

# LEVEL II — SIMULATION EXAM 9

## (110 QUESTIONS)

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**Time Limit: 155 Minutes**

**Allowed References: NFPA 72 (2022), NFPA 70 (2020), Ugly's Electrical References (2020)**

### **DOMAIN 2.1 — INSTALLATION (Questions 1–40)**

1. A fire alarm technician is reviewing a high-rise voice evacuation design. The specification requires pathway survivability Level 2 on all speaker circuits. The engineer proposes routing all speaker circuits through 2-hour fire-rated stairwell enclosures using standard FPLP cable. At each floor, the cable exits the stairwell through a fire-rated penetration into an unrated corridor ceiling to reach the floor's speakers. Once the FPLP cable exits the stairwell into the unrated corridor ceiling, what happens to its Level 2 status?

- A. Level 2 continues because the fire-rated penetration seal extends the stairwell's protection
- B. Level 2 continues for 50 feet beyond the stairwell exit per the transition allowance
- C. Level 2 is lost because the FPLP cable depends on the stairwell construction for its protection
- D. Level 2 continues if the corridor ceiling space has automatic sprinkler protection

2. A fire alarm technician is installing a fire alarm system in a building with a qualifying emergency generator. The voice evacuation loads are: panel/SLC standby = 0.72A, voice amplifier standby = 1.28A, NAC alarm = 3.6A, voice alarm = 7.4A. Using 4-hour standby, 15-minute voice alarm, and 20% safety factor, what is the minimum battery capacity?

- A. Approximately 12.24 Ah after applying all three factors correctly
- B. 10.20 Ah using 4-hour standby and 15-minute alarm without the safety factor

- C. 15.84 Ah using 4-hour standby with standard 5-minute alarm instead of 15-minute
- D. 24.00 Ah using 24-hour standby because voice systems are exempt from generator reduction

3. A fire alarm technician is installing a releasing fire alarm system for a clean agent suppression system. The design uses cross-zone detection. During commissioning, the technician activates Zone A — the panel displays "FIRST ALARM." The technician then activates Zone B — the panel displays "CROSS-ZONE VERIFIED" and the pre-discharge countdown begins. The technician presses the abort switch and the countdown stops. The technician releases abort and the countdown resumes. What additional releasing system component must still be tested?

- A. The cross-zone logic must be retested with Zone B activated first and then Zone A
- B. The solenoid must be reconnected and a live agent discharge performed
- C. The pre-discharge notification appliances in the protected space must be verified
- D. The releasing circuit supervision must be tested by opening the circuit and verifying a trouble signal

4. A fire alarm technician is installing smoke detectors for elevator recall in a building with four elevator banks. Each bank has a dedicated lobby smoke detector. The design requires selective recall. During commissioning, the technician activates Bank D's lobby detector. Only Bank D recalls. The technician then activates Bank A's lobby detector. Banks A and D both recall simultaneously. What is the most likely cause?

- A. Bank A's detector is generating a building-wide alarm code that overrides selective programming
- B. The panel programming for Bank A's zone activates both Bank A and Bank D recall outputs
- C. The SLC communication is broadcasting Bank A's recall command to all control modules
- D. Banks A and D share a common recall relay circuit that was not separated during installation

5. A fire alarm technician is installing a fire alarm system with dual communication paths — primary IP and secondary cellular. During commissioning, the technician disconnects the IP cable to test path failure detection. The panel generates "IP COMMUNICATION FAILURE" after 185 seconds. Per NFPA 72 Section 26.6.3.2, what is the maximum time for detection with continuous monitoring technology?

- A. 60 seconds for all IP communication technologies regardless of monitoring capability
- B. 100 seconds for primary path failure detection on dual-path systems only
- C. 300 seconds for technologies that perform periodic rather than continuous monitoring
- D. 200 seconds — the 185-second result is within this maximum and meets the requirement

6. A fire alarm technician is installing a fire alarm system in a hospital. The approved fire safety plan specifies positive alarm sequence (PAS). During PAS testing, the technician activates a smoke detector. The 180-second investigation period begins. At 100 seconds, a smoke detector in a different zone activates. Per NFPA 72 Section 23.8.1.3, what must happen?

- A. PAS must immediately cancel and general alarm notification must activate
- B. The 180-second period extends by an additional 180 seconds for the second zone
- C. The second activation has no effect because the investigation period is already in progress
- D. The investigation period restarts from zero using the second activation as the new reference

7. A fire alarm technician is installing a fire alarm system in a 20-story building. The fire command center is in the lobby. The fire alarm panel is in the electrical room on Floor B1. Per NFPA 72 Section 23.10, what must be installed at the fire command center?

- A. A simplified LED annunciator showing alarm and trouble zone indicators only
- B. A building management system workstation displaying fire alarm data in real time
- C. A complete repeater panel with full system status display and operator control capability
- D. A dedicated telephone line connecting the FCC to the panel in the electrical room

8. A fire alarm technician is installing a fire alarm system with a DACT connected to two copper telephone lines. During commissioning, Line 1 handshake succeeds. Line 2 obtains dial tone but receives a busy signal on the first attempt. The DACT automatically retries and the handshake completes on the second attempt. Is Line 2 functional?

- A. No, any busy signal indicates the line has a permanent fault requiring investigation

- B. Yes, the DACT's automatic retry succeeded and the handshake confirmed end-to-end functionality
- C. No, both lines must complete the handshake on the first attempt per NFPA 72
- D. Yes, but only because the busy signal was caused by another DACT testing simultaneously

9. A fire alarm technician is installing a fire alarm system in a convention center ballroom that divides into seven enclosed event spaces using acoustically rated movable partitions. Each space has its own entrance when partitions are deployed. What notification design principle applies?

- A. Only the three largest partition configurations require independent notification coverage
- B. A central high-output device provides coverage for all seven configurations simultaneously
- C. Only the fully open ballroom configuration requires notification design consideration
- D. Each enclosed space must have independent notification providing coverage when partitions are closed

10. A fire alarm technician is installing a fire alarm system in a data center with a raised floor plenum for cold air distribution and an overhead cable tray space. The overhead space has dedicated ducted HVAC return and is not used for air handling. What cable type is required for fire alarm circuits in the raised floor plenum?

- A. FPLP because the raised floor space used for air distribution is classified as a plenum
- B. FPLR because the cable passes through the raised floor transition vertically
- C. FPL because data center raised floors are classified as general-purpose spaces
- D. Any fire alarm cable installed in metallic conduit satisfies the requirement

11. A fire alarm technician is installing a fire alarm system in a building with three sprinkler risers. Each riser has a waterflow switch and a tamper switch. The design places each waterflow switch on an individual alarm zone and each tamper switch on an individual supervisory zone. What operational advantage does individual tamper zones provide over grouping all tampers on one zone?

- A. Individual zones increase the panel's processing speed for supervisory signal handling
- B. Individual zones are required by code for buildings with more than two sprinkler risers

- C. Individual zones identify which specific valve was moved, directing investigation to the correct riser
- D. Individual zones eliminate the need for waterflow zones on the same risers

12. A fire alarm technician is installing smoke detectors for elevator recall. The building has machine-room-less (MRL) elevators with drive motors and controllers at the top of each hoistway. Per NFPA 72 Section 21.3, the drive equipment area must be treated as the machine room. When the MRL drive area detector activates, what recall response is required?

- A. Phase I recall to the primary designated floor identical to the lobby detector response
- B. Phase I recall to an alternate floor because smoke near the drive equipment may compromise the primary floor
- C. Immediate power shunt trip to disconnect elevator power before any recall sequence initiates
- D. Only a supervisory signal at the panel because MRL hoistway detection is informational

13. A fire alarm technician is installing a fire alarm system with a mass notification system per NFPA 72 Chapter 24. The emergency plan establishes that mass notification may override fire alarm audio during specific threat scenarios. When mass notification overrides fire alarm audible output, what fire alarm function must continue without interruption?

- A. Fire alarm visual notification must continue flashing during the audio override event
- B. The fire alarm panel must generate a trouble signal for the duration of the override
- C. The fire alarm panel must transfer all output control to the mass notification controller
- D. The fire alarm signal must continue transmitting to the supervising station

14. A fire alarm technician is installing a fire alarm system with a graphic annunciator at the building entrance. During commissioning, activating Zone 7 illuminates Zone 14's LED while Zone 7's LED stays dark. The panel output data has been verified as correct. What is the most likely cause?

- A. The annunciator's internal LED driver board has Zones 7 and 14 cross-connected
- B. The panel's communication board transmits Zone 7 data with Zone 14's identifier code

- C. Zone 7 and Zone 14 SLC devices have conflicting address assignments in the panel
- D. Zone 14's LED has a parallel connection that activates whenever any adjacent zone alarms

15. A fire alarm technician is installing a fire alarm system in a building where the architect specifies white devices throughout. Per NFPA 72 Section 17.14.8, which device type has a mandatory color requirement?

- A. Horn/strobe devices must be red for universal emergency identification per NFPA 72
- B. All fire alarm devices must be red per NFPA 72 for fire safety recognition
- C. Manual fire alarm stations must be red per the code requirement
- D. Smoke detectors must maintain the manufacturer's listed standard color

16. A fire alarm technician is installing a fire alarm system in a nursing home using defend-in-place on resident care floors. When a smoke detector activates on a resident floor, notification activates only on the alarm floor. What is the primary rationale for limiting notification?

- A. Full building notification is required only for nursing homes with more than 100 residents
- B. Limiting notification prevents unnecessary relocation of mobility-impaired residents on unaffected floors
- C. The building code prohibits full notification in nursing homes during nighttime hours
- D. Full notification causes panic that is more dangerous than the fire itself

17. A fire alarm technician is installing a fire alarm system with a pre-action sprinkler system using double-interlock configuration. During commissioning, the technician activates a smoke detector in the pre-action zone. The panel processes the alarm and energizes the releasing solenoid. The pre-action valve opens. For a double-interlock system, what configuration error does this indicate?

- A. No error exists — double-interlock systems should open on detection alone
- B. The solenoid wiring is connected to a single-interlock control board instead of double-interlock
- C. The detection is functioning correctly but the air pressure interlock has been bypassed

D. The system is operating as single-interlock rather than double-interlock and must be reconfigured

18. A fire alarm technician is installing a fire alarm system where the specification requires pathway survivability Level 2 on all voice evacuation circuits. The riser circuits use 2-hour CI cable. Horizontal floor-level speaker runs use standard FPLP in standard EMT conduit. Does the horizontal run meet Level 2?

A. No, standard FPLP in standard EMT does not meet Level 2 — CI cable or 2-hour construction is required

B. Yes, EMT conduit provides fire protection equivalent to 2-hour rated construction

C. Yes, horizontal runs under 100 feet are exempt from pathway survivability requirements

D. No, but Level 1 sprinkler protection is an acceptable substitute for Level 2 on horizontal runs

19. A fire alarm technician is installing a fire alarm system in a building with a fire pump controller. The controller has contacts for pump running, power available, phase reversal, and controller trouble. Per NFPA 72 Section 10.18, all four must be monitored. How should the "pump running" contact be classified at the fire alarm panel?

A. As an alarm signal because the pump only runs when a fire condition exists

B. As a trouble signal because pump running during non-fire conditions indicates a fault

C. As a supervisory signal because it is an informational off-normal equipment status

D. Pump running does not connect to the fire alarm panel — only fault contacts are monitored

20. A fire alarm technician is installing a fire alarm system with voice evacuation using 70.7V audio distribution. Two speakers on Floor 6 have been wired in parallel without impedance-matching transformers. The amplifier output measures 70.3 VAC at the panel. What is the primary risk?

A. The speakers will produce distorted audio at double the intended volume level

B. The low impedance load without transformers can cause amplifier overload and potential damage

C. The speakers will produce no audio because 70.7V systems require transformers to function

D. The parallel connection creates a supervision gap the panel cannot detect or report

21. A fire alarm technician is installing a releasing fire alarm system for a clean agent suppression system in an occupied data center. The system includes cross-zone detection, a 15-second pre-discharge countdown, and an abort switch. A safety reviewer questions whether 15 seconds provides adequate evacuation time. What determines the answer?

A. NFPA 72 specifies a fixed 30-second minimum for all occupied clean agent spaces

B. The clean agent manufacturer specifies countdown based on concentration buildup rate

C. The fire department determines the delay based on their estimated response time

D. The room size, exit locations, travel distance, and expected occupant count determine adequacy

22. A fire alarm technician is installing a fire alarm system in a 25-story residential tower with defend-in-place strategy. The sequence shows that a smoke detector alarm on Floor 18 activates notification on Floors 17, 18, and 19 only. The building manager asks why all 25 floors are not notified. What is the primary rationale?

A. Simultaneous evacuation of all floors creates dangerous stairwell congestion and is impractical for high-rise buildings

B. Residential towers are exempt from full building notification per NFPA 72 Chapter 29

C. Full notification is required only in buildings taller than 30 stories per the building code

D. Defend-in-place reduces system cost by requiring fewer notification appliances throughout

23. A fire alarm technician is installing a fire alarm system with a central station monitoring connection per NFPA 72 Chapter 26. What is the maximum time for the central station operator to initiate the required response after receiving an alarm signal?

A. 60 seconds from receipt to acknowledgment of the alarm at the operator console

B. 90 seconds from receipt to initiation of the required response action

C. 120 seconds from receipt to completion of fire department notification

D. 30 seconds from receipt to first contact with the emergency dispatch center

24. A fire alarm technician is installing a fire alarm system in a building with an emergency generator. Per NEC Article 700, the automatic transfer switch must transfer fire alarm panel power within what maximum time?

- A. 30 seconds for all emergency loads per the standard transfer requirement
- B. 60 seconds with the panel's batteries bridging the extended transition period
- C. 120 seconds because fire alarm panels have internal batteries for transition
- D. 10 seconds per NEC Article 700 for all emergency system loads

25. A fire alarm technician is installing a fire alarm system in a warehouse with 45-foot ceilings and high-bay storage racks to within 5 feet of the ceiling. The design includes ceiling-level beam detection and in-rack detection at 15-foot and 30-foot elevations. What is the purpose of the in-rack detection?

- A. In-rack detectors identify fires at the storage level before smoke reaches the 45-foot ceiling
- B. In-rack detectors provide redundancy in case the ceiling beam detectors malfunction
- C. NFPA 72 mandates in-rack detection for all rack configurations exceeding 25 feet
- D. In-rack detectors compensate for beam detector blind spots between transmitter and reflector

26. A fire alarm technician is installing a fire alarm system in a building with a swimming pool, a commercial laundry, and a ceramics kiln room. Each space produces conditions incompatible with smoke detectors. What detection technology is most appropriate for all three?

- A. Aspirating detection with sampling units mounted outside each space for remote analysis
- B. Multi-criteria detectors rated for harsh environments with particle discrimination algorithms
- C. Heat detection because all three environments create conditions causing smoke detector problems
- D. Flame detectors because combustible materials in these spaces produce visible flame first

27. A fire alarm technician is installing a fire alarm system in a cold storage distribution center. The main freezer is at  $-18^{\circ}\text{F}$ . The loading dock fluctuates between  $8^{\circ}\text{F}$  and  $92^{\circ}\text{F}$ . Offices are at  $72^{\circ}\text{F}$ . Heat detectors are specified for the freezer and dock. What minimum activation temperature is required for the loading dock?

- A.  $92^{\circ}\text{F}$  to provide immediate response to any temperature above the normal maximum
- B. At least  $112^{\circ}\text{F}$  to maintain the required  $20^{\circ}\text{F}$  margin above the  $92^{\circ}\text{F}$  maximum ambient
- C.  $200^{\circ}\text{F}$  because environments with temperature fluctuations require high-temperature ratings
- D.  $135^{\circ}\text{F}$  because it is the universal standard commercial heat detector activation temperature

28. A fire alarm technician is installing a fire alarm system in a convention center exhibit hall measuring  $380 \times 220$  feet with 44-foot ceilings. Projected beam detectors span the 380-foot dimension. The beams are spaced at 48-foot intervals across the 220-foot dimension. What must the technician verify?

- A. That the 48-foot spacing does not exceed the standard 30-foot spot detector spacing requirement
- B. That the total beam count equals at least one per 5,000 square feet of floor area
- C. That the beam spacing matches the fire sprinkler spacing for uniform protection
- D. That the 48-foot spacing does not exceed the manufacturer's listed maximum for the 44-foot ceiling

29. A fire alarm technician is installing a fire alarm system with a voice evacuation system. The design specifies remote amplifier panels on Floors 8 and 16 of a 24-story building. Each remote panel has its own batteries and serves the speaker circuits for its floor zone. What must be calculated independently for each remote panel?

- A. A separate battery calculation based on each panel's specific standby and alarm loads
- B. A combined battery calculation averaging loads across both remote panels and the main panel
- C. Only a voltage drop calculation from the main panel to each remote panel's communication circuit
- D. An SLC loading calculation for addressable devices connected through each remote panel

30. A fire alarm technician is installing a fire alarm system in a building where the sequence of operations shows a kitchen hood suppression activation triggers building notification, supervising station signal, and HVAC shutdown. The fire alarm monitors the suppression system through a monitor module. During commissioning, the technician simulates a suppression activation. The panel generates an alarm. What responses must the panel initiate?

- A. Only station signal because kitchen suppression events are supervisory in nature
- B. Only local kitchen notification because the suppression has addressed the fire
- C. Building notification, station signal, and HVAC shutdown per the approved sequence
- D. No additional response because the suppression system operates independently

31. A fire alarm technician is installing a fire alarm system in a hospital where the approved fire safety plan calls for defend-in-place on patient care floors. Under this strategy, a smoke detector alarm on a patient floor activates notification on the alarm floor only. The nurse manager asks why the floor above is not also notified. What determines the notification scope?

- A. NFPA 72 always requires notification on the alarm floor plus one above and one below
- B. The building's approved fire safety plan determines the specific notification scope
- C. Only the alarm floor receives notification in all defend-in-place hospital implementations
- D. The fire department determines the notification scope during each individual event

32. A fire alarm technician is installing a fire alarm system with a releasing circuit for a pre-action sprinkler system. Per NFPA 72 Section 23.11, the releasing circuit must be supervised. During commissioning, the technician opens the circuit to test supervision. The panel displays a trouble signal. What has been verified?

- A. That the releasing circuit can deliver adequate voltage to energize the solenoid
- B. That the pre-action valve solenoid is properly connected and operational
- C. That the cross-zone logic prevents false release during circuit fault conditions
- D. That the panel actively monitors the releasing circuit and detects loss of continuity

33. A fire alarm technician is installing a fire alarm system with dual communication — primary IP and secondary cellular. Per NFPA 72, IP technology with continuous monitoring must detect path failure within 200 seconds. During commissioning, the technician disconnects the IP cable. The panel generates "IP COMMUNICATION FAILURE" after 205 seconds. Does this meet the requirement?

- A. No, 205 seconds exceeds the 200-second maximum and must be investigated and corrected
- B. Yes, the 200-second limit has a built-in 5% tolerance for manufacturing variation
- C. Yes, because commissioning mode extends all supervision timers by 10 seconds
- D. No, but the timing can be adjusted through a field-programmable parameter in the communicator

34. A fire alarm technician is installing a fire alarm system in a building with an in-building ERCES per NFPA 72 Section 24.12. The ERCES uses a bidirectional amplifier with distributed antennas. What conditions must the fire alarm system monitor?

- A. Only power failure because antenna and amplifier faults are handled internally by the ERCES
- B. Only amplifier malfunctions because they directly impact radio signal quality
- C. Power failure, antenna faults, and amplifier malfunctions as supervisory signals
- D. All ERCES conditions as alarm signals because radio failure is an emergency condition

35. A fire alarm technician is installing ADA-accessible hotel guest room notification. The room is 15 × 17 feet with a 9-foot ceiling. Per NFPA 72 and ADA, what notification must be provided?

- A. Only a wall-mounted strobe at the standard candela for the room dimensions
- B. A wall-mounted strobe meeting NFPA 72 requirements plus a supplemental device for waking sleeping hearing-impaired occupants
- C. Only a ceiling-mounted strobe at 177 cd positioned directly above the bed
- D. A wall-mounted strobe plus a low-frequency 520 Hz audible generator near the bed

36. A fire alarm technician is installing a fire alarm system with a voice evacuation system using 70.7V audio distribution. The longest speaker circuit is 700 feet. During testing, the technician measures 61.8 VAC at the farthest speaker. The speakers are rated for minimum 55 VAC input. Is this acceptable?

- A. Yes, 61.8 VAC exceeds the 55 VAC minimum with a 6.8-volt margin
- B. No, the 70.7V system must maintain at least 90% (63.6 VAC) at all speaker locations
- C. No, the voltage drop indicates the amplifier output power is insufficient for this circuit
- D. Yes, but the speakers should be replaced with higher-sensitivity models for improved output

37. A fire alarm technician is installing a fire alarm system with networked panels across a campus. Building A has the master panel. Building D has a network node. The network cable runs through underground conduit. During heavy storms, communication between A and D drops intermittently while all other building links remain stable. The A-to-D conduit runs through a low area that floods. What is the most probable cause?

- A. Lightning-induced surges on the A-to-D cable corrupting the digital communication signal
- B. Ground potential differences between Buildings A and D increasing during storms
- C. The storm's electromagnetic field specifically interfering with the A-to-D cable path
- D. Rainwater infiltration into the A-to-D conduit segment compromising cable insulation

38. A fire alarm technician is installing a fire alarm system where the specification requires all cable above suspended ceilings to be installed in conduit. The ceiling spaces are non-plenum with dedicated ducted HVAC return. NEC does not require conduit for listed fire alarm cable in non-plenum spaces. What should the technician do?

- A. Ignore the specification and install cable without conduit per minimum NEC requirements
- B. Notify the engineer that the specification exceeds code but install conduit per the specification
- C. Install conduit as specified because the project specification is a contractual obligation
- D. Request the AHJ to override the specification and reduce it to code minimum

39. A fire alarm technician is installing a fire alarm system in a building with a fire command center per NFPA 72 Section 23.10. The FCC contains a panel repeater, voice evacuation controls, firefighter telephone, and elevator status. The building engineer asks whether a smartphone application connected to the panel via Wi-Fi can substitute for the repeater. What is the answer?

- A. Yes, if the app displays full system status with alarm, trouble, and supervisory information
- B. No, the FCC requires a permanently installed fire alarm panel or dedicated repeater — not a portable device
- C. Yes, but only if the smartphone remains permanently docked and connected at the FCC
- D. No, but a laptop permanently connected via Ethernet could serve as the repeater

40. A fire alarm technician is installing a fire alarm system in a building with a pre-action sprinkler system using single-interlock configuration. During commissioning, the technician activates a smoke detector in the pre-action zone. The solenoid energizes and the pre-action valve opens, allowing water to fill the piping. No sprinkler heads discharge. Is this correct?

- A. Yes, single-interlock opens the valve on detection — discharge requires sprinkler head activation
- B. No, the valve should remain closed until a sprinkler head also fuses from heat
- C. Yes, but the valve should close automatically after 60 seconds if no heads activate
- D. No, the detection signal should only prime the pilot line without opening the main valve

## **DOMAIN 2.2 — MAINTENANCE AND INSPECTION (Questions 41–78)**

41. A fire alarm technician is performing annual testing on a releasing fire alarm system. The solenoid is disconnected and a substitute load installed. Cross-zone logic, countdown timer, and abort switch have been verified. The technician then opens the releasing circuit and the panel generates a trouble signal. What additional test in the protected space still remains?

- A. The releasing solenoid must be reconnected to verify physical agent discharge
- B. The cross-zone test must be repeated with zones activated in the opposite sequence

- C. The panel's communication with the supervising station during a release must be tested
- D. The pre-discharge audible and visual warning appliances must be verified for adequate output

42. A fire alarm technician tests the voice evacuation live microphone from the fire command center. Audio is heard on Floors 1-10 but not on Floors 11-18. The pre-recorded message plays correctly on all 18 floors. What is the most likely cause?

- A. The amplifiers serving Floors 11-18 have a fault blocking live audio but passing recorded audio
- B. The microphone output power is insufficient to drive the total building speaker load
- C. The live microphone audio routing is programmed to broadcast only to Floors 1-10
- D. The speaker circuits on Floors 11-18 have frequency-dependent impedance faults

43. A fire alarm technician tests elevator recall. The building has three banks with selective recall. Activating Bank C's lobby detector: only Bank C recalls. Activating Bank B's lobby detector: both Banks B and C recall. Only Bank B's control module relay activated. Where is the problem?

- A. The elevator controllers for Banks B and C share a common recall input wired in parallel
- B. The panel programming for Bank B's zone activates both Bank B and Bank C recall outputs
- C. Bank B's SLC communication is interfering with Bank C's control module
- D. Bank B's smoke detector is generating a building-wide alarm code

44. A fire alarm technician is performing sensitivity testing on a 7-year-old analog addressable system with 500 detectors. The panel report shows 18 detectors between 3.8% and 5.0% (above 3.7% max) and 4 detectors between 0.1% and 0.4% (below 0.5% min). What action is required?

- A. Only the 18 high-reading detectors require cleaning — the 4 low readings indicate better sensitivity
- B. All 22 out-of-range detectors — both high and low — require investigation and corrective action
- C. All 500 detectors must be cleaned because 22 out-of-range suggests building-wide contamination
- D. The panel sensitivity thresholds should be expanded to accommodate the 7-year drift range

45. A fire alarm technician tests AC power supervision by disconnecting primary AC. After 2 hours and 50 minutes, the panel generates "AC POWER FAILURE" trouble. Per NFPA 72 Section 10.6.9, is this timing acceptable?

- A. No, the trouble must appear immediately upon loss of primary power
- B. No, the trouble should appear within 60 minutes for modern panel systems
- C. Yes, but only because the panel was in annual testing mode which extends timers
- D. Yes, 2 hours and 50 minutes is within the 3-hour maximum permitted by NFPA 72

46. A fire alarm technician discovers during inspection that a smoke detector in a hospital corridor has been covered with a surgical mask by nursing staff during a renovation. The mask has been in place for six weeks. What must be documented?

- A. Surgical masks are porous enough to permit smoke entry and the detector remains functional
- B. The detector has been disabled for six weeks — a significant impairment requiring immediate correction
- C. The covering is acceptable during active renovation if logged in the building maintenance record
- D. The mask may remain until the renovation is complete to prevent construction dust alarms

47. A fire alarm technician tests a double-interlock pre-action sprinkler system. The technician activates a smoke detector. The panel processes the alarm. The pre-action valve does not open. Is this correct?

- A. Yes, double-interlock requires both detection AND air pressure drop before the valve opens
- B. No, detection should open the valve as the first interlock condition for all pre-action systems
- C. Yes, but only because the system was in maintenance mode during the testing procedure
- D. No, the detection signal should at least energize the pilot solenoid for faster valve response

48. A fire alarm technician tests communication paths — primary IP and secondary cellular. IP test succeeds. The technician disconnects IP and tests cellular. After 200 seconds, the panel generates "IP COMMUNICATION FAILURE." The cellular test then transmits successfully. What has been verified?

- A. Only the IP path works because the cellular test occurred under abnormal fault conditions
- B. The IP supervision timing should have been 60 seconds and the 200-second result is non-compliant
- C. Both paths function correctly and the 200-second IP supervision timing meets NFPA 72
- D. The cellular path has an unacceptable delay because it transmitted only after the IP trouble appeared

49. A fire alarm technician discovers that the panel's event log has been full for seven months, overwriting oldest entries. Building management was unaware. What operational impact exists?

- A. The full log causes panel processing delays that reduce system response speed
- B. The event log capacity has no operational impact because the panel functions independently
- C. The panel must be replaced with a model having larger event log storage
- D. Seven months of diagnostic history has been permanently lost — the log must be downloaded and cleared

50. A fire alarm technician tests semiannual smoke detectors on Floor 5. Six adjacent detectors (addresses 051-056) take 28 to 38 seconds to activate with aerosol smoke. All other Floor 5 detectors activate in 3 to 7 seconds. What does the delayed response indicate?

- A. The SLC polling rate for addresses 051-056 is configured slower than other devices
- B. The six detectors likely have contaminated sensing chambers reducing their responsiveness
- C. The aerosol can was running low during those six consecutive tests producing less smoke
- D. The HVAC system is diluting smoke at those locations before it reaches the detectors

51. A fire alarm technician tests primary-to-secondary power transfer. After disconnecting AC, battery voltage reads: 0 min = 27.0 VDC, 5 min = 26.6 VDC, 10 min = 26.2 VDC, 15 min = 25.8 VDC. After reconnecting AC, the charger activates. Are these readings acceptable?

- A. Yes, the gradual 1.2-volt decline over 15 minutes is normal for batteries under standby load
- B. No, the 1.2-volt drop indicates the batteries are deteriorating and nearing end of life
- C. Yes, but only if voltage recovers above 27.0 VDC within 30 minutes of charger restart
- D. No, voltage should remain constant during standby because the current draw is minimal

52. A fire alarm technician discovers a smoke detector in a nursing home covered with a clear plastic bag by housekeeping staff. Small holes are punched in the bag. Staff say it prevents cleaning chemical alarms. What must be documented?

- A. The holes allow adequate smoke entry and the modification is acceptable during cleaning
- B. The bag can remain if housekeeping signs an acknowledgment accepting responsibility
- C. The container can remain if the detector still activates during functional testing
- D. The unauthorized modification renders the detector non-compliant and must be removed immediately

53. Per NFPA 72 Table 14.4.3.2, what is the required testing frequency for releasing device circuits controlling suppression agent discharge?

- A. Semiannually because releasing circuits are more critical than standard detection circuits
- B. Monthly because the suppression system must always be ready to respond
- C. Annually as part of the comprehensive releasing system functional test
- D. Only during initial acceptance with no recurring periodic testing required

54. A fire alarm technician tests notification appliances. A wall-mounted speaker on a 70.7V circuit produces clear audio but at significantly reduced volume compared to identical speakers. Circuit voltage at the speaker reads 69.5 VAC. What is the most likely cause?

- A. The amplifier channel has a partial fault reducing output to this specific speaker
- B. The speaker's internal wattage tap is set to a lower power than the other speakers
- C. The 69.5 VAC reading is below the speaker's minimum operating voltage threshold
- D. The speaker wire has a high-resistance splice reducing power delivery to the device

55. A fire alarm technician tests visible notification in a hospital corridor. Two strobes are visible from the same location. Both flash but approximately 0.3 seconds apart. The devices are on different NAC circuits. What code requirement is violated?

- A. The synchronization requirement — all visible appliances in the same field of view must flash together
- B. The candela requirement because unsynchronized strobes produce uneven light distribution
- C. The flash rate requirement because the combined output exceeds 2 flashes per second
- D. The mounting height requirement because improperly mounted strobes create timing offsets

56. A fire alarm technician discovers two pull stations in a school painted yellow to match school colors. Paint covers housing, handle, and instruction labels. What must be documented?

- A. The pull stations function if they activate during testing and paint is cosmetic only
- B. Only the instruction labels need restoration — housing color is an aesthetic preference
- C. The school should repaint the devices red within 30 days to restore compliance
- D. The painted pull stations must be replaced because paint obscures the required red color and labels

57. A fire alarm technician performs a battery load test. Starting voltage is 26.6 VDC. After the test duration under full alarm load, ending voltage is 24.4 VDC. The manufacturer's minimum end-voltage is 20.4 VDC. Do the batteries pass?

- A. No, the 2.2-volt drop indicates batteries are approaching end of life
- B. No, batteries must maintain voltage above 24.0 VDC throughout the entire test
- C. Yes, 24.4 VDC is well above the 20.4 VDC minimum with a 4.0-volt margin
- D. Yes, but the batteries should be preventively replaced within 6 months

58. A fire alarm technician tests the HVAC shutdown interface. A duct detector activates, the panel processes the alarm, the control module relay closes. The AHU does not shut down. Where should the investigation focus?

- A. On the panel programming because the HVAC output may not be linked to the duct zone
- B. On the wiring between the control module relay and the AHU controller shutdown input
- C. On the duct detector because it may generate an incorrect signal type for HVAC output
- D. On the SLC communication because the control module may not have received the command

59. A fire alarm technician discovers the Record of Completion was last updated five years ago. Two renovations added 50 devices and changed the sequence of operations. What corrective action is needed?

- A. The Record must be updated to reflect the current system configuration per NFPA 72 Section 7.8
- B. Annual testing records adequately capture modifications making the update optional
- C. The original Record remains valid as the initial compliance baseline documentation
- D. A new Record is needed only if the panel was physically replaced during renovations

60. A fire alarm system event log shows 110 "WATERFLOW — ALARM" entries over three months with no fires. No sprinkler heads activated. The building engineer reports municipal pressure surges. What should be recommended?

- A. Disconnect the waterflow switches until the municipal issue is permanently resolved
- B. Replace all switches with models having built-in pressure surge compensation
- C. Increase the panel's alarm threshold for waterflow zones to filter brief events
- D. Investigate the pressure surges and adjust the waterflow switch retard delay settings

61. A fire alarm technician discovers during testing that a building renovation enclosed a corridor smoke detector behind a new wall. The detector communicates with the panel. What must be documented?

- A. The detector can remain behind the wall because it communicates normally with the panel
- B. The panel location descriptor should be updated to reflect the detector's concealed position
- C. The detector must be relocated to the occupied corridor and the concealed space evaluated
- D. The concealed detector provides dual coverage for both spaces simultaneously

62. A fire alarm technician tests a tamper switch on an OS&Y valve. After two full revolutions from fully open, the supervisory signal appears. Per NFPA 72, does this pass?

- A. No, the switch must activate after one revolution for OS&Y valves specifically
- B. Yes, activation within two revolutions meets the NFPA 72 requirement
- C. No, the requirement is activation within one and a half revolutions maximum
- D. Yes, but only for OS&Y valves — butterfly valves have stricter requirements

63. A fire alarm technician tests a horn/strobe. The temporal-three horn pattern sounds correctly. The strobe flashes at approximately 0.9 flashes per second. Per NFPA 72, what should be documented?

- A. The strobe fails — NFPA 72 requires 1 to 2 flashes per second and 0.9 is below the minimum

- B. The strobe passes because any flash rate below 2 per second is within acceptable limits
- C. The flash rate is irrelevant if the candela output meets the room coverage requirement
- D. The strobe rate is acceptable for sleeping areas but fails for commercial applications

64. A fire alarm technician discovers a tamper switch activation generates an alarm signal instead of a supervisory signal. Contact closure is confirmed at the panel. What is the most likely cause?

- A. The tamper switch requires a different EOLR value than the panel's alarm circuits
- B. The panel hardware cannot distinguish alarm from supervisory on the same input type
- C. The tamper switch wiring polarity is reversed causing misclassification at the panel
- D. The tamper switch input is programmed as an alarm zone rather than supervisory

65. A fire alarm system has primary IP and secondary cellular communication. "IP COMMUNICATION FAILURE" has been active for 50 days. Cellular functions normally. What should be documented?

- A. The cellular provides complete monitoring so the IP failure is not urgent
- B. The IP trouble should be repaired at the owner's convenience during the next visit
- C. The system has operated without communication redundancy for 50 days — a significant impairment
- D. No documentation is needed because the system functions with the cellular path

66. A fire alarm technician discovers a building tenant mounted a decorative shelf directly over a corridor horn/strobe, completely blocking both horn and strobe output. What must be documented?

- A. Only the strobe obstruction is significant because horn sound travels around obstacles
- B. The shelf obstructs both audible and visible notification and must be removed
- C. The device is functional if it activates during testing regardless of the shelf
- D. Building management may apply for an AHJ variance to keep the decorative shelf

67. A fire alarm technician performs a battery load test. Starting voltage is 27.2 VDC. After the test duration under full alarm load, ending voltage is 19.8 VDC. The manufacturer's minimum end-voltage is 20.4 VDC. What must be documented?

- A. The batteries failed — 19.8 VDC is below the manufacturer's 20.4 VDC minimum
- B. The batteries passed because 19.8 VDC exceeds the industry minimum of 18 VDC
- C. The test is inconclusive and must be repeated after batteries are fully recharged
- D. The batteries can remain in service for 90 days while replacements are ordered

68. A fire alarm technician discovers a smoke detector relocated from the ceiling to a desk at approximately 30 inches above the floor by building staff. What must be documented?

- A. The detector at desk height may detect smoke faster because smoke fills the entire room
- B. The relocation is acceptable if building staff document the reason for the change
- C. The detector at desk height is non-functional for detection and must be reinstalled at the ceiling
- D. The detector should be raised to at least 60 inches for improved smoke coverage

69. Per NFPA 72 Table 14.4.3.2, what is the minimum testing frequency for supervisory devices such as tamper switches?

- A. Monthly to ensure sprinkler valve positions remain in the correct open position
- B. Semiannually to coincide with the smoke detector testing schedule
- C. Quarterly to match the building's standard maintenance inspection program
- D. Annually as part of the comprehensive system functional test

70. A fire alarm technician discovers the fire command center graphic annunciator is completely dark — no LEDs or display elements. The panel repeater, voice controls, and telephone all function. What must be documented?

- A. The annunciator is supplementary and its failure has no operational impact
- B. The annunciator failure impairs emergency response and must be documented as a deficiency
- C. The annunciator must be replaced entirely because component-level repair is not supported
- D. The annunciator can be repaired at the building owner's convenience during the next visit

71. Per NFPA 72 Table 14.4.3.2, releasing device circuits must be tested at what frequency?

- A. Annually as part of the comprehensive releasing system functional test
- B. Semiannually because releasing circuits are more critical than detection circuits
- C. Monthly to ensure the suppression system is always ready to respond
- D. Only during initial acceptance with no recurring periodic testing required

72. A fire alarm technician discovers the fire alarm panel room contains paint, cleaning chemicals, and storage boxes. Working clearance is 20 inches. What code requirements are being violated?

- A. Only the chemical storage is a concern — other items and clearance are acceptable
- B. The room may be used for storage if chemicals are in sealed containers per OSHA
- C. Both the storage and inadequate clearance violate NEC Article 110 working space requirements
- D. Only the 20-inch clearance violates code — organized storage is permitted in panel rooms

73. Per NFPA 72 Table 14.4.3.2, what is the required functional testing frequency for smoke detectors?

- A. Annually as part of the comprehensive system functional test
- B. Quarterly to coincide with the building's standard maintenance program

- C. Monthly to ensure continuous reliable detection throughout the premises
- D. Semiannually using approved aerosol smoke or a calibrated test source

74. A fire alarm technician tests the stairwell pressurization interface. A detector activates and fans start. Floor 6 stairwell door requires more force to open. Floor 14 door opens normally with no resistance. What should be documented?

- A. Only fan activation requires documentation — door resistance is the mechanical engineer's scope
- B. Both observations should be documented because inconsistent pressurization suggests a duct or damper issue
- C. Some floor-to-floor variation is expected and both floors pass the test
- D. Only the Floor 6 observation matters because it confirms positive pressure exists

75. A fire alarm technician discovers during annual testing that the panel clock shows 1:15 PM when actual time is 3:00 PM — a 105-minute discrepancy. What must be documented?

- A. Time discrepancies under 2 hours are within acceptable tolerance
- B. The clock error only affects display and has no operational significance
- C. Only the AHJ can determine whether the discrepancy requires correction
- D. The 105-minute discrepancy affects event log accuracy and the clock must be corrected

76. A fire alarm technician tests the access control interface. When the alarm activates, magnetically locked egress doors must unlock. The technician activates a detector: 14 of 16 locks release but 2 remain locked. What must be investigated?

- A. The control module outputs, wiring, and power supply to the two non-releasing locks
- B. The panel programming because the two locks may not be in the alarm response matrix
- C. The access control firmware which may need updating for fire alarm compatibility
- D. The NAC circuits because the locks may be powered from the notification circuit

77. A fire alarm technician tests a waterflow switch by opening the inspector's test valve. Water flows continuously. After 88 seconds, the panel generates "WATERFLOW — ALARM." Per NFPA 72, does this pass?

- A. No, the alarm must appear within 60 seconds per standard waterflow timing
- B. No, the alarm must appear within 30 seconds for wet-pipe systems specifically
- C. Yes, 88 seconds is within the 90-second maximum for waterflow alarm response
- D. Yes, but the 88-second response suggests the retard delay is at maximum setting

78. A fire alarm technician performs annual sensitivity testing. The panel report shows one detector at 0.3% obscuration/ft — below the manufacturer's 0.5% minimum. What does this indicate?

- A. The detector is outside its listed parameters and must be investigated for a fault
- B. The detector is at peak sensitivity representing the ideal operating condition
- C. Low readings are always acceptable because they indicate enhanced detection
- D. The panel's sensitivity reporting calibration has drifted and needs recalibration

### **DOMAIN 2.3 — SUBMITTAL PREPARATION AND SYSTEM LAYOUT (Questions 79–100)**

79. A fire alarm voltage drop calculation shows a NAC using 14 AWG copper ( $3.14 \Omega/1000 \text{ ft}$ ), round-trip 800 feet, alarm current 2.8 amps on a 24 VDC system. What is the end-of-circuit voltage?

- A. 21.50 VDC providing generous margin above the minimum
- B. 16.97 VDC providing minimal but code-compliant margin above 16 VDC
- C. 15.50 VDC falling below the 16 VDC minimum requiring circuit redesign
- D. 24.0 VDC because 14 AWG produces negligible drop under 1,000 feet

80. A fire alarm battery calculation: panel/SLC standby = 0.80A, voice standby = 1.20A, NAC alarm = 4.4A, voice alarm = 8.6A. Building has a qualifying generator. Using 4-hour standby, 15-minute alarm, 20% safety factor. What is the minimum capacity?

- A. 15.60 Ah using 4-hour standby with 5-minute alarm instead of 15-minute
- B. 10.85 Ah using 4-hour standby and 15-minute alarm without the safety factor
- C. 24.00 Ah using 24-hour standby because generators don't reduce voice requirements
- D. Approximately 13.0 Ah after applying 4-hour standby, 15-minute alarm, and 20% safety factor

81. A fire alarm sequence of operations matrix shows a duct detector triggering HVAC shutdown only — no building notification, no recall, no station signal. A reviewer flags the missing station transmission. What is correct?

- A. Duct detectors never transmit to the station because they are supervisory-class devices
- B. The reviewer is incorrect — duct signals transmit automatically regardless of the matrix
- C. The duct detector signal should transmit to the supervising station even without notification
- D. Station transmission applies only when duct detectors are configured as alarm inputs

82. A fire alarm conduit schedule shows 1-inch EMT with ten 14 AWG THHN and six 16 AWG THHN (16 total). Annex C max for 14 AWG alone is 22 and for 16 AWG alone is 31. Mixed sizes are present. How must fill be verified?

- A. Calculate total conductor area from Chapter 9 Table 5 and compare to the 40% fill limit
- B. Compare each size to its individual maximum — both are below so the installation passes
- C. Add counts (10+6=16) and compare to the smaller Annex C maximum of 22
- D. Use the Annex C table for 14 AWG only since the larger conductor controls fill

83. A fire alarm floor plan shows a 90-degree L-shaped corridor — 170 feet on the longer leg and 110 feet on the shorter leg. Detectors at 30-foot spacing with a detector at the corner. Is the corner detector necessary?

- A. No, detectors along each leg provide adequate coverage through the direction change
- B. No, corner detectors create redundant coverage that wastes project budget
- C. Yes, but only if the corridor width exceeds 10 feet at the corner intersection
- D. Yes, the corner detector ensures detection at the direction change where coverage from either leg may be limited

84. A fire alarm device schedule shows 192 devices on SLC 1 (max 198). A renovation adds 15 new devices. How should the technician advise?

- A. Add 6 to SLC 1 and place 9 on a new loop — but note SLC 1 at max has zero flexibility
- B. All 15 should go on a new SLC to preserve remaining capacity on SLC 1 for future needs
- C. All 15 can be added by requesting a firmware extension beyond 198 devices
- D. Install monitor modules to consolidate existing devices and free addresses for new devices

85. A fire alarm riser diagram shows remote NAC power supplies on Floors 7, 14, and 21 of a 28-story building. Each has its own batteries. What must be calculated separately?

- A. A voltage drop calculation from the main panel to each remote panel location
- B. A combined battery calculation averaging loads across all three remote panels
- C. A separate battery calculation based on each remote panel's specific standby and alarm loads
- D. A conduit fill calculation for the supervised circuit between the main panel and each remote

86. A fire alarm specification requires the Record of Completion per NFPA 72. What must this document contain?

- A. System specifications, circuit details, device counts, power supply data, and required signatures
- B. Only the installer's license number and signature certifying code compliance
- C. Only the AHJ's inspection report and acceptance test pass/fail determination
- D. The design engineer's calculations, specification references, and submittal review comments

87. A fire alarm technician reviews a specification requiring all cable above suspended ceilings to be in conduit. Spaces are non-plenum. NEC does not require conduit in non-plenum spaces. What should the technician do?

- A. Ignore the specification because it exceeds minimum code requirements
- B. Install conduit only in corridor ceiling spaces and omit it in rooms
- C. Request the AHJ to override the specification to reduce costs
- D. Install conduit as specified because the project specification is a contractual obligation

88. A fire alarm voltage drop calculation for a 70.7V speaker circuit shows 63.5 VAC at the farthest speaker. The manufacturer's minimum input is 55 VAC. Does the circuit pass?

- A. No, 70.7V systems must maintain at least 90% (63.6 VAC) at all locations
- B. Yes, 63.5 VAC exceeds the 55 VAC minimum with an 8.5-volt margin
- C. No, speakers require exactly 70.7 VAC for proper impedance matching
- D. Yes, but only if the amplifier can be increased to compensate for the loss

89. A fire alarm shop drawing shows a releasing system with a 20-second pre-discharge timer. The engineer notes it may not provide adequate evacuation. What determines the appropriate delay?

- A. NFPA 72 specifies a fixed 30-second minimum for all occupied clean agent spaces

- B. The agent manufacturer specifies delay based on concentration buildup rate
- C. The fire department determines delay based on their estimated response time
- D. The room size, exit count, travel distance, and expected occupant count determine adequacy

90. A fire alarm as-built drawing shows 172 devices on SLC 1. Panel programming shows 180. The Record of Completion shows 165. What must be corrected?

- A. Only the as-built drawings need updating since they are closest to the panel count
- B. All three documents must be reconciled against a physical field count to show the same number
- C. The panel must be reprogrammed to match the as-built drawings as the design reference
- D. Only the Record needs updating because it has the most outdated count

91. A fire alarm floor plan shows a 190-foot straight corridor with detectors at 30-foot spacing. First detector at 10 feet: positions at 10, 40, 70, 100, 130, 160, 190. Seven detectors with the last at the far end. Is this correct?

- A. Yes, 7 detectors with 30-foot spacing and both end distances within 15 feet provide complete coverage
- B. No, 8 detectors are required because the gap near the center creates a coverage hole
- C. No, the first detector at 10 feet wastes a detector since 15 feet is the maximum end distance
- D. Yes, but additional detectors are required at every corridor intersection

92. A fire alarm shop drawing shows two SLC loops: SLC 1 (Class B, Floors 1-5) and SLC 2 (Class A, Floors 6-20). A reviewer questions the different classifications. What is a valid rationale?

- A. NFPA 72 requires Class A above Floor 5 in buildings taller than 6 stories
- B. Both loops must use identical classifications for consistent panel performance
- C. The designer determined upper floors benefit from Class A fault tolerance due to longer egress times
- D. Class B is prohibited above Floor 5 per NEC Article 760 for life safety circuits

93. A fire alarm shop drawing shows a NAC with 11 horn/strobes at 0.295A each, 7 speakers at 0.140A each, and 5 strobes at 0.185A each. The NAC output is rated at 3.0 amps. What is the total load?

- A. 3.245 amps from the horn/strobes alone exceeding the 3.0-amp rating
- B. 2.36 amps total providing substantial margin within the 3.0-amp rating
- C. 3.92 amps total based on averaging all device currents and multiplying by count
- D. 5.15 amps total from all devices which significantly exceeds the 3.0-amp rating

94. A fire alarm riser diagram shows "PATHWAY SURVIVABILITY LEVEL 2" on voice evacuation circuits. What satisfies Level 2?

- A. Standard FPLP in standard EMT conduit without additional fire rating
- B. Either 2-hour fire-rated cable (CI cable) or installation within 2-hour fire-rated construction
- C. Standard FPLR in a 1-hour fire-rated stairwell enclosure
- D. Any listed fire alarm cable in rigid metal conduit with firestop at each penetration

95. A fire alarm specification requires acceptance testing per NFPA 72 before the CO is issued. The spec requires 7 business days' notice to the AHJ. The general contractor demands testing in 3 days. How should the contractor respond?

- A. Maintain the 7-day notice requirement per the specification and reschedule accordingly
- B. Conduct testing in 3 days and submit results to the AHJ for retroactive approval
- C. Contact the AHJ to request an expedited waiver of the notice period
- D. Perform a preliminary test in 3 days and schedule the formal AHJ test with proper notice

96. A fire alarm floor plan shows a conference room measuring  $50 \times 40$  feet with a 10-foot ceiling. Two wall-mounted strobes — one 60 cd on each 50-foot wall. Per NFPA 72, a single 60 cd strobe covers rooms up to  $45 \times 45$  feet. Do the two strobes provide adequate coverage?

- A. No, each strobe individually cannot cover the 50-foot dimension so the room fails
- B. No, four strobes are required — one on each wall — per the table methodology
- C. Yes, two strobes on opposite walls provide overlapping coverage addressing the full room
- D. Yes, but only if both strobes are synchronized and at identical mounting heights

97. A fire alarm technician reviews as-built drawings showing 142 devices on SLC 1. Physical count reveals 150 devices. Panel programming confirms 150. What documentation action is required?

- A. No action because the 8-device discrepancy is within standard acceptable tolerance
- B. The panel must be reprogrammed to match the 142-device as-built drawing count
- C. Only the Record of Completion needs updating since the drawings were the original design
- D. The as-built drawings must be updated to reflect the 150 devices currently installed

98. A fire alarm battery calculation: standby =  $0.65A \times 24hr = 15.60$  Ah, alarm =  $4.8A \times 0.083hr = 0.398$  Ah, subtotal =  $15.998$  Ah,  $\times 1.20 = 19.20$  Ah. The drawing specifies 18 Ah batteries. Is this adequate?

- A. Yes, 18 Ah is close enough to 19.20 Ah for practical purposes
- B. No, 18 Ah is below the 19.20 Ah calculated minimum — the next standard size must be used
- C. Yes, but only if the building has a qualifying generator reducing the standby
- D. No, but the calculation error is in applying 20% to the subtotal instead of each component

99. A fire alarm sequence of operations for a hospital shows smoke detector alarms on patient floors trigger alarm-floor-only notification while pull station alarms trigger full building notification. Both trigger elevator recall and station signal. Is this valid?

- A. Yes, defend-in-place hospitals may have differentiated responses per the approved fire safety plan
- B. No, all alarm types must trigger identical building-wide notification responses
- C. No, smoke detectors must always trigger broader notification than pull stations
- D. Yes, but only if the hospital has fewer than 200 beds per the building code threshold

100. A fire alarm as-built drawing captures the panel's dedicated branch circuit: 20A breaker, 12 AWG, 170-foot run, labeled, lock-on device, no GFCI/AFCI. What additional detail should be documented?

- A. The voltage at panel terminals for baseline comparison during future service
- B. The electrician's name and license number for warranty documentation
- C. The conduit type, size, and routing path from the electrical panel to the fire alarm panel
- D. The circuit breaker manufacturer and catalog number for replacement parts

#### **DOMAIN 2.4 — MANAGEMENT (Questions 101–110)**

101. A fire alarm project supervisor discovers a subcontractor pulled cable with excessive tension on 16 runs totaling 2,400 feet. Internal insulation may be damaged. What must the supervisor require?

- A. Visual inspection at each junction box is sufficient to identify pulling damage
- B. The cable can be connected — any damage will be found during functional testing
- C. The subcontractor must certify in writing that proper pulling technique was used
- D. Megger testing on all 16 cable runs to verify insulation integrity before connecting devices

102. A fire alarm contractor is coordinating acceptance testing for a building with elevator recall, HVAC shutdown, stairwell pressurization, smoke control, and door holder release. Which trade contractors must be present?

- A. The elevator, HVAC, controls, and door hardware contractors must be present to verify their equipment
- B. Only the fire alarm contractor attends because the test covers fire alarm equipment exclusively
- C. The general contractor solely coordinates and attends on behalf of all trades
- D. Only the AHJ and fire alarm contractor need to be present — trades submit results separately

103. A fire alarm project manager receives a change request to convert from horn/strobe to voice evacuation at 85% completion. What is the correct response?

- A. Install speakers on remaining areas and keep horn/strobes in completed areas
- B. Refuse because voice evacuation conversion at 85% is technically impossible
- C. A formal change order documenting engineering revision, cost, and schedule impact must be processed
- D. Absorb the cost to maintain the client relationship and project timeline

104. A fire alarm contractor discovers the electrical contractor installed an AFCI/GFCI breaker on the fire alarm dedicated circuit. What is the correct action?

- A. Accept the breaker because it provides enhanced protection beyond code minimum
- B. Notify the general contractor to direct the electrical contractor to replace it with a standard breaker
- C. Replace the breaker directly since fire alarm compliance is the fire alarm contractor's scope
- D. Contact the building owner to authorize the cost of the breaker replacement

105. A fire alarm contractor receives 350 detectors — 330 with one date code and 20 with a different date code. All same model listed for the panel. Should the contractor be concerned?

- A. Yes, all detectors on the same SLC must have identical date codes for firmware consistency

- B. Yes, the 20 different units should be installed on a separate SLC loop from the 330
- C. No, but the 20 units should be placed in non-critical locations as a precaution
- D. No, date code variations are normal in large orders and do not affect compatibility

106. A fire alarm technician asks whether a service call to tighten a loose wire nut — resolving an SLC ground fault — requires a formal written service report. What is correct?

- A. Every service activity must be documented in a written report regardless of repair scope
- B. Reports are needed only when devices are replaced or panel programming is changed
- C. Reports are required only when the repair resolves an active alarm condition
- D. Minor repairs under 15 minutes can be documented with verbal confirmation

107. A fire alarm project's field technicians produced messy but accurate markup drawings during construction. Closeout is approaching. What should the contractor do?

- A. Submit the messy markups as-is because they represent actual installed conditions
- B. Submit the original shop drawings since the installation followed the approved design
- C. Create clean professional as-built drawings incorporating all field markup information accurately
- D. Have technicians recreate drawings from memory to produce cleaner documentation

108. Per NFPA 72, what minimum documentation must the contractor deliver to the building owner at closeout?

- A. Only the panel manufacturer's operating manual and warranty documents
- B. As-built drawings, Record of Completion, sequence of operations, and operating instructions
- C. Only the as-built drawings and the contractor's signed completion certificate
- D. The complete bid documents, shop drawings, and internal quality worksheets

109. A fire alarm contractor schedules acceptance testing for a hospital. Infection control requires 72-hour notice before aerosol testing in patient care areas. The general contractor wants testing in 48 hours. How should the contractor proceed?

- A. Provide the 72-hour notice and coordinate patient care testing per infection control requirements
- B. Proceed with testing in 48 hours because fire code compliance overrides hospital protocols
- C. Test only non-patient areas in 48 hours and skip patient areas entirely
- D. Use non-aerosol methods exclusively in patient areas without advance notice

110. A fire alarm project supervisor schedules acceptance testing. The AHJ requires 10 business days' notice. The general contractor demands testing in 4 days. How should the supervisor respond?

- A. Conduct testing in 4 days and submit results to the AHJ for retroactive approval
- B. Request the AHJ waive the notice period due to the project's critical timeline
- C. Perform a preliminary test in 4 days and schedule the formal AHJ test with proper notice
- D. Maintain the 10-day notice requirement and reschedule with proper AHJ notification

# LEVEL II — SIMULATION EXAM 9: ANSWER KEY AND EXPLANATIONS

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1. C — Standard FPLP cable depends on the surrounding 2-hour fire-rated stairwell construction for its Level 2 protection. Once the cable exits the stairwell into an unrated corridor ceiling space, the 2-hour construction protection is no longer present. The cable itself has no independent fire rating — Level 2 is lost at the point of exit.
2. A — Standby =  $(0.72 + 1.28) \times 4 = 8.0$  Ah. Alarm =  $(3.6 + 7.4) \times 0.25 = 2.75$  Ah. Subtotal = 10.75 Ah. With 20% safety factor:  $10.75 \times 1.20 = 12.90$  Ah, approximately 12.24 Ah with rounding variations. The generator reduces standby to 4 hours while voice evacuation requires 15-minute alarm duration.
3. D — Cross-zone logic, countdown timer, and abort switch have all been verified. The remaining releasing system test is verifying the releasing circuit supervision by opening the circuit and confirming the panel generates a trouble signal. This confirms the panel actively monitors circuit integrity and would detect a wiring failure.
4. B — Bank D's selective recall tested correctly — only Bank D recalled. When Bank A's detector activated, both A and D recalled despite only Bank A's detector being triggered. The most likely cause is a panel programming error where Bank A's detector zone is configured to activate both Bank A and Bank D recall outputs.
5. D — NFPA 72 Section 26.6.3.2 requires IP communication technologies with continuous path monitoring to detect failure within 200 seconds. The panel generated the trouble after 185 seconds, which is within the 200-second maximum. The system meets the supervision timing requirement.
6. A — NFPA 72 Section 23.8.1.3 requires that if a second automatic alarm from a different zone occurs during the PAS investigation period, PAS must immediately cancel and general alarm notification must activate. A second zone activation provides independent confirmation of a genuine alarm condition.
7. C — NFPA 72 Section 23.10 requires the fire command center to have a complete fire alarm control panel or a complete repeater panel with full system status display and operator control capability. Simplified annunciators, BMS workstations, and telephone lines do not satisfy this requirement.
8. B — The DACT automatically retried Line 2 after the initial busy signal, and the handshake completed successfully on the second attempt. The successful handshake confirms the complete

end-to-end communication path functions. DACTs are designed to retry after busy signals, and a successful retry validates the line.

9. D — When acoustically rated partitions divide the ballroom into seven enclosed spaces, each space is isolated from the others. Sound and light from appliances in one space cannot reach occupants in adjacent enclosed spaces. Each configuration must have independent notification coverage when partitions are deployed.
10. A — A raised floor space used for air distribution — whether supply or return — is classified as a plenum. FPLP cable is required for all fire alarm circuits routed through this space. Lower-rated cables cannot substitute for FPLP in plenum applications regardless of the plenum location.
11. C — Individual tamper zones identify which specific valve was moved from its normal position, directing investigation to the correct riser and building area. Grouping all tamper switches on a single zone eliminates this specificity, forcing maintenance personnel to investigate all riser locations.
12. B — When the MRL drive area detector activates, smoke near the motor and controller at the top of the hoistway may travel down the shaft to the primary recall floor. Recalling elevators to a potentially smoke-contaminated floor endangers passengers. NFPA 72 Section 21.3 requires recall to an alternate floor for machine room detection.
13. D — When mass notification overrides fire alarm audible notification, the fire alarm signal must continue transmitting to the supervising station for fire department dispatch. The override affects only in-building audio — not external alarm communication. Fire department response continues regardless of which system controls the speakers.
14. A — The panel sends correct zone data, but the annunciator displays Zone 7's alarm on Zone 14's LED while Zone 7's LED stays dark. The most likely cause is a cross-connection on the annunciator's internal LED driver board where the wiring for Zones 7 and 14 are swapped.
15. C — NFPA 72 Section 17.14.8 specifically requires manual fire alarm stations to be red. This is the only fire alarm device type with a mandatory code-specified color requirement. Smoke detectors, horn/strobes, and speakers may be any color acceptable to the project specifications.
16. B — Defend-in-place limits notification to the alarm floor to prevent unnecessary relocation of mobility-impaired nursing home residents on unaffected floors. Moving residents who require wheelchairs, walkers, or physical assistance poses significant physical risk. Staff on the alarm floor manage the response while other floors continue uninterrupted care.
17. D — A double-interlock pre-action system requires BOTH fire detection AND a drop in supervisory air pressure before the valve opens. The valve opening on detection alone means the system is functioning as single-interlock rather than double-interlock. The releasing panel, valve controller, or interlock wiring must be reconfigured.

18. A — Standard FPLP cable in standard EMT conduit does not meet Level 2 pathway survivability. Level 2 requires either 2-hour fire-rated cable (CI cable) or installation within 2-hour fire-rated construction. Standard EMT does not provide 2-hour fire protection regardless of the cable type inside.
19. C — Fire pump running status is classified as a supervisory signal because it indicates an off-normal equipment condition requiring awareness but not emergency response. The pump may run for testing, pressure maintenance, or fire response. The running status provides informational awareness — not confirmation of a fire condition.
20. B — In a 70.7V audio system, impedance-matching transformers convert the high-voltage signal to each speaker driver's low impedance. Without transformers, parallel speakers present very low impedance directly to the amplifier, causing excessive current draw, severe audio distortion, and potential amplifier overload or damage.
21. D — The pre-discharge countdown must provide adequate evacuation time based on the room's specific characteristics: physical dimensions, exit locations, maximum travel distance to exits, and expected occupant count. These factors determine whether 15 seconds is sufficient — not a fixed code value or manufacturer specification.
22. A — Simultaneous evacuation of all 25 floors into the stairwells creates dangerous congestion that slows evacuation and can cause crush injuries at stairwell entrances. Defend-in-place notifies only affected floors, allowing controlled evacuation while remaining floors shelter safely in fire-rated compartments.
23. B — NFPA 72 Section 26.3.4 requires the central station to initiate the required response actions — including fire department notification — within 90 seconds of receiving an alarm signal. This window encompasses signal receipt, operator processing, account verification, and dispatch initiation.
24. D — NEC Article 700.12(B) requires emergency system transfer switches to transfer load from normal to generator power within 10 seconds of utility failure. This rapid transfer minimizes battery-only operation for fire alarm panels and ensures all emergency loads receive generator power promptly.
25. A — In-rack detectors at intermediate heights identify fires where they originate — among stored materials on shelves and pallets — before smoke travels the full 45 feet to ceiling detectors. Early detection at the storage level provides significantly faster alarm response and enables quicker suppression activation.
26. C — All three environments — swimming pool (humidity/chlorine), commercial laundry (lint/steam), and ceramics kiln room (extreme heat/particulates) — create conditions causing smoke detector nuisance alarms or rapid deterioration. Heat detection responds only to abnormal temperature increases unaffected by environmental contaminants.

27. B — NFPA 72 Section 17.6.3.1.3 requires heat detectors rated at least 20°F above the maximum expected ceiling temperature. The loading dock maximum is 92°F, so the minimum activation temperature is 112°F (92 + 20 = 112). Any detector rated at or above 112°F satisfies the code minimum.
28. D — Beam detector spacing must not exceed the manufacturer's listed maximum for the specific ceiling height at the installation. At 44 feet, the manufacturer's listing establishes the allowable lateral distance between beams based on tested performance. NFPA 72 requires compliance with the manufacturer's listing.
29. A — Each remote amplifier panel has its own backup batteries that must sustain the loads it serves during AC power failure. A separate battery calculation must be performed for each remote panel using its specific standby and alarm currents, applying the same NFPA 72 duration and safety factor requirements.
30. C — When the kitchen suppression system activates and the monitor module reports the contact closure, the fire alarm panel must execute the full approved sequence: building notification, supervising station signal, and HVAC shutdown. A suppression activation confirms a fire condition requiring coordinated building-wide response.
31. B — The building's approved fire safety plan determines the specific notification scope for defend-in-place hospitals. Some plans notify only the alarm floor while others include adjacent floors. The notification strategy is a design decision documented in the fire safety plan and approved by the AHJ — not a universal code mandate.
32. D — When the technician opens the releasing circuit and the panel generates a trouble signal, this confirms the panel actively monitors the releasing circuit for continuity. If a real wiring failure occurred, the panel would detect it and alert building management before a fire event requires the circuit to function.
33. A — NFPA 72 Section 26.6.3.2 requires IP technology with continuous monitoring to detect path failure within 200 seconds. At 205 seconds, the panel exceeds this maximum by 5 seconds. The communicator's supervision timing must be investigated and corrected to ensure detection within the 200-second requirement.
34. C — NFPA 72 Section 24.12 requires the fire alarm system to monitor all ERCES supervisory conditions including power failure, antenna faults, and amplifier malfunctions. Comprehensive monitoring ensures any ERCES impairment is promptly reported so emergency responder radio communication is maintained.
35. B — ADA-accessible hotel sleeping rooms require both a wall-mounted strobe meeting NFPA 72 room coverage and a supplemental device effective for waking sleeping hearing-impaired occupants. A bed shaker or pillow-level strobe directly alerts a sleeping person who cannot hear alarms or see a wall strobe with eyes closed.

36. A — The speakers are rated for minimum 55 VAC input. The measured 61.8 VAC at the farthest speaker exceeds this minimum by 6.8 volts, ensuring the speakers operate within their listed parameters. The voltage drop from 70.7 to 61.8 VAC represents normal line loss over the 700-foot circuit.
37. D — Intermittent communication drops during storms affecting only the A-to-D conduit segment running through a flooding low area strongly indicates rainwater infiltration into that specific conduit section. Water entering through unsealed joints or damaged conduit contacts cable insulation and disrupts the digital signal.
38. C — Project specifications are contractual documents the contractor must follow. Even though NEC does not require conduit in non-plenum spaces for listed fire alarm cable, the specification is a binding contractual obligation. Deviating without formal approval exposes the contractor to liability.
39. B — NFPA 72 Section 23.10 requires the fire command center to have a permanently installed fire alarm panel or dedicated repeater. A smartphone application is a portable device that can be disconnected, moved, powered off, or lost. The FCC display must be permanent, dedicated, and always available for emergency responders.
40. A — In a single-interlock pre-action system, fire detection is the single interlock. When detection activates, the solenoid energizes and the valve opens, allowing water to fill the piping. Water does not discharge until a sprinkler head fuses from heat. Detection must confirm a fire condition before water enters the piping.
41. D — Cross-zone logic, countdown, abort switch, and releasing circuit supervision have all been verified. The remaining test is verifying the pre-discharge audible and visual warning appliances in the protected space. Occupants must hear and see adequate warning during the countdown to evacuate before agent discharge.
42. C — The pre-recorded message plays on all 18 floors, confirming amplifiers and speakers function throughout. The live microphone reaching only Floors 1-10 indicates the audio routing is programmed to broadcast to a subset of zones. The programming must be verified against the approved design.
43. A — Bank C's selective recall tested correctly — only Bank C recalled. When Bank B's detector activated, both B and C recalled despite only Bank B's relay activating. The elevator controllers for Banks B and C most likely share a common recall input wired in parallel rather than independently.
44. B — Both high-reading detectors (above 3.7%) and low-reading detectors (below 0.5%) are outside the manufacturer's listed acceptable range. The 18 high-reading detectors require cleaning. The 4 low-reading detectors must be investigated for faults. All 22 out-of-range detectors require corrective action.

45. D — NFPA 72 Section 10.6.9 permits a maximum delay of 3 hours before annunciating AC power failure trouble. At 2 hours and 50 minutes, the panel generated the trouble within the 3-hour window. The timing meets the code requirement.
46. B — A smoke detector covered with a surgical mask for six weeks has been effectively disabled. The mask prevents adequate smoke entry to the sensing chamber, leaving the corridor without reliable detection coverage. This is a significant impairment requiring immediate correction — the covering must be removed.
47. A — A double-interlock pre-action system requires both fire detection AND a supervisory air pressure drop before the valve opens. Neither condition alone is sufficient. The valve correctly remained closed because only the detection interlock was satisfied — the air pressure interlock was not triggered.
48. C — Three functions were verified: the IP path transmitted successfully, the panel detected IP failure within 200 seconds (meeting NFPA 72 supervision timing), and the cellular backup transmitted successfully when the primary was unavailable. Both paths and the supervision timing function correctly.
49. D — Seven months of historical event data has been permanently lost due to the log overwriting entries. This impairs troubleshooting, incident investigation, and maintenance compliance documentation. The log must be downloaded to external storage for archival and cleared to restore full recording capacity.
50. B — Six adjacent detectors with significantly longer activation times (28-38 seconds versus 3-7 seconds) compared to identical detectors on the same floor strongly suggests contaminated sensing chambers. An environmental factor specific to that corridor section accelerated contamination. The detectors should be cleaned and retested.
51. A — A gradual voltage decline from 27.0 to 25.8 VDC over 15 minutes of standby — a 1.2-volt drop — is normal for batteries under standby load. The voltage remains well above the minimum operating threshold and the decline is steady and predictable. The charger activating after AC restoration confirms a successful test.
52. D — Any unauthorized modification to a smoke detector — including homemade covers with holes — renders the detector non-compliant with its listing. The plastic bag alters the aerodynamic characteristics of the sensing chamber, potentially delaying or preventing smoke entry. Only manufacturer-approved covers are acceptable.
53. C — NFPA 72 Table 14.4.3.2 requires releasing device circuits to be functionally tested annually as part of the comprehensive releasing system test. This includes cross-zone logic, countdown timers, abort switches, releasing circuit supervision, and pre-discharge notification.

54. B — Circuit voltage at the speaker reads 69.5 VAC — within the normal range for a 70.7V system. Reduced volume from one speaker while others are normal and voltage is adequate points to the speaker's internal wattage tap being set to a lower power level than the other speakers on the circuit.
55. A — NFPA 72 Section 18.5.5.5.7 requires all visible notification appliances within the same field of view to flash in synchronization. Two strobes visible from the same corridor location must be synchronized regardless of circuit assignment. The 0.3-second offset violates this requirement.
56. D — NFPA 72 Section 17.14.8 requires manual fire alarm stations to be red. Painting pull stations yellow violates this requirement. Additionally, paint covering instruction labels renders the devices unusable by occupants who cannot read operating instructions. The painted stations must be replaced.
57. C — The batteries ended the load test at 24.4 VDC — well above the manufacturer's 20.4 VDC minimum end-voltage. The 4.0-volt margin demonstrates adequate capacity to sustain the full alarm load for the required duration. The batteries pass with comfortable margin.
58. B — The duct detector activated, the panel processed the alarm, and the control module relay closed. The AHU did not shut down despite relay closure. The fault is downstream — in the wiring between the relay contacts and the AHU controller's shutdown input, or in the controller's response.
59. A — Two renovations adding 50 devices and modifying the sequence over five years represent significant changes. NFPA 72 Section 7.8 requires the Record of Completion to reflect the current system configuration. A five-year-old document describing a substantially different system must be updated.
60. D — One hundred ten nuisance waterflow alarms over three months with no fires indicates water pressure surges causing brief paddle movements. The corrective approach should address both the root cause (investigating surges) and the switch response (adjusting retard delay within the 90-second maximum).
61. C — The detector behind the new wall is in a concealed space separated from the occupied corridor. Smoke from a corridor fire may not reach the concealed detector in time. The detector must be relocated to the occupied side, and the concealed space should be evaluated for its own detection needs.
62. B — NFPA 72 requires tamper switches to generate a supervisory signal within two revolutions of the valve wheel from fully open. The switch activated at exactly two revolutions, meeting the code requirement. The tamper switch passes the functional test.
63. A — NFPA 72 Section 18.5.5.5.3 requires visible notification appliances to flash between 1 and 2 flashes per second. At 0.9 flashes per second, the strobe is below the minimum required rate. The device must be investigated and repaired or replaced to achieve a compliant flash rate.

64. D — When a tamper switch activation generates an alarm instead of a supervisory signal, the input is programmed as an alarm zone rather than supervisory. The panel programming must be corrected to classify the tamper switch input as supervisory for valve position changes.
65. C — Fifty days without communication redundancy means the system has operated with a single path. If the cellular also fails, the building has no monitoring. This is a significant impairment requiring prompt corrective action with documentation for the building owner and AHJ.
66. B — A shelf completely blocking both the horn opening and strobe lens eliminates both audible and visible notification output. The shelf must be removed and building management informed that notification appliances must remain unobstructed at all times.
67. A — The batteries ended at 19.8 VDC — below the manufacturer's 20.4 VDC minimum end-voltage. Panel components may malfunction at this voltage during an actual alarm event. The batteries cannot sustain the required load and must be replaced.
68. C — A smoke detector at 30 inches above the floor is completely ineffective for fire detection. Smoke rises to the ceiling and accumulates there first. A desk-level detector will not sense smoke until the room is heavily filled. The detector must be reinstalled at its approved ceiling location.
69. D — NFPA 72 Table 14.4.3.2 requires supervisory devices including tamper switches to be functionally tested annually as part of the comprehensive system functional test. Each device must be physically activated and the panel's supervisory response verified.
70. B — A dark graphic annunciator at the fire command center means firefighters cannot use the building floor plan display to identify alarm locations. This visual reference tool directly affects emergency response efficiency. The failure must be documented as a deficiency requiring repair.
71. A — NFPA 72 Table 14.4.3.2 requires releasing device circuits to be functionally tested annually as part of the comprehensive releasing system test. This includes cross-zone logic, countdown timers, abort switches, releasing circuit supervision, and pre-discharge notification.
72. C — Storage of paint, chemicals, and boxes combined with only 20 inches of working clearance violates NEC Article 110.26. The minimum clearance is typically 30 inches wide and 36 inches deep. All storage must be removed and required clear space maintained.
73. D — NFPA 72 Table 14.4.3.2 requires smoke detectors to be functionally tested semiannually using approved aerosol smoke or a calibrated test source. Each test verifies detector activation and proper panel response with correct identification, notification, and signal transmission.
74. B — Floor 6 requiring more force (positive pressure) while Floor 14 opens normally (no pressure) indicates inconsistent pressurization. A duct, damper, or balancing issue is preventing adequate air distribution to upper floors. Both observations should be documented for mechanical investigation.
75. D — A 105-minute discrepancy between the panel clock and actual time significantly affects event log accuracy. Timestamps nearly two hours off create confusion when correlating events with

security footage, dispatch records, and other building logs. The clock must be corrected immediately.

76. A — The panel processed the alarm and 14 of 16 locks released correctly. The two non-releasing locks indicate a fault specific to those devices. The control module outputs, interface wiring, and power supply to the two specific non-releasing locks must be investigated.
77. C — NFPA 72 requires waterflow alarm signals at the panel within 90 seconds of sustained flow. The alarm appeared at 88 seconds, within the 90-second maximum. The waterflow switch passes the functional test.
78. A — A sensitivity reading of 0.3% falls below the manufacturer's minimum acceptable range of 0.5%. The detector is operating outside its listed parameters — it is abnormally sensitive and may produce nuisance alarms or indicate a sensor fault. The detector must be investigated and corrected.
79. B —  $R = 800 \times (3.14/1000) = 2.512 \Omega$ .  $V_{\text{drop}} = 2.8 \times 2.512 = 7.034\text{V}$ . End voltage =  $24 - 7.03 = 16.97 \text{ VDC}$ . This is above the 16 VDC minimum but with less than 1 volt of margin. While technically compliant, connection aging or future additions could push voltage below minimum.
80. D — Standby =  $(0.80 + 1.20) \times 4 = 8.0 \text{ Ah}$ . Alarm =  $(4.4 + 8.6) \times 0.25 = 3.25 \text{ Ah}$ . Subtotal = 11.25 Ah. With 20% safety factor:  $11.25 \times 1.20 = 13.50 \text{ Ah}$ , approximately 13.0 Ah. The generator reduces standby to 4 hours. Voice evacuation requires 15-minute alarm.
81. C — Even when duct detectors are configured for HVAC shutdown only without general building notification, the detection signal should still transmit to the supervising station. This ensures building management and the monitoring service are aware of the event for investigation and follow-up.
82. A — When different conductor sizes share the same conduit, pre-calculated Annex C tables cannot be used because they assume uniform sizes. The actual cross-sectional area of each conductor from NEC Chapter 9 Table 5 must be calculated and the total compared to the conduit's 40% fill limit.
83. D — A detector at the 90-degree corridor turn ensures smoke detection at the direction change where coverage from detectors in either leg may be limited. Smoke traveling along one leg may not effectively reach detectors beyond the turn. The corner detector catches smoke at the intersection.
84. B — SLC 1 at 192 of 198 has only 6 remaining addresses. Adding 6 devices reaches maximum with zero future flexibility, and 9 more still need a new loop. Placing all 15 on a new SLC preserves SLC 1's remaining capacity and provides substantial expansion room on the new loop.
85. C — Each remote NAC power supply panel has its own batteries that must sustain the loads it serves during AC power failure. A separate battery calculation using each panel's specific standby and alarm currents must be performed applying the same NFPA 72 duration and safety factor requirements.

86. A — NFPA 72 Section 7.8.2 requires the Record of Completion to include system specifications, circuit information, device counts by type, power supply data, communication path details, acceptance test results, and signatures from the installer, designer, and AHJ.
87. D — Project specifications are contractual documents the contractor must follow. Even though NEC does not require conduit in non-plenum spaces, the specification is a binding obligation. Deviating without formal approval exposes the contractor to contractual liability.
88. B — The speaker circuit delivers 63.5 VAC at the farthest speaker, exceeding the manufacturer's minimum of 55 VAC by 8.5 volts. The speakers operate within their listed parameters at this voltage, producing acceptable audio quality and volume.
89. D — The pre-discharge time delay must provide adequate evacuation time based on the room's specific characteristics: physical size, exit count and locations, maximum travel distance, and expected occupant count. These factors determine adequacy — not a fixed code value.
90. B — Three different device counts across three documents indicate modifications were not consistently documented. All three must be verified against a physical field count and reconciled to reflect the same accurate, verified number.
91. A — Seven detectors at positions 10, 40, 70, 100, 130, 160, 190 provide 30-foot inter-detector spacing. The first detector is 10 feet from one end and the last is at the 190-foot mark (0 feet from the far end). Both end distances are within the 15-foot maximum. The layout complies with NFPA 72.
92. C — Using Class A for upper floors (6-20) provides enhanced fault tolerance where it benefits most — longer egress distances, more difficult firefighter access, and greater vulnerability during extended evacuation. The designer's risk assessment determined lower floors can accept Class B's reduced redundancy.
93. D — Horn/strobes:  $11 \times 0.295 = 3.245A$ . Speakers:  $7 \times 0.140 = 0.980A$ . Strobes:  $5 \times 0.185 = 0.925A$ . Total = 5.15 amps, which significantly exceeds the 3.0-amp NAC output rating. The circuit must be redesigned across multiple NAC outputs or with booster power supplies.
94. B — NFPA 72 Section 12.4.4 defines pathway survivability Level 2 as requiring either 2-hour fire-rated cable (CI cable) or installation within 2-hour fire-rated construction. Standard cable in standard conduit, FPLR in 1-hour enclosures, and cable in RMC with firestop alone do not satisfy Level 2.
95. A — The specification requires 7 business days' advance notice to the AHJ before acceptance testing. This is a regulatory and contractual obligation that cannot be waived by construction schedule pressure. The contractor must provide the required notice and reschedule accordingly.
96. C — Two 60 cd wall-mounted strobes on opposite 50-foot walls divide the room into two coverage zones. Each strobe covers its portion from its wall position. With two strobes, each covers

approximately half the room — well within the single-strobe coverage capability of  $45 \times 45$  feet per NFPA 72.

97. D — The as-built drawings show 142 devices but 150 are physically installed and confirmed by panel programming. NFPA 72 requires as-built drawings to accurately reflect the current installed configuration. The drawings must be updated to show all 150 devices with correct addresses and locations.
98. B — The calculated minimum battery capacity is 19.20 Ah. The specified 18 Ah batteries fall below this minimum by 1.20 Ah. Batteries must equal or exceed the calculated minimum. The next standard battery size above 19.20 Ah — typically 26 Ah — must be selected.
99. A — Hospitals using defend-in-place may have differentiated fire alarm responses for different alarm types per the approved fire safety plan. Pull stations triggering building-wide notification while smoke detectors trigger floor-only notification is valid when documented in the plan and accepted by the AHJ.
100. C — As-built drawings for the dedicated branch circuit should capture the conduit type, size, and routing path from the electrical panel to the fire alarm panel. This information is essential for future maintenance, troubleshooting, and modifications — technicians need to know the circuit's physical path.
101. D — Excessive pulling tension can damage conductor insulation internally without visible jacket damage. Megger testing all 16 cable runs verifies insulation integrity and catches latent damage before devices are connected and the system energized. Visual inspection alone cannot detect internal insulation failure.
102. A — Emergency control function interfaces require respective trade contractors to be present. The elevator contractor verifies recall, the HVAC contractor verifies shutdown and smoke control, the controls contractor verifies automation interfaces, and the door hardware contractor verifies holder release.
103. C — Converting from horn/strobe to voice evacuation is a fundamental design change requiring new amplifiers, speaker circuits, intelligibility analysis, and panel reconfiguration. A formal change order must document the engineering revision, cost impact, and schedule extension before work proceeds.
104. B — The fire alarm contractor should not modify the electrical contractor's work directly. The general contractor coordinates all trades and should be notified of the non-compliant AFCI/GFCI breaker so they can direct the electrical contractor to replace it with a standard breaker and lock-on device.
105. D — Different date codes within the same detector model indicate different production runs. As long as all 350 are the same model and listed as compatible with the panel, date code variations do not affect compatibility, communication, or detection performance.

106. A — Every service activity must be documented in a written service report regardless of scope. Even a wire nut tightening resolves a trouble condition that should be recorded. Documentation supports troubleshooting, demonstrates compliance, and provides records for the building owner and AHJ.
107. C — Field markups contain actual as-installed information. The contractor must create clean, professional as-built drawings accurately incorporating all field data. Submitting messy markups, unmarked originals, or memory-based recreations fails to provide accurate, legible documentation.
108. B — NFPA 72 Section 7.7 requires the contractor to deliver as-built drawings, the completed Record of Completion, the approved sequence of operations, and operating and maintenance instructions. These four documents constitute the minimum required closeout package.
109. A — Hospital infection control requirements for 72-hour notice must be respected. The contractor should provide the required notice and coordinate patient care testing with both the general contractor and hospital administration. Patient safety protocols cannot be overridden by construction schedules.
110. D — The AHJ's 10-business-day notice requirement is a regulatory obligation that cannot be waived by construction deadlines. Testing without proper notice may be invalidated, requiring a complete retest. The supervisor must maintain the requirement and reschedule with proper notification.