LEVEL III — SIMULATION EXAM 4 (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 medical campus with eight buildings. Each building has its own panel. The master panel in Building A must display all alarm, trouble, and supervisory signals from all eight buildings in real time. During a design review, the network engineer asks whether a building management system (BMS) gateway can serve as the network backbone instead of the manufacturer's proprietary panel network. What is the correct assessment?

A. A BMS gateway provides faster data throughput than proprietary panel networks

B. BMS gateways are required by NFPA 72 for campus systems exceeding five buildings

C. BMS gateways provide equivalent functionality to proprietary fire alarm panel networks

D. Fire alarm panel networking must use the manufacturer's listed protocol — BMS gateways are not listed fire alarm equipment

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 = 0.92A, voice amplifier standby = 1.58A, network = 0.50A. Alarm loads: NAC = 5.8A, voice = 11.2A. Three remote power supplies each have their own batteries. Using 4-hour standby, 15-minute alarm, 20% safety factor, what loads go in the main panel calculation?

A. All system loads including remote power supply loads must be combined on the main panel

B. Only loads directly powered by the main panel — each remote supply calculates separately

C. All standby loads system-wide but only the main panel alarm loads

D. Only panel/SLC standby and NAC alarm — voice amplifier has its own internal battery

3. A fire alarm designer is specifying pathway survivability for a 38-story high-rise. The design uses 2-hour CI cable for speaker circuit risers. At Floor 20, both outgoing and return CI cable paths cross through a common unrated mechanical room spanning 70 feet. Both paths are in separate conduits within the same room. What is the status of Level 2 and Class A protection at this crossing?

A. Both Level 2 and Class A are lost because CI cable loses its rating in unrated spaces

B. Level 2 is lost but Class A is maintained because the paths are in separate conduits

C. Level 2 is maintained by the CI cable but Class A diversity is compromised because both paths share the same space

D. Both Level 2 and Class A are maintained because separate conduits constitute separate paths

4. A fire alarm designer is specifying cross-zone releasing for a clean agent system protecting two adjacent server rooms. Each room has independent agent storage, nozzles, and detection. During commissioning of Room 1's cross-zone, Room 2's agent also begins discharging. What is the most likely cause?

A. Both rooms' releasing circuits are connected to the same releasing panel output terminal

B. Room 2's agent cylinders are pneumatically cross-connected to Room 1's pilot line

C. The cross-zone programs share a common detection zone between the two rooms

D. Room 1's cross-zone verification signal is being broadcast to Room 2's releasing output

5. A fire alarm designer is specifying detection for a 95-foot atrium in a luxury hotel. Aesthetic requirements prohibit visible equipment on walls or balconies. Spot detectors at the ceiling are impractical due to stratification. What detection approach best addresses both stratification and aesthetics?

A. Projected beam detectors recessed into decorative columns at three heights

B. Ceiling-mounted spot detectors with extended-range sensing for high ceilings

C. Wireless detectors behind removable decorative panels at each balcony level

D. Aspirating detection with sampling pipes concealed in architectural elements at multiple heights

6. A fire alarm designer calculates NAC voltage drop: 12 AWG (1.98 Ω/1000 ft), round-trip 1,950 feet, 2.1 amps. R = 3.861 Ω. V_drop = 8.108V. End voltage = 15.89 VDC. Devices listed 16-33 VDC. What is the assessment?

A. The circuit passes because the 15.89 VDC is within the manufacturer's extended tolerance range

B. The circuit fails — 15.89 VDC is below the 16 VDC minimum and must be redesigned

C. The circuit passes if a 10% safety margin is deducted from the calculated voltage drop

D. The circuit fails but can be corrected by increasing the system voltage from 24 to 27 VDC

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 an administrative wing. Which area requires the MOST restrictive notification approach?

A. Surgical suites because audible notification during procedures poses direct patient safety risk

B. Patient care floors because notification must balance fire safety with patient vulnerability

C. The ED because transient occupants require immediate full notification

D. Administrative offices because high ambient noise requires louder appliances

8. A fire alarm designer is evaluating speech intelligibility for a voice evacuation system. STI of 0.50 minimum is specified. Three challenging spaces: a marble atrium lobby (extreme reverberation), a loading dock (high noise plus concrete surfaces), and an industrial compressor room (120 dB ambient). For which space is 0.50 STI most impractical?

A. The marble lobby because reverberation degrades clarity beyond acoustic correction

B. The loading dock because noise plus reflective surfaces create the worst combination

C. The compressor room because 120 dB ambient overwhelms voice notification capability

D. All three present equal challenges requiring identical acoustic treatment

9. A fire alarm designer is specifying the system for a convention center ballroom divisible into nine enclosed event spaces using acoustically rated partitions. Each space has a separate entrance when deployed. How must notification address these configurations?

A. Only the fully open ballroom requires notification coverage since partitions are temporary

B. A central high-output device covers all nine configurations from the ballroom center

C. Only alternating spaces need coverage since adjacent spaces share notification

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

10. A fire alarm designer is specifying communication paths for a high-rise with central station monitoring. The DACT's copper lines are being discontinued. Three replacement options: IP only, cellular only, or dual-path IP/cellular. Which provides the most robust monitoring?

A. Cellular only because modern cellular exceeds traditional DACT reliability

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

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

D. All three are equally compliant if each meets the technology requirements

11. A fire alarm designer is developing elevator recall for a building with five elevator banks. Banks A-D serve the tower. Bank E is a dedicated service elevator. The machine room is on the penthouse. When the machine room detector activates, all banks must recall to alternate floors. The designer proposes Banks A-D to the lobby alternate and Bank E to the service level. Is this valid?

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

B. No, all five banks must recall to the same single alternate floor

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

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

12. A fire alarm designer is specifying detection for a heritage building with ornate plaster ceilings and landmark restrictions prohibiting surface-mounted equipment. What detection satisfies both code and preservation?

A. Surface-mounted detectors painted to match the ceiling with board approval

B. Detection may be waived entirely for landmark-protected buildings

C. Aspirating detection with sampling pipes threaded through existing architectural cavities

D. Battery-powered wireless detectors adhered to the ceiling with removable adhesive

13. A fire alarm designer is specifying conduit fill for 1-inch EMT carrying eight 14 AWG THHN, six 12 AWG THHN, and six 18 AWG THHN (20 total). Mixed sizes prevent Annex C use. What method must be used?

A. Compare each size to its individual Annex C maximum count

B. Use the Annex C table for 12 AWG as the controlling calculation

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

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

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 owner asks whether a wall-mounted touchscreen monitor running the manufacturer's web-based monitoring portal can serve as the repeater. What is correct?

A. Yes, if the monitor displays full status with alarm, trouble, and supervisory data

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

C. Yes, but only if the manufacturer certifies the web portal as equivalent to a repeater

D. No, but a desktop computer with dedicated monitoring software could serve as the 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 "phase reversal" should be classified at the fire alarm panel. What is correct?

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

B. As an alarm signal because phase reversal can prevent the pump from delivering water

C. Phase reversal monitoring is optional when the controller has auto-correction capability

D. As a trouble signal because it affects the fire alarm panel's power supply quality

16. A fire alarm designer specifies visible notification for a 70,000-square-foot open office with 12-foot ceilings. Interior divisions are only 5.5-foot cubicle partitions. How should these partitions be treated?

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

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

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

D. Ceiling-mounted strobes are 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. During design review, the engineer asks what happens if only detection activates without air pressure drop. What is correct?

A. The valve opens on detection alone as a precautionary measure to fill piping

B. Detection primes the pilot solenoid for faster response when heads fuse

C. The panel generates alarm but holds release for 60-second confirmation

D. The valve remains closed — double-interlock requires both detection AND pressure drop

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 adjacent floors should be notified. What determines the answer?

A. NFPA 72 always requires notification on the alarm floor plus one above and below

B. The building's approved fire safety plan determines the specific notification scope

C. Only the alarm floor is notified in all defend-in-place implementations

D. The fire department determines scope during each individual event

19. A fire alarm designer specifies the releasing circuit for a clean agent system in an occupied telecommunications room. Per NFPA 72, the system must include pre-discharge warning, time delay, and abort. The design uses a 22-second countdown. What determines whether 22 seconds is adequate?

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

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

C. The agent manufacturer specifies countdown based on concentration rate

D. The fire department determines delay based on response time

20. A fire alarm designer specifies the system for a 28-story residential tower using defend-in-place. Smoke alarm on Floor 16 notifies Floors 15, 16, and 17 only. The building manager asks why all floors are not notified. What is the primary rationale?

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

B. Full notification is required only in buildings taller than 35 stories

C. Simultaneous evacuation of all floors creates dangerous stairwell congestion

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

21. A fire alarm designer develops PAS for a hospital. During the 180-second investigation period, a manual pull station on a different floor is activated. What must happen?

A. The pull station is queued until PAS completes at 180 seconds

B. PAS continues because the pull station is on a different floor

C. The 180-second period restarts using the pull station as reference

D. PAS must immediately cancel and general notification must activate

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

A. Horn/strobe devices for emergency identification

B. Manual fire alarm stations per the code requirement

C. All fire alarm devices per NFPA 72 universal identification

D. Smoke detectors must maintain manufacturer's standard color

23. A fire alarm designer develops notification for a performing arts center. Theater ambient is 98 dB. Orchestra pit reaches 110 dB. Per NFPA 72, what minimum audible levels are required?

A. Theater 113 dB, pit 125 dB — both impractical, requiring enhanced visible notification

B. Theater 103 dB, pit 115 dB — achievable with high-output horns

C. Theater 98 dB, pit 110 dB — matching ambient is adequate

D. Theater 113 dB, pit 125 dB — achievable with speaker arrays

24. A fire alarm designer evaluates voice evacuation approaches for a 32-story building. Option A: central amplifiers on Floor 1 with 780-foot runs. Option B: remote amplifiers on Floors 11 and 22 with maximum 330-foot runs. What is Option B's primary advantage?

A. Option B eliminates battery backup at remote locations

B. Option B allows smaller gauge wire throughout the building

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

D. Option B eliminates pathway survivability requirements on speaker circuits

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

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

B. Only station signal because kitchen suppression events are supervisory

C. Only local kitchen notification because suppression addressed the fire

D. No response because suppression operates independently

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

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

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

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

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

27. A fire alarm designer specifies the system for a building with four sprinkler risers. Each riser has waterflow and tamper switches. The designer places each on individual zones — eight total. The fire captain requests zone-specific waterflow notification. What advantage does this provide?

A. Zone-specific notification is required by NFPA 72 for all buildings with multiple risers

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

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

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 -30°F. Loading docks fluctuate 0°F to 94°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. 200°F because fluctuating environments require high-temperature ratings

C. At least 114°F to maintain the 20°F margin above the 94°F maximum ambient

D. 94°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 recall to an alternate floor because smoke near the drive may affect the primary floor

B. Phase I recall to the primary floor identical to the lobby detector

C. Immediate shunt trip disconnecting power before recall

D. Only supervisory signal because MRL drive detection is informational

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 fire alarm function must continue?

A. Fire alarm visual notification must continue on all floors

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

C. The panel must transfer all output control to mass notification

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

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 an open fault, what must the panel do?

A. Immediately open the valve as a precautionary measure

B. Generate a trouble signal indicating the releasing circuit has lost continuity

C. Transmit an alarm because releasing faults are emergency conditions

D. Disable detection in the pre-action zone to prevent unmonitored release

32. A fire alarm designer specifies detection for a building with a swimming pool, a commercial kitchen, and a welding shop. Each produces conditions incompatible with smoke detectors. What detection is most appropriate for all three?

A. Aspirating detection with sampling units outside each space

B. Multi-criteria detectors with particle discrimination algorithms

C. Heat detection because all three environments cause smoke detector problems

D. Flame detection because combustible materials produce visible flame

33. A fire alarm designer specifies ADA-accessible hotel guest room notification. Room is 14 × 18 feet, 9-foot ceiling. Per NFPA 72, 15 cd wall strobe covers up to 20 × 20 feet. What additional notification is required?

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

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

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. Two speakers on Floor 8 are wired in parallel without impedance-matching transformers. What is the primary risk?

A. Speakers produce distorted audio at double the intended volume

B. Speakers produce no audio because 70.7V requires transformers

C. Parallel connection creates a supervision gap the panel cannot detect

D. Low impedance load can cause amplifier distortion, overheating, and damage

35. A fire alarm designer specifies beam detectors for an exhibit hall 420 × 260 feet with 50-foot ceilings. Beams span the 420-foot dimension with 52-foot lateral spacing. What must be verified?

A. The 52-foot spacing does not exceed the 30-foot standard spot detector spacing

B. The 52-foot spacing does not exceed the manufacturer's listed maximum for the 50-foot ceiling

C. The beam count equals at least one per 5,000 square feet

D. The spacing matches fire sprinkler spacing for consistent protection

36. A fire alarm designer develops a phased construction project. Phase 1 (Floors 1-15) is operational. Phase 2 (Floors 16-30) begins construction. Phase 2 activities generate dust near the Phase 1 boundary. What coordination is required?

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 zones adjacent to construction must be bypassed with monitoring station notified

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

37. A fire alarm designer evaluates SLC distribution for a renovation adding 45 devices at 34 mA. Panel has three loops: SLC 1 = 190/142 mA, SLC 2 = 185/136 mA, SLC 3 = 85/62 mA (all max 198/150 mA). Which distribution provides best flexibility?

A. All 45 on SLC 3 because it has the most remaining device and current capacity

B. Split 15/15/15 evenly across all three loops

C. 8 on SLC 1 reaching 198, 13 on SLC 2 reaching 198, and 24 on SLC 3

D. 5 on SLC 1, 5 on SLC 2, and 35 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. 60 seconds from receipt to acknowledgment at console

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

C. 30 seconds from receipt to first contact with dispatch

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

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

C. 60 seconds with panel batteries bridging the transfer

D. 120 seconds because panels have internal batteries for transition

40. A fire alarm designer specifies in-rack detection for a warehouse with 55-foot ceilings and racks to within 3 feet of ceiling. In-rack detectors at 18-foot and 37-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. In-rack detectors identify fires at storage levels before smoke reaches the 55-foot ceiling

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

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 in the protected space?

A. Pre-discharge warning appliances must be verified for adequate audible and visual output

B. Releasing solenoid must be reconnected for live discharge verification

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

D. Substitute load voltage must be measured with a calibrated instrument

42. A fire alarm designer reviews sensitivity for a 10-year-old system with 650 detectors. Report shows 28 detectors between 3.8% and 5.8% (above 3.7% max) and 9 detectors between 0.1% and 0.4% (below 0.5% min). What action is required?

A. Only the 28 high-reading detectors need cleaning — low readings indicate better sensitivity

B. All 650 detectors must be cleaned because 37 out-of-range indicates building-wide issues

C. Panel sensitivity thresholds should be expanded for the 10-year drift

D. All 37 out-of-range detectors — both high and low — require investigation and correction

43. A fire alarm technician tests the voice evacuation live microphone from the FCC. Audio heard on Floors 1-16 but not Floors 17-32. Pre-recorded message plays on all 32 floors. What is the most likely cause?

A. Amplifiers for Floors 17-32 have a fault blocking live audio

B. The live microphone routing is programmed to broadcast only to Floors 1-16

C. Microphone output power is insufficient for the total building load

D. Speaker circuits on Floors 17-32 have frequency-dependent impedance faults

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

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

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

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

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

45. A fire alarm technician tests AC power supervision. AC disconnected. After 3 hours 20 minutes, no trouble has appeared. Per NFPA 72, what is the maximum delay?

A. 3 hours — the 3:20 delay exceeds the maximum and must be corrected

B. 6 hours per extended allowance for modern panels

C. 24 hours matching battery standby duration

D. No delay — trouble must appear immediately

46. A fire alarm technician discovers a smoke detector covered with a latex glove by staff during renovation. Covering in place for ten weeks. What must be documented?

A. Latex gloves permit smoke entry and the detector remains functional

B. Covering is acceptable during active renovation if logged

C. Glove may remain until renovation completes

D. Detector disabled for ten weeks — significant impairment requiring immediate correction

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

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

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

D. No, detection should energize the pilot solenoid for faster response

48. A fire alarm technician tests communication — IP primary, cellular secondary. IP succeeds. Disconnects IP, tests cellular. After 208 seconds, panel shows "IP COMMUNICATION FAILURE." Cellular then succeeds. Does IP timing pass?

A. Yes, the 200-second limit has built-in 5% tolerance

B. Yes, commissioning mode extends timers by 10 seconds

C. No, but firmware update can correct the timing

D. No, 208 seconds exceeds the 200-second maximum and must be corrected

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

A. The full log causes panel processing delays

B. Panel must be replaced with larger log capacity

C. Twelve months of diagnostic history lost — log must be downloaded and cleared

D. Log has no operational impact because panel functions independently

50. A fire alarm technician tests semiannual detectors on Floor 14. Eight adjacent detectors take 30 to 45 seconds to activate. Others activate in 3 to 8 seconds. What does delayed response indicate?

A. The eight detectors likely have contaminated sensing chambers

B. SLC polling rate for those addresses is configured slower

C. Aerosol can was running low during those eight tests

D. HVAC dilutes smoke at those locations before reaching detectors

51. A fire alarm technician tests power transfer. After disconnecting AC, voltage: 0 min = 26.6V, 5 min = 26.2V, 10 min = 25.8V, 15 min = 25.4V. 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 a clear plastic container with holes by kitchen staff. What must be documented?

A. Holes allow smoke entry and modification is acceptable

B. Unauthorized modification renders detector non-compliant and must be removed

C. Container may remain if detector activates during testing

D. Container may remain if staff sign acknowledgment

53. Per NFPA 72 Table 14.4.3.2, what is required testing frequency for releasing device circuits?

A. Semiannually because releasing circuits are more critical

B. Monthly for suppression system readiness

C. Annually as part of comprehensive releasing system test

D. Only during initial acceptance with no recurring testing

54. A fire alarm technician tests notification. A speaker on 70.7V circuit produces clear but reduced volume. Circuit voltage reads 69.5 VAC. What is most likely cause?

A. Speaker's internal wattage tap set lower than others on the circuit

B. Amplifier has partial fault reducing output to this speaker

C. The 69.5 VAC is below speaker's minimum voltage threshold

D. Speaker wire has high-resistance splice reducing power

55. A fire alarm technician tests visible notification in hospital corridor. Two strobes visible from same location flash 0.4 seconds apart on different NAC circuits. What is violated?

A. Flash rate requirement because combined offset exceeds 2 per second

B. Candela requirement because unsynchronized output produces uneven coverage

C. Mounting height requirement because improper mounting creates offsets

D. Synchronization requirement — strobes in same field of view must flash together

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

A. Pull stations function if they activate during testing — paint is cosmetic

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

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

D. School should repaint red within 30 days

57. A fire alarm technician performs battery load test. Starting 27.0 VDC. After test under full alarm load, ending 18.6 VDC. Manufacturer minimum 20.4 VDC. What must be documented?

A. Batteries passed because 18.6 exceeds industry minimum of 18 VDC

B. Test inconclusive — must repeat after batteries recharge

C. Batteries failed — 18.6 VDC is below 20.4 VDC minimum

D. Batteries can remain in service 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 wiring between control module relay and AHU controller shutdown input

B. In the duct detector generating an incorrect signal type

C. In the panel programming — output may not be linked to duct zone

D. In the SLC communication — module may not have received command

59. A fire alarm technician discovers Record of Completion last updated nine years ago. Five renovations added 85 devices and changed sequence four times. What is needed?

A. Annual testing records capture modifications making update optional

B. Original Record remains valid as initial compliance baseline

C. New Record needed only if panel was physically replaced

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

60. A fire alarm system log shows 200 "WATERFLOW — ALARM" entries over seven months with no fires and no head activations. Engineer reports municipal pressure surges. What should be recommended?

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

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

C. Increase panel alarm threshold for waterflow zones to filter events

D. Disconnect switches until pressure issue is resolved

61. A fire alarm technician discovers 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. Panel descriptor should be updated for the concealed position

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

D. Concealed detector provides dual coverage for both spaces

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

A. Yes, activation within two revolutions meets NFPA 72

B. No, switch must activate after one revolution for OS&Y

C. No, requirement is activation within one and a half revolutions

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

63. A fire alarm technician tests horn/strobe. Temporal-three sounds correctly. Strobe flashes at 0.5 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 room coverage

C. Rate acceptable for sleeping areas but fails for commercial

D. Strobe fails — NFPA 72 requires 1 to 2 flashes per second and 0.5 is below minimum

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

A. Tamper requires different EOLR than alarm circuits

B. Tamper input programmed as alarm zone rather than supervisory

C. Panel cannot distinguish alarm from supervisory on same input

D. Tamper wiring polarity reversed causing misclassification

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

A. Cellular provides complete monitoring — IP failure not urgent

B. IP trouble should be repaired at owner's convenience

C. System operated without redundancy for 65 days — significant impairment

D. No documentation needed because system functions with cellular

66. A fire alarm technician discovers decorative panel over corridor horn/strobe blocking both outputs. What must be documented?

A. Decorative panel obstructs both audible and visible notification and must be removed

B. Only strobe obstruction significant because horn travels around obstacles

C. Device functional if it activates during testing regardless of obstruction

D. Building management may apply for AHJ variance

67. A fire alarm technician performs battery load test. Starting 26.8 VDC. After test, ending 19.2 VDC. Manufacturer minimum 20.4 VDC. What must be documented?

A. Batteries passed because 19.2 exceeds industry minimum 18 VDC

B. Test inconclusive — repeat after batteries recharge

C. Batteries can remain in service for 60 days while replacements ordered

D. Batteries failed — 19.2 VDC below 20.4 VDC minimum

68. A fire alarm technician discovers smoke detector relocated from ceiling to a shelf at 32 inches above floor. What must be documented?

A. Detector at shelf height may detect smoke faster

B. Detector at 32 inches is non-functional and must be reinstalled at ceiling

C. Relocation acceptable if staff document the reason

D. Detector should be raised to 60 inches for improved 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. Semiannually to match smoke detector schedule

C. Annually as part of comprehensive system functional test

D. Quarterly to coincide with building maintenance

70. A fire alarm technician discovers FCC graphic annunciator has nine burned-out LED indicators. What must be documented?

A. LEDs are cosmetic and do not affect operation

B. Only LEDs in occupied zones need repair

C. Annunciator must be replaced entirely

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

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

A. Semiannually because releasing circuits are more critical

B. Annually as part of comprehensive releasing system test

C. Monthly for suppression system readiness

D. Only during initial acceptance

72. A fire alarm technician discovers panel room contains paint, chemicals, and boxes. Working clearance 16 inches. What violations exist?

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

B. Only chemical storage is a concern

C. Room may be used for storage if chemicals are sealed

D. Only 16-inch clearance violates code — organized storage permitted

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. Quarterly to coincide with building maintenance

C. Semiannually using approved aerosol smoke or calibrated test source

D. Monthly for continuous reliable detection

74. A fire alarm technician tests stairwell pressurization. Detector activates, fans start. Floor 7 door requires more force. Floor 20 door opens normally. What should be documented?

A. Only fan activation requires documentation

B. Some variation expected — both floors pass

C. Only Floor 7 matters because it confirms pressure

D. Both observations should be documented because inconsistent pressurization suggests duct or damper issue

75. A fire alarm technician discovers panel clock shows 1:45 PM when actual time is 3:30 PM — 105-minute discrepancy. What must be documented?

A. Time discrepancies under 2 hours are within tolerance

B. The 105-minute discrepancy affects event log accuracy and must be corrected

C. Clock error only affects display — no operational significance

D. Only AHJ determines whether correction required

76. A fire alarm technician tests access control interface. Alarm activates. 18 of 20 locks release but 2 remain locked. What must be investigated?

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

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

C. Access control firmware needing updates

D. NAC circuits — locks may be wired to notification circuit

77. A fire alarm technician tests waterflow switch. Inspector's test valve open, water flows. After 91 seconds, no alarm appears. Per NFPA 72, does this pass?

A. No, alarm must appear within 60 seconds

B. No, alarm must appear within 30 seconds for wet-pipe

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

D. Yes, 91 seconds is close enough to pass

78. A fire alarm technician performs sensitivity testing. One detector reads 0.2% — below 0.5% minimum. What does this indicate?

A. Detector at peak sensitivity — ideal condition

B. Low readings always acceptable — enhanced capability

C. Panel calibration drifted — needs manufacturer adjustment

D. Detector outside listed parameters — must be investigated

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 1,050 feet, 2.3 amps on 24 VDC. What is end-of-circuit voltage?

A. 21.50 VDC providing generous margin

B. 16.42 VDC — barely above 16 VDC with thin margin and redesign recommended

C. 15.20 VDC below 16 VDC requiring redesign

D. 24.0 VDC because 14 AWG produces negligible drop under 1,100 feet

80. A fire alarm designer calculates battery capacity: panel/SLC standby = 0.92A, voice standby = 1.08A, NAC alarm = 3.8A, voice alarm = 7.2A. Generator present. 4-hour standby, 15-minute alarm, 20% safety factor. Minimum capacity?

A. Approximately 12.5 Ah after applying all three factors correctly

B. 24.00 Ah using 24-hour standby because generators do not reduce voice requirements

C. 10.35 Ah using correct durations without safety factor

D. 15.00 Ah using 4-hour standby with 5-minute alarm

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

A. Duct detectors never transmit because they are supervisory-class devices

B. Reviewer incorrect — duct signals transmit automatically regardless of matrix

C. Duct detector signal should transmit to the supervising station even without notification

D. Station transmission applies only when duct detectors configured as alarm inputs

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

A. Compare each individually — since both below maximums, it passes

B. Add counts and compare to smaller Annex C max

C. Use Annex C for 14 AWG only

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

83. A fire alarm floor plan shows 90-degree L-shaped corridor — 200 feet longer leg, 140 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 direction change

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

C. No, corner detectors create redundant coverage

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

84. A fire alarm device schedule shows 194 devices on SLC 1 (max 198). Renovation adds 18 devices. How should designer advise?

A. All 18 should go on a new SLC to preserve remaining capacity on SLC 1

B. Add 4 to SLC 1 reaching 198 and place 14 on new loop

C. All 18 can be added by requesting firmware extension

D. Install monitor modules consolidating devices to free addresses

85. A fire alarm riser shows remote NAC power supplies on Floors 8, 16, and 24 of a 32-story building. Each has own batteries. What must be calculated separately?

A. Voltage drop from main panel to each remote location

B. Combined calculation averaging loads across all three remotes

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

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. Only installer's license and signature certifying compliance

B. Only AHJ's inspection report and acceptance test determination

C. Design engineer's calculations and specification references

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

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

A. Ignore specification because it exceeds code requirements

B. Install conduit as specified because the specification is a contractual obligation

C. Request AHJ to override the specification to reduce costs

D. Install conduit only in corridors and omit in rooms

88. A fire alarm voltage drop for a 70.7V speaker circuit shows 59.5 VAC at farthest speaker. Manufacturer minimum is 55 VAC. Does circuit pass?

A. Yes, 59.5 VAC exceeds 55 VAC minimum with 4.5-volt margin

B. No, 70.7V must maintain at least 90% (63.6 VAC) at all locations

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

D. Yes, but only if amplifier can be increased to compensate

89. A fire alarm shop drawing shows releasing system with 16-second pre-discharge timer. Engineer notes may not provide adequate evacuation. What determines the delay?

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

B. Agent manufacturer specifies delay based on concentration rate

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

D. Fire department determines delay based on response time

90. A fire alarm as-built shows 180 devices on SLC 1. Panel programming shows 188. Record of Completion shows 172. What must be corrected?

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

B. Only Record needs updating because most outdated

C. Panel must be reprogrammed to match as-built

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

91. A fire alarm corridor shows 240-foot straight corridor with detectors at 30-foot spacing. First detector at 15 feet: 15, 45, 75, 105, 135, 165, 195, 225. Eight detectors. Last is 15 feet from far end. Is this correct?

A. No, 9 detectors needed because gap near center creates coverage hole

B. Yes, 8 detectors with 30-foot spacing and both end distances at 15 feet provide coverage

C. No, first and last must be at corridor ends for complete coverage

D. Yes, but additional detectors needed at every intersection

92. A fire alarm shop drawing shows SLC 1 (Class B, Floors 1-5) and SLC 2 (Class A, Floors 6-22). Reviewer questions different classifications. Valid rationale?

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

B. NFPA 72 requires Class A above Floor 5 in buildings taller than 6 stories

C. Class B prohibited above Floor 5 per NEC Article 760

D. Both loops must use identical classifications

93. A fire alarm shop drawing shows NAC with 13 horn/strobes at 0.310A, 7 speakers at 0.145A, and 5 strobes at 0.195A on 3.0-amp output. Total load?

A. 4.03 amps from horn/strobes alone exceeding rating

B. 2.68 amps total within rating with margin

C. Approximately 6.02 amps total significantly exceeding the 3.0-amp rating

D. 7.50 amps based on doubling for inrush estimation

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

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

B. Standard FPLP in standard EMT without additional fire rating

C. Standard FPLR in 1-hour fire-rated stairwell

D. Any listed cable in rigid metal conduit with firestop at each floor

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 4 days. How should contractor respond?

A. Conduct testing in 4 days and submit for AHJ retroactive approval

B. Contact AHJ to request expedited waiver

C. Perform preliminary test and schedule formal test later

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

96. A fire alarm floor plan shows conference room 48 × 38 feet, 10-foot ceiling. One 75 cd wall strobe on 48-foot wall. Per NFPA 72, 75 cd covers up to 45 × 45 feet. The 48-foot dimension exceeds 45. Assessment?

A. Room passes because the 3-foot overage is within installation tolerance

B. Room requires higher candela or additional strobes because one dimension exceeds 45-foot max

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

D. 75 cd is adequate because 38-foot width compensates for excess length

97. A fire alarm technician reviews as-built showing 158 devices on SLC 1. Physical count: 166. Panel confirms 166. What is required?

A. No action — 8-device discrepancy within tolerance

B. Panel must be reprogrammed to match 158-device drawing

C. As-built must be updated to reflect 166 devices currently installed

D. Only Record of Completion needs updating

98. A fire alarm battery calculation: standby = 0.55A × 24hr = 13.20 Ah, alarm = 5.5A × 0.083hr = 0.457 Ah, subtotal = 13.657 Ah, × 1.20 = 16.39 Ah. Drawing specifies 18 Ah. Adequate?

A. Yes, 18 Ah exceeds 16.39 Ah minimum with 1.61 Ah margin

B. No, 18 Ah too close — next standard size needed

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

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

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

A. No, all alarm types must produce identical responses

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

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

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

100. A fire alarm as-built captures panel's dedicated circuit: 20A breaker, 12 AWG, 200-foot run, labeled, lock-on, no GFCI/AFCI. What additional detail should be documented?

A. Voltage at panel terminals for baseline comparison

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

C. Electrician's name and license for warranty

D. Breaker manufacturer and catalog number

DOMAIN 3.4 — MANAGEMENT (Questions 101–115)

101. A fire alarm project supervisor discovers a subcontractor pulled cable with excessive tension on 22 runs totaling 3,200 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. Megger testing on all 22 runs to verify insulation integrity before connecting devices

D. Subcontractor must certify in writing that technique was proper

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

B. Only fire alarm contractor because test covers fire alarm exclusively

C. General contractor solely coordinates and attends for all trades

D. Only AHJ and fire alarm contractor — others submit results separately

103. A fire alarm project manager receives a change request to convert from horn/strobe to voice evacuation at 78% completion. What is correct?

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

B. Refuse because conversion at 78% is technically impossible

C. Absorb cost to maintain client relationship

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

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

A. Accept because it provides enhanced protection

B. Notify the general contractor to direct the electrical contractor to replace it with standard breaker

C. Replace breaker directly since fire alarm compliance is contractor's scope

D. Contact building owner to authorize replacement cost

105. A fire alarm contractor receives 500 detectors — 475 with one date code, 25 with different code. Same model listed for panel. Should contractor be concerned?

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

B. Yes, 25 different units must go on separate SLC loop

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

D. No, but 25 should be in non-critical locations as precaution

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

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

B. Reports needed only when devices replaced or programming changed

C. Reports required only when resolving an 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. What should contractor do?

A. Submit messy markups as-is because they represent actual conditions

B. Submit original shop drawings since installation followed design

C. Have technicians recreate from memory for cleaner documentation

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

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

A. Only panel manual and warranty documents

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

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

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

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

A. Provide 72-hour notice and coordinate patient testing per infection control requirements

B. Proceed in 48 hours because fire code overrides hospital protocols

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

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

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

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

B. Request AHJ waive notice due to critical timeline

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

D. Perform preliminary test and schedule formal test later

111. A fire alarm project manager discovers that the elevator contractor has not completed the recall relay wiring. The fire alarm acceptance test is scheduled in one week. Elevator recall testing is a critical part of acceptance. How should the manager handle this?

A. Test all fire alarm outputs to the recall relays using simulated loads at the control modules

B. Proceed with testing all non-elevator interfaces and schedule elevator testing follow-up

C. Delay the entire acceptance test until the elevator contractor completes their work

D. Coordinate with GC to ensure the elevator contractor completes relay wiring before the test

112. A fire alarm contractor discovers that a building tenant installed a supplemental fire alarm notification device — a residential smoke alarm — connected to the fire alarm panel's NAC circuit via a spliced wire connection. The residential alarm is not listed for connection to commercial fire alarm systems. What should the contractor do?

A. Leave the device connected since it provides additional notification coverage

B. Disconnect the unlisted device, document the finding, and notify building management of the code violation

C. Reconnect the device using proper terminal connections instead of spliced wiring

D. Replace the residential alarm with a listed commercial device at the same location

113. A fire alarm project supervisor is managing a project where the building owner verbally authorizes "minor" additions totaling 25 new devices over three separate conversations without any formal change orders. The additions have accumulated $18,000 in labor and materials. How should the supervisor address this?

A. Issue a consolidated change order retroactively documenting all three additions with costs and obtain written approval

B. Include the $18,000 on the final invoice as additional work with reference to verbal authorizations

C. Write off the cost as goodwill to maintain the client relationship

D. Refuse to install any additional devices until individual change orders are issued for each addition

114. A fire alarm designer discovers during installation that the architect's ceiling height dimension on the floor plans is incorrect. The plans show 10-foot ceilings but actual field measurement reveals 12-foot ceilings. This affects the visible notification candela calculations because ceiling height changes the coverage requirements for ceiling-mounted strobes. What should the designer do?

A. Proceed with installation using the 10-foot ceiling calculations since the plans are the approved design

B. Issue a field change notice to the architect and recalculate candela requirements for the actual 12-foot height

C. Recalculate using 12-foot height for ceiling-mounted strobes only — wall-mounted are unaffected

D. Stop installation and request a complete architectural drawing revision before proceeding

115. A fire alarm contractor completes a project and the building owner requests a letter stating the fire alarm system "guarantees the safety of all building occupants during any fire event." How should the contractor respond?

A. Provide the letter because a code-compliant system provides reasonable safety assurance

B. Provide the letter with standard industry disclaimer language limiting liability

C. Provide a modified letter stating the system "is designed to enhance occupant safety"

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

LEVEL III — SIMULATION EXAM 4: ANSWER KEY AND EXPLANATIONS

1. D — Fire alarm panel networking must use the manufacturer's listed and approved communication protocol. BMS gateways are not listed as fire alarm equipment and cannot substitute for proprietary panel-to-panel networking. NFPA 72 requires all fire alarm system components — including network communication — to be listed for their intended purpose.

2. B — Each power source calculates its own battery requirements based on the loads it directly serves. The main panel batteries serve only the panel/SLC, voice amplifier, network, NAC, and voice alarm loads. Each of the three remote power supplies has its own dedicated batteries and its own separate calculation based on its specific loads.

3. C — CI cable maintains its 2-hour fire rating independently regardless of surrounding construction, so Level 2 is preserved. However, both paths sharing the same 70-foot mechanical room — even in separate conduits — creates a single point of failure where one fire could damage both paths simultaneously, compromising Class A pathway diversity.

4. A — Both rooms' releasing circuits connected to the same panel output terminal means when the panel energizes that output for Room 1's cross-zone verification, the signal reaches both solenoids simultaneously. Each room must have completely independent releasing circuit outputs on separate panel terminals to prevent unintended discharge.

5. D — Aspirating detection with sampling pipes concealed in architectural elements at multiple heights addresses both stratification and aesthetics. The pipes can be hidden in columns, moldings, and trim while sampling air at different elevations. The detection unit is remotely located, leaving no visible equipment in the atrium.

6. B — At 15.89 VDC, the end-of-circuit voltage falls below the 16 VDC minimum listed operating voltage for the devices. Devices operating below their listed range may not produce rated output and may fail entirely. The circuit must be redesigned with larger conductors, shorter runs, or additional power sources.

7. A — Surgical suites require the most restrictive notification approach because audible alarms during active procedures can startle surgeons, disrupt concentration, and directly endanger patients on the operating table. Visible-only notification with staff acknowledgment at the nursing station addresses the concern while maintaining code-required notification.

8. C — The industrial compressor room at 120 dB ambient presents the most impractical challenge. Even maximum speaker output with acoustic treatment cannot overcome noise levels that extreme

to deliver intelligible speech at 0.50 STI. Alternative notification means must address this limitation.

9. D — When acoustically rated floor-to-ceiling partitions create nine 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. B — 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 — redundancy single-path options cannot provide.

11. A — 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 alternate floors, 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 architectural cavities provides effective detection without visible surface-mounted equipment. The detection unit is in a concealed mechanical space, satisfying both code requirements and landmark preservation restrictions.

13. D — 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 allowance.

14. B — NFPA 72 Section 23.10 requires the fire command center to have a permanently installed fire alarm panel or dedicated repeater. A touchscreen monitor running web-based software is not listed fire alarm equipment and cannot substitute for a dedicated repeater panel permanently installed at the FCC.

15. A — Phase reversal on the fire pump electrical service is a supervisory condition — an off-normal equipment status requiring investigation. Phase reversal can cause the motor to run backward, rendering it unable to deliver water. 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 are mounted above the partition height, partitions do not obstruct strobe light output. The visible coverage calculation treats the space as an open room.

17. D — A double-interlock pre-action system requires BOTH fire detection AND a drop in supervisory air pressure before the valve opens. Neither condition alone is sufficient. If only

detection activates, the panel generates an alarm but the valve remains closed until both conditions are met.

18. B — The building's approved fire safety plan determines the specific notification scope for defend-in-place facilities. Some plans notify only the alarm floor while others include adjacent floors. The strategy is a design decision documented in the plan and approved by the AHJ.

19. A — 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 22 seconds is sufficient — not a fixed code value.

20. C — Simultaneous evacuation of all 28 floors into the stairwells creates dangerous congestion that slows evacuation and can cause crush injuries. Defend-in-place notifies only affected floors, allowing controlled evacuation while remaining floors shelter safely in fire-rated compartments.

21. D — Manual pull station activation is not subject to PAS delay. NFPA 72 Section 23.8.1.3 applies PAS only to automatic detection signals. A manually activated pull station represents a human-confirmed emergency. PAS must cancel and general notification must activate immediately.

22. B — 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. Smoke detectors, horn/strobes, and speakers may be any color acceptable to the project specifications.

23. A — NFPA 72 Section 18.4.4.1 requires audible notification at 15 dB above ambient. Theater: 98 + 15 = 113 dB. Orchestra pit: 110 + 15 = 125 dB. Both levels are impractical to achieve with standard appliances. The design must compensate with enhanced visible notification.

24. C — Remote amplifier panels at intermediate floors shorten speaker circuit distances, directly addressing the root cause of line losses. Centralized amplifiers with 780-foot runs experience significant cumulative resistance losses. Distributing amplifiers with 330-foot runs maintains consistent audio levels.

25. A — When the kitchen suppression system activates, 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.

26. D — The raised floor space used for air distribution is a plenum requiring FPLP cable. The overhead cable tray space 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. B — Zone-specific waterflow notification directs occupants to evacuate only the area served by the activated riser while other building areas continue normal operations. This targeted response reduces unnecessary disruption and focuses responder attention on the affected area.

28. C — 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 94°F, so the minimum activation temperature is 114°F (94 + 20 = 114).

29. A — 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.

30. 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.

31. B — When a supervised releasing circuit develops an open fault, the panel detects loss of continuity and generates a trouble signal. This alerts building management that the circuit cannot deliver the release signal to the valve solenoid until repaired.

32. C — All three environments — swimming pool (humidity/chlorine), commercial kitchen (grease/steam), and welding shop (metal particulates/sparks) — create conditions causing smoke detector nuisance alarms. Heat detection responds only to abnormal temperature increases unaffected by contaminants.

33. A — 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 who cannot hear alarms or see a wall strobe.

34. D — In a 70.7V system, impedance-matching transformers convert the high-voltage signal to each speaker's low impedance. Without transformers, parallel speakers present very low impedance directly to the amplifier, causing excessive current, distortion, and potential amplifier damage.

35. B — Beam detector spacing must not exceed the manufacturer's listed maximum for the specific ceiling height. At 50 feet, the listing establishes allowable lateral distance based on tested performance. NFPA 72 requires compliance with the manufacturer's listing.

36. C — During Phase 2 construction above operational Phase 1, cutting, drilling, and finishing generate dust causing nuisance alarms on Phase 1 devices near the boundary. Phase 1 zones affected must be bypassed with the monitoring station notified of the impairment.

37. A — SLC 3 has the most remaining capacity: 113 device addresses and 88 mA of current headroom. Placing all 45 on SLC 3 (reaching 130 devices/96 mA) preserves the remaining margin on SLC 1 and SLC 2 — both near capacity. This provides the best overall flexibility.

38. D — 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. B — 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.

40. C — In-rack detectors at intermediate heights identify fires where they originate — among stored materials on shelves and pallets — before smoke travels the full 55 feet to ceiling detectors. Early detection at storage level provides significantly faster alarm response.

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

42. D — Both high-reading detectors (above 3.7%) and low-reading detectors (below 0.5%) are outside the manufacturer's listed acceptable range. The 28 high-reading detectors require cleaning. The 9 low-reading detectors must be investigated. All 37 require corrective action.

43. B — The pre-recorded message plays on all 32 floors confirming amplifiers and speakers function. The live microphone reaching only Floors 1-16 indicates the 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 E activated, both D and E recalled despite only Bank E's relay activating. The elevator controllers for Banks D and E share a common recall input wired in parallel — when Bank E'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-20-minute delay exceeds this maximum by 20 minutes. The panel's timing must be corrected.

46. D — A smoke detector covered with a latex glove for ten weeks has been effectively disabled. The glove prevents smoke from entering the sensing chamber, leaving the corridor without detection coverage. This is a significant impairment requiring immediate correction.

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.

48. D — NFPA 72 Section 26.6.3.2 requires IP technology with continuous monitoring to detect path failure within 200 seconds. At 208 seconds, the panel exceeds this maximum. The timing must be investigated and corrected.

49. C — Twelve 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. A — Eight adjacent detectors with significantly longer activation times (30-45 seconds versus 3-8 seconds) compared to identical detectors on the same floor strongly suggests contaminated sensing chambers. The detectors should be cleaned and retested.

51. D — A gradual voltage decline from 26.6 to 25.4 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 threshold. The charger activating after AC restoration confirms a successful test.

52. B — Any unauthorized modification to a smoke detector — including covers with holes — renders the detector non-compliant with its listing. The container alters sensing chamber aerodynamics. 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.

54. A — Circuit voltage at 69.5 VAC is within the normal range for a 70.7V system. Reduced volume from one speaker while others are normal and voltage is adequate indicates the speaker's internal wattage tap is set to a lower power level.

55. D — NFPA 72 Section 18.5.5.5.7 requires all visible 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 0.4-second offset violates this requirement.

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

57. C — The batteries ended at 18.6 VDC — below the manufacturer's 20.4 VDC minimum end-voltage. Panel components may malfunction at this voltage. The batteries cannot sustain the required load and must be replaced.

58. A — 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. D — Five renovations adding 85 devices and modifying the sequence four times over nine years represent major changes. NFPA 72 Section 7.8 requires the Record of Completion to reflect the current configuration. A nine-year-old document must be updated.

60. B — Two hundred nuisance waterflow alarms over seven months with no fires indicates 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 90 seconds).

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 and the concealed space evaluated.

62. A — 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. D — NFPA 72 Section 18.5.5.5.3 requires visible notification appliances to flash between 1 and 2 flashes per second. At 0.5 flashes per second, the strobe is below the minimum. The device must be repaired or replaced.

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

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

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

67. D — The batteries ended at 19.2 VDC — below the manufacturer's 20.4 VDC minimum. Panel components may malfunction at this voltage. The batteries must be replaced.

68. B — A smoke detector at 32 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. C — 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. D — Burned-out LEDs at the fire command center graphic annunciator prevent firefighters from identifying active alarms in those zones. This impairs emergency response. All non-functioning LEDs must be repaired.

71. B — 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. A — Storage of paint, chemicals, and boxes combined with only 16 inches of working clearance violates NEC Article 110.26. All storage must be removed and the required 30-inch-wide by 36-inch-deep minimum clearance maintained.

73. C — 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. D — Floor 7 requiring more force (positive pressure) while Floor 20 opens normally (no pressure) indicates inconsistent pressurization. A duct, damper, or balancing issue prevents adequate distribution. Both observations should be documented.

75. B — 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 other records. The clock must be corrected immediately.

76. A — The panel processed the alarm and 18 of 20 locks released correctly. The two non-releasing locks indicate faults specific to those devices. The control module outputs, wiring, and power supply to those locks must be investigated.

77. C — NFPA 72 requires waterflow alarm signals at the panel within 90 seconds of sustained flow. After 91 seconds with no alarm, the switch has failed its test. The switch, retard delay, wiring, and connection must be investigated.

78. D — A sensitivity reading of 0.2% falls well below the manufacturer's minimum acceptable range of 0.5%. The detector is operating outside its listed parameters and may indicate a sensor fault. The detector must be investigated and corrected.

79. B — R = 1,050 × (3.14/1000) = 3.297 Ω. V_drop = 2.3 × 3.297 = 7.583V. End voltage = 24 − 7.58 = 16.42 VDC. While above the 16 VDC minimum, the 0.42-volt margin is dangerously thin. Connection aging or additions could push voltage below minimum.

80. A — Standby = (0.92 + 1.08) × 4 = 8.0 Ah. Alarm = (3.8 + 7.2) × 0.25 = 2.75 Ah. Subtotal = 10.75 Ah. With 20%: 10.75 × 1.20 = 12.90 Ah, approximately 12.5 Ah with rounding. Generator reduces standby to 4 hours. Voice requires 15-minute alarm.

81. C — 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 building management and monitoring service are aware of the event.

82. D — When different conductor sizes share the same conduit, Annex C tables cannot be used. The actual area of each conductor from Chapter 9 Table 5 must be calculated and the total compared to the conduit's 40% fill limit.

83. B — A detector at the 90-degree corridor turn ensures 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.

84. A — SLC 1 at 194 of 198 has only 4 remaining addresses. Adding any of the 18 brings it closer to maximum with minimal flexibility. Placing all 18 on a new SLC preserves SLC 1's capacity and provides substantial expansion room.

85. C — Each remote NAC power supply panel 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 with the same NFPA 72 requirements.

86. D — NFPA 72 Section 7.8.2 requires the Record of Completion to include system specifications, circuit information, device counts, power supply data, communication details, test results, and signatures from installer, designer, and AHJ.

87. B — 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 approval creates liability.

88. A — The speaker circuit delivers 59.5 VAC at the farthest speaker, exceeding the manufacturer's minimum of 55 VAC by 4.5 volts. The speakers operate within their listed parameters.

89. C — The pre-discharge time delay must provide adequate evacuation time based on room size, exit count, travel distance, and expected occupant count. These factors determine adequacy — not a fixed code value.

90. D — 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 the same number.

91. B — Eight detectors at positions 15, 45, 75, 105, 135, 165, 195, 225 provide 30-foot spacing. First detector is 15 feet from one end and the last is 15 feet from the far end (240 − 225 = 15). Both end distances comply with NFPA 72.

92. A — Using Class A for upper floors (6-22) 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. C — Horn/strobes: 13 × 0.310 = 4.03A. Speakers: 7 × 0.145 = 1.015A. Strobes: 5 × 0.195 = 0.975A. Total = 6.02 amps, significantly exceeding the 3.0-amp rating. The circuit must be redesigned.

94. A — 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 satisfy Level 2.

95. D — The specification requires 10 business days' notice to the AHJ. This is a regulatory and contractual obligation that cannot be waived. The contractor must maintain the requirement and reschedule.

96. B — Per NFPA 72 Table 18.5.5.5.1(a), a 75 cd strobe covers up to 45 × 45 feet. The 48-foot dimension exceeds the 45-foot maximum. Higher candela or additional strobes are required.

97. C — The as-built shows 158 but 166 are installed and confirmed by programming. NFPA 72 requires as-builts to reflect current configuration. The drawings must be updated to show all 166 devices.

98. A — The calculated minimum is 16.39 Ah. The specified 18 Ah batteries exceed this minimum by 1.61 Ah, providing adequate capacity with margin.

99. D — 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. B — As-built drawings for the dedicated circuit should capture conduit type, size, and routing path from the electrical panel to the fire alarm panel. This information is essential for future maintenance and troubleshooting.

101. C — Excessive pulling tension can damage conductor insulation internally without visible jacket damage. Megger testing all 22 runs verifies insulation integrity before devices are connected. Visual inspection alone cannot detect internal failure.

102. A — 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. D — Converting from horn/strobe to voice evacuation is a fundamental design change requiring amplifiers, speaker circuits, intelligibility analysis, and panel reconfiguration. A formal change order must document the revision, cost, and schedule before work proceeds.

104. B — The fire alarm contractor should not modify the electrical contractor's work. The general contractor coordinates all trades and should be notified so they can direct the electrical contractor to replace the non-compliant breaker.

105. C — Different date codes within the same model indicate different production runs. As long as all 500 are the same model and listed for the panel, date code variations do not affect compatibility or performance.

106. A — 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 for maintenance history, compliance, and records.

107. D — Field markups contain actual as-installed information. The contractor must create clean, professional as-built drawings incorporating all field data accurately. Messy markups, originals, or memory-based drawings fail to provide legible documentation.

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

109. A — Hospital infection control requirements for 72-hour notice must be respected. The contractor should provide the required notice and coordinate testing. Patient safety protocols cannot be overridden by construction schedules.

110. C — The AHJ's 10-day notice requirement is a regulatory obligation that cannot be waived. Testing without proper notice may be invalidated. The supervisor must maintain the requirement and reschedule.

111. D — The acceptance test requires verification of elevator recall interfaces. The project manager should coordinate with the GC to ensure the elevator contractor completes relay wiring before the test date so all interfaces can be tested together.

112. B — An unlisted residential device spliced onto a commercial fire alarm NAC circuit creates a code violation and potential system reliability issue. The device must be disconnected, the finding documented, and building management notified of the unauthorized modification.

113. A — Verbal authorizations without change orders create billing disputes and contractual exposure. A consolidated retroactive change order documenting all three additions with complete cost documentation and written approval resolves the outstanding liability.

114. C — NFPA 72 Table 18.5.5.5.1(b) for ceiling-mounted strobes uses room dimensions AND ceiling height for candela determination. The wall-mount table uses only room dimensions and is unaffected by ceiling height changes. Only ceiling-mounted strobe calculations need revision for the actual 12-foot height.

115. D — No fire alarm system can guarantee the safety of all occupants during every fire event. Providing such a letter creates significant legal liability through false assurance. The contractor should offer the Record of Completion, which accurately certifies code-compliant installation per NFPA 72.