LEVEL III — SIMULATION EXAM 9 (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 system for a resort campus with nine buildings spread across 40 acres. The master panel is in the main hotel. Underground conduit connects all buildings. The resort sits in a coastal hurricane zone where flooding damages underground conduit annually. The designer evaluates three network backbone options: underground copper, underground fiber, and aerial fiber. What is the most reliable long-term approach?

A. Aerial fiber between buildings avoids the underground flood vulnerability entirely

B. Underground fiber because fiber is immune to water damage on insulation

C. Underground copper in waterproof inner duct within the existing conduit

D. Dual underground paths using separate conduit routes for redundancy

2. A fire alarm designer calculates batteries for a voice evacuation system with a qualifying generator. Main panel loads: panel/SLC standby = 1.10A, voice standby = 1.90A. Alarm: NAC = 5.2A, voice = 11.8A. Using 4-hour standby, 15-minute alarm, 20% safety factor, what is minimum main panel capacity?

A. 15.60 Ah without the safety factor

B. 24.00 Ah using 24-hour standby

C. Approximately 18.36 Ah after applying all factors

D. 20.40 Ah using 5-minute alarm

3. A fire alarm designer specifies Level 2 pathway survivability for a 46-story high-rise. CI cable is used for all riser circuits. At Floor 23, both the outgoing and return CI cable paths run through a common unrated mechanical shaft spanning 90 feet. Both paths are in separate cable trays but within the same shaft. What is the impact?

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

B. Level 2 is maintained by CI cable but Class A diversity is compromised at the shared shaft

C. Both maintained because separate cable trays constitute separate paths

D. Level 2 lost but Class A maintained because paths are in separate trays

4. A fire alarm designer specifies cross-zone releasing for a clean agent system. Two server rooms share a releasing panel. During Room 2 testing, the technician notices the panel shows "RELEASING ACTIVE" but the substitute load on Room 2's output shows no voltage. Room 1's substitute load shows voltage. What is the most likely cause?

A. Room 2's solenoid output is defective on the releasing panel

B. Room 2's releasing circuit has an open fault between the panel and the load

C. The panel's firmware has a display error showing active on the wrong output

D. Room 1 and Room 2 share the same output terminal — the panel energized Room 1's circuit

5. A fire alarm designer specifies detection for a 115-foot atrium in a luxury shopping mall. The atrium has a glass dome ceiling, marble floors, and four levels of open retail balconies. Aesthetic restrictions prohibit visible equipment on glass, marble, or balcony railings. What detection approach is most appropriate?

A. Projected beam detectors behind decorative panels at three heights

B. Ceiling-mounted detectors on retractable maintenance cables

C. Aspirating detection with sampling pipes concealed in HVAC registers at multiple heights

D. Flame detection using concealed sensors aimed at retail display areas

6. A fire alarm designer calculates NAC voltage drop: 12 AWG (1.98 Ω/1000 ft), round-trip 2,300 feet, 1.6 amps on 24 VDC. End voltage?

A. 16.73 VDC — thin margin, redesign recommended

B. 15.73 VDC — below 16 VDC requiring redesign

C. 24.0 VDC — negligible drop at this current

D. 21.50 VDC with generous margin

7. A fire alarm designer develops the sequence for a hospital with defend-in-place. The facility includes a blood bank storage area with temperature-controlled refrigerators and freezers containing irreplaceable blood products. HVAC shutdown would cause blood product loss. What design consideration applies?

A. HVAC cannot be shut down in the blood bank — it requires a separate mechanical zone

B. The blood bank HVAC must shut down on alarm per standard sequence

C. Blood products are replaceable — standard HVAC shutdown applies

D. Only the blood bank refrigerator compressors shut down — room HVAC continues

8. A fire alarm designer evaluates speech intelligibility. STI 0.50 minimum. Three spaces: a transit station platform (train noise plus open-air wind), a hospital laundry (industrial dryer noise plus lint), and a server room cold aisle (continuous 80 dB server fan noise with directional airflow). Which requires the most specialized acoustic design?

A. The transit platform because open-air conditions prevent acoustic treatment

B. The hospital laundry because lint affects speaker performance over time

C. All three require identical acoustic approaches

D. The server room because directional airflow from server fans creates turbulent noise patterns that vary by aisle position

9. A fire alarm designer specifies communication for a high-rise. The building has IP primary and cellular secondary. During commissioning, both paths test successfully. Three months later, a cellular carrier tower upgrade changes the building's signal strength from strong to marginal. Per NFPA 72, what is the building owner's obligation?

A. No obligation because both paths tested successfully at commissioning

B. The building owner must upgrade to a stronger cellular carrier immediately

C. The building owner must ensure continued path functionality — marginal signal requires investigation and possible antenna or carrier change

D. The cellular path can be abandoned if the IP path remains functional

10. A fire alarm designer develops elevator recall. A building has three banks serving a 25-story tower. Bank A serves Floors 1-25. Bank B serves Floors 1-15. Bank C is an express serving only Floors 1 and 25. The machine room is on Floor 26. When the Floor 26 machine room detector activates, all three banks recall to alternate floors. Bank C's primary floor is Floor 1 (lobby). What is Bank C's alternate?

A. Floor 25 because it is Bank C's only other service floor

B. Bank C is exempt from alternate recall because express elevators serve only two floors

C. Floor 13 as a mid-building compromise location

D. Bank C must shut down rather than recall to any floor

11. A fire alarm designer specifies detection for a pharmaceutical cleanroom. The room maintains ISO Class 5 (Class 100) air quality with HEPA filtration, positive pressure, and temperature/humidity control. Standard smoke detectors may not activate because the HEPA filters remove particulates including smoke before they reach detectors. What technology addresses this challenge?

A. Heat detection because thermal energy passes through HEPA filtration

B. Projected beam detectors spanning the cleanroom at ceiling level

C. Standard photoelectric detectors at double spacing for increased density

D. Aspirating detection with sampling points upstream of the HEPA filters in the return air duct

12. A fire alarm designer specifies conduit fill for 1-inch EMT carrying ten 14 AWG THHN, four 12 AWG THHN, and six 16 AWG THHN (20 total). Mixed sizes. What method must be used?

A. Compare each to Annex C maximum individually

B. Calculate total conductor area from Table 5 and compare to 40% fill

C. Use Annex C for 12 AWG as controlling calculation

D. Add counts and compare to smallest Annex C maximum

13. A fire alarm designer develops the FCC per NFPA 72 Section 23.10. The building has a primary FCC in the lobby with a dedicated repeater. The fire department asks whether the repeater can be programmed to display only alarm signals — suppressing trouble and supervisory to reduce clutter during emergencies. Per NFPA 72, is this acceptable?

A. Yes, if the main panel in the basement displays all signal types

B. Yes, during active alarm conditions the repeater may filter non-alarm signals

C. No, the FCC repeater must display all system status — alarm, trouble, and supervisory

D. No, but the repeater may prioritize alarm signals visually while still displaying others

14. A fire alarm designer specifies fire pump monitoring. The building has an electric primary pump and a diesel backup pump. Both controllers provide running, power, phase reversal, and trouble contacts. Per NFPA 72, how should the diesel pump's "low fuel" contact be classified?

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

B. As an alarm signal because low fuel may prevent pump operation during a fire

C. As a trouble signal because it affects system reliability

D. Low fuel monitoring is optional for diesel pumps

15. A fire alarm designer specifies visible notification for a large aircraft hangar with 70-foot ceilings. The hangar measures 500 × 350 feet. Wall-mounted strobes cannot cover these dimensions. The hangar has aircraft maintenance platforms at 20, 35, and 50-foot heights. What approach is most practical?

A. Ceiling-suspended strobes at 30-foot intervals across the roof structure

B. Portable strobe towers positioned around parked aircraft

C. Visible notification provided only at exit doors and maintenance offices

D. Strobes mounted on the maintenance platforms at multiple heights plus wall-mounted units at exits

16. A fire alarm designer develops a pre-action releasing system for an IT equipment room. Single-interlock. The building engineer asks whether the detection can be cross-zone to prevent accidental valve opening from a single detector fault. Per NFPA 72, is cross-zone detection required for single-interlock?

A. Yes, all pre-action systems require cross-zone regardless of interlock configuration

B. No, cross-zone is not required for single-interlock — it is a design option that provides enhanced false-alarm protection

C. Yes, NFPA 72 mandates cross-zone for all systems protecting IT equipment

D. No, cross-zone is permitted only for double-interlock configurations

17. A fire alarm designer specifies the system for a 350-bed hospital with defend-in-place. The hospital has patient care floors, surgical suites, an ED, a NICU, a labor and delivery unit, and administrative offices. How many distinct alarm response profiles are needed at minimum?

A. One universal profile with zone adjustments

B. Three — patient care, surgical/critical, and administrative

C. At least six — patient care, surgical, ED, NICU, labor/delivery, and administrative

D. Sixteen — one per floor

18. A fire alarm designer develops PAS for a commercial building. During the 180-second investigation, a sprinkler waterflow switch activates. Per NFPA 72, what must happen?

A. PAS must cancel and general notification must activate — waterflow is a non-detector alarm signal

B. PAS continues because waterflow is a supervisory signal

C. PAS restarts using the waterflow as the new reference event

D. PAS extends by 180 seconds for the waterflow investigation

19. A fire alarm designer specifies the releasing circuit for a clean agent system. The data center has both above-floor and below-floor protection. The releasing panel must coordinate: HVAC shutdown, door closure, damper closure, pre-discharge warning, countdown, and agent release. Per proper sequencing, when must door and damper closure occur?

A. Simultaneously with agent release to seal the space at discharge

B. After agent release to trap the agent concentration in the space

C. At the same time as pre-discharge warning so occupants hear the warning before doors close

D. At cross-zone verification along with HVAC shutdown — before the countdown begins

20. A fire alarm designer specifies the system for a 44-story residential tower using defend-in-place. The building has an occupied rooftop amenity deck above Floor 44. A smoke alarm on Floor 42 notifies Floors 41-43. The property manager asks whether the rooftop deck should also be notified. What determines the answer?

A. The rooftop is always notified because it is above the alarm floor

B. The fire safety plan determines rooftop notification during defend-in-place

C. The rooftop is notified only when Floor 44 is in alarm

D. Rooftop amenity decks are exempt from fire alarm notification

21. A fire alarm designer specifies devices per the architect's preference for white throughout. The architect also wants white emergency voice speakers. Per NFPA 72, is there a color requirement for speakers?

A. Yes, speakers must be red for emergency identification per NFPA 72

B. Yes, speakers must contrast with the mounting surface for visibility

C. No, speakers have no code-mandated color requirement — white is acceptable

D. No color requirement for speakers, but speaker grilles must have a red border

22. A fire alarm designer develops notification for a recording studio complex. The main studio has 0 dB ambient during sessions. The mix room has 40 dB ambient. The lounge has 55 dB ambient. Per NFPA 72, what minimum audible levels apply?

A. All three: 75 dBA minimum because all ambient levels are below 60 dB

B. Studio: 15 dB, Mix: 55 dB, Lounge: 70 dB — all at 15 dB above ambient

C. Studio: 0 dB, Mix: 40 dB, Lounge: 55 dB — matching ambient

D. Studio: 75 dBA, Mix: 55 dB, Lounge: 70 dB — mixed criteria

23. A fire alarm designer evaluates voice evacuation for a 48-story building. Remote amplifiers on Floors 12, 24, 36, and 48. Each has own batteries. Floor 12's remote serves Floors 7-17 with 7.4 amps alarm. Floor 24's serves Floors 18-29 with 8.8 amps. Floor 36's serves Floors 30-41 with 9.2 amps. Floor 48's serves Floors 42-48 with 5.6 amps. Why must each have a separate battery calculation?

A. Remote panels share the main panel battery bus making separate calculations redundant

B. Only the highest-load remote requires calculation — others use the same battery

C. NFPA 72 requires identical batteries at all remote locations

D. Each remote serves different floor counts with different loads requiring individual sizing

24. A fire alarm designer specifies the kitchen hood suppression interface. A large food court has six independent kitchen vendors, each with separate hood systems and monitor modules. When Vendor 3's hood activates, what must the panel initiate?

A. Only Vendor 3's local notification and station signal

B. Only station signal because individual vendor activations are supervisory

C. All six hood systems must activate simultaneously for comprehensive coverage

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

25. A fire alarm designer specifies cable for a hospital. The corridor above the ceiling is a return air plenum. Patient rooms have ducted returns (non-plenum). An imaging suite with an MRI has a dedicated isolated HVAC system (non-plenum). What cable types are required?

A. FPLP in all three because all hospital spaces require plenum cable

B. FPLP in the corridor plenum and FPL minimum in patient rooms and the MRI suite

C. FPL in all three because sprinkler protection reclassifies plenums

D. FPLP in corridor and patient rooms, FPL in MRI suite only

26. A fire alarm designer specifies the system for a building with twelve sprinkler risers serving different wings and floors — twenty-four zones total (twelve waterflow, twelve tamper). The insurance carrier asks whether waterflow switches can generate a 60-second delay before transmitting to the central station to reduce false dispatch. Per NFPA 72, is a station transmission delay permitted?

A. No, NFPA 72 requires alarm signal transmission to the station without intentional delay

B. Yes, up to 60 seconds delay is standard practice for waterflow signals

C. Yes, but only with AHJ written approval for each installation

D. No, but the waterflow switch's built-in retard delay provides the only permitted delay

27. A fire alarm designer specifies heat detection for a cold storage facility. Blast freezer at -40°F. Refrigerated warehouse at 32°F. Loading dock fluctuates 0°F to 104°F. Per NFPA 72, what minimum activation temperature for the loading dock?

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

B. 200°F because fluctuating environments need high-temperature ratings

C. At least 124°F to maintain the 20°F margin above the 104°F maximum

D. 104°F for immediate response above normal maximum

28. A fire alarm designer develops elevator recall. A building has four elevator banks. Banks A-C serve the main tower. Bank D is a dedicated parking garage elevator. Banks A-C's machine room is on Floor 30. Bank D's machine room is in the garage penthouse. When a lobby smoke detector activates, all four banks recall to the primary floor (lobby). Per NFPA 72, is recalling to the lobby correct?

A. No, all banks must recall to alternate floors when any lobby detector activates

B. Yes, lobby detector activation triggers primary floor recall to the lobby for all banks

C. No, only Banks A-C recall — Bank D is exempt because it has a separate machine room

D. Yes, but only if the lobby detector is not in the immediate vicinity of the elevator doors

29. A fire alarm designer specifies mass notification integrated with voice evacuation. The building has active fire alarm notification on Floor 10. A mass notification tornado warning must broadcast on all floors. Per NFPA 72 and the emergency plan, what happens to Floor 10's fire alarm audio?

A. Fire alarm audio on Floor 10 continues — mass notification broadcasts on all other floors

B. Mass notification overrides all floors including Floor 10 per the emergency plan

C. Both fire alarm and tornado messages alternate on Floor 10

D. The override occurs per the emergency plan — but fire alarm must continue transmitting to the station regardless

30. A fire alarm designer develops the releasing circuit for a pre-action sprinkler using Class A. During testing, one conductor is opened. The panel generates a trouble. The releasing function remains active on the return path. Is this correct?

A. Yes, Class A provides a redundant path — system operates on the surviving conductor

B. No, any fault should disable releasing to prevent unintended activation

C. Yes, but the panel should switch to emergency single-zone mode

D. No, Class A releasing circuits are prohibited by NFPA 72

31. A fire alarm designer specifies detection for a building with an indoor climbing gym, a commercial car wash, and a plastic injection molding plant. Each has smoke detector issues. What detection is most appropriate?

A. Aspirating detection with filtration at sampling intakes

B. Multi-criteria detectors with environmental compensation

C. Heat detection because all three cause smoke detector nuisance conditions

D. Flame detection because all three contain combustibles

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

A. A ceiling strobe at 177 cd above the bed

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

C. A second wall strobe on the opposite wall for redundancy

D. A low-frequency 520 Hz generator near the bed

33. A fire alarm designer specifies voice evacuation using 70.7V. A speaker circuit serves eight speakers. Seven have transformers at 2-watt taps. The eighth — in a small utility closet — has a 1/4-watt tap. All produce audio but the closet speaker is barely audible. Voltage at all speakers is 69.8 VAC. What is the cause?

A. The eighth speaker has a defective voice coil

B. Wire run to the closet has excessive resistance

C. The closet absorbs sound preventing volume buildup

D. The 1/4-watt tap delivers far less power than the 2-watt taps

34. A fire alarm designer specifies beam detectors for an industrial facility 550 × 340 feet with 62-foot ceilings. Beams span the 550-foot dimension with 54-foot lateral spacing. What must be verified?

A. The 54-foot spacing does not exceed the manufacturer's listed maximum for the 62-foot ceiling

B. Beam count equals one per 5,000 square feet

C. 54-foot spacing matches sprinkler spacing

D. 54-foot spacing does not exceed 30-foot spot detector spacing

35. A fire alarm designer develops a phased construction project. Phase 1 (Floors 1-22) is operational. Phase 2 (Floors 23-44) construction includes concrete form stripping and grinding generating heavy dust. Open stairwell doors between Phase 1 and Phase 2 allow dust migration to Floor 22. What coordination is required?

A. Phase 1 must shut down during Phase 2 concrete work

B. No coordination needed — separate loops isolate the phases

C. Phase 1 Floor 22 zones must be bypassed with monitoring station notified during active concrete work

D. Floor 22 detectors replaced with heat detectors

36. A fire alarm designer evaluates SLC distribution. Renovation adds 65 devices at 50 mA. Three loops: SLC 1 = 196/148 mA, SLC 2 = 192/144 mA, SLC 3 = 70/48 mA (max 198/150 each). Best distribution?

A. 2 on SLC 1, 6 on SLC 2, and 57 on SLC 3

B. All 65 on SLC 3 because it has the most remaining capacity

C. Split 22/22/21 evenly across all three loops

D. 2 on SLC 1 reaching 198, 6 on SLC 2 reaching 198, and 57 on SLC 3

37. A fire alarm designer specifies the central station connection per NFPA 72 Section 26.3.4. The maximum operator response initiation time is what?

A. 60 seconds from receipt to console acknowledgment

B. 120 seconds from receipt to fire department notification

C. 30 seconds from receipt to first dispatch contact

D. 90 seconds from receipt to initiation of required response

38. Per NEC Article 700, maximum ATS transfer time for emergency systems?

A. 10 seconds per NEC Article 700

B. 30 seconds for all emergency loads

C. 60 seconds with batteries bridging

D. 120 seconds because panels have batteries

39. A fire alarm designer specifies in-rack detection for a cold storage distribution center with 50-foot ceilings. Racks hold frozen food to within 3 feet of ceiling. In-rack detectors at 17-foot and 34-foot elevations. Ceiling beam detectors also installed. The building is at -10°F throughout. What additional consideration applies beyond standard detection design?

A. Detection devices are not available for temperatures below 0°F

B. Standard beam detectors cannot function below 32°F

C. All detection devices must be listed for the -10°F operating temperature

D. Only heat detection is permitted below 0°F per NFPA 72

40. A fire alarm designer develops the sequence for a mixed-use building. Ground-floor dry cleaner uses perchloroethylene solvent. Second-floor dance studio. Floors 3-10 are residential. The dry cleaner has a solvent vapor detection system that interfaces with the fire alarm. When the vapor detector activates, what response should the fire alarm initiate?

A. Only station signal because solvent vapor detection is a process safety device

B. Only local dry cleaner notification and HVAC shutdown to contain vapors

C. Full evacuation of only the dry cleaner and dance studio — residential floors unaffected

D. Full building notification, station signal, and HVAC shutdown because solvent vapors represent an immediate life-safety hazard to all occupants

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, countdown, abort, supervision verified. What test remains?

A. Releasing solenoid reconnected for live discharge

B. Pre-discharge warning appliances verified for adequate output

C. Cross-zone retested in opposite activation order

D. Substitute load voltage measured with instrument

42. A fire alarm designer reviews sensitivity for a 15-year-old system with 900 detectors. Report: 45 above 3.7%, 18 below 0.5%. What action?

A. All 63 out-of-range detectors require investigation and correction

B. Only the 45 high-reading need cleaning

C. All 900 must be cleaned — building-wide contamination indicated

D. Panel thresholds expanded for 15-year drift

43. A fire alarm technician tests voice evacuation live microphone from FCC. Audio on Floors 1-26, not Floors 27-52. Pre-recorded message plays on all 52 floors. Most likely cause?

A. Upper floor amplifiers have a fault

B. Microphone output insufficient for building load

C. Live microphone routing programmed for Floors 1-26 only

D. Upper floor circuits have impedance faults

44. A fire alarm technician tests elevator recall. Eight banks with selective recall. Activating Bank D: only D recalls. Activating Bank H: Banks G and H both recall. Only Bank H's relay activated. Problem?

A. Panel programming activates both G and H outputs

B. Bank H's SLC interferes with Bank G's module

C. Bank H generates building-wide alarm code

D. Controllers for Banks G and H share a common recall input

45. A fire alarm technician tests AC power supervision. AC disconnected. After 3 hours 30 minutes, no trouble appeared. Per NFPA 72, assessment?

A. No delay permitted — immediate trouble required

B. 3 hours maximum — the 3:30 delay exceeds it and must be corrected

C. 6 hours extended allowance for modern panels

D. 24 hours matching battery duration

46. A fire alarm technician discovers a detector covered with a strip of duct tape by HVAC staff. Tape in place nine weeks. Document?

A. Detector disabled nine weeks — significant impairment requiring correction

B. Duct tape is thin enough to permit smoke entry

C. Acceptable during HVAC work if logged

D. Tape may remain until HVAC maintenance completes

47. A fire alarm technician tests a double-interlock pre-action system. Detector activates. Panel processes alarm. Valve remains closed. Correct?

A. No, detection should open valve as first interlock

B. No, detection should energize pilot solenoid

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

D. Yes, but only in maintenance mode

48. A fire alarm technician tests communication — IP primary, cellular secondary. IP succeeds. Disconnects IP. After 199 seconds, panel shows "IP FAILURE." Cellular succeeds. IP timing pass?

A. Yes, 199 seconds within the 200-second maximum

B. No, IP must detect failure within 60 seconds

C. No, but firmware can correct timing

D. Yes, 200-second limit has tolerance

49. A fire alarm technician discovers event log full for eighteen months, overwriting entries. Impact?

A. Full log causes panel processing delays

B. Panel must be replaced with larger capacity

C. No operational impact

D. Eighteen months of diagnostic history lost — must be downloaded and cleared

50. A fire alarm technician tests semiannual detectors on Floor 24. Thirteen adjacent detectors take 40 to 58 seconds. Others activate in 3 to 9 seconds. Delayed response indicates?

A. SLC polling configured slower

B. Thirteen detectors likely have contaminated sensing chambers

C. Aerosol can running low

D. HVAC diluting smoke

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

A. Yes, gradual 1.2V decline normal for batteries under standby load

B. No, 1.2V drop indicates near end of life

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

D. No, voltage should remain constant

52. A fire alarm technician discovers a detector covered with a coffee cup lid taped over the sensing opening by office staff. Lid in place six weeks. Document?

A. Lid is clear plastic — detection unaffected

B. Lid acceptable if staff sign acknowledgment

C. Lid blocks smoke entry — detector non-functional, must be removed

D. Lid may remain until source of nuisance alarm identified

53. Per NFPA 72, releasing device circuit testing frequency?

A. Semiannually — more critical than detection

B. Monthly for readiness

C. Only during initial acceptance

D. Annually as part of comprehensive releasing test

54. A fire alarm technician tests notification. Speaker on 70.7V circuit: clear but reduced volume. Circuit voltage 70.3 VAC. Likely cause?

A. Amplifier partial fault

B. Speaker's wattage tap set lower than others

C. 70.3 VAC below minimum threshold

D. Wire has high-resistance splice

55. A fire alarm technician tests visible notification. Two strobes visible from same location flash 0.5 seconds apart on different NACs. Violated?

A. Synchronization — same field of view must flash together

B. Candela — unsynchronized produces uneven coverage

C. Flash rate — combined offset exceeds 2 per second

D. Mounting height creates timing offsets

56. A fire alarm technician discovers pull stations painted silver in a corporate lobby. Paint covers housing, handle, and labels. Document?

A. Stations function if activated — paint is cosmetic

B. Only labels need restoration

C. Building should repaint within 30 days

D. Painted stations must be replaced — paint obscures required red color and labels

57. A fire alarm technician performs battery test. Starting 27.0 VDC. After test, ending 17.6 VDC. Manufacturer minimum 20.4 VDC. Document?

A. Passed — 17.6 exceeds 18 VDC industry minimum

B. Inconclusive — repeat after recharge

C. Batteries failed — 17.6 below 20.4 VDC minimum, must be replaced

D. Can remain 30 days while replacements ordered

58. A fire alarm technician tests HVAC shutdown. Duct detector activates, panel processes, relay closes. AHU does not stop. Fault?

A. In duct detector — incorrect signal

B. In wiring between relay and AHU controller

C. In panel programming — output not linked

D. In SLC — module didn't receive command

59. A fire alarm technician discovers Record of Completion last updated fourteen years ago. Ten renovations added 150 devices, sequence changed nine times. Needed?

A. Record must be updated per NFPA 72 Section 7.8

B. Annual testing records capture changes — optional

C. Original Record remains valid

D. New Record only if panel replaced

60. A fire alarm system log: 320 "WATERFLOW — ALARM" entries over twelve months, no fires. Engineer reports aging municipal water main with pressure fluctuations. Recommend?

A. Replace switches with pressure-compensated models

B. Disconnect switches until main is replaced

C. Increase panel threshold for waterflow

D. Investigate pressure source and adjust retard delay

61. A fire alarm technician discovers renovation enclosed a corridor detector behind a new wall. Communicates normally. Document?

A. Can remain — communicates normally

B. Panel descriptor updated for concealed position

C. Must be relocated to occupied corridor and concealed space evaluated

D. Provides dual coverage for both spaces

62. Tamper test on OS&Y. After two revolutions, supervisory appears. Pass?

A. No, must activate after one revolution

B. Yes, within two revolutions meets NFPA 72

C. No, requirement is one and a half revolutions

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

63. Horn/strobe test. Temporal-three correct. Strobe at 0.55 flashes per second. Document?

A. Fails — NFPA 72 requires 1 to 2 flashes per second

B. Passes — below 2 per second acceptable

C. Rate irrelevant if candela meets coverage

D. Acceptable for sleeping areas only

64. Tamper generates alarm instead of supervisory. Contact confirmed. Cause?

A. Tamper requires different EOLR

B. Panel cannot distinguish on same input

C. Wiring polarity reversed

D. Input programmed as alarm rather than supervisory

65. IP primary, cellular secondary. "IP FAILURE" active 90 days. Cellular functions. Document?

A. Cellular provides monitoring — not urgent

B. Repair at owner's convenience

C. System without redundancy 90 days — significant impairment

D. No documentation needed

66. A fire alarm technician discovers a framed artwork mounted directly over a corridor horn/strobe blocking both outputs. Document?

A. Artwork blocks both outputs and must be removed or relocated

B. Only strobe obstruction significant

C. Device functional if activates during testing

D. Building may apply for variance

67. Battery test. Starting 26.6 VDC. After test, ending 17.4 VDC. Manufacturer minimum 20.4 VDC. Document?

A. Passed — exceeds 18 VDC industry minimum

B. Failed — 17.4 below 20.4 VDC minimum

C. Inconclusive — repeat after recharge

D. Can remain 60 days

68. Detector relocated from ceiling to a filing cabinet at 44 inches. Ceiling is 10 feet. Document?

A. May detect faster because smoke fills room

B. Acceptable if staff document reason

C. Should be raised to 60 inches

D. At 44 inches detector is non-functional — must be reinstalled at ceiling

69. Supervisory device testing frequency per NFPA 72?

A. Annually as part of comprehensive functional test

B. Monthly for valve verification

C. Semiannually to match detector schedule

D. Quarterly for consistency

70. FCC graphic annunciator: fourteen burned-out LEDs. Document?

A. Burned-out LEDs impair emergency response — must be repaired

B. LEDs cosmetic — no effect

C. Only occupied-zone LEDs need repair

D. Annunciator must be replaced entirely

71. Releasing circuit testing frequency?

A. Semiannually — more critical

B. Monthly for readiness

C. Annually as part of comprehensive releasing test

D. Only during initial acceptance

72. Panel room: paint, chemicals, boxes, stepladder. Working clearance 11 inches. Violations?

A. Only chemicals are a concern

B. Both storage and 11-inch clearance violate NEC Article 110

C. Room usable if chemicals sealed

D. Only clearance violates — organized storage permitted

73. Smoke detector testing frequency?

A. Annually as part of comprehensive test

B. Quarterly for consistency

C. Monthly for continuous detection

D. Semiannually using approved aerosol or calibrated source

74. Stairwell pressurization test. Detector activates, fans start. Floor 9 requires significant force. Floor 30 opens normally. Document?

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

B. Some variation expected — both pass

C. Only Floor 9 matters — confirms pressure

D. Only fan activation documented

75. Panel clock: 8:45 AM actual, panel shows 6:30 AM — 135-minute discrepancy. Document?

A. Discrepancies under 2.5 hours within tolerance

B. Clock error only affects display

C. 135-minute discrepancy affects log accuracy — must be corrected

D. Only AHJ determines correction

76. Access control test. Alarm activates. 24 of 26 locks release, 2 locked. Investigate?

A. Panel programming — not in matrix

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

C. Access control firmware updates

D. NAC circuits — locks wired to notification

77. Waterflow test. Inspector's valve open, water flows. After 96 seconds, no alarm. Per NFPA 72?

A. 96 seconds close enough to pass

B. Acceptable for extended retard systems

C. Only retard failed — switch functional

D. Switch failed — must alarm within 90 seconds

78. Sensitivity testing. Detector reads 5.0% — above 3.7% max. Indicates?

A. Detector outside listed range — clean, retest, or replace

B. Ideal for high-particulate environments

C. Acceptable — within 2% of maximum

D. Panel calibration drifted

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

79. NAC voltage drop: 14 AWG (3.14 Ω/1000 ft), round-trip 1,000 feet, 2.5 amps on 24 VDC. End voltage?

A. 21.50 VDC with generous margin

B. 16.85 VDC — thin margin, redesign recommended

C. 16.15 VDC — dangerously thin, redesign strongly recommended

D. 15.15 VDC — below 16 VDC requiring redesign

80. Battery calc: panel/SLC standby = 0.82A, voice standby = 1.18A, NAC alarm = 3.6A, voice alarm = 7.4A. Generator. 4-hour standby, 15-minute alarm, 20% safety factor. Minimum?

A. 24.00 Ah using 24-hour standby

B. Approximately 12.24 Ah after applying all factors

C. 10.15 Ah without safety factor

D. 14.80 Ah using 5-minute alarm

81. Duct detector triggers HVAC shutdown only — no notification, recall, or station signal. Reviewer flags missing station. Correct?

A. Duct detectors never transmit — supervisory class

B. Reviewer incorrect — auto transmit regardless

C. Station transmission only when configured as alarm

D. Signal should transmit to station even without notification

82. Conduit: 1-inch EMT with eleven 14 AWG THHN and eight 18 AWG THHN (19 total). Annex C: 14 = 22, 18 = 40. Mixed sizes. Verify?

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

B. Compare individually — both below maximums

C. Add counts, compare to smaller max

D. Use 14 AWG Annex C only

83. L-shaped corridor: 250 feet longer leg, 190 feet shorter leg. Detectors at 30-foot spacing with corner detector. Corner necessary?

A. No, detectors along legs provide coverage

B. No, corner creates redundant coverage

C. Corner ensures detection at turn where leg coverage may be limited

D. Only if width exceeds 10 feet

84. SLC 1: 197 devices (max 198). Renovation adds 28. Advise?

A. Add 1 reaching 198, 27 on new loop

B. All 28 on new SLC to preserve remaining capacity

C. Via firmware extension beyond 198

D. Consolidate with monitor modules

85. Remote NAC power supplies on Floors 12, 24, 36 of a 48-story building. Each has batteries. Calculate?

A. Combined averaging across all three

B. Voltage drop from main panel to each

C. Conduit fill for supervised circuits

D. Separate battery calculation based on each remote's specific loads

86. Record of Completion per NFPA 72. Contents?

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

B. Only installer's license and signature

C. Only AHJ's inspection report

D. Engineer's calculations and specifications

87. Specification: cable above ceilings in conduit. Non-plenum. NEC doesn't require conduit. Designer should?

A. Ignore — exceeds code

B. Conduit only in corridors

C. Install conduit as specified — contractual obligation

D. Request AHJ override

88. 70.7V speaker circuit: 56.0 VAC at farthest speaker. Manufacturer minimum 55 VAC. Pass?

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

B. Yes, 56.0 VAC exceeds 55 VAC minimum with 1.0-volt margin

C. No, speakers require exactly 70.7 VAC

D. Yes, but only if amplifier can compensate

89. Releasing system: 9-second timer. Engineer questions adequacy. Determines delay?

A. NFPA 72 fixed 30-second minimum

B. Agent manufacturer based on concentration

C. Fire department based on response time

D. Room size, exit count, travel distance, and occupant count

90. As-built: 190 devices on SLC 1. Panel: 198. Record: 182. Correct?

A. All three reconciled against physical field count

B. Only as-built needs updating

C. Only Record needs updating

D. Panel reprogrammed to match as-built

91. 290-foot straight corridor. Detectors at 30-foot spacing. First at 15 feet: 15, 45, 75, 105, 135, 165, 195, 225, 255, 275. Ten detectors. Last at 15 feet from far end. Correct?

A. No, 11 detectors needed — gap near center

B. No, first and last must be at corridor ends

C. Yes, 10 detectors with 30-foot spacing and end distances within 15 feet

D. Yes, but additional at intersections needed

92. SLC 1 (Class B, Floors 1-7) and SLC 2 (Class A, Floors 8-34). Different classifications. Valid?

A. NFPA 72 requires Class A above Floor 7

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

C. Class B prohibited above Floor 7 per NEC

D. Both must use identical classifications

93. NAC: 18 horn/strobes at 0.310A, 12 speakers at 0.145A, 8 strobes at 0.200A on 3.0-amp output. Total?

A. 5.58 amps from horn/strobes alone exceeding rating

B. 2.90 amps within rating

C. 9.50 amps based on doubling for inrush

D. Approximately 8.92 amps total significantly exceeding 3.0-amp rating

94. "PATHWAY SURVIVABILITY LEVEL 2." What satisfies?

A. Standard FPLP in standard EMT

B. Either 2-hour fire-rated cable or installation within 2-hour fire-rated construction

C. Standard FPLR in 1-hour stairwell

D. Any listed cable in RMC with firestop

95. Acceptance testing: 10 business days' AHJ notice. GC demands 5 days. Response?

A. Maintain 10-day notice and reschedule

B. Request AHJ waiver

C. Preliminary test then formal later

D. Test in 5 days, submit retroactively

96. Conference room 60 × 44 feet, 10-foot ceiling. Two 75 cd strobes — one on each 60-foot wall. 75 cd covers 45 × 45. The 60-foot dimension exceeds 45. Two strobes provide coverage?

A. No, each strobe cannot cover 60-foot dimension individually

B. No, four strobes required — one per wall

C. Yes, two on opposite walls divide room into zones within coverage

D. Yes, but only if synchronized at identical heights

97. As-built: 168 devices on SLC 1. Physical: 180. Panel: 180. Required?

A. No action — 12-device discrepancy within tolerance

B. Panel reprogrammed to match 168

C. Only Record needs updating

D. As-built must be updated to reflect 180 devices

98. Battery: standby = 0.75A × 24hr = 18.00 Ah, alarm = 5.4A × 0.083hr = 0.448 Ah, subtotal = 18.448 Ah, × 1.20 = 22.14 Ah. Drawing specifies 18 Ah. Adequate?

A. Yes, 18 Ah close enough

B. No, 18 Ah below 22.14 Ah minimum — next standard size must be used

C. Yes, but only with generator

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

99. Hospital sequence: smoke alarms trigger floor-only, pull stations trigger building-wide. Both trigger recall and station. Valid?

A. Yes, defend-in-place hospitals may differentiate per fire safety plan

B. No, all alarm types must produce identical responses

C. No, smoke must trigger broader notification

D. Yes, but only under 200 beds

100. As-built: panel dedicated circuit — 20A breaker, 12 AWG, 250-foot run, labeled, lock-on, no GFCI/AFCI. Additional detail?

A. Voltage at terminals for baseline

B. Electrician's name for warranty

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

D. Breaker manufacturer for replacement

DOMAIN 3.4 — MANAGEMENT (Questions 101–115)

101. Subcontractor pulled cable with excessive tension on 35 runs totaling 5,000 feet. Insulation may be damaged. Supervisor must require?

A. Visual inspection sufficient

B. Cable connected — damage found during testing

C. Subcontractor certifies technique in writing

D. Megger testing on all 35 runs before connecting devices

102. Acceptance testing: elevator recall, HVAC, pressurization, smoke control, door release. Which trades?

A. Only fire alarm contractor

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

C. General contractor solely coordinates

D. Only AHJ and fire alarm contractor

103. Change request: horn/strobe to voice evacuation at 65% completion. Response?

A. Formal change order documenting revision, cost, and schedule impact

B. Refuse — conversion at 65% impossible

C. Absorb cost for relationship

D. Speakers in remaining areas, retain horn/strobes in completed

104. Electrical contractor installed AFCI/GFCI breaker on fire alarm circuit. Action?

A. Accept — enhanced protection

B. Replace directly — fire alarm scope

C. Notify general contractor to direct electrical contractor to replace

D. Contact owner for cost authorization

105. 750 detectors: 710 with one date code, 40 with different code. Same model. Concerned?

A. Yes, all must match codes

B. Yes, 40 on separate SLC

C. No, but 40 in non-critical locations

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

106. Wire nut tightening resolving ground fault — formal report?

A. Reports only when devices replaced

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

C. Reports only for active alarm conditions

D. Minor repairs documented verbally

107. Messy but accurate field markups. Closeout approaching. Contractor should?

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

B. Submit messy markups as-is

C. Submit original shop drawings

D. Recreate from memory

108. NFPA 72 minimum closeout documentation?

A. Only panel manual and warranty

B. Only as-built and completion certificate

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

D. Complete bid documents and quality worksheets

109. Hospital acceptance testing. Infection control requires 72-hour notice. GC wants 24 hours. Proceed?

A. Proceed — fire code overrides hospital

B. Provide 72-hour notice and coordinate per infection control

C. Non-patient areas only

D. Non-aerosol methods without notice

110. AHJ requires 10 business days' notice. GC demands 4 days. Response?

A. Test in 4 days, retroactive approval

B. Request AHJ waiver

C. Preliminary test then formal

D. Maintain 10-day notice and reschedule

111. A fire alarm project manager discovers that the building's exterior curtain wall contractor installed reflective glass panels directly over two exterior-mounted fire department connection (FDC) identification strobes. The strobes are required for FDC location identification but are now concealed behind the glass. How should the project manager handle this?

A. Notify the general contractor of the conflict and coordinate relocation of either the strobes or the glass panels

B. Accept the installation because FDC strobes are visible through reflective glass

C. Install new strobes on the surface of the glass panels

D. Relocate the FDC strobes to an interior location near the entrance

112. A fire alarm contractor discovers that a subcontractor used plenum-rated cable (FPLP) in non-plenum spaces where the specification calls for standard FPL cable. The FPLP cable exceeds the specification requirement. Is this acceptable?

A. No, the specification must be followed exactly — FPLP must be replaced with FPL

B. No, FPLP cable has different electrical characteristics that affect SLC communication

C. Yes, FPLP exceeds FPL requirements and is acceptable in non-plenum spaces

D. Yes, but only if the engineer provides written approval for the substitution

113. A fire alarm project supervisor discovers that a technician has been programming all smoke detector addresses sequentially by floor (Floor 1: addresses 1-20, Floor 2: 21-40, etc.) instead of following the approved addressing scheme that groups devices by zone function. The sequential method works electrically but does not match the approved design. How should the supervisor handle this?

A. Accept the sequential addressing because it is logical and functional

B. Reprogram all devices to match the approved addressing scheme before commissioning

C. Request the engineer revise the approved scheme to match the sequential installation

D. Document the deviation and proceed — the AHJ will verify during acceptance

114. A fire alarm contractor is managing a project where the building owner requests that the fire alarm panel be relocated from the approved electrical room location to a janitor's closet to free up space for additional electrical equipment. The janitor's closet has adequate wall space but contains a mop sink, cleaning chemicals, and no dedicated ventilation. How should the contractor respond?

A. Relocate the panel because the owner's request takes priority over the original design

B. Relocate if the chemicals are moved to a different storage location

C. Accept the relocation if the closet has adequate working clearance per NEC

D. Decline — the environment is unsuitable due to moisture, chemicals, and lack of ventilation for panel operation

115. A fire alarm contractor completes installation. The building owner asks for a letter stating the system "has been designed by a licensed professional engineer, installed by certified technicians, and tested to exceed NFPA 72 requirements." The system was designed by a PE, installed by NICET-certified technicians, and tested to meet — not exceed — NFPA 72. How should the contractor respond?

A. Provide the Record of Completion accurately certifying code-compliant installation and reference the PE's sealed drawings for design certification

B. Provide the letter exactly as requested because all three claims are accurate

C. Provide the letter with "meets" substituted for "exceeds" throughout

D. Decline entirely because contractors cannot make any claims about design or testing

LEVEL III — SIMULATION EXAM 9: ANSWER KEY AND EXPLANATIONS

1. A — Aerial fiber between buildings avoids the underground flood vulnerability entirely. Three previous annual flooding events have demonstrated that the underground conduit path is inherently unreliable in this coastal hurricane zone. Aerial routing eliminates the recurring failure point permanently.

2. C — Standby = (1.10 + 1.90) × 4 = 12.0 Ah. Alarm = (5.2 + 11.8) × 0.25 = 4.25 Ah. Subtotal = 16.25 Ah. With 20%: 16.25 × 1.20 = 19.50 Ah, approximately 18.36 Ah with rounding. Generator reduces standby to 4 hours. Voice requires 15-minute alarm.

3. B — CI cable maintains its 2-hour fire rating independently, so Level 2 is preserved throughout the shaft. However, both outgoing and return paths sharing the same 90-foot mechanical shaft — even in separate cable trays — creates a single point of failure where one fire could damage both paths, compromising Class A diversity.

4. D — The panel shows "RELEASING ACTIVE" indicating it energized an output. Room 1's substitute load shows voltage but Room 2's shows none. Both rooms sharing the same output terminal means the panel energized Room 1's circuit instead of Room 2's. Each room must have independent output terminals.

5. C — Aspirating detection with sampling pipes concealed in HVAC registers at multiple heights addresses stratification by drawing air from different elevations. The sampling infrastructure integrates with existing mechanical systems, satisfying aesthetic restrictions. The detection unit is remotely located.

6. A — R = 2,300 × (1.98/1000) = 4.554 Ω. V_drop = 1.6 × 4.554 = 7.286V. End voltage = 24 − 7.29 = 16.71 VDC. While above 16 VDC, the 0.71-volt margin is thin. Connection aging, temperature rise, and additions will erode it.

7. B — The blood bank HVAC maintains critical temperature for blood product storage. Standard HVAC shutdown would cause irreplaceable blood products to deteriorate. The blood bank requires a separate HVAC zone that is excluded from fire alarm shutdown, with the mechanical design maintaining temperature control independently.

8. D — The server room's directional airflow from rack-mounted fans creates turbulent noise patterns that vary significantly by position within each aisle. The noise is not uniform — it changes direction and intensity based on server load and proximity. Speaker placement must account for these variable directional patterns.

9. C — Both communication paths must remain functional throughout the system's service life — not just at commissioning. A cellular carrier upgrade that degrades signal strength to marginal levels requires the building owner to investigate and resolve the issue, potentially by adding an antenna, signal booster, or changing carriers.

10. A — Bank C's primary floor is the lobby. When the machine room detector activates, smoke may affect the lobby. Bank C must recall to its alternate floor — Floor 25 — which is its only other service floor. Elevators must not recall to a floor that may be compromised by smoke.

11. D — In an ISO Class 5 cleanroom, HEPA filters remove airborne particulates including smoke before they reach ceiling-mounted detectors. Aspirating detection with sampling points upstream of the HEPA filters — in the return air duct — captures smoke before filtration removes it, providing reliable detection.

12. B — When different conductor sizes share the same conduit, Annex C tables cannot be used. 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.

13. C — NFPA 72 Section 23.10 requires the FCC repeater to display all system status — alarm, trouble, and supervisory signals. Filtering or suppressing any signal type removes critical information from emergency responders. The repeater must provide complete system status at all times.

14. A — Low fuel on a diesel backup fire pump is a supervisory condition — an off-normal equipment status requiring investigation. Low fuel means the diesel pump may not sustain operation during an extended fire demand. NFPA 72 Section 10.18 requires this reported as a supervisory signal.

15. D — Strobes mounted on the maintenance platforms at multiple heights (20, 35, and 50 feet) plus wall-mounted units at exits provide visible coverage at the elevations where maintenance workers are located. This multi-height approach addresses the 70-foot ceiling challenge with practical mounting locations.

16. B — Cross-zone detection is not required by NFPA 72 for single-interlock pre-action systems. Single-interlock opens the valve on any detection activation. Cross-zone is a design enhancement that provides additional false-alarm protection but is not a code mandate for single-interlock configurations.

17. C — At minimum six distinct profiles are needed: patient care (defend-in-place), surgical (restricted audible), ED (full notification), NICU (enhanced restriction), labor and delivery (modified notification for active deliveries), and administrative (standard). Each has unique clinical requirements.

18. A — A waterflow signal indicates actual water flow — a non-detector alarm condition. Per NFPA 72 Section 23.8, PAS applies only to automatic detection signals. Waterflow must cancel PAS and activate general notification because it indicates a potential fire or system activation.

19. D — At cross-zone verification, the releasing panel initiates HVAC shutdown, door closure, and damper closure to seal the space. This occurs before the countdown begins so ventilation stops and the space is sealed before agent discharge. Agent release occurs only at countdown completion.

20. B — The fire safety plan determines whether the rooftop amenity deck receives notification during defend-in-place alarms. Some plans notify all occupied spaces above the alarm floor while others limit notification to the specified floor range. The approach is a documented design decision.

21. C — NFPA 72 has no color requirement for speakers. Section 17.14.8 mandates red only for manual fire alarm stations. Speakers, horn/strobes, smoke detectors, and other devices may be any color acceptable to the project specifications.

22. A — NFPA 72 Section 18.4.3 requires audible notification at 15 dB above ambient OR 75 dBA minimum, whichever is greater. All three spaces (0 dB, 40 dB, 55 dB) have ambient levels below 60 dB, so the 75 dBA minimum governs all three.

23. D — Each remote serves different floor counts with different speaker quantities and current draws: 7.4A, 8.8A, 9.2A, and 5.6A respectively. Using identical sizing would under-size some and over-size others. Each battery must be calculated for its specific load.

24. D — When any kitchen hood suppression activates, the panel must execute the full approved sequence — notification, station signal, and HVAC shutdown. Any suppression activation confirms a fire condition requiring coordinated building-wide response regardless of which vendor's system activated.

25. B — The corridor ceiling used as return air plenum requires FPLP. Patient rooms and the MRI suite both have dedicated ducted HVAC (non-plenum) and accept FPL minimum. Each space's cable requirement depends on its air-handling function.

26. A — NFPA 72 requires alarm signal transmission to the supervising station without intentional delay. The waterflow switch's built-in retard mechanism (within 90 seconds maximum) is the only permitted delay between water flow and alarm generation. Adding a panel-level transmission delay is not permitted.

27. 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 104°F, so minimum activation is 124°F (104 + 20 = 124).

28. B — Lobby smoke detector activation triggers Phase I primary floor recall — all four banks recall TO the lobby. The lobby detector indicates smoke near the elevator lobbies, and the code response is to bring all cars to the designated recall floor (lobby) for firefighter access. Machine room detection triggers alternate floor recall.

29. D — The mass notification override occurs per the emergency plan's priority hierarchy. However, the fire alarm signal must continue transmitting to the supervising station for fire department

dispatch regardless of any in-building audio override. Station transmission is independent of building notification.

30. A — Class A circuits provide a redundant return path. When one conductor is opened, the circuit continues operating on the surviving conductor. The panel correctly generates a trouble for the fault while maintaining releasing capability through the redundant path.

31. C — All three environments — indoor climbing gym (chalk dust/rosin), commercial car wash (water spray/detergent mist), and plastic injection molding (plastic fumes/heated particles) — create conditions causing smoke detector nuisance alarms. Heat detection is unaffected by these contaminants.

32. B — ADA-accessible sleeping rooms require both a wall-mounted strobe meeting room coverage and a supplemental device for waking sleeping hearing-impaired occupants. A bed shaker or pillow-level strobe directly alerts a sleeping person.

33. D — In a 70.7V system, each transformer tap determines power delivery. A 1/4-watt tap delivers one-eighth the power of a 2-watt tap. The closet speaker receives far less power, producing correspondingly lower volume despite identical circuit voltage at 69.8 VAC.

34. A — Beam detector spacing must not exceed the manufacturer's listed maximum for the specific ceiling height. At 62 feet, the listing establishes allowable lateral distance. NFPA 72 requires compliance with the listing.

35. C — Concrete form stripping and grinding generate heavy dust that can migrate through open stairwell doors to Floor 22 detectors. Affected zones must be bypassed during active work with the monitoring station notified of the impairment.

36. B — SLC 3 has the most remaining capacity: 128 device addresses and 102 mA of current headroom. Placing all 65 on SLC 3 preserves the severely limited margin on SLC 1 and SLC 2 — both near maximum. This provides the best overall flexibility.

37. D — NFPA 72 Section 26.3.4 requires the central station to initiate the required response actions within 90 seconds of receiving an alarm signal.

38. A — NEC Article 700.12(B) requires emergency system transfer switches to transfer load from normal to generator power within 10 seconds of utility failure.

39. C — All detection devices — smoke detectors, beam detectors, and associated SLC modules — must be listed for operation at -10°F. Standard devices are typically rated for 32°F to 120°F. Operating below the listed temperature range causes malfunction, communication failure, or unreliable detection.

40. D — Perchloroethylene solvent vapors are toxic and represent an immediate life-safety hazard to all building occupants — not just the dry cleaner. The vapor detection activation must trigger full

building notification, station signal, and HVAC shutdown to protect occupants on all floors from vapor migration.

41. B — Cross-zone, countdown, abort, and supervision have been verified. The remaining test is verifying 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. All 63 require investigation and correction — high readings need cleaning and low readings need fault investigation.

43. C — The pre-recorded message plays on all 52 floors confirming amplifiers and speakers function. The live microphone reaching only Floors 1-26 indicates routing is programmed for a subset. Programming must be verified against the approved design.

44. D — Bank D's selective recall tested correctly. When Bank H activated, both G and H recalled despite only Bank H's relay activating. The controllers share a common recall input — when Bank H's relay closes, both controllers receive the signal.

45. B — NFPA 72 Section 10.6.9 permits a maximum of 3 hours before annunciating AC power failure. The 3-hour-30-minute delay exceeds this maximum by 30 minutes. The timing must be corrected.

46. A — A detector covered with duct tape for nine weeks has been effectively disabled. Duct tape creates a solid barrier completely blocking smoke entry. This is a significant impairment requiring immediate correction.

47. C — A double-interlock pre-action requires both detection AND air pressure drop. Neither alone opens the valve. The valve correctly remained closed because only detection was satisfied.

48. A — NFPA 72 Section 26.6.3.2 requires IP with continuous monitoring to detect failure within 200 seconds. At 199 seconds, the panel is within the maximum. Both paths function and timing meets the requirement.

49. D — Eighteen months of diagnostic history has been permanently lost due to overwriting. This impairs troubleshooting, investigation, and compliance. The log must be downloaded and cleared.

50. B — Thirteen adjacent detectors with significantly longer activation times (40-58 seconds versus 3-9 seconds) strongly suggests contaminated sensing chambers. The detectors should be cleaned and retested.

51. A — 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. Voltage remains above threshold. Charger activation confirms a successful test.

52. C — A coffee cup lid taped over the sensing opening creates a solid barrier blocking smoke entry. The detector is non-functional regardless of the lid's transparency. The covering must be removed immediately.

53. D — NFPA 72 Table 14.4.3.2 requires releasing device circuits to be tested annually as part of the comprehensive releasing system test.

54. B — Circuit voltage reads 70.3 VAC — within normal range. Reduced volume from one speaker while others are normal indicates the speaker's wattage tap is set lower than the others on the circuit.

55. A — NFPA 72 Section 18.5.5.5.7 requires all visible appliances within the same field of view to flash in synchronization. The 0.5-second offset violates this requirement.

56. D — NFPA 72 Section 17.14.8 requires pull stations to be red. Painting them silver violates this requirement. Paint covering labels renders devices unusable. The stations must be replaced.

57. C — The batteries ended at 17.6 VDC — below the 20.4 VDC minimum. Panel components may malfunction at this voltage. The batteries must be replaced.

58. B — The duct detector activated, the panel processed the alarm, and the relay closed. The AHU did not stop. The fault is downstream — in the wiring between the relay and the AHU controller.

59. A — Ten renovations adding 150 devices and changing the sequence nine times over fourteen years represent massive changes. NFPA 72 Section 7.8 requires the Record to reflect current configuration.

60. D — Three hundred twenty nuisance alarms over twelve months indicates pressure fluctuations from the aging water main. The corrective approach addresses root cause (investigating pressure source) and switch response (adjusting retard delay within 90 seconds).

61. C — The detector behind the wall is in a concealed space separated from the corridor. Smoke may not reach it in time. The detector must be relocated and the concealed space evaluated.

62. B — NFPA 72 requires tamper switches to generate supervisory within two revolutions from fully open. Activation at two revolutions meets the requirement.

63. A — NFPA 72 Section 18.5.5.5.3 requires visible appliances to flash between 1 and 2 per second. At 0.55, the strobe is below minimum and must be repaired or replaced.

64. D — When a tamper generates alarm instead of supervisory, the input is programmed as alarm. Programming must be corrected.

65. C — Ninety days without communication redundancy means single-path operation. If cellular fails, no monitoring. This is a significant impairment.

66. A — Artwork blocking both horn and strobe eliminates both audible and visible output. The artwork must be removed or relocated.

67. B — The batteries ended at 17.4 VDC — below the 20.4 VDC minimum. The batteries must be replaced.

68. D — A smoke detector at 44 inches above the floor is completely ineffective. Smoke rises to the ceiling first. The detector must be reinstalled at its approved ceiling location.

69. A — NFPA 72 Table 14.4.3.2 requires supervisory devices to be tested annually as part of the comprehensive functional test.

70. A — Burned-out LEDs prevent firefighters from identifying 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 tested annually as part of the comprehensive releasing system test.

72. B — Paint, chemicals, boxes, and a stepladder combined with 11 inches of clearance violates NEC Article 110.26. All storage must be removed and required working space maintained.

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

74. A — Floor 9 requiring significant force while Floor 30 opens normally indicates inconsistent pressurization. A duct, damper, or balancing issue prevents adequate upper-floor distribution. Both observations should be documented.

75. C — A 135-minute discrepancy significantly affects event log accuracy. Timestamps over two hours off create serious confusion when correlating events. The clock must be corrected immediately.

76. B — The panel processed the alarm and 24 of 26 locks released. The two non-releasing locks indicate faults specific to those devices. Control module outputs, wiring, and power must be investigated.

77. D — NFPA 72 requires waterflow alarm within 90 seconds. After 96 seconds with no alarm, the switch has failed. The switch, retard delay, wiring, and connection must be investigated.

78. A — A sensitivity reading of 5.0% well exceeds the 3.7% maximum. The detector has severe contamination. It must be cleaned and retested, or replaced if cleaning does not restore the reading.

79. C — $R = 1{,}000 \times (3.14/1000) = 3.14\ \Omega$. $V_{drop} = 2.5 \times 3.14 = 7.85$V. End voltage = $24 - 7.85 = 16.15$ VDC. The 0.15-volt margin is dangerously thin. Any aging or temperature change could push voltage below minimum.

80. B — Standby = (0.82 + 1.18) × 4 = 8.0 Ah. Alarm = (3.6 + 7.4) × 0.25 = 2.75 Ah. Subtotal = 10.75 Ah. With 20%: 10.75 × 1.20 = 12.90 Ah, approximately 12.24 Ah. Generator reduces standby to 4 hours.

81. D — Even when duct detectors are configured for HVAC shutdown only, the signal should still transmit to the supervising station for awareness and follow-up.

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

83. C — A detector at the corner ensures detection at the direction change where coverage from each leg may be limited. Smoke along one leg may not reach detectors beyond the turn.

84. B — SLC 1 at 197 of 198 has only 1 remaining. Placing all 28 on a new SLC preserves SLC 1's capacity and provides substantial expansion room.

85. D — Each remote NAC power supply has its own batteries. A separate calculation using each panel's specific loads must be performed.

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

87. C — Project specifications are contractual obligations. The specification is binding even though NEC does not require conduit in non-plenum spaces.

88. B — The speaker circuit delivers 56.0 VAC, exceeding the 55 VAC minimum by 1.0 volt. While the margin is thin, the speakers operate within listed parameters.

89. D — The pre-discharge delay must provide adequate evacuation time based on room size, exit count, travel distance, and occupant count.

90. A — Three different device counts indicate inconsistent documentation. All three must be reconciled against a physical field count for the same verified number.

91. C — Ten detectors at the specified positions provide 30-foot spacing. First at 15 feet from one end and last at 15 feet from the 290-foot far end. Both end distances comply with NFPA 72.

92. B — Using Class A for upper floors (8-34) provides enhanced fault tolerance where it benefits most — longer egress, more difficult access, and greater vulnerability. Lower floors accept Class B based on risk assessment.

93. D — Horn/strobes: 18 × 0.310 = 5.58A. Speakers: 12 × 0.145 = 1.74A. Strobes: 8 × 0.200 = 1.60A. Total = 8.92 amps, significantly exceeding the 3.0-amp rating. Circuit must be redesigned.

94. B — 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.

95. A — The 10-day notice requirement is a regulatory and contractual obligation. The contractor must maintain it and reschedule.

96. C — Two 75 cd strobes on opposite 60-foot walls divide the room into two zones. Each covers approximately 30 feet from its wall — within the 45-foot maximum per strobe.

97. D — As-built shows 168 but 180 are installed and confirmed by programming. NFPA 72 requires as-builts to reflect current configuration.

98. B — The calculated minimum is 22.14 Ah. The specified 18 Ah falls below by 4.14 Ah. The next standard size above 22.14 Ah must be selected.

99. A — Hospitals using defend-in-place may have differentiated responses per the approved fire safety plan. Different alarm types triggering different notification scopes is valid when documented and accepted by the AHJ.

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

101. D — Excessive pulling tension can damage insulation internally without visible damage. Megger testing all 35 runs verifies integrity before devices are connected. Visual inspection cannot detect internal failure.

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

103. A — Converting horn/strobe to voice evacuation is a fundamental design change. A formal change order must document revision, cost, and schedule 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 direct the replacement.

105. D — Different date codes within the same model indicate different production runs. As long as all 750 are the same model and listed for the panel, 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 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 data accurately.

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

109. B — Hospital infection control requirements for 72-hour notice must be respected. Patient safety protocols cannot be overridden by construction schedules.

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

111. A — The reflective glass panels concealing FDC identification strobes prevent firefighters from locating the fire department connection. The project manager should notify the general contractor so the GC can coordinate between the curtain wall and fire alarm contractors to relocate either the strobes or the glass panels.

112. C — FPLP (plenum-rated) cable exceeds the requirements for FPL (general-purpose) cable. Using a higher-rated cable in a space requiring lower-rated cable is acceptable — the installation meets or exceeds the specification. No replacement is necessary.

113. B — The approved addressing scheme was engineered to group devices by zone function for proper panel programming, annunciation, and emergency response. Sequential addressing that does not match the approved design must be corrected before commissioning to ensure the system operates as designed.

114. D — A janitor's closet with a mop sink, cleaning chemicals, and no ventilation is an unsuitable environment for a fire alarm panel. Moisture from the sink, chemical fumes, and lack of ventilation create conditions that can damage panel electronics and degrade reliability. The contractor should decline the relocation.

115. A — The system was tested to meet — not exceed — NFPA 72. Claiming it exceeds requirements is inaccurate. The contractor should provide the Record of Completion certifying code-compliant installation and reference the PE's sealed drawings for design certification, accurately representing both the design and installation scope.