent "FIRE ALARM CIRCUIT" labels at both ends.

Appendix C: Troubleshooting Guide

C.1 FACP Trouble Indications

Panel Display	Probable Cause	Diagnostic Steps	Reference
GROUND FAULT	Conductor shorted to conduit or wet device base.	Isolate loop by sections; use insulation tester; inspect wet areas.	10.6.7 / NEC 760.136
OPEN CIRCUIT / SLC FAULT	Broken conductor, loose terminal, or missing EOL.	Check loop continuity; inspect splice joints and terminals.	14.4.2
NAC FAULT	Open or short on notification circuit.	Measure continuity; verify EOL resistor and polarity.	14.4.2.2
BATTERY FAULT	Low voltage, aged, or loose battery.	Measure voltage under load; replace if < 12.0 V at rest.	10.6.10
AC FAIL	Utility feed lost or breaker tripped.	Check dedicated breaker, verify label; inspect utility power.	10.6.9
COMMUNICATION LOSS	Network cable severed or node offline.	Check fiber ring; verify IP settings; inspect network switch.	Ch. 26

C.2 Initiating Device Troubleshooting

Device	Problem	Probable Cause	Remedy
Smoke Detector	False alarms	Dust, insects, air drafts, steam from nearby HVAC.	Clean with vacuum; relocate away from vents; replace if > 10 years.
Smoke Detector	Fails to alarm on test	Open circuit, head removed, wrong base address.	Check wiring; confirm head-in-base; verify address.
Heat Detector	No activation	Excessive spacing, high ceiling, or wrong rating.	Add detectors to reduce spacing; verify temperature rating.
Duct Detector	Repeated false alarms	Dirty filter or fan vibration.	Clean tubes; verify airflow direction; secure mounting.
Pull Station	Alarm not received	Loose wire or broken internal switch.	Check continuity at terminals; replace if switch failed.

C.3 Notification Appliance Troubleshooting

Symptom	Likely Cause	Corrective Action
Horn/strobe silent during alarm	Open NAC; reversed polarity.	Measure circuit voltage; correct polarity; check EOL.
Strobes flash out of sync	Multiple circuits without sync module.	Add sync module; verify master/slave configuration.
Speaker distorted	Shorted line or amplifier fault.	Measure line impedance; verify amplifier channel output.
Alarm level too low	Insufficient dBA margin over ambient.	Add appliances or increase output per NFPA 72 18.4.3.

C.4 Power Supply Troubleshooting

Problem	Cause	Corrective Action
Battery voltage below 11.8 V under load	Battery age; heat damage; sulfation.	Replace both batteries as matched pair with same date code.
Battery overheats	Wrong charger voltage; reversed polarity.	Verify float voltage 13.2–13.8 V; correct polarity.
Charger indicator off	Blown fuse or AC feed lost.	Check primary breaker; inspect fuse; restore AC.
Voltage drop on NAC circuit	Undersized conductors; excessive run length.	Recalculate voltage drop; add remote power supply.

C.5 Nuisance Alarm Prevention

- Clean all smoke detectors and sampling ports quarterly in dusty or contaminated environments.
- Replace ionization detectors in kitchens or steam-prone areas with photoelectric or heat detectors.
- Seal all conduit penetrations in damp basements to prevent moisture entry.
- Enable "alarm verification" function in panel programming if supported (NFPA 72 Section 17.7.3.7.1).
- Schedule detector sensitivity testing every 2 years in high-contamination environments.

Appendix D: Common Symbols and Abbreviations

D.1 Common Abbreviations

Abbreviation	Meaning
AFF	Above Finish Floor
AHJ	Authority Having Jurisdiction
AHU	Air Handling Unit
ATS	Automatic Transfer Switch
DACT	Digital Alarm Communicator Transmitter
DD	Duct Detector
ECS	Emergency Communication System
EOL	End-of-Line (resistor or device)
FACP	Fire Alarm Control Panel
FCC	Fire Command Center
HVAC	Heating, Ventilation, and Air Conditioning
IDC	Initiating Device Circuit
MNS	Mass Notification System
NAC	Notification Appliance Circuit
NICET	National Institute for Certification in Engineering Technologies
NPLFA	Non-Power-Limited Fire Alarm Circuit
PLFA	Power-Limited Fire Alarm Circuit
PS	Pull Station
PSL	Pathway Survivability Level (NFPA 72 Ch. 12)
PSU	Power Supply Unit
ROC	Record of Completion
SD	Smoke Detector
SLC	Signaling Line Circuit
SOO	Sequence of Operations
STI	Speech Transmission Index
SUPV	Supervisory Signal or Device
WFS	Waterflow Switch

D.2 Standard Symbol Descriptions

The following device symbols are typically used on fire alarm engineering drawings. Always verify against the project-specific legend:

Symbol Description	Device Type	Drawing Reference
Solid circle (●) on ceiling plan	Photoelectric smoke detector	Initiating device drawing
Triangle (▲) on ceiling plan	Heat detector (fixed or ROR)	Initiating device drawing
Square (■) near exit door	Manual pull station	Initiating device drawing
Speaker symbol (🔊) on wall	Horn/strobe combination	Notification appliance drawing
Rectangle on equipment room plan	Fire alarm control panel	Electrical/equipment room plan
Diamond (◆) with label	Monitor or control module	SLC loop drawing
Dashed rectangle	Magnetic door holder	Architectural/life safety plan
Circle with crosshairs	Projected beam detector (pair)	Ceiling/reflected ceiling plan

Appendix E: Master Inspection Checklist

This master checklist provides a comprehensive step-by-step reference for a full annual inspection. Use this list in conjunction with the site-specific device list and test form.

Section 1 – Pre-Inspection

#	Task	Complete ✓
1.1	Previous inspection report reviewed; prior deficiencies confirmed corrected.	
1.2	As-built drawings and device list on hand and verified current.	
1.3	Monitoring station notified; system placed on test. Test # recorded.	
1.4	AHJ notified if required by jurisdiction.	
1.5	Building owner / facilities manager authorization confirmed.	
1.6	Testing in Progress signs posted at panel and building entrances.	
1.7	All inspection tools calibrated and functional; certificates in binder.	
1.8	Communication plan established (radios for multi-person teams).	

Section 2 – Visual Inspection

#	Task	Complete ✓
2.1	FACP cabinet secure, clean, and properly labeled.	
2.2	Dedicated breaker labeled "Fire Alarm – Do Not Turn Off."	
2.3	Battery terminals clean; date codes visible and within life.	
2.4	All conduit supported; metallic raceways bonded.	
2.5	Cable type (FPL/FPLR/FPLP) verified for each environment.	
2.6	Junction box covers installed; labeled "Fire Alarm."	
2.7	Smoke detectors unobstructed; spacing verified.	
2.8	Heat detectors at correct temperature rating.	
2.9	Pull stations at correct height; labels legible.	
2.10	Duct detectors sampling tubes correct length and orientation.	
2.11	Horn/strobes at correct height; correct candela rating.	
2.12	Annunciator labeling matches zone map.	
2.13	All auxiliary modules in listed enclosures with labels.	

Section 3 – Functional Testing

#	Task	Complete ✓
3.1	All smoke detectors tested with approved aerosol.	
3.2	All heat detectors tested with calibrated heat source.	
3.3	All manual pull stations tested; reset function verified.	
3.4	Waterflow switches tested; elapsed time recorded.	
3.5	Supervisory (tamper) switches tested.	
3.6	Horn/strobes tested; dBA levels measured and recorded.	
3.7	Strobes verified synchronized in multi-strobe areas.	
3.8	Voice system tested; STI ≥ 0.45 confirmed.	
3.9	Elevator recall tested; Phase I and II verified.	
3.10	HVAC shutdown verified on all AHUs.	
3.11	Magnetic door holders verified to release on alarm.	
3.12	Battery voltage tested under 5-minute load.	
3.13	AC fail trouble tested; confirmed generated and clears.	
3.14	Supervising station signal test; time ≤ 90 s on both paths.	

Section 4 – Post-Inspection

#	Task	Complete ✓
4.1	FACP reset to "System Normal"; no active troubles or supervisory signals.	
4.2	All HVAC, elevator, and door systems restored to normal operation.	
4.3	System removed from test mode with monitoring station confirmed.	
4.4	All "Testing in Progress" signs removed.	
4.5	All disabled devices re-enabled.	
4.6	Deficiency log completed and signed.	
4.7	Owner or authorized representative signature obtained.	
4.8	Final inspection report delivered to owner and submitted to AHJ.	

Glossary of Fire Alarm Terms

The following terms are used throughout this handbook and are aligned with definitions in NFPA 72 (2022) and NFPA 70 (2023):

Term	Definition
Addressable System	A fire alarm system using digital polling of each device on a Signaling Line Circuit (SLC), enabling pinpoint device identification.
AHJ (Authority Having Jurisdiction)	The organization, office, or individual responsible for enforcing code requirements or approving equipment and installations.
Alarm Verification	A panel feature that delays an alarm signal for a specified time (typically 30–60 s) to allow the detector to confirm a valid alarm condition.
Class A Circuit	A wiring configuration providing a redundant return path so that both an open and a short circuit can be reported while the circuit remains operational.
Class B Circuit	A wiring configuration where an open circuit is supervisory but a short can disable the circuit. Most common in conventional systems.
Deficiency	Any condition in which a fire alarm system component or installation does not comply with the requirements of NFPA 72, NEC Article 760, or the applicable local code.
DACT (Digital Alarm Communicator Transmitter)	A device that transmits alarm, supervisory, and trouble signals over the public telephone network or cellular network to a supervising station.
End-of-Line (EOL) Resistor	A resistor connected at the end of a supervised circuit that allows the panel to detect both open and short circuit faults.
FACP (Fire Alarm Control Panel)	The central processing unit of a fire alarm system; receives signals from initiating devices and controls output circuits.
Fire Watch	A continuous patrol of the protected premises by a qualified individual when the fire alarm system is impaired, as required by NFPA 72 Section 14.2.3.
Ground Fault	An unintentional low-resistance connection between a fire alarm circuit conductor and earth ground or a grounded metallic conductor.
Impairment	A condition where the fire alarm system or a portion thereof is not fully operational, such as when devices are disabled or circuits are faulted.
Initiating Device	A system component that originates transmission of a change-of-state condition—such as a smoke detector, heat detector, or manual pull station.
Isolation Module	A module installed in an SLC that limits a wiring fault (short circuit) to a segment of the loop, preserving operation of all other devices.
NFPA 72	National Fire Alarm and Signaling Code; the primary standard governing design, installation, testing, and maintenance of fire alarm systems in the United States.
Notification Appliance Circuit (NAC)	A circuit that supplies power to audible and/or visible notification appliances such as horns, strobes, and speakers.
Pathway Survivability Level (PSL)	A NFPA 72 classification describing the ability of a fire alarm circuit to survive a fire condition (PSL 0–4, with 4 providing the highest survivability).
Record of Completion (ROC)	A document completed by the installer certifying that the system was installed and tested per NFPA 72 and approved documents.
Signaling Line Circuit (SLC)	A circuit used to connect addressable devices to the FACP, providing two-way digital communication for polling and response.

Term	Definition
Sequence of Operations (SOO)	A document or matrix defining the programmed response of the fire alarm system to each type of initiating event.
Supervising Station	A facility that receives signals from fire alarm systems and notifies the fire department or takes other prescribed action.
Supervisory Signal	A signal indicating the need for action in connection with the supervision of guard tours or the supervision of the protective signaling system.
Trouble Signal	A signal indicating a fault condition within the fire alarm system, such as an open circuit, ground fault, or battery problem.

Closing: Field Best Practices and Professional Standards

The Inspector's Professional Obligation

Fire alarm inspection is one of the few professional activities in which the consequences of poor work cannot be corrected after the fact. A deficient inspection that allows a compromised system to remain in service may cost lives. This is not an abstraction—it is the professional reality that every inspector must internalize before signing any inspection report.

The standards of excellence for a professional inspector include:

- **Integrity:** Never sign off on untested devices, never estimate test results, never certify systems not physically inspected.
- **Accuracy:** Record actual measured values—voltage, dBA, transmission time, battery readings—not assumed or interpolated values.
- **Transparency:** Report all deficiencies, even minor ones, even when the building owner will object.
- **Accountability:** Sign every form, date every entry, and retain every record.
- **Impartiality:** Never allow commercial relationships between your inspection firm and the installing contractor to influence the accuracy of your findings.

Continuing Education and Certification

Organization	Credential / Program	Relevance
NICET	Fire Alarm Systems – Levels I through IV	Industry-standard competency certification for fire alarm inspection and design.
NFPA	Fire Inspector I and II Certification	Code application, enforcement, and inspection methodology.
IAEI	Electrical Inspector and Plan Reviewer	NEC Article 760 compliance and electrical systems inspection.
State Licensing Boards	Annual CEU requirements (varies by state)	Code updates, ethics training, and specialty endorsements.

Final Words

As codes evolve and fire alarm technology advances—from wireless mesh networks to AI-assisted event analysis to IP-based mass notification—the inspector's judgment, knowledge, and integrity remain the irreplaceable foundation of system reliability. No technology can substitute for the professional who walks every floor, tests every device, measures every signal, and signs every form.

Commit to lifelong learning. Stay current with NFPA 72 code cycles. Build relationships with the AHJ in your jurisdiction. Document everything. Protect lives, protect property, and protect the professional reputation that is the only credential that truly matters in this field.

"When the alarm sounds, your signature must stand for tested, verified, and ready."

Jordan P. Withlock