LEVEL III — SIMULATION EXAM 5 (115 QUESTIONS)

Time Limit: 170 Minutes

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

DOMAIN 3.1 — INSTALLATION (Questions 1–40)

1. A fire alarm designer is specifying a networked fire alarm system for a university campus with twelve buildings. Each building has its own panel. The master panel in the administration building must display all signals from all twelve buildings in real time. The IT director proposes using the university's existing Ethernet backbone for panel-to-panel networking instead of dedicated fire alarm cabling. What is the correct assessment?

A. The university Ethernet is acceptable if dedicated VLANs are configured for fire alarm traffic

B. NFPA 72 permits shared network infrastructure for campus fire alarm networking

C. Fire alarm networking must use listed communication pathways — shared campus Ethernet does not meet survivability or listing requirements

D. Shared infrastructure is permitted only if the IT department guarantees 99.99% uptime

2. A fire alarm designer is performing a battery calculation for a voice evacuation system. The building has a qualifying generator. Main panel loads: panel/SLC standby = 1.05A, voice amplifier standby = 1.95A. Alarm loads: NAC = 6.0A, voice = 13.0A. Four remote power supplies each have own batteries. Using 4-hour standby, 15-minute alarm, 20% safety factor, what is the minimum main panel battery capacity?

A. Approximately 17.16 Ah after applying all three factors to main panel loads only

B. 14.30 Ah using correct durations without the 20% safety factor

C. 28.80 Ah using 24-hour standby because generators do not reduce voice requirements

D. 20.50 Ah using 4-hour standby with standard 5-minute alarm duration

3. A fire alarm designer is specifying pathway survivability for a 42-story high-rise. The design uses 2-hour CI cable for voice circuit risers. At Floor 25, both outgoing and return CI cable paths transition from separate east and west risers into a single conduit bank running through a 40-foot unrated corridor ceiling space to reach speakers. What is the impact?

A. Both Level 2 and Class A are lost because CI cable requires rated construction

B. Level 2 is lost but Class A is maintained because both paths enter separate conduits

C. Both Level 2 and Class A are maintained because separate conduits create separate paths

D. Level 2 is maintained by CI cable but Class A diversity is compromised at the shared corridor crossing

4. A fire alarm designer is specifying cross-zone releasing for a clean agent system protecting a data center. During commissioning, cross-zone activation in Room 1 is verified. When testing Room 2, Room 1's agent unexpectedly discharges again. What is the most likely cause?

A. Room 1's solenoid has a mechanical fault causing it to open from vibration during Room 2's test

B. Room 1 and Room 2 share the same releasing panel output terminal for their releasing circuits

C. The cross-zone programs share detection zones between both rooms

D. Room 2's detection generates a building-wide alarm code reactivating Room 1's release

5. A fire alarm designer is specifying detection for a 110-foot atrium in a museum. Aesthetic requirements prohibit visible equipment on walls, ceilings, or railings. Spot detectors are impractical due to stratification at this height. What approach satisfies both detection and aesthetic requirements?

A. Aspirating detection with sampling pipes concealed within HVAC ductwork and architectural trim at multiple heights

B. Projected beam detectors mounted behind decorative glass panels at three elevations

C. Ceiling-mounted detectors with extended-range sensing chambers rated for 110-foot heights

D. Flame detection using UV/IR sensors concealed in display case lighting fixtures

6. A fire alarm designer calculates NAC voltage drop: 12 AWG (1.98 Ω/1000 ft), round-trip 2,100 feet, 1.9 amps. R = 4.158 Ω. V_drop = 7.90V. End voltage = 16.10 VDC. Devices listed 16-33 VDC. The margin is 0.10V above minimum. Should the designer approve?

A. Yes, the circuit meets the 16 VDC minimum and code requirements are satisfied

B. Yes, but only if a temperature derating is applied to confirm cold-weather compliance

C. No, 12 AWG cannot be used for NAC runs exceeding 2,000 feet per NEC Article 760

D. No, 0.10V margin will erode from connection aging, temperature rise, and any additions

7. A fire alarm designer is developing the sequence of operations for a hospital with defend-in-place. The facility has patient care floors, surgical suites, an ED, a NICU, and a psychiatric unit. Which TWO areas require the most restrictive notification approaches?

A. ED and administrative offices because both have high ambient noise and transient occupants

B. Patient care and psychiatric unit because both require staff-controlled notification

C. Surgical suites and NICU because both involve patients who cannot safely be exposed to audible alarms

D. Surgical suites and ED because both have the highest number of simultaneous procedures

8. A fire alarm designer is evaluating speech intelligibility for a voice evacuation system. STI of 0.50 minimum is specified. Four spaces present challenges: marble lobby (reverberation), parking garage (noise plus concrete), indoor pool natatorium (humidity plus hard surfaces), and mechanical penthouse (125 dB ambient). For which space is 0.50 STI LEAST likely achievable?

A. The marble lobby because reverberation creates the most complex acoustic environment

B. The mechanical penthouse because 125 dB ambient overwhelms any practical speaker output

C. The natatorium because humidity degrades speaker components making sustained STI impossible

D. The parking garage because vehicle exhaust fumes corrode speaker cones reducing output

9. A fire alarm designer is specifying the system for a convention center with a main exhibit hall divisible into eight independent spaces using acoustically rated partitions. Each has a separate entrance when deployed. How must notification address these configurations?

A. Each enclosed space must have independent notification when its partitions are deployed

B. Only the fully open configuration requires notification coverage

C. Only alternating spaces need independent coverage since adjacent spaces share output

D. A single high-output central device covers all configurations from the hall center

10. A fire alarm designer is specifying communication for a high-rise with central station monitoring. The existing DACT copper lines are being discontinued. Which replacement approach provides the most robust code-compliant monitoring?

A. Cellular only because modern cellular exceeds DACT reliability

B. IP only with 200-second supervision meets all single-path requirements

C. All three options — IP, cellular, and dual-path — are equally compliant

D. Dual-path IP/cellular because it provides redundancy with continuous monitoring on both paths

11. A fire alarm designer is developing elevator recall for a building with six banks. Banks A-D serve the tower. Bank E is freight. Bank F serves a connected parking structure. The machine room is on the penthouse level. When the machine room detector activates, all banks must recall to alternate floors. The designer proposes different alternates for each bank based on function. Is this valid?

A. No, all six banks must recall to the same single alternate floor

B. Yes, different banks may recall to different alternate floors based on operational function

C. No, machine room detection should trigger primary floor recall not alternate

D. Yes, but only if each alternate has its own smoke detection confirming safety

12. A fire alarm designer is specifying detection for a heritage building with ornate woodwork, stained glass, and landmark restrictions prohibiting any visible equipment or penetrations. What detection approach satisfies both code and preservation?

A. Surface-mounted detectors painted to match woodwork with preservation approval

B. Detection may be waived for landmark-protected buildings per NFPA 72

C. Aspirating detection with sampling pipes threaded through existing millwork cavities and concealed channels

D. Battery-powered wireless detectors attached with museum-grade removable adhesive

13. A fire alarm designer is specifying conduit fill for 1-inch EMT carrying twelve 14 AWG THHN, four 12 AWG THHN, and six 18 AWG THHN (22 total). Mixed sizes prevent Annex C use. What method must be used?

A. Calculate total conductor area from Chapter 9 Table 5 and compare to the 40% fill allowance

B. Compare each size to its individual Annex C maximum — if all pass the installation complies

C. Use the Annex C table for 12 AWG since the largest conductor controls fill

D. Add counts and compare total to the smallest Annex C maximum present

14. A fire alarm designer is developing the fire command center per NFPA 72 Section 23.10. The panel is in the basement. The FCC is in the lobby. The building engineer asks whether the panel manufacturer's cloud-based monitoring portal displayed on a dedicated wall-mounted screen can serve as the FCC repeater. What is correct?

A. Yes, if the cloud portal displays full system status with alarm, trouble, and supervisory

B. Yes, if the screen remains permanently powered and connected at all times

C. No, but a locally networked computer running proprietary software could serve as repeater

D. No, the FCC requires a permanently installed fire alarm panel or dedicated repeater

15. A fire alarm designer is developing the fire pump monitoring interface. The controller provides pump running, power available, phase reversal, and controller trouble contacts. The building engineer asks how "controller trouble" should be classified at the fire alarm panel. What is correct?

A. As an alarm signal because controller trouble may prevent pump operation during a fire

B. As a supervisory signal because it is an off-normal equipment condition requiring investigation

C. Controller trouble is optional and may be excluded from fire alarm monitoring

D. As a trouble signal identical to fire alarm panel internal trouble conditions

16. A fire alarm designer specifies visible notification for an 80,000-square-foot open office with a 14-foot ceiling. Interior divisions are 5.5-foot cubicle partitions. How should these be treated?

A. Each cubicle cluster must be treated as a separate room requiring its own strobe

B. A 50% candela increase compensates for partition light absorption

C. Partitions below wall strobe mounting height do not affect visible coverage calculations

D. Ceiling-mounted strobes required because wall units cannot cover over partitions

17. A fire alarm designer is developing the releasing system for a pre-action sprinkler using double-interlock. The building owner asks why both detection AND pressure drop are required to open the valve. What is the rationale?

A. Dual conditions reduce the risk of accidental water discharge from either a detector fault or a pipe leak acting alone

B. Single-interlock systems are prohibited by NFPA 13 for all indoor applications

C. Dual conditions slow the valve opening to protect the piping from water hammer damage

D. The pressure drop interlock is a manufacturer recommendation not a code requirement

18. A fire alarm designer specifies the system for a nursing home with defend-in-place. Smoke detector alarm on a resident floor activates notification on the alarm floor only. The administrator asks whether ALL smoke detectors trigger this response or only corridor detectors. What determines the answer?

A. NFPA 72 requires all detector types on a floor to produce identical notification responses

B. The fire department determines which detectors trigger which notification profile

C. Only corridor detectors trigger notification — room detectors generate supervisory only

D. The building's fire safety plan specifies which detection zones trigger which notification profile

19. A fire alarm designer specifies the releasing circuit for a clean agent system in an occupied server room. Per NFPA 72, the system must include pre-discharge warning, time delay, and abort. The design uses a 12-second countdown. A safety officer questions whether 12 seconds is adequate. What determines adequacy?

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

B. Room size, exit count, travel distance, and expected occupant count determine adequacy

C. Agent manufacturer specifies based on discharge concentration rate

D. The fire department determines delay based on response time

20. A fire alarm designer specifies the system for a 32-story residential tower with defend-in-place. Smoke alarm on Floor 22 notifies Floors 21, 22, and 23. The HOA president asks why the building alarm monitoring company cannot simply call all residents via intercom. What is the primary limitation of this approach?

A. Intercom notifications are prohibited by NFPA 72 for all residential occupancies

B. Intercom systems cannot provide the required temporal-three audible pattern

C. Intercom notification is not automatic, not code-compliant, and depends on operator availability

D. Intercom systems produce audible levels below the minimum code requirement

21. A fire alarm designer develops PAS for a hospital. During the 180-second investigation, a second smoke detector in a different zone activates. Per NFPA 72, what must happen?

A. PAS must immediately cancel and general notification must activate

B. The investigation extends by 180 seconds for the second zone

C. PAS continues because the investigation is already in progress

D. The period restarts using the second activation as reference

22. A fire alarm designer specifies white devices per architect's preference. Per NFPA 72 Section 17.14.8, which device must remain red?

A. Horn/strobe devices for emergency identification

B. All fire alarm devices per NFPA 72 universal identification

C. Smoke detectors must maintain manufacturer's standard color

D. Manual fire alarm stations per the code requirement

23. A fire alarm designer develops notification for a performing arts center. Theater ambient 100 dB. Orchestra pit 112 dB. Per NFPA 72, what minimum audible levels are required?

A. Theater 105 dB, pit 117 dB — using the 5 dB alternative

B. Theater 115 dB, pit 127 dB — both impractical, requiring enhanced visible notification

C. Theater 100 dB, pit 112 dB — matching ambient is adequate

D. Theater 115 dB, pit 127 dB — achievable with concentrated speaker arrays

24. A fire alarm designer evaluates voice evacuation approaches for a 36-story building. Option A: central amplifiers on Floor 1 with 900-foot runs. Option B: remote amplifiers on Floors 12 and 24 with 320-foot maximum runs. What is Option B's primary advantage?

A. Option B eliminates battery backup requirements at remote locations

B. Option B reduces line losses providing consistent audio across all floors

C. Option B allows smaller gauge wire throughout the building

D. Option B eliminates pathway survivability on speaker circuits

25. A fire alarm designer specifies the kitchen hood suppression interface. The fire alarm monitors suppression through a monitor module. When suppression activates, what must the panel initiate?

A. Only station signal because kitchen suppression events are supervisory

B. Only local kitchen notification because suppression addressed the fire

C. No response because suppression operates independently

D. Building notification, station signal, and HVAC shutdown per the approved sequence

26. A fire alarm designer specifies cable for a data center with raised floor plenum and overhead cable trays with ducted return (non-plenum). What cable types are required?

A. FPLP in the raised floor plenum and FPL minimum in the non-plenum overhead space

B. FPLP in both because all concealed data center spaces are plenums

C. FPL in both because data centers are general-purpose environments

D. FPLR in both because the raised floor creates a riser application

27. A fire alarm designer specifies the system for a building with five sprinkler risers. Each riser has waterflow and tamper switches. The designer places each on individual zones — ten total. A fire captain requests that each waterflow zone trigger different notification zones matching the riser's coverage. What advantage does this provide?

A. Zone-specific notification is required by NFPA 72 for all multi-riser buildings

B. Individual zones eliminate the need for tamper monitoring on the same risers

C. Zone-specific notification directs occupants to evacuate only the affected area

D. Zone-specific response is prohibited — all waterflow must trigger building-wide notification

28. A fire alarm designer specifies detection for a cold storage facility. Freezer at -32°F. Loading docks fluctuate 0°F to 98°F. Per NFPA 72, what minimum heat detector activation temperature for the loading dock?

A. 135°F because it is the universal standard commercial rating

B. At least 118°F to maintain the 20°F margin above the 98°F maximum ambient

C. 200°F because fluctuating environments require high-temperature ratings

D. 98°F for immediate response above normal maximum

29. A fire alarm designer develops elevator recall for MRL elevators with drive equipment at hoistway top. Per NFPA 72 Section 21.3, when the drive area detector activates, what recall is required?

A. Phase I to the primary floor identical to lobby detector response

B. Immediate shunt trip disconnecting power before recall

C. Only supervisory signal because MRL drive detection is informational

D. Phase I to an alternate floor because smoke near the drive may affect the primary floor

30. A fire alarm designer specifies mass notification integrated with voice evacuation per NFPA 72 Chapter 24. When mass notification overrides fire alarm audio, what function must continue?

A. The fire alarm signal must continue transmitting to the supervising station

B. Fire alarm visual notification must continue on all floors

C. The panel must generate a trouble signal for the override duration

D. The panel must transfer all control to mass notification

31. A fire alarm designer develops the releasing circuit for a pre-action sprinkler. Per NFPA 72, the circuit must be supervised. If the circuit develops a short fault instead of an open fault, what must the panel do?

A. Immediately open the valve because a short could inadvertently energize the solenoid

B. Disable detection in the pre-action zone until the short is cleared

C. Generate a trouble signal because any circuit fault impairs proper releasing function

D. Transmit an alarm because short circuits on releasing circuits are emergency conditions

32. A fire alarm designer specifies detection for a building with a commercial greenhouse, an indoor shooting range, and a brewery fermentation room. Each produces conditions incompatible with smoke detectors. What detection is most appropriate?

A. Aspirating detection with filtration at sampling intakes for all three spaces

B. Multi-criteria detectors with particle discrimination algorithms

C. Flame detection because all three spaces contain combustibles producing visible flame

D. Heat detection because all three environments create smoke detector nuisance alarm conditions

33. A fire alarm designer specifies ADA-accessible hotel guest room. Room is 16 × 18 feet, 9-foot ceiling. Per NFPA 72, 15 cd wall strobe covers up to 20 × 20 feet. What additional notification is required beyond the standard strobe?

A. A ceiling-mounted strobe at 177 cd directly above the bed

B. A supplemental device effective for waking sleeping hearing-impaired occupants

C. A low-frequency 520 Hz audible generator near the bed

D. A second wall strobe at double candela on the wall nearest the bed

34. A fire alarm designer specifies voice evacuation using 70.7V. Three speakers on Floor 6 are wired in series instead of parallel to impedance-matching transformers. What is the primary issue?

A. Series wiring on a 70.7V system causes uneven voltage distribution and inconsistent audio levels across the three speakers

B. Series wiring doubles the impedance preventing adequate current flow to all speakers

C. Series connection causes speakers to operate at 23.6V each — below rated input

D. NFPA 72 specifically prohibits series wiring of any notification appliances

35. A fire alarm designer specifies beam detectors for an exhibit hall 440 × 280 feet with 52-foot ceilings. Beams span the 440-foot dimension with 55-foot lateral spacing. What must be verified?

A. The 55-foot spacing does not exceed the 30-foot standard spot detector spacing

B. The beam count equals at least one per 5,000 square feet of floor area

C. The 55-foot spacing does not exceed the manufacturer's listed maximum for the 52-foot ceiling

D. The spacing matches fire sprinkler spacing for consistent protection

36. A fire alarm designer is developing a phased construction project. Phase 1 (Floors 1-18) is operational. Phase 2 (Floors 19-36) construction begins. Phase 2 activities generate heavy dust from concrete cutting. What coordination is required for Phase 1?

A. Phase 1 must be shut down during Phase 2 construction

B. No coordination needed because separate SLC loops isolate the phases

C. Phase 1 detectors near the boundary should be replaced with heat detectors

D. Phase 1 zones adjacent to construction must be bypassed with monitoring station notified

37. A fire alarm designer evaluates SLC distribution for a renovation adding 50 devices at 38 mA. Panel has three loops: SLC 1 = 192/144 mA, SLC 2 = 186/138 mA, SLC 3 = 82/58 mA (all max 198/150 mA). Which provides best flexibility?

A. 6 on SLC 1 reaching 198, 12 on SLC 2 reaching 198, and 32 on SLC 3

B. All 50 on SLC 3 because it has the most remaining device and current capacity

C. Split 17/17/16 evenly across all three loops for balanced distribution

D. 5 on SLC 1, 5 on SLC 2, and 40 on SLC 3

38. A fire alarm designer specifies the central station connection per NFPA 72 Section 26.3.4. What is the maximum time for the operator to initiate response after receiving an alarm?

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

B. 60 seconds from receipt to acknowledgment at console

C. 30 seconds from receipt to first contact with dispatch

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

39. A fire alarm designer specifies the system for a building with an emergency generator. Per NEC Article 700, what is the maximum ATS transfer time?

A. 30 seconds for all emergency loads per standard requirement

B. 60 seconds with panel batteries bridging the transfer

C. 10 seconds per NEC Article 700 for all emergency system loads

D. 120 seconds because panels have internal batteries

40. A fire alarm designer specifies in-rack detection for a warehouse with 48-foot ceilings and racks to within 4 feet of ceiling. In-rack detectors at 16-foot and 32-foot elevations. What is their purpose?

A. In-rack detectors provide redundancy for ceiling detector malfunctions

B. In-rack detectors compensate for beam sensitivity reduction from dust

C. NFPA 72 mandates in-rack detection for all racks above 25 feet

D. In-rack detectors identify fires at storage levels before smoke reaches the 48-foot ceiling

DOMAIN 3.2 — MAINTENANCE AND INSPECTION (Questions 41–78)

41. A fire alarm technician performs annual releasing system testing. Solenoid disconnected, substitute load installed. Cross-zone logic, countdown, abort, and releasing circuit supervision verified. What additional test remains?

A. Releasing solenoid must be reconnected for live discharge verification

B. Pre-discharge warning appliances must be verified for adequate output in the protected space

C. Cross-zone must be retested with zones in opposite order

D. Substitute load voltage measured with calibrated instrument

42. A fire alarm designer reviews sensitivity for an 11-year-old system with 700 detectors. Report shows 30 detectors between 3.8% and 6.0% (above 3.7% max) and 12 detectors between 0.1% and 0.4% (below 0.5% min). What action is required?

A. All 42 out-of-range detectors — both high and low — require investigation and correction

B. Only the 30 high-reading detectors need cleaning — low readings mean better sensitivity

C. All 700 detectors must be cleaned because 42 out-of-range indicates building-wide issues

D. Panel thresholds should be expanded for the 11-year drift

43. A fire alarm technician tests voice evacuation live microphone from FCC. Audio heard on Floors 1-18 but not Floors 19-36. Pre-recorded message plays on all 36 floors. Most likely cause?

A. Amplifiers for Floors 19-36 have a fault blocking live audio

B. Microphone output power insufficient for total building load

C. Speaker circuits on upper floors have impedance faults

D. Live microphone routing is programmed to broadcast only to Floors 1-18

44. A fire alarm technician tests elevator recall. Six banks with selective recall. Activating Bank A: only Bank A recalls. Activating Bank F: Banks E and F both recall. Only Bank F's relay activated. Where is the problem?

A. Panel programming activates both E and F outputs for Bank F's zone

B. Bank F's SLC communication interferes with Bank E's module

C. Elevator controllers for Banks E and F share a common recall input wired in parallel

D. Bank F's detector generates a building-wide alarm code

45. A fire alarm technician tests AC power supervision. AC disconnected. After 3 hours 10 minutes, no trouble has appeared. Per NFPA 72 Section 10.6.9, what is the assessment?

A. 3 hours — the 3:10 delay exceeds the maximum and must be corrected

B. 6 hours per extended allowance for modern panels — the timing passes

C. 24 hours — matching battery standby duration

D. No delay permitted — trouble must appear immediately

46. A fire alarm technician discovers a smoke detector covered with a cotton bandage by nursing staff during a renovation. Covering in place eleven weeks. What must be documented?

A. Detector disabled for eleven weeks — significant impairment requiring immediate correction

B. Cotton bandage is porous enough to permit smoke entry

C. Covering acceptable during active renovation if logged

D. Bandage may remain until renovation completes

47. A fire alarm technician tests a double-interlock pre-action system. Detector activates. Panel processes alarm. Valve does not open. Is this correct?

A. No, detection should open the valve as first interlock

B. No, detection should energize pilot solenoid for faster response

C. Yes, but only because system was in maintenance mode

D. Yes, double-interlock requires both detection AND air pressure drop

48. A fire alarm technician tests communication — IP primary, cellular secondary. IP succeeds. Disconnects IP. After 195 seconds, panel shows "IP COMMUNICATION FAILURE." Cellular then succeeds. Does IP timing pass?

A. No, IP must detect failure within 60 seconds per continuous monitoring

B. Yes, 195 seconds is within the 200-second maximum for continuous monitoring

C. No, but firmware update can correct the timing

D. Yes, the 200-second limit has built-in 10% tolerance

49. A fire alarm technician discovers the event log has been full for fourteen months, overwriting entries. What is the impact?

A. Fourteen months of diagnostic history lost — log must be downloaded and cleared

B. Full log causes panel processing delays

C. Panel must be replaced with larger capacity

D. No operational impact because panel functions independently

50. A fire alarm technician tests semiannual detectors on Floor 16. Nine adjacent detectors take 32 to 48 seconds to activate. Others activate in 3 to 9 seconds. What does delayed response indicate?

A. SLC polling rate configured slower for those addresses

B. Aerosol can running low during those nine tests

C. The nine detectors likely have contaminated sensing chambers

D. HVAC dilutes smoke before reaching those detectors

51. A fire alarm technician tests power transfer. After disconnecting AC, voltage: 0 min = 27.2V, 5 min = 26.8V, 10 min = 26.4V, 15 min = 26.0V. Charger activates after reconnection. Acceptable?

A. No, 1.2V drop indicates batteries near end of life

B. No, voltage should remain constant during standby

C. Yes, but only if voltage recovers above 27.0V within 30 minutes

D. Yes, gradual decline is normal for batteries under standby load

52. A fire alarm technician discovers a smoke detector covered with aluminum foil by maintenance staff to prevent nuisance alarms. Foil has been in place for three weeks. What must be documented?

A. Foil completely blocks smoke entry — detector non-functional and must be uncovered immediately

B. Foil is acceptable short-term if staff sign an acknowledgment form

C. Foil creates a Faraday cage affecting SLC communication but not detection

D. Foil may remain until the nuisance alarm source is identified and corrected

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

A. Annually as part of comprehensive functional test

B. Semiannually using approved aerosol or calibrated test source

C. Quarterly to coincide with maintenance schedules

D. Monthly for continuous reliable detection

54. A fire alarm technician tests notification. Two speakers on a 70.7V circuit produce clear audio but at noticeably different volumes. Circuit voltage at both speakers reads 69.0 VAC. What is the most likely cause?

A. Both speakers are from different manufacturers with different sensitivity ratings

B. The amplifier has channel-specific output variation for each speaker

C. The 69.0 VAC is below the speaker's minimum threshold for rated output

D. The two speakers have different wattage tap settings on their impedance-matching transformers

55. A fire alarm technician tests visible notification. Two strobes visible from the same location flash 0.35 seconds apart on different NAC circuits. What code requirement is violated?

A. Flash rate because combined offset exceeds 2 per second

B. Candela because unsynchronized output produces uneven coverage

C. Synchronization — strobes in the same field of view must flash together

D. Mounting height because improper mounting creates timing offsets

56. A fire alarm technician discovers two pull stations in a library painted brown to match decor. Paint covers housing, handle, and labels. What must be documented?

A. Painted pull stations must be replaced because paint obscures required red color and labels

B. Only labels need restoration — housing color does not affect operation

C. Pull stations function if activated during testing — paint is cosmetic

D. Library should repaint red within 30 days

57. A fire alarm technician performs battery load test. Starting 26.6 VDC. After test, ending 18.4 VDC. Manufacturer minimum 20.4 VDC. What must be documented?

A. Batteries passed because 18.4 exceeds industry minimum 18 VDC

B. Batteries failed — 18.4 VDC below 20.4 VDC minimum and must be replaced

C. Test inconclusive — repeat after recharge

D. Batteries can remain for 30 days while replacements ordered

58. A fire alarm technician tests HVAC shutdown. Duct detector activates, panel processes alarm, control module relay closes. AHU does not shut down. Where is the fault?

A. In the duct detector generating incorrect signal type

B. In the panel programming — output not linked to duct zone

C. In the SLC communication — module did not receive command

D. In the wiring between control module relay and AHU controller

59. A fire alarm technician discovers the Record of Completion last updated ten years ago. Six renovations added 95 devices and changed the sequence five times. What is needed?

A. Annual testing records capture modifications — update optional

B. Original Record remains valid as initial baseline

C. Record must be updated to reflect current system per NFPA 72 Section 7.8

D. New Record needed only if panel was replaced

60. A fire alarm system log shows 220 "WATERFLOW — ALARM" entries over eight months with no fires and no head activations. Engineer reports municipal pressure fluctuations. What should be recommended?

A. Investigate pressure surges and adjust waterflow switch retard delay settings

B. Replace all switches with models having built-in pressure compensation

C. Increase panel alarm threshold for waterflow zones

D. Disconnect switches until pressure issue resolved

61. A fire alarm technician discovers a renovation enclosed a corridor smoke detector behind a new wall. Detector communicates normally. What must be documented?

A. Detector can remain because it communicates normally

B. Detector must be relocated to the occupied corridor and concealed space evaluated

C. Panel descriptor should be updated for the concealed position

D. Concealed detector provides dual coverage for both spaces

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

A. No, switch must activate after one revolution

B. No, requirement is one and a half revolutions

C. Yes, but only for OS&Y — butterfly valves have stricter requirements

D. Yes, activation within two revolutions meets NFPA 72

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

A. Strobe passes because any rate below 2 per second is acceptable

B. Flash rate irrelevant if candela meets coverage

C. Strobe fails — NFPA 72 requires 1 to 2 flashes per second and 0.9 is below minimum

D. Rate acceptable for sleeping areas but fails commercial

64. A fire alarm technician discovers tamper switch generates alarm instead of supervisory. Contact closure confirmed. Most likely cause?

A. Tamper input programmed as alarm zone rather than supervisory

B. Tamper requires different EOLR than alarm circuits

C. Panel cannot distinguish alarm from supervisory on same input

D. Tamper wiring polarity reversed

65. A fire alarm system has IP primary and cellular secondary. "IP COMMUNICATION FAILURE" active 70 days. Cellular functions. What should be documented?

A. Cellular provides complete monitoring — IP not urgent

B. System operated without redundancy for 70 days — significant impairment

C. IP trouble repaired at owner's convenience

D. No documentation needed — system functions with cellular

66. A fire alarm technician discovers a large sign mounted over a corridor horn/strobe blocking both outputs. What must be documented?

A. Only strobe obstruction significant — horn travels around obstacles

B. Device functional if it activates during testing

C. Building management may apply for AHJ variance

D. Sign obstructs both audible and visible notification and must be removed

67. A fire alarm technician performs battery load test. Starting 26.4 VDC. After test, ending 18.9 VDC. Manufacturer minimum 20.4 VDC. What must be documented?

A. Batteries passed because 18.9 exceeds industry minimum 18 VDC

B. Test inconclusive — repeat after recharge

C. Batteries failed — 18.9 below 20.4 VDC minimum

D. Batteries can remain 60 days while replacements ordered

68. A fire alarm technician discovers smoke detector relocated from ceiling to bookshelf at 40 inches above floor by building staff. What must be documented?

A. Detector at bookshelf height is non-functional and must be reinstalled at ceiling

B. Detector at shelf height may detect faster because smoke fills room

C. Relocation acceptable if staff document the reason

D. Detector should be raised to 60 inches for better coverage

69. Per NFPA 72 Table 14.4.3.2, supervisory devices must be tested at what minimum frequency?

A. Monthly for valve position verification

B. Annually as part of comprehensive system functional test

C. Semiannually to match smoke detector schedule

D. Quarterly for building maintenance consistency

70. A fire alarm technician discovers FCC graphic annunciator has ten burned-out LEDs. What must be documented?

A. Burned-out LEDs prevent firefighters from identifying alarms in those zones and must be repaired

B. LEDs are cosmetic — no operational affect

C. Only LEDs in occupied zones need repair

D. Annunciator must be replaced entirely

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

A. Semiannually because more critical than detection

B. Monthly for suppression readiness

C. Annually as part of comprehensive releasing system test

D. Only during initial acceptance

72. A fire alarm technician discovers panel room contains paint, solvents, and stacked boxes. Working clearance 14 inches. What violations exist?

A. Only chemical storage is a concern

B. Room may be used for storage if chemicals sealed

C. Only 14-inch clearance violates code — organized storage permitted

D. Both storage and inadequate clearance violate NEC Article 110 working space requirements

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

A. Annually as part of comprehensive functional test

B. Semiannually using approved aerosol or calibrated test source

C. Quarterly for building maintenance consistency

D. Monthly for continuous detection reliability

74. A fire alarm technician tests stairwell pressurization. Detector activates, fans start. Floor 5 door requires significant force. Floor 22 door opens normally. What should be documented?

A. Both observations should be documented — inconsistent pressurization suggests duct or damper issue

B. Some variation expected — both floors pass

C. Only Floor 5 matters because it confirms pressure

D. Only fan activation requires documentation

75. A fire alarm technician discovers panel clock shows 12:30 PM when actual time is 2:18 PM — 108-minute discrepancy. What must be documented?

A. Time discrepancies under 2 hours are within tolerance

B. Clock error only affects display — no operational significance

C. The 108-minute discrepancy affects event log accuracy and must be corrected

D. Only AHJ determines whether correction required

76. A fire alarm technician tests access control interface. Alarm activates. 19 of 21 locks release but 2 remain locked. What must be investigated?

A. Panel programming — two locks may not be in response matrix

B. Access control firmware needing updates

C. NAC circuits — locks wired to notification circuit

D. Control module outputs, wiring, and power supply to the two non-releasing locks

77. A fire alarm technician tests waterflow switch. Inspector's test valve open, water flows. After 92 seconds, no alarm appears. Per NFPA 72, assessment?

A. The switch passes because 92 seconds is close enough to 90

B. The switch has failed — alarm must appear within 90 seconds

C. The 92-second delay is acceptable for systems with extended retard settings

D. Only the retard mechanism has failed — the switch itself is functional

78. A fire alarm technician performs sensitivity testing. One detector reads 0.1% — well below 0.5% minimum. What does this indicate?

A. Detector outside listed parameters — must be investigated for fault or replacement

B. Detector at peak sensitivity — ideal condition

C. Low readings always acceptable — enhanced capability

D. Panel calibration drifted — needs manufacturer adjustment

DOMAIN 3.3 — SUBMITTAL PREPARATION AND SYSTEM LAYOUT (Questions 79–100)

79. A fire alarm designer calculates NAC voltage drop: 14 AWG (3.14 Ω/1000 ft), round-trip 980 feet, 2.6 amps on 24 VDC. What is end-of-circuit voltage?

A. 21.50 VDC providing generous margin

B. 16.00 VDC — at the exact minimum with zero margin

C. 16.01 VDC — barely above 16 VDC minimum, redesign strongly recommended

D. 15.20 VDC below 16 VDC requiring immediate redesign

80. A fire alarm designer calculates battery: panel/SLC standby = 0.88A, voice standby = 1.12A, NAC alarm = 4.4A, voice alarm = 8.6A. Generator present. 4-hour standby, 15-minute alarm, 20% safety factor. Minimum?

A. 24.00 Ah using 24-hour standby

B. 10.85 Ah without safety factor

C. 16.00 Ah using 5-minute alarm

D. Approximately 13.5 Ah after applying all factors correctly

81. A fire alarm sequence shows duct detector triggering HVAC shutdown only — no notification, recall, or station signal. Reviewer flags missing station transmission. Correct assessment?

A. Duct detectors never transmit — supervisory class

B. The duct detector signal should transmit to the supervising station even without notification

C. Reviewer incorrect — duct signals transmit automatically

D. Station transmission only when duct detectors configured as alarm

82. A fire alarm conduit schedule: 1-inch EMT with thirteen 14 AWG THHN and five 16 AWG THHN (18 total). Annex C max: 14 AWG = 22, 16 AWG = 31. Mixed sizes. How must fill be verified?

A. Calculate total conductor area from Chapter 9 Table 5 and compare to 40% fill limit

B. Compare each individually — both below maximums so it passes

C. Add counts and compare to smaller Annex C max

D. Use Annex C for 14 AWG only

83. A fire alarm floor plan: 90-degree L-shaped corridor — 210 feet longer leg, 150 feet shorter leg. Detectors at 30-foot spacing with detector at corner. Is corner detector necessary?

A. No, detectors along each leg provide coverage through the turn

B. No, corner detectors create redundant coverage

C. Yes, corner detector ensures detection at the turn where leg coverage may be limited

D. Yes, but only if corridor exceeds 10 feet width at intersection

84. A fire alarm device schedule: 196 devices on SLC 1 (max 198). Renovation adds 20. How should designer advise?

A. Add 2 to SLC 1 reaching 198 and place 18 on new loop

B. All 20 can be added by requesting firmware extension

C. Install monitor modules to consolidate and free addresses

D. All 20 should go on a new SLC to preserve remaining capacity

85. A fire alarm riser: remote NAC power supplies on Floors 9, 18, and 27 of a 36-story building. Each has own batteries. What must be calculated separately?

A. Voltage drop from main panel to each remote

B. A separate battery calculation based on each remote panel's specific loads

C. Combined calculation averaging loads across all three

D. Conduit fill for supervised circuit to each remote

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

A. System specifications, circuit details, device counts, power supply data, and required signatures

B. Only installer's license and signature

C. Only AHJ's inspection report

D. Design engineer's calculations and specifications

87. A fire alarm specification requires all cable above ceilings in conduit. Spaces non-plenum. NEC does not require conduit. What should designer do?

A. Ignore specification — exceeds code

B. Install conduit only in corridors

C. Install conduit as specified — specification is contractual obligation

D. Request AHJ override to reduce costs

88. A fire alarm voltage drop: 70.7V speaker circuit shows 58.5 VAC at farthest speaker. Manufacturer minimum 55 VAC. Does circuit pass?

A. No, 70.7V must maintain 90% (63.6 VAC) minimum

B. No, speakers require exactly 70.7 VAC for impedance matching

C. Yes, but only if amplifier can be increased

D. Yes, 58.5 VAC exceeds 55 VAC minimum with 3.5-volt margin

89. A fire alarm shop drawing: releasing system with 14-second pre-discharge timer. Engineer notes may not provide adequate evacuation. What determines delay?

A. Room size, exit count, travel distance, and expected occupant count

B. NFPA 72 specifies fixed 30-second minimum

C. Agent manufacturer specifies based on concentration rate

D. Fire department determines based on response time

90. A fire alarm as-built: 182 devices on SLC 1. Panel programming: 190. Record of Completion: 174. What must be corrected?

A. Only as-built needs updating — closest to panel count

B. All three must be reconciled against physical field count for same number

C. Only Record needs updating — most outdated

D. Panel must be reprogrammed to match as-built

91. A fire alarm corridor: 250-foot straight corridor with detectors at 30-foot spacing. First detector at 10 feet: 10, 40, 70, 100, 130, 160, 190, 220, 250. Nine detectors. Last at far end. Correct?

A. No, 10 detectors needed — gap near center creates coverage hole

B. No, first and last must be within 15 feet of each end

C. Yes, but additional detectors needed at every intersection

D. Yes, 9 detectors with 30-foot spacing and end distances within 15 feet provide coverage

92. A fire alarm shop drawing: SLC 1 (Class B, Floors 1-4) and SLC 2 (Class A, Floors 5-26). Reviewer questions different classifications. Valid rationale?

A. NFPA 72 requires Class A above Floor 4

B. Class B prohibited above Floor 4 per NEC 760

C. Designer determined upper floors benefit from Class A due to longer egress times

D. Both must use identical classifications

93. A fire alarm shop drawing: NAC with 14 horn/strobes at 0.295A, 8 speakers at 0.150A, and 6 strobes at 0.190A on 3.0-amp output. Total load?

A. 4.13 amps from horn/strobes alone exceeding rating

B. Approximately 6.47 amps total significantly exceeding the 3.0-amp rating

C. 2.72 amps total within rating with margin

D. 8.00 amps based on doubling for inrush estimation

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

A. Standard FPLP in standard EMT

B. Standard FPLR in 1-hour stairwell

C. Any listed cable in RMC with firestop at each floor

D. Either 2-hour fire-rated cable (CI cable) or installation within 2-hour fire-rated construction

95. A fire alarm specification requires acceptance testing per NFPA 72 before CO. Spec requires 10 business days' notice to AHJ. GC demands testing in 3 days. Contractor response?

A. Maintain 10-day notice requirement and reschedule with proper notification

B. Contact AHJ to request expedited waiver

C. Perform preliminary test and schedule formal test later

D. Conduct testing in 3 days and submit for retroactive approval

96. A fire alarm floor plan: conference room 52 × 38 feet, 10-foot ceiling. One 75 cd wall strobe on 52-foot wall. Per NFPA 72, 75 cd covers up to 45 × 45 feet. The 52-foot dimension exceeds 45. Assessment?

A. Room passes because 38-foot width compensates for excess length

B. 75 cd adequate with a 7-foot overage within installation tolerance

C. Room requires higher candela or additional strobes because one dimension exceeds the 45-foot maximum

D. Room passes if strobe is on 38-foot wall instead

97. A fire alarm technician reviews as-built: 160 devices on SLC 1. Physical count: 170. Panel confirms 170. Required?

A. No action — 10-device discrepancy within tolerance

B. As-built must be updated to reflect 170 devices currently installed

C. Panel must be reprogrammed to match 160-device drawing

D. Only Record of Completion needs updating

98. A fire alarm battery calculation: standby = 0.65A × 24hr = 15.60 Ah, alarm = 5.8A × 0.083hr = 0.481 Ah, subtotal = 16.081 Ah, × 1.20 = 19.30 Ah. Drawing specifies 18 Ah. Adequate?

A. Yes, 18 Ah is close enough for practical purposes

B. Yes, but only if building has generator reducing standby

C. No, 20% factor should apply to each component separately

D. No, 18 Ah below 19.30 Ah minimum — next standard size must be used

99. A fire alarm sequence for hospital: smoke alarms trigger alarm-floor-only notification, pull stations trigger full building notification. Both trigger recall and station signal. Valid?

A. Yes, defend-in-place hospitals may have differentiated responses per fire safety plan

B. No, all alarm types must produce identical responses

C. No, smoke detectors must trigger broader notification than pull stations

D. Yes, but only if hospital has fewer than 200 beds

100. A fire alarm as-built captures panel's dedicated circuit: 20A breaker, 12 AWG, 210-foot run, labeled, lock-on, no GFCI/AFCI. What additional detail should be documented?

A. Voltage at panel terminals for baseline comparison

B. Electrician's name and license for warranty

C. The conduit type, size, and routing path from electrical panel to fire alarm panel

D. Breaker manufacturer and catalog number

DOMAIN 3.4 — MANAGEMENT (Questions 101–115)

101. A fire alarm project supervisor discovers subcontractor pulled cable with excessive tension on 26 runs totaling 3,800 feet. Internal insulation may be damaged. What must supervisor require?

A. Visual inspection at each pull point is sufficient

B. Cable can be connected — damage found during testing

C. Subcontractor must certify technique in writing

D. Megger testing on all 26 runs to verify insulation integrity before connecting devices

102. A fire alarm contractor coordinates acceptance testing for a building with elevator recall, HVAC shutdown, pressurization, smoke control, and door release. Which trades must participate?

A. Only fire alarm contractor — test covers fire alarm exclusively

B. Elevator, HVAC, controls, and door hardware contractors must verify their equipment

C. General contractor solely coordinates for all trades

D. Only AHJ and fire alarm contractor

103. A fire alarm project manager receives change request to convert horn/strobe to voice evacuation at 75% completion. Correct response?

A. Formal change order documenting engineering revision, cost, and schedule impact must be processed

B. Refuse because conversion at 75% is impossible

C. Absorb cost to maintain client relationship

D. Install speakers in remaining areas and retain horn/strobes in completed areas

104. A fire alarm contractor discovers electrical contractor installed AFCI/GFCI breaker on fire alarm dedicated circuit. Correct action?

A. Accept because it provides enhanced protection

B. Replace breaker directly — fire alarm compliance is contractor's scope

C. Notify general contractor to direct electrical contractor to replace with standard breaker

D. Contact building owner to authorize replacement cost

105. A fire alarm contractor receives 550 detectors — 520 with one date code, 30 with different code. Same model listed for panel. Concerned?

A. Yes, all must have identical date codes for firmware consistency

B. Yes, 30 different units must go on separate SLC loop

C. No, but 30 should be in non-critical locations

D. No, date code variations normal and do not affect compatibility

106. A fire alarm technician asks whether tightening a wire nut resolving a ground fault requires a formal service report. Correct?

A. Reports needed only when devices replaced or programming changed

B. Every service activity must be documented in written report regardless of scope

C. Reports required only when resolving active alarm condition

D. Minor repairs under 15 minutes documented verbally

107. A fire alarm project's field technicians produced messy but accurate markups. Closeout approaching. Contractor should?

A. Create clean professional as-built drawings incorporating all field markup information

B. Submit messy markups as-is — they represent actual conditions

C. Submit original shop drawings since installation followed design

D. Have technicians recreate from memory for cleaner documentation

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

A. Only panel manual and warranty documents

B. Only as-built drawings and contractor's completion certificate

C. As-built drawings, Record of Completion, sequence of operations, and operating instructions

D. Complete bid documents, shop drawings, and quality worksheets

109. A fire alarm contractor schedules acceptance testing for a hospital. Infection control requires 48-hour notice before aerosol testing in patient areas. GC wants testing in 24 hours. How should contractor proceed?

A. Proceed in 24 hours because fire code overrides hospital protocols

B. Test only non-patient areas and skip patient areas

C. Use non-aerosol methods in patient areas without notice

D. Provide 48-hour notice and coordinate patient testing per infection control requirements

110. A fire alarm project supervisor schedules acceptance testing. AHJ requires 10 business days' notice. GC demands testing in 5 days. Supervisor response?

A. Conduct testing in 5 days and submit for retroactive approval

B. Maintain 10-day notice requirement and reschedule with proper notification

C. Request AHJ waive notice due to critical timeline

D. Perform preliminary test and schedule formal test later

111. A fire alarm project manager discovers the mechanical contractor installed a large exhaust duct directly below the fire alarm panel location, creating excessive vibration. The panel manufacturer's installation guide prohibits mounting panels on surfaces subject to continuous vibration exceeding 0.5G. What should the project manager do?

A. Notify the general contractor of the conflict and request coordination to either relocate the duct or the panel

B. Install vibration isolation pads between the panel and the wall to dampen vibration

C. Proceed with installation because the panel's internal components are vibration-resistant

D. Relocate the fire alarm panel to a different wall without notifying the other trades

112. A fire alarm contractor discovers that a building tenant has installed a consumer-grade wireless smoke detector and connected it to the fire alarm panel's SLC loop using a field-fabricated interface module. The wireless detector is not listed for connection to commercial fire alarm systems. What should the contractor do?

A. Leave the device since it provides additional detection coverage

B. Reconnect using proper terminal connections instead of field-fabricated interface

C. Disconnect the unlisted device, document the finding, and notify building management

D. Replace the consumer device with a listed compatible wireless detector at the same location

113. A fire alarm project supervisor is managing three concurrent installation crews. Crew 1 completed wiring on Floors 1-10 last week. Crew 2 is wiring Floors 11-20. Crew 3 begins programming. Crew 3 discovers that Crew 1 used 18 AWG wire on three NAC circuits where the drawings specify 14 AWG. How should the supervisor handle this?

A. The three NAC circuits must be rewired with 14 AWG per the approved drawings before programming continues

B. Request an engineering review to determine if 18 AWG is adequate for the actual loads

C. Accept 18 AWG because it is a listed fire alarm wire gauge

D. Document the discrepancy and proceed — voltage drop testing will determine adequacy

114. A fire alarm contractor is managing a project where the building owner has been making direct requests to individual field technicians for "small adjustments" — moving devices, changing notification patterns, adding detectors — without going through the project manager. This has resulted in undocumented scope changes and inconsistencies between the installation and the approved drawings. How should the project manager address this?

A. Accept the owner's changes since they are the paying client and document them informally

B. Establish that all change requests must go through the project manager for documentation and formal processing

C. Instruct technicians to refuse all owner requests until the project is complete

D. Have technicians comply with requests but add the cost to the final invoice

115. A fire alarm contractor completes installation. The building owner asks the contractor to sign a letter stating the system "will detect all fires within 30 seconds and notify all occupants within 60 seconds." The system was designed to meet NFPA 72 requirements. How should the contractor respond?

A. Decline and instead provide the Record of Completion certifying code-compliant installation per NFPA 72

B. Provide the letter because NFPA 72 compliant systems achieve these performance metrics

C. Provide the letter with disclaimer language limiting the contractor's liability

D. Provide a modified letter with accurate performance language based on the system design

LEVEL III — SIMULATION EXAM 5: ANSWER KEY AND EXPLANATIONS

1. C — Fire alarm panel networking must use listed communication pathways that meet NFPA 72 survivability and performance requirements. A shared university Ethernet backbone is subject to IT maintenance, reconfigurations, outages, and traffic congestion that could disrupt fire alarm communications. Listed fire alarm network pathways ensure dedicated, reliable, and survivable panel-to-panel communication.

2. A — Standby = (1.05 + 1.95) × 4 = 12.0 Ah. Alarm = (6.0 + 13.0) × 0.25 = 4.75 Ah. Subtotal = 16.75 Ah. With 20% safety factor: 16.75 × 1.20 = 20.10 Ah, approximately 17.16 Ah accounting for rounding variations. Each remote power supply calculates separately using its own loads.

3. D — CI cable maintains its 2-hour fire rating independently, so Level 2 is preserved at the corridor crossing. However, both outgoing and return paths entering a single conduit bank through the same 40-foot corridor ceiling space creates a shared physical route where one fire could damage both paths simultaneously, compromising Class A pathway diversity.

4. B — Both rooms sharing the same releasing panel output terminal means energizing that output for Room 2's cross-zone verification also activates Room 1's solenoid through the same circuit. Each room must have a completely independent releasing output on separate panel terminals to prevent unintended discharge in adjacent rooms.

5. A — Aspirating detection with sampling pipes concealed within HVAC ductwork and architectural trim at multiple heights addresses both stratification and aesthetics. The pipes draw air from different elevations to detect smoke at any layer. The detection unit is remotely located in a mechanical space, leaving no visible equipment in the atrium.

6. D — A 0.10-volt margin above the 16 VDC minimum is critically insufficient for long-term operation. Connection resistance increases with aging, conductor resistance rises with temperature, and any device additions increase current draw. All factors erode this negligible margin, virtually guaranteeing the circuit will fall below minimum operating voltage.

7. C — Surgical suites and NICU both involve patients who cannot safely be exposed to standard audible alarms. Surgical patients under anesthesia and neonates in critical care are directly endangered by audible notification. Both require restricted notification profiles with visual-only or staff-controlled responses.

8. B — The mechanical penthouse at 125 dB ambient presents the most impractical intelligibility challenge. Even maximum speaker output with aggressive acoustic treatment cannot overcome

noise levels that extreme to deliver intelligible speech at 0.50 STI. Alternative notification means must be used.

9. A — When acoustically rated partitions create eight enclosed spaces, each 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 when partitions are deployed.

10. D — Dual-path IP/cellular provides redundancy with continuous monitoring on both paths. Each independently meets the 200-second failure detection per NFPA 72 Section 26.6.3.2. If one path fails, the other maintains monitoring without interruption.

11. B — Different elevator banks may recall to different alternate floors based on their operational function. When the machine room detector activates, all banks must recall to alternates, but each bank's alternate can be selected based on where its passengers are best served during the emergency.

12. C — Aspirating detection with sampling pipes threaded through existing millwork cavities and concealed channels provides detection without any visible equipment or penetrations. The detection unit is in a concealed mechanical space, satisfying both code detection requirements and the strictest landmark preservation restrictions.

13. A — When different conductor sizes share the same conduit, 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 allowance.

14. D — NFPA 72 Section 23.10 requires the fire command center to have a permanently installed fire alarm panel or dedicated repeater. A cloud-based monitoring portal displayed on a screen — regardless of permanence — is not listed fire alarm equipment and cannot substitute for a dedicated repeater.

15. B — Controller trouble is a supervisory condition — an off-normal equipment status requiring investigation. The fire pump controller has a fault that may affect its ability to start and run the pump during a demand. NFPA 72 Section 10.18 requires this condition reported as a supervisory signal.

16. C — Cubicle partitions at 5.5 feet are below the typical wall-mounted strobe mounting height of 80-96 inches. Since strobes mount above partition height, partitions do not obstruct strobe light output. The visible coverage calculation treats the space as an open room.

17. A — Double-interlock requires two independent conditions to prevent accidental water discharge. A single detector fault alone cannot cause water to fill the piping. A single pipe leak losing air pressure alone cannot cause water to fill the piping. Both conditions must occur together, providing enhanced protection against unintended discharge.

18. D — The building's fire safety plan specifies which detection zones trigger which notification profiles. Corridor detectors, room detectors, and duct detectors may each have different programmed responses based on the plan's design intent. The notification scope is a documented design decision — not a universal code mandate.

19. B — The pre-discharge countdown must provide adequate evacuation time based on the room's specific characteristics: physical dimensions, exit locations, maximum travel distance, and expected occupant count. These factors determine whether 12 seconds is sufficient — not a fixed code value.

20. C — Intercom notification depends on an operator being available to make the call, is not automatic, does not meet NFPA 72 notification appliance requirements, and has no guaranteed response time. Code-compliant notification must be automatic, immediate upon alarm activation, and meet specified audible and visible requirements.

21. 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 provides independent confirmation of a genuine condition.

22. D — NFPA 72 Section 17.14.8 specifically requires manual fire alarm stations to be red. This is the only device type with a mandatory code-specified color requirement. All other devices may be any color acceptable to the project.

23. B — NFPA 72 Section 18.4.4.1 requires audible notification at 15 dB above ambient. Theater: 100 + 15 = 115 dB. Orchestra pit: 112 + 15 = 127 dB. Both levels are impractical with standard appliances. The design must compensate with enhanced visible notification.

24. B — Remote amplifier panels at intermediate floors shorten speaker circuit distances, directly addressing the root cause of line losses. Centralized amplifiers with 900-foot runs experience significant resistance losses. Distributing amplifiers with 320-foot runs maintains consistent audio levels.

25. D — When the kitchen suppression system activates, the fire alarm panel must execute the full approved sequence: building notification, supervising station signal, and HVAC shutdown. Suppression activation confirms a fire condition requiring coordinated building-wide response.

26. A — The raised floor space used for air distribution is a plenum requiring FPLP cable. The overhead cable tray with dedicated ducted return — not used for air handling — is not a plenum and accepts FPL minimum. Each space's requirement depends on its air-handling function.

27. C — Zone-specific waterflow notification directs occupants to evacuate only the area served by the activated riser while other areas continue normal operations. This targeted response reduces unnecessary disruption and focuses responder attention on the affected area.

28. 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 98°F, so minimum activation is 118°F (98 + 20 = 118).

29. D — 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 to a potentially smoke-contaminated floor endangers passengers. NFPA 72 Section 21.3 requires alternate floor recall.

30. A — 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 communication.

31. C — Any circuit fault — whether open or short — impairs proper releasing function. A short could potentially cause unintended solenoid energization, while an open prevents intentional activation. The panel must generate a trouble signal for any releasing circuit fault condition to alert building management.

32. D — All three environments — greenhouse (high humidity/soil particulates), indoor shooting range (gunpowder residue/lead dust), and brewery fermentation (CO2/yeast particles) — create conditions causing smoke detector nuisance alarms. Heat detection is unaffected by these contaminants.

33. B — ADA-accessible 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.

34. A — In a 70.7V system, speakers connect in parallel through individual impedance-matching transformers. Series wiring distributes the 70.7V unevenly across the three speakers, causing inconsistent voltage at each device. This produces varying audio levels and may cause some speakers to operate below their rated input.

35. C — Beam detector spacing must not exceed the manufacturer's listed maximum for the specific ceiling height. At 52 feet, the listing establishes allowable lateral distance. NFPA 72 requires compliance with the manufacturer's listing.

36. D — During Phase 2 construction above operational Phase 1, concrete cutting generates heavy dust that can cause nuisance alarms on Phase 1 devices near the boundary. Affected Phase 1 zones must be bypassed with the monitoring station notified.

37. B — SLC 3 has the most remaining capacity: 116 device addresses and 92 mA of current headroom. Placing all 50 on SLC 3 (reaching 132 devices/96 mA) preserves the limited remaining margin on SLC 1 and SLC 2. This provides the best overall system flexibility.

38. A — 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.

39. C — 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.

40. D — In-rack detectors at intermediate heights identify fires where they originate — among stored materials on shelves and pallets — before smoke travels the full 48 feet to ceiling detectors. Early detection at storage levels provides significantly faster alarm response.

41. B — Cross-zone logic, countdown, abort, and releasing circuit supervision have all been verified. The remaining test is verifying the pre-discharge warning appliances produce adequate audible and visual output in the protected space for occupant evacuation.

42. A — Both high-reading detectors (above 3.7%) and low-reading detectors (below 0.5%) are outside the manufacturer's listed range. The 30 high-reading detectors require cleaning. The 12 low-reading detectors must be investigated. All 42 require corrective action.

43. D — The pre-recorded message plays on all 36 floors confirming amplifiers and speakers function. The live microphone reaching only Floors 1-18 indicates audio routing is programmed to broadcast to a subset of zones. Programming must be verified against the approved design.

44. C — Bank A's selective recall tested correctly. When Bank F activated, both E and F recalled despite only Bank F's relay activating. The elevator controllers for Banks E and F share a common recall input wired in parallel — when Bank F's relay closes, both controllers receive the signal.

45. A — NFPA 72 Section 10.6.9 permits a maximum delay of 3 hours before annunciating AC power failure trouble. The 3-hour-10-minute delay exceeds this maximum by 10 minutes. The panel's timing must be corrected.

46. A — A smoke detector covered with a cotton bandage for eleven weeks has been effectively disabled. The bandage prevents adequate smoke entry to the sensing chamber, leaving the corridor without detection coverage. This is a significant impairment requiring immediate correction.

47. D — 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.

48. B — NFPA 72 Section 26.6.3.2 requires IP technology with continuous monitoring to detect path failure within 200 seconds. At 195 seconds, the panel is within the maximum. Both paths function and the supervision timing meets the requirement.

49. A — Fourteen months of historical event data has been permanently lost due to the log overwriting entries. This impairs troubleshooting, incident investigation, and maintenance compliance. The log must be downloaded and cleared.

50. C — Nine adjacent detectors with significantly longer activation times (32-48 seconds versus 3-9 seconds) strongly suggests contaminated sensing chambers. An environmental factor specific to that area accelerated contamination. The detectors should be cleaned and retested.

51. D — A gradual voltage decline from 27.2 to 26.0 VDC over 15 minutes — a 1.2-volt drop — is normal for batteries under standby load. The voltage remains well above the minimum threshold. The charger activating after reconnection confirms a successful test.

52. A — Aluminum foil completely blocks smoke entry to the sensing chamber, rendering the detector non-functional. Unlike porous coverings, foil creates a solid barrier. The foil must be removed immediately and the nuisance alarm source addressed through proper means.

53. B — NFPA 72 Table 14.4.3.2 requires smoke detectors to be functionally tested semiannually using approved aerosol smoke or a calibrated test source.

54. D — Circuit voltage at both speakers reads 69.0 VAC — within normal range and identical at both locations. Different volumes from speakers receiving the same voltage indicates different wattage tap settings on their impedance-matching transformers, causing different power levels.

55. C — 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 location must be synchronized regardless of circuit assignment. The 0.35-second offset violates this requirement.

56. A — NFPA 72 Section 17.14.8 requires manual fire alarm stations to be red. Painting pull stations brown violates this requirement. Paint covering labels renders devices unusable by occupants. The painted stations must be replaced.

57. B — The batteries ended at 18.4 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 must be replaced.

58. D — 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.

59. C — Six renovations adding 95 devices and modifying the sequence five times over ten years represent major changes. NFPA 72 Section 7.8 requires the Record of Completion to reflect the current configuration. A ten-year-old document must be updated.

60. A — Two hundred twenty nuisance waterflow alarms over eight months with no fires indicates pressure surges causing brief paddle movements. The corrective approach addresses both root cause (investigating surges) and switch response (adjusting retard delay within 90 seconds).

61. B — The detector behind the new wall is in a concealed space separated from the occupied corridor. Smoke from a corridor fire may not reach it in time. The detector must be relocated to the occupied side and the concealed space evaluated.

62. D — NFPA 72 requires tamper switches to generate a supervisory signal within two revolutions of the valve wheel from fully open. Activation at exactly two revolutions meets the requirement.

63. C — 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 minimum. The device must be repaired or replaced.

64. A — When a tamper switch activation generates alarm instead of supervisory, the input is programmed as an alarm zone rather than supervisory. Programming must be corrected.

65. B — Seventy days without communication redundancy means the system operates with a single path. If cellular also fails, the building has no monitoring. This is a significant impairment requiring prompt correction.

66. D — A sign completely blocking both horn and strobe eliminates both audible and visible notification output. The sign must be removed and building management informed that appliances must remain unobstructed.

67. C — The batteries ended at 18.9 VDC — below the manufacturer's 20.4 VDC minimum. Panel components may malfunction at this voltage. The batteries must be replaced.

68. A — A smoke detector at 40 inches above the floor is completely ineffective for detection. Smoke rises to the ceiling and accumulates there first. The detector must be reinstalled at its approved ceiling location.

69. B — 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.

70. A — Burned-out LEDs at the FCC graphic annunciator prevent firefighters from identifying active alarms in those zones. This impairs emergency response. All non-functioning LEDs must be repaired.

71. 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.

72. D — Storage of paint, solvents, and boxes combined with only 14 inches of clearance violates NEC Article 110.26. All storage must be removed and required working space maintained.

73. B — NFPA 72 Table 14.4.3.2 requires smoke detectors to be functionally tested semiannually using approved aerosol smoke or a calibrated test source.

74. A — Floor 5 requiring significant force (positive pressure) while Floor 22 opens normally (no pressure) indicates inconsistent pressurization. A duct, damper, or balancing issue prevents adequate distribution. Both observations should be documented.

75. C — A 108-minute discrepancy significantly affects event log accuracy. Timestamps nearly two hours off create confusion when correlating events with security footage, dispatch records, and other logs. The clock must be corrected immediately.

76. D — The panel processed the alarm and 19 of 21 locks released correctly. The two non-releasing locks indicate faults specific to those devices. Control module outputs, wiring, and power supply must be investigated.

77. B — NFPA 72 requires waterflow alarm signals at the panel within 90 seconds of sustained flow. After 92 seconds with no alarm, the switch has failed its functional test. The switch, retard delay, wiring, and connection must be investigated and corrected.

78. A — A sensitivity reading of 0.1% falls well below the 0.5% minimum acceptable range. The detector is operating far outside its listed parameters and likely has a sensor fault. The detector must be investigated and replaced if the fault is confirmed.

79. C — R = 980 × (3.14/1000) = 3.077 Ω. V_drop = 2.6 × 3.077 = 7.999V. End voltage = 24 − 8.0 = 16.0 VDC. At exactly the minimum with zero margin, any connection aging, temperature change, or addition would push voltage below minimum. Redesign is strongly recommended.

80. D — Standby = (0.88 + 1.12) × 4 = 8.0 Ah. Alarm = (4.4 + 8.6) × 0.25 = 3.25 Ah. Subtotal = 11.25 Ah. With 20%: 11.25 × 1.20 = 13.50 Ah. Generator reduces standby to 4 hours. Voice requires 15-minute alarm.

81. B — Even when duct detectors are configured for HVAC shutdown only without building notification, the detection signal should still transmit to the supervising station. This ensures awareness for investigation and follow-up.

82. A — When different conductor sizes share the same conduit, Annex C tables cannot be used. Actual area from Chapter 9 Table 5 must be calculated and compared to the 40% fill limit.

83. C — A detector at the 90-degree turn ensures detection at the direction change where coverage from detectors in either leg may be limited. Smoke traveling along one leg may not reach detectors beyond the turn.

84. D — SLC 1 at 196 of 198 has only 2 remaining addresses. Placing all 20 on a new SLC preserves SLC 1's remaining capacity and provides substantial expansion room on the new loop.

85. B — Each remote NAC power supply has its own batteries sustaining its loads during AC failure. A separate battery calculation using each panel's specific standby and alarm currents must be performed.

86. A — NFPA 72 Section 7.8.2 requires system specifications, circuit information, device counts, power supply data, communication details, test results, and signatures from installer, designer, and AHJ.

87. C — Project specifications are contractual obligations. Even though NEC does not require conduit in non-plenum spaces, the specification is binding. Deviating without approval creates liability.

88. D — The speaker circuit delivers 58.5 VAC at the farthest speaker, exceeding the manufacturer's 55 VAC minimum by 3.5 volts. The speakers operate within listed parameters.

89. A — The pre-discharge delay must provide adequate evacuation time based on room size, exit count, travel distance, and expected occupant count. These factors determine adequacy.

90. B — Three different device counts across three documents indicate inconsistent documentation. All three must be reconciled against a physical field count to reflect the same verified number.

91. D — Nine detectors at positions 10, 40, 70, 100, 130, 160, 190, 220, 250 provide 30-foot spacing. First detector 10 feet from one end (within 15 feet) and last at the 250-foot far end (0 feet). Both comply with NFPA 72.

92. C — Using Class A for upper floors (5-26) provides enhanced fault tolerance where it benefits most — longer egress, more difficult access, and greater vulnerability during extended evacuation. Lower floors accept Class B based on risk assessment.

93. B — Horn/strobes: 14 × 0.295 = 4.13A. Speakers: 8 × 0.150 = 1.20A. Strobes: 6 × 0.190 = 1.14A. Total = 6.47 amps, significantly exceeding the 3.0-amp output. Circuit must be redesigned.

94. D — NFPA 72 Section 12.4.4 defines Level 2 as requiring either 2-hour fire-rated cable (CI cable) or installation within 2-hour fire-rated construction. Standard cable in EMT and FPLR in 1-hour enclosures do not qualify.

95. A — The specification requires 10 business days' notice to the AHJ. This is a regulatory and contractual obligation. The contractor must maintain the requirement and reschedule.

96. C — Per NFPA 72 Table 18.5.5.5.1(a), 75 cd covers up to 45 × 45 feet. The 52-foot dimension exceeds the 45-foot maximum. Higher candela or additional strobes are required.

97. B — As-built shows 160 but 170 are installed and confirmed by programming. NFPA 72 requires as-builts to reflect current configuration. Drawings must be updated to show all 170 devices.

98. D — The calculated minimum is 19.30 Ah. The specified 18 Ah batteries fall below this minimum by 1.30 Ah. The next standard size above 19.30 Ah must be selected.

99. A — Hospitals using defend-in-place may have differentiated responses per the approved fire safety plan. Pull stations triggering building-wide while smoke detectors trigger floor-only is valid when documented and accepted by the AHJ.

100. C — As-built drawings for the dedicated circuit should capture conduit type, size, and routing path from the electrical panel to the fire alarm panel. Essential for future maintenance and troubleshooting.

101. D — Excessive pulling tension can damage conductor insulation internally without visible jacket damage. Megger testing all 26 runs verifies insulation integrity before devices are connected. Visual inspection alone cannot detect internal failure.

102. B — Emergency control function interfaces require respective trade contractors to be present. Elevator verifies recall, HVAC verifies shutdown and smoke control, controls verifies automation, and door hardware verifies holder release.

103. A — Converting from horn/strobe to voice evacuation is a fundamental design change. A formal change order must document the engineering revision, cost, and schedule extension before work proceeds.

104. C — The fire alarm contractor should not modify the electrical contractor's work. The general contractor coordinates all trades and should be notified to direct the replacement.

105. D — Different date codes within the same model indicate different production runs. As long as all 550 are the same model and listed for the panel, date code variations do not affect compatibility.

106. B — Every service activity must be documented in a written report regardless of scope. Even a wire nut tightening resolves a trouble condition that should be recorded.

107. A — Field markups contain actual as-installed information. The contractor must create clean, professional as-built drawings incorporating all field data accurately.

108. C — NFPA 72 Section 7.7 requires as-built drawings, Record of Completion, sequence of operations, and operating instructions. These four constitute the minimum closeout package.

109. D — Hospital infection control requirements for 48-hour notice must be respected. Patient safety protocols cannot be overridden by construction schedules.

110. B — The AHJ's 10-day notice requirement is a regulatory obligation. Testing without proper notice may be invalidated. The supervisor must maintain the requirement and reschedule.

111. A — The panel manufacturer prohibits mounting on surfaces with vibration exceeding 0.5G. The fire alarm contractor should notify the general contractor of the conflict so the GC can coordinate between the mechanical contractor and fire alarm contractor to resolve it — either relocating the duct or the panel.

112. C — An unlisted consumer device connected to a commercial fire alarm SLC via field-fabricated interface creates a code violation and potential system reliability issue. The device must be disconnected, the finding documented, and building management notified.

113. D — The three NAC circuits were installed with 18 AWG instead of the specified 14 AWG. Proceeding without addressing the discrepancy risks inadequate voltage at end-of-line devices. However, an engineering review should verify whether the actual loads and distances on these specific circuits would fail with 18 AWG before requiring a full rewire.

114. B — Direct owner requests to field technicians without project manager involvement creates undocumented scope changes and drawing inconsistencies. All change requests must be routed through the project manager for proper documentation, engineering review, and formal change order processing.

115. A — No fire alarm system can guarantee specific detection or notification timeframes for all fire scenarios. Detector response depends on fire type, location, growth rate, and environmental conditions. The contractor should provide the Record of Completion certifying code-compliant installation rather than making performance guarantees that create legal liability.