LEVEL I — SIMULATION EXAM 9 (85 QUESTIONS)

Time Limit: 110 Minutes

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

DOMAIN 1.1 — INSTALLATION (Questions 1–46)

1. A fire alarm technician is installing smoke detectors in a building with exposed concrete waffle-slab ceilings. The coffers are 4 inches deep and 3 feet square. A coworker says standard smooth-ceiling spacing can be used because the coffers are only 4 inches deep. Per NFPA 72, is the coworker correct?

A. Yes, because coffers less than 6 inches deep are always treated as smooth flat ceilings

B. No, coffers 4 inches deep are at the threshold where beam pocket spacing rules may apply

C. Yes, because only beams deeper than 8 inches require spacing adjustment per the code

D. No, but only if the coffers are narrower than 2 feet in both horizontal dimensions

2. A fire alarm technician is installing an addressable fire alarm system. The panel manufacturer's SLC protocol allows T-tap wiring on the signaling line circuit. The technician runs the main SLC trunk through the corridor and drops short branch wires to detectors in individual offices. What is the primary risk of excessive T-tap branches on an SLC?

A. T-taps create signal echoes that delay the panel's processing of alarm signals by several seconds

B. Each T-tap adds a junction that requires its own end-of-line resistor for circuit supervision

C. Excessive T-taps can create signal reflection and impedance issues that degrade communication

D. T-taps prevent the panel from identifying individual device addresses on the branch circuits

3. A fire alarm technician measures the resistance across a newly installed Class B IDC at the panel terminals. All devices are connected and the EOLR is installed. The meter reads 15.2 kΩ. The panel manufacturer specifies a 4.7 kΩ EOLR. What is the most likely cause of the higher-than-expected reading?

A. A device on the circuit has an internal contact issue adding extra resistance to the circuit path

B. The panel's supervision circuitry is applying additional resistance that elevates the reading

C. The EOLR value is correct but the meter is measuring total circuit impedance, not just resistance

D. The installed EOLR is the wrong value — a 15 kΩ resistor was installed instead of 4.7 kΩ

4. A fire alarm system requires 24 VDC secondary power. The technician has two 12-volt sealed lead-acid batteries rated at 33 Ah each. If connected in series, what is the resulting voltage and capacity?

A. 12 VDC at 66 Ah because series connection doubles capacity while voltage stays the same

B. 24 VDC at 66 Ah because series connection doubles both voltage and capacity

C. 12 VDC at 33 Ah because the batteries cancel each other when connected in series

D. 24 VDC at 33 Ah because series connection doubles voltage while capacity stays the same

5. A fire alarm technician is installing a fire alarm panel in a building and discovers that the designated location for the panel is directly behind a door that opens into the electrical room. When the door is fully open, it blocks access to the panel. What code concern does this present?

A. No concern because the door can be closed to provide access when panel work is needed

B. The panel must have adequate working clearance per NEC Article 110 unobstructed by the door

C. The concern is only aesthetic and does not affect the code compliance of the installation

D. The panel location is acceptable if a secondary access point is available from an adjacent room

6. A fire alarm technician is installing cable in a building where the architect has specified that all fire alarm cable in the ceiling space must be installed in conduit, even though the ceiling space is not a plenum and the cable is FPLP rated. Must the technician install the cable in conduit?

A. Yes, the project specifications are contractual documents that the contractor must follow

B. No, because FPLP cable does not require conduit per NEC and the specification is unenforceable

C. Yes, but only in the portions of the ceiling space that are accessible from below

D. No, the technician should notify the architect that the specification exceeds code requirements

7. Per NFPA 72, heat detectors must have a rated activation temperature at least how many degrees above the maximum expected ceiling temperature in the protected area?

A. 10°F above the maximum expected ceiling temperature for adequate thermal margin

B. 15°F above the maximum expected ceiling temperature per industry best practice

C. 30°F above the maximum expected ceiling temperature for non-restorable detector types

D. 20°F above the maximum expected ceiling temperature per NFPA 72

8. A fire alarm technician is installing visible notification appliances in a dormitory. Each sleeping room is 12 feet by 14 feet with an 8-foot ceiling. The rooms have standard hollow-core doors that close automatically. Per NFPA 72, what visible notification is required inside each sleeping room?

A. No visible notification is required inside individual sleeping rooms with automatic door closers

B. A minimum 75 cd wall-mounted strobe is required in every sleeping room regardless of size

C. A wall-mounted visible appliance with candela rating appropriate for the room dimensions

D. Only audible notification at 75 dB at the pillow is required — visible notification is corridor-only

9. A fire alarm technician is running fire alarm conduit through a mechanical room and needs to cross over a large steam pipe. The technician uses two 90-degree bends and two 45-degree bends to navigate over the pipe. What is the total bend count consumed from the 360-degree maximum?

A. 180 degrees because only the 90-degree bends count toward the maximum

B. 270 degrees total from two 90-degree bends plus two 45-degree bends

C. 360 degrees which is at the exact maximum requiring careful evaluation

D. 225 degrees because offset bends receive a 50% credit toward the maximum

10. A fire alarm technician is connecting the secondary battery supply to a fire alarm panel. The battery terminals are marked with "+" and "−" symbols. The technician connects the red wire to the "+" terminal and the black wire to the "−" terminal on each battery. What additional step should be performed after the physical connection?

A. Apply dielectric grease to both terminals to prevent corrosion over the battery's service life

B. Wrap each battery terminal connection with electrical tape for insulation and vibration protection

C. Label each battery with the installation date and the installer's company identification

D. Verify the total voltage across the series pair reads approximately 24-27 VDC at the panel terminals

11. A fire alarm technician is installing a smoke detector in a room with a cathedral ceiling that peaks at 18 feet along a center ridge. The ceiling slopes evenly from the ridge to 8-foot sidewalls on each side. Per NFPA 72, where should the detector be placed?

A. Within 3 feet of the peak along the ridge line where smoke accumulates first

B. At the 8-foot sidewall height mounted on the wall within 12 inches of the ceiling

C. At the midpoint of the ceiling slope at approximately 13 feet above the floor

D. On the flat portions of the ceiling only because sloped ceilings require beam detectors

12. A fire alarm technician is installing fire alarm cable and discovers that the planned route passes through a room containing a natural gas-fired furnace and a water heater. The room is classified as a mechanical room on the architectural drawings. What type of detection should the technician expect to see specified for this room?

A. Photoelectric smoke detection because gas furnaces produce combustion byproducts

B. Flame detection because natural gas fires produce visible flame before generating smoke

C. Heat detection because the furnace and water heater create conditions that cause smoke detector nuisance alarms

D. No detection because mechanical rooms with gas appliances are exempt from fire alarm coverage

13. A fire alarm technician is installing a conventional fire alarm system with 8 IDC zones. The building has two floors. The first floor has four fire alarm zones and the second floor has four zones. The stairwell between floors contains a smoke detector. To which zone should the stairwell detector be assigned?

A. Zone 1 because stairwell devices default to the lowest numbered available zone

B. A dedicated zone separate from any floor zone because the stairwell serves both floors

C. Zone 5 because it is the first zone on the second floor closest to the stairwell entrance

D. Either a first-floor zone or a second-floor zone based on the stairwell's primary exit level

14. A fire alarm technician is calculating the voltage drop on a NAC circuit. The circuit uses 14 AWG copper conductors with a resistance of 3.14 ohms per 1,000 feet per NEC Chapter 9 Table 8. The round-trip wire distance is 450 feet and the alarm current is 2.4 amps. What is the voltage drop?

A. 1.41 volts calculated using only the one-way wire distance of 225 feet

B. 7.54 volts calculated by multiplying the full resistance per 1,000 feet by the current

C. 2.83 volts calculated by dividing the current by the wire resistance per foot

D. 3.39 volts calculated using the round-trip distance, resistance per foot, and alarm current

15. A fire alarm technician is installing devices in a building with a poured concrete ceiling. The technician needs to mount a smoke detector base directly to the concrete surface. What fastener type is most appropriate?

A. Tapcon screws or concrete expansion anchors rated for the detector base weight

B. Wood screws with plastic wall anchors inserted into pre-drilled holes in the concrete

C. Self-adhesive mounting tape rated for ceiling-mounted devices up to 8 ounces

D. Toggle bolts inserted through holes drilled completely through the concrete slab

16. A fire alarm technician is installing a fire alarm system in a small church. The sanctuary has a vaulted ceiling that peaks at 35 feet. Pew seating accommodates 200 people. Standard spot-type smoke detectors are specified for the sanctuary ceiling. What concern should the technician raise?

A. The vaulted ceiling requires flame detectors instead of smoke detectors per code

B. The 200-person occupant load requires a voice evacuation system instead of horn/strobes

C. Smoke may stratify below the 35-foot ceiling making spot-type detectors at that height unreliable

D. The sanctuary requires sprinkler protection before any fire alarm detection can be installed

17. A fire alarm technician is installing an addressable system and programs two devices with addresses 087 and 088. Device 087 is a smoke detector in Conference Room A. Device 088 is a heat detector in the adjacent kitchen. During commissioning, the technician tests device 087 and the panel displays "ALARM — HEAT DETECTOR — ADDRESS 087 — KITCHEN." What errors exist?

A. Only the device type is wrong — the panel shows heat detector instead of smoke detector

B. Both the device type and the location descriptor are wrong for address 087

C. Only the location descriptor is wrong — the panel shows Kitchen instead of Conference Room A

D. The address assignment is wrong — devices 087 and 088 have been physically swapped

18. A fire alarm technician is working on a construction site and needs to access the ceiling space above a suspended grid. The ceiling is 10 feet high. The technician positions a 6-foot stepladder directly below the work area. Per safe ladder use practices, what is the maximum height the technician should stand on the stepladder?

A. On the second rung from the top, never standing on the top two rungs of a stepladder

B. On the top rung only if another worker is holding the ladder for stability

C. On the top cap if the technician maintains three points of contact at all times

D. On any rung as long as the technician's belt buckle stays between the ladder side rails

19. A fire alarm technician is installing fire alarm cable in a building and encounters an area where the cable route passes within 4 inches of a fluorescent light ballast mounted on the ceiling. What concern does this proximity create?

A. The ballast generates heat that can degrade the fire alarm cable insulation over time

B. The ballast's mounting hardware may damage the cable if it contacts the cable jacket

C. Fluorescent ballasts emit UV radiation that breaks down fire alarm cable jacket materials

D. Electromagnetic interference from the ballast may affect fire alarm circuit signal quality

20. A fire alarm technician is installing a Class A signaling line circuit. The SLC exits the panel, serves all devices on the first floor, rises to the second floor, serves all second-floor devices, and returns to the panel through a separate riser. At the point where the outgoing and return paths cross in the corridor, they are routed through the same conduit for a 30-foot section. Does this compromise the Class A classification?

A. No, brief sections of shared conduit do not affect the Class A classification

B. Yes, the outgoing and return paths sharing a conduit defeats the purpose of pathway diversity

C. No, because Class A refers only to the electrical configuration and not the physical routing

D. Yes, but only if the shared section exceeds 50 feet in total length

21. A fire alarm technician is installing a pull station at a building exit door. The exit opens onto a loading dock with an exterior platform 4 feet above the parking lot grade. Should the pull station be mounted inside or outside the building?

A. Outside on the loading dock platform because the exit door leads to an exterior area

B. Inside the building adjacent to the exit door because pull stations are interior devices

C. Both inside and outside because dual-coverage is required at exterior exit locations

D. Inside the building within 5 feet of the exit doorway per NFPA 72

22. A fire alarm technician is installing notification appliances in a manufacturing plant with a measured average ambient noise level of 92 dB during production operations. Audible notification appliances must produce sound at what minimum level per NFPA 72?

A. 92 dB to match the ambient noise level during production operations

B. 97 dB which is 5 dB above the maximum ambient noise level per the alternate requirement

C. 107 dB which is 15 dB above the 92 dB average ambient noise level

D. 85 dB which is the universal minimum for all industrial occupancies per NFPA 72

23. A fire alarm technician is installing a fire alarm system and connecting a DACT to the building's telephone lines. The DACT requires two telephone lines for redundancy. The technician discovers that the building has only one copper telephone line — the second line is a VoIP service. What concern does this create?

A. VoIP lines may not reliably transmit DACT signals during power outages affecting network equipment

B. The DACT can use both lines equally because VoIP provides identical functionality to copper

C. Only one telephone line is required for DACT operation making the second line unnecessary

D. The VoIP line must be converted to a dedicated fire alarm data circuit before DACT connection

24. A fire alarm technician is installing devices in a building and reaches a room labeled "Computer Server Room" on the drawings. The room has a raised access floor, overhead cable trays, and precision air conditioning. The specifications call for aspirating smoke detection. Where should the aspirating system's sampling pipes be installed?

A. Only on the ceiling because all smoke rises to the highest point in any room

B. Only below the raised floor where cable connections represent the primary fire risk

C. Both above the ceiling and below the raised floor for comprehensive detection coverage

D. Only at the rack level where equipment generates the most heat and is most likely to ignite

25. A fire alarm technician is installing conduit and encounters a structural penetration where a 4-inch concrete wall separates two rooms. Neither room has a fire rating designation on the drawings. The technician core-drills a hole for a 3/4-inch conduit. Is firestopping required at this penetration?

A. Yes, all wall penetrations require firestopping regardless of the wall's fire rating

B. No, firestopping is only required when the wall has a fire resistance rating

C. Yes, but only if the wall is load-bearing per the structural engineering drawings

D. No, but only if the conduit passes through a sleeve installed during original construction

26. A fire alarm technician finishes installing all wiring for a new addressable system. Before energizing the panel, the technician performs megger testing on the SLC circuit with all devices disconnected. The megger reads 450 MΩ between each conductor and ground. What do these readings indicate?

A. The SLC insulation is in excellent condition with no compromised insulation or ground paths

B. The readings are too high and indicate an open circuit on the SLC conductors

C. The megger test voltage is too low to produce meaningful results on addressable circuits

D. The readings are acceptable but must be confirmed with a continuity test for complete verification

27. A fire alarm technician is installing fire alarm cable through a concrete block wall. The technician uses a core drill to create a hole through the wall. After pulling the cable through, the technician notices the concrete edges of the hole are rough and sharp. What protection must be provided?

A. The cable must be wrapped with electrical tape at the penetration point for insulation

B. A conduit sleeve must be installed through the hole to prevent the sharp edges from damaging the cable

C. Fire-rated caulk applied around the cable provides adequate edge protection at the penetration

D. A listed bushing or grommet must protect the cable from the rough edges of the core-drilled hole

28. A fire alarm technician is installing a fire alarm system in a strip mall. Each tenant space has a separate fire alarm zone. The fire alarm panel is located in the landlord's utility room. A new tenant is building out their space and the construction includes a 1-hour fire-rated demising wall between their space and the adjacent tenant. The fire alarm zone for the new tenant space is Zone 7. What must be verified about Zone 7's boundaries?

A. Zone 7 must cover both the new tenant space and the common corridor outside it

B. Zone 7 devices must all be powered from a dedicated NAC circuit for the new tenant space

C. Zone 7 must not cross the fire-rated demising wall into the adjacent tenant space

D. Zone 7 must include at least one device in the landlord's utility room for panel protection

29. A fire alarm technician is installing a visible notification appliance on a wall in a room that measures 24 feet by 24 feet. Per NFPA 72 Table 18.5.5.5.1(a), a single wall-mounted strobe at 15 cd covers a room up to 20 × 20 feet. What candela rating is needed to cover this 24 × 24 foot room with a single wall-mounted strobe?

A. 15 cd because the room is close enough to the 20 × 20 coverage area

B. 30 cd which is the minimum for rooms between 20 × 20 and 28 × 28 feet per the table

C. 60 cd because any room larger than 20 × 20 requires the next standard candela jump

D. 75 cd because rooms larger than 20 × 20 require a minimum of 75 cd per NFPA 72

30. A fire alarm technician is connecting a fire alarm panel to its primary AC power supply. The branch circuit is a dedicated 15-amp circuit with 14 AWG conductors. The technician verifies the breaker has a lock-on device and is labeled "FIRE ALARM." The technician then checks for GFCI protection on the circuit. Why is it important to verify the absence of GFCI protection?

A. GFCI protection can disconnect the fire alarm panel's power during non-fire ground fault conditions

B. GFCI breakers reduce the available voltage to the panel below its minimum operating threshold

C. GFCI devices interfere with the panel's internal ground fault detection circuitry

D. GFCI protection is required on fire alarm circuits and the technician must verify its presence

31. A fire alarm technician is installing devices in a building and reaches a room where the ceiling has been painted with a textured finish. The texture creates a rough surface with peaks approximately 1/4 inch above the base surface. Does this ceiling texture affect smoke detector placement?

A. Yes, the texture must be sanded smooth within a 12-inch radius of each detector location

B. Yes, the detector must be wall-mounted because textured ceilings prevent proper base mounting

C. No, minor ceiling textures do not significantly affect smoke detector placement or performance

D. No, but the detector's sensitivity must be increased to compensate for reduced airflow at the surface

32. A fire alarm technician is installing a fire alarm system in a building with a mezzanine that is enclosed by full-height walls and has its own ceiling. The mezzanine is 2,500 square feet and is used as office space. How should the mezzanine be treated for fire alarm zoning purposes?

A. As part of the main floor zone because the mezzanine is structurally connected to the floor below

B. As a separate area that does not require its own zone if it shares an exit with the main floor

C. As an extension of the floor above because the mezzanine ceiling is the underside of the upper floor

D. As a separate zone because it is an enclosed, independently occupied level with its own ceiling

33. A fire alarm technician is installing an addressable fire alarm system and needs to connect a conventional 120 VAC relay output to the fire alarm panel's SLC for HVAC shutdown. What addressable device provides this interface?

A. A monitor module that reads the relay's current state and reports it to the panel

B. A control module that receives a command from the panel and activates its relay contacts

C. An annunciator module that displays the relay's status on a remote display

D. A power supply module that provides regulated 120 VAC to the relay coil from the SLC

34. A fire alarm technician is installing fire alarm cable in a building with a metal stud wall. The studs have pre-punched knockout holes for cable passage. The knockout holes have smooth, rolled edges. Does the technician need to install bushings or grommets at these pre-punched holes?

A. No, factory-punched knockouts with smooth rolled edges provide adequate cable protection

B. Yes, all metal stud penetrations require listed bushings regardless of edge condition

C. No, but only if the cable jacket is rated for a minimum of 300 VDC insulation

D. Yes, because fire alarm cable requires a higher level of edge protection than standard cables

35. A fire alarm technician is installing a fire alarm system in a large retail store. The store has an open floor plan with merchandise displays up to 6 feet tall. The ceiling is smooth and flat at 14 feet. Standard spot-type smoke detectors are specified. What placement concern do the tall displays create?

A. The displays create dead air pockets at floor level that trap smoke below detector height

B. Merchandise displays above 5 feet require individual smoke detection at the display level

C. Tall displays near the ceiling may obstruct smoke travel to detectors requiring layout evaluation

D. No concern because ceiling-mounted detectors are unaffected by floor-level obstructions

36. A fire alarm technician is installing a fire alarm system with a cellular communicator as the primary communication path to the supervising station. The building has thick reinforced concrete exterior walls. What concern should the technician evaluate regarding the cellular communicator?

A. The concrete walls may shield the building from radio frequency interference improving reception

B. Cellular signal strength inside the building may be insufficient due to signal attenuation by concrete

C. Reinforced concrete has no effect on cellular signal strength in modern communication systems

D. The communicator must be mounted on an exterior wall with the antenna facing the nearest cell tower

37. A fire alarm technician is installing a duct smoke detector on a return air duct that is 60 inches wide. The detector manufacturer specifies a maximum sampling tube length of 60 inches for ducts up to 60 inches wide. The technician has sampling tubes in 36-inch and 60-inch lengths. Which tube must be used?

A. The 36-inch tube because shorter tubes provide more concentrated air sampling

B. Either length is acceptable since both are within the manufacturer's available options

C. The 36-inch tube with a 24-inch extension piece added in the field

D. The 60-inch tube to span the full duct width per the manufacturer's specifications

38. A fire alarm technician is installing visible notification appliances in a corridor with alcoves. The corridor is straight with three 4-foot-deep alcoves on one side where office doors are set back from the main corridor wall. Do the alcoves affect visible notification appliance placement?

A. Alcoves deeper than 3 feet may require additional visible appliances for occupant coverage

B. No adjustment is needed because corridor strobes provide coverage to all adjacent spaces

C. Each alcove requires its own dedicated strobe regardless of depth per NFPA 72

D. Only alcoves deeper than 6 feet require additional visible notification per standard practice

39. A fire alarm technician is running fire alarm conduit and needs to determine the maximum number of 18 AWG THHN conductors permitted in a 1/2-inch EMT conduit. The technician consults NEC Annex C, Table C1 and finds the maximum is 22 conductors. The technician plans to install 8 conductors. Is this installation acceptable?

A. No, because 18 AWG conductors are below the minimum size permitted in EMT conduit

B. No, because fire alarm circuits in 1/2-inch EMT are limited to 6 conductors maximum

C. Yes, 8 conductors is well within the maximum of 22 permitted by the Annex C table

D. Yes, but only if all 8 conductors are from the same fire alarm circuit

40. A fire alarm technician is installing a fire alarm panel in a building with an existing security system panel. Both panels are wall-mounted in the same electrical room. The fire alarm panel's conduit enters the room from the ceiling and drops down the wall to the panel. The security panel's conduit follows a similar path on the opposite wall. Can the two panels share a common conduit entry point?

A. Yes, because both systems are low-voltage life safety systems with compatible wiring

B. No, each panel must have its own separate conduit entry and the circuits must not be mixed

C. Yes, but only if both panels are manufactured by the same company for system integration

D. No, but a shared junction box at the ceiling entry point is acceptable if a barrier is installed

41. A fire alarm technician is installing an addressable fire alarm system in a 3-story building. The SLC loop serves all three floors. On the second floor, a smoke detector at address 044 is installed in a supply closet. During programming, the technician must assign a zone to this device. What determines the correct zone assignment for this detector?

A. The device's physical floor location and position relative to fire barriers on that floor

B. The sequential address number determines the zone — devices 041-050 are automatically Zone 4

C. The panel assigns zones automatically based on the SLC wiring order during auto-configuration

D. The zone assignment matches the NAC circuit number that serves the same area as the detector

42. A fire alarm technician is wiring a conventional IDC on a fire alarm system. The circuit uses Class B wiring with a 4.7 kΩ EOLR. The technician wires four smoke detectors in the circuit. After completing the wiring, the technician discovers that the EOLR was accidentally installed at the second detector instead of the last detector. What is the consequence of this error?

A. The panel will supervise only the portion of the circuit from the panel to the second detector

B. The panel will display an alarm for the zone because the EOLR is in the wrong position

C. The panel will operate normally because the EOLR value is correct regardless of its location

D. The panel will display a trouble signal because it detects two separate supervision references

43. A fire alarm technician is installing a notification appliance circuit and the project drawings show the NAC circuit as "Class A." Compared to a Class B NAC, what additional wiring component is required for the Class A configuration?

A. An isolation module at the midpoint of the circuit to separate the two halves during a fault

B. A return path from the last appliance back to the panel creating a loop configuration

C. A second EOLR installed at the midpoint of the circuit for dual-point supervision

D. A separate power supply at the far end of the circuit to provide backup NAC voltage

44. A fire alarm technician is installing a fire alarm system and the project specifications require all devices to be "UL Listed." A coworker brings a box of smoke detectors that carry only an "ETL Listed" mark from Intertek. Can these detectors be used?

A. No, only devices with the UL mark can be used when the specification says "UL Listed"

B. No, ETL listing is not recognized by NFPA 72 or the NEC for fire alarm devices

C. Yes, ETL is a nationally recognized testing laboratory and the listing satisfies the intent

D. Yes, but only if the AHJ provides written approval for the specific ETL-listed product

45. During installation, a fire alarm technician notices that the electrical contractor has labeled the fire alarm panel's dedicated circuit breaker with a small adhesive label that reads "FA Panel." No other distinctive marking or lock-on device is present. Does this meet NEC requirements?

A. The labeling satisfies the identification requirement but a lock-on device must still be added

B. The adhesive label is not permanent enough and must be replaced with an engraved placard

C. Both the identification and lock-on device requirements are fully satisfied by the adhesive label

D. No NEC requirements apply to circuit breaker labeling for fire alarm panel circuits

46. A fire alarm technician is installing a fire alarm system in a parking garage with open sides on two levels and fully enclosed lower levels. What detection technology should the technician expect for the open-air levels versus the enclosed levels?

A. Smoke detectors on all levels because garages require uniform detection regardless of ventilation

B. Flame detectors on open levels and smoke detectors on enclosed levels per standard practice

C. No detection on open levels and heat detectors on enclosed levels per typical garage design

D. Heat detectors on open levels and smoke or heat detectors on enclosed levels based on conditions

DOMAIN 1.2 — MAINTENANCE (Questions 47–82)

47. A fire alarm technician is performing semiannual smoke detector testing in a hospital. The hospital operates 24 hours a day with patients in all rooms. How should the technician manage notification during testing?

A. Test only detectors in unoccupied rooms and hallways to avoid disturbing patients entirely

B. Coordinate with nursing staff and place the system on test to prevent building-wide alarm activation

C. Disconnect all NAC circuits before testing to prevent any notification from sounding in patient areas

D. Schedule all testing for night shifts when fewer staff are available but patients are sleeping

48. A fire alarm technician is performing annual testing and discovers that a horn/strobe on a NAC circuit produces a continuous tone instead of the temporal-three pattern during alarm. All other devices on the same circuit produce the correct temporal pattern. What is the most likely cause?

A. The panel programming has assigned a different alarm pattern to this specific device zone

B. The NAC circuit voltage at this device location is too low for the temporal pattern generator

C. The panel's temporal pattern generator circuit board has a partial failure affecting one output

D. The device has an internal fault in its temporal pattern circuitry and must be replaced

49. During annual testing of a fire alarm system, the technician activates a smoke detector on the third floor. The panel correctly identifies the device. The horn/strobes activate on floors 2, 3, and 4 per the sequence of operations. The supervising station confirms receipt of the alarm. However, the elevator recall relay does not activate. The building has three elevators and the sequence of operations requires recall for any smoke alarm. What type of deficiency is this?

A. A programming deficiency where the elevator recall output is not linked to the third-floor detector zone

B. A notification deficiency because the recall signal depends on horn/strobe activation first

C. A wiring deficiency because the smoke detector is not compatible with the recall relay module

D. An initiating device deficiency because the detector type does not support elevator recall signals

50. A fire alarm system has been generating intermittent trouble signals for "NAC 2 — GROUND FAULT." The technician disconnects NAC 2 at the panel and the fault clears. The technician reconnects devices one at a time. The ground fault reappears when the eighth device — a horn/strobe in a bathroom — is reconnected. What is the most probable cause?

A. The eighth device has a manufacturing defect in its internal wiring creating a path to ground

B. The bathroom's electrical system has a ground fault that is coupling into the fire alarm circuit

C. Moisture in the bathroom environment has compromised the wiring insulation at the device location

D. The conduit connection at the bathroom device box has a loose fitting allowing water entry

51. A fire alarm technician is performing annual testing of emergency control functions. The technician activates a smoke detector in the elevator lobby on the fifth floor. The panel displays the alarm and sends the elevator recall signal. Two of three elevators recall to the ground floor and open their doors. The third elevator does not respond. What should be documented?

A. All three elevators passed because the recall signal was sent and the system performed its function

B. The third elevator failed to recall and the interface between the fire alarm and elevator controller must be investigated

C. The test cannot be evaluated until the third elevator is manually returned to the ground floor

D. The two responding elevators demonstrate that the fire alarm interface is functioning correctly

52. A fire alarm technician discovers during inspection that a smoke detector in a break room is covered with a clear plastic food storage container by building staff. The container has small holes punched in it. Building staff say the holes allow smoke to enter while keeping cooking particles out. Is this modification acceptable?

A. Yes, the holes allow adequate smoke entry and the container reduces nuisance alarms effectively

B. Yes, if the container has been tested by the building staff and the detector still activates

C. No, but building staff may use manufacturer-approved protective covers designed for the detector

D. No, any unauthorized modification to a smoke detector renders it non-compliant and must be removed

53. Per NFPA 72 Table 14.4.3.2, how frequently must the fire alarm system's emergency control functions — such as elevator recall and HVAC shutdown — be functionally tested?

A. Annually as part of the comprehensive system functional test per the testing table

B. Semiannually to match the smoke detector testing frequency schedule

C. Monthly because emergency functions are life safety systems requiring frequent verification

D. Only at initial acceptance testing with no recurring periodic testing required

54. A fire alarm technician is troubleshooting an addressable system that shows "TROUBLE — SLC 1 — GROUND FAULT." The technician disconnects the SLC at the panel. The ground fault clears. The technician reconnects the first quarter of the loop (devices 001 through 030). The fault remains clear. The technician adds the second quarter (devices 031 through 060). The fault returns. Where should the technician focus the investigation?

A. On devices 001 through 030 because the fault appeared after additional load was added

B. On the second quarter of the loop — devices 031 through 060 — where the fault returned

C. On the panel's SLC output board because the fault appears with increased device count

D. On all devices simultaneously because ground faults can migrate between circuit sections

55. A fire alarm system in a school generates frequent nuisance alarms from smoke detectors in the gymnasium. The alarms typically occur during physical education classes. What environmental factor is most likely causing the nuisance alarms?

A. Vibration from gym activities is shaking the detectors and triggering mechanical activation

B. Body heat from students raises the gymnasium temperature above the detector's threshold

C. Sound waves from gym activities reach frequencies that interfere with detector electronics

D. Dust stirred up from floor activities and ball impacts enters the detector sensing chambers

56. During annual testing, a fire alarm technician tests a tamper switch on a butterfly valve in a sprinkler system. The technician partially closes the valve and waits for the supervisory signal. After 30 seconds, no signal appears. The technician fully closes the valve and a supervisory signal appears immediately. What does this suggest?

A. The tamper switch is functioning correctly because butterfly valves require full closure for activation

B. The tamper switch is malfunctioning because it should activate during partial valve closure

C. The tamper switch adjustment needs correction because it should activate within two revolutions or equivalent

D. The test was performed incorrectly because butterfly valves must be tested using a different method

57. A fire alarm technician is testing the primary-to-secondary power transfer. The technician disconnects AC power. The system transfers to battery. After reconnecting AC power, the battery charger indicator illuminates. The technician measures the battery voltage 10 minutes after AC restoration and reads 25.4 VDC. The pre-test float voltage was 27.2 VDC. What is the significance of this reading?

A. The batteries are recovering from the brief discharge and the charger is restoring them to float voltage

B. The charger is malfunctioning because the voltage should return to float immediately after AC restoration

C. The batteries have failed because any discharge that drops below 26 VDC indicates end of life

D. The reading is invalid because battery voltage must be measured under load, not at open circuit

58. A fire alarm technician is inspecting a fire alarm system and discovers that the panel's dedicated branch circuit is protected by a combination AFCI/GFCI breaker. What code violation exists?

A. Only the GFCI function violates the code — the AFCI function is acceptable

B. Both AFCI and GFCI protection are prohibited on fire alarm panel dedicated circuits

C. Only the AFCI function violates the code — the GFCI function is acceptable for safety

D. Neither function violates the code because combination breakers are modern safety devices

59. During testing, the fire alarm technician activates an addressable smoke detector. The panel displays the correct alarm information. The horn/strobes activate. The technician calls the supervising station, which confirms receiving an "unidentified signal" that could not be processed. What is the most likely cause?

A. The panel's SLC communication board has corrupted the alarm data during processing

B. The supervising station's equipment is outdated and incompatible with the panel's protocol

C. The telephone line used by the DACT has excessive noise corrupting the transmitted signal

D. The panel's communication module has incorrect account programming for signal identification

60. A fire alarm technician is testing visible notification appliances in a hospital corridor. Two strobes are visible from the same location — one on each end of a 90-foot corridor. During testing, the technician observes that the two strobes flash at the same rate but are not synchronized — they flash about 0.3 seconds apart. What code requirement does this violate?

A. No requirement is violated because the strobes are on the same circuit and will self-synchronize

B. The flash rate requirement because both strobes must flash at exactly 1.0 flash per second

C. The synchronization requirement that all strobes within the same field of view must flash together

D. The candela requirement because unsynchronized strobes produce reduced effective light output

61. A fire alarm technician discovers during inspection that a building's Record of Completion was last updated five years ago. Since then, two renovations have added 30 devices and modified the system programming. What corrective action is needed?

A. No action because the Record of Completion is a one-time document completed at initial acceptance

B. The Record of Completion must be updated to reflect the current system configuration

C. A new Record of Completion is required only if the panel was replaced during the renovations

D. The annual testing records serve as an adequate substitute for an updated Record of Completion

62. A fire alarm technician performs a battery load test. The batteries start at 26.8 VDC. Under full alarm load for the required duration, the batteries end at 24.4 VDC. The panel manufacturer specifies a minimum acceptable end-voltage of 20.4 VDC. Do the batteries pass?

A. Yes, the ending voltage of 24.4 VDC is well above the minimum acceptable threshold of 20.4 VDC

B. No, the 2.4-volt drop indicates the batteries have insufficient capacity for the required load

C. Yes, but the batteries should be scheduled for replacement within the next 6 months

D. No, because any voltage drop greater than 2 volts during a load test indicates battery failure

63. A fire alarm system event log shows repeated "DEVICE DIRTY" trouble signals for 15 smoke detectors throughout a building. The building is 6 years old and the detectors have never been cleaned. What maintenance action is required?

A. Replace all 15 detectors because cleaning cannot restore factory sensitivity after 6 years

B. Reprogram the panel to reset the dirty device thresholds to extend the detector service life

C. Increase the detector sensitivity in the panel programming to compensate for the contamination

D. Clean all 15 detectors per the manufacturer's procedures and retest for acceptable sensitivity

64. During annual testing, the fire alarm technician activates a pull station and the panel displays the alarm. The horn/strobes activate throughout the building. However, the HVAC system does not shut down. The sequence of operations states that all pull station alarms trigger HVAC shutdown. What should be documented?

A. The pull station passed its test because the alarm was correctly identified and notification activated

B. The HVAC shutdown is not triggered by pull stations — only duct detector alarms trigger shutdown

C. The HVAC shutdown function failed for pull station alarms and must be investigated and corrected

D. The HVAC system shutdown requires a 60-second delay after pull station activation before triggering

65. A fire alarm technician is performing semiannual testing on waterflow switches in a building with a dry-pipe sprinkler system. The technician opens the inspector's test connection and observes that water does not flow immediately. Why does water flow take longer in a dry-pipe system?

A. Dry-pipe systems require a manual valve to be opened before water enters the piping

B. The air pressure in the dry system must drop sufficiently to trip the dry-pipe valve before water flows

C. Dry-pipe waterflow switches have a built-in retard delay that is longer than wet-pipe switches

D. The water supply pressure is lower in dry-pipe systems requiring more time to reach the test connection

66. A fire alarm system generates a trouble signal that reads "BATTERY CHARGER FAULT." The technician measures the battery voltage and reads 22.1 VDC with the charger connected. The AC power supply to the panel reads 120 VAC. What is the most likely condition?

A. The charger circuit has failed and the batteries are discharging under standby load without being recharged

B. The AC power voltage is marginal and the charger cannot produce adequate output

C. The batteries have internally failed and are preventing the charger from reaching float voltage

D. The panel's power supply board has a fault that affects both the charger and the SLC output

67. A fire alarm technician is testing an addressable smoke detector at address 055. The panel displays "ALARM — SMOKE DETECTOR — ADDRESS 055 — MECHANICAL ROOM." The technician is actually testing a detector physically located in a classroom. How many programming errors are present?

A. One error — only the address number is incorrect since the detector is in the wrong room

B. Two errors — the device type is correct but the address and location are both wrong

C. No errors — the panel is displaying data from a different detector that activated simultaneously

D. One error — only the location descriptor is incorrect for address 055

68. A fire alarm technician is troubleshooting a NAC circuit that shows "OPEN — NAC 4" on the panel. The technician measures the resistance at the NAC 4 panel terminals and reads infinite ohms. Using the divide-and-conquer method, the technician disconnects the circuit at the midpoint. The panel-side half reads 0.6 ohms. The field-side half reads infinite ohms. What has been determined?

A. The panel-side half has a short circuit that is masking the actual fault location

B. The open circuit is on the field side — between the midpoint and the end of the circuit

C. Both halves have faults because neither reads the expected EOLR value

D. The panel's NAC output board is defective because the panel-side half shows abnormally low resistance

69. During a fire alarm inspection, the technician discovers that a building tenant has installed a drop ceiling below the original ceiling in an office. The original smoke detector remains on the original ceiling above the new drop ceiling. The detector is now concealed and inaccessible without lifting tiles. What must be documented?

A. The detector location is acceptable because it remains mounted on the original ceiling surface

B. The detector is functioning normally and the drop ceiling does not affect its fire detection capability

C. The detector must be relocated below the new drop ceiling to remain in the occupied airspace

D. The drop ceiling creates an additional concealed space that may also need its own detection

70. A fire alarm technician measures the voltage at a smoke detector location on an addressable SLC and reads 18.2 VDC. The panel manufacturer specifies an SLC operating range of 24 to 32 VDC. What does this below-range reading indicate?

A. Excessive voltage drop on the SLC due to circuit length, device loading, or a wiring resistance issue

B. The panel's SLC output has been reprogrammed to a lower voltage for energy conservation

C. The reading is normal for a device at the far end of the SLC loop during standby operation

D. The detector at this location is drawing excessive current pulling the SLC voltage below range

71. A fire alarm technician is testing a voice evacuation system during annual testing. The pre-recorded message plays correctly through all speakers except one speaker on the fourth floor that produces no sound. The technician checks the amplifier assignment and confirms the fourth-floor amplifier is operating. What should be investigated?

A. The pre-recorded message file for the fourth floor because it may be corrupted in the audio module

B. The speaker circuit wiring and the individual speaker at the silent location for a connection fault

C. The panel's SLC communication with the fourth-floor voice evacuation devices

D. The firefighter telephone circuit because it shares infrastructure with the speaker system

72. A fire alarm system has two SLC loops. The panel displays "SLC 2 — HIGH CURRENT" trouble. This trouble appeared after a renovation that added 25 new devices to SLC 2, bringing the total to 155 devices on a loop rated for 159 maximum. What is the most likely cause?

A. One of the 25 new devices has an internal fault drawing excessive current from the SLC

B. The panel's SLC 2 output board needs a firmware update to support the additional device count

C. The total standby current of 155 devices exceeds the SLC's maximum rated current capacity

D. The cumulative current draw of all 155 devices is approaching or exceeding the SLC's current rating

73. A fire alarm technician discovers during inspection that the fire alarm panel is located in a room that is used for general storage. Boxes are stacked against the wall on both sides of the panel, leaving only 18 inches of clear space in front of the panel. What code requirement is being violated?

A. NEC Article 110 working clearance requirements that mandate minimum clear space for equipment access

B. NFPA 72 requires fire alarm panels to be in rooms dedicated exclusively to fire protection equipment

C. The building code prohibits storage within 10 feet of any fire alarm system component

D. The OSHA requirement for 36 inches of clearance around all wall-mounted life safety equipment

74. Per NFPA 72 Table 14.4.3.2, smoke detectors must be functionally tested at what frequency?

A. Annually using an approved smoke aerosol applied directly to the detector sensing chamber

B. Quarterly using either smoke aerosol or the panel's remote test function

C. Semiannually using an approved smoke aerosol or calibrated test source

D. Monthly using the detector's built-in magnetic test switch for expedient verification

75. A fire alarm technician is testing a conventional fire alarm system. The technician activates a smoke detector on Zone 3. The panel correctly displays "ALARM — ZONE 3." The technician notices that the panel also displays "TROUBLE — ZONE 5" simultaneously. Zone 5 had no active troubles before the test. What might cause a trouble to appear on an unrelated zone during testing?

A. The alarm current drawn by Zone 3 is causing a voltage drop that affects Zone 5 supervision

B. A wiring error connects Zone 3 and Zone 5 together at a shared junction box

C. The panel's processor is overloaded by the alarm condition and generating false troubles

D. Zone 5 has an intermittent fault that coincidentally appeared at the same time as the test

76. A fire alarm technician is testing the fire alarm system's communication link to the supervising station. The panel transmits a test alarm signal. The station confirms receipt but reports the signal identified the building as "Account 4478" when the correct account is "Account 4487." What must be corrected?

A. The station's database must be updated to match the panel's account number

B. The panel manufacturer must issue a firmware update to correct the account number format

C. The telephone line must be checked for cross-talk that is corrupting the account identifier

D. The panel's communication module must be reprogrammed with the correct account number

77. A fire alarm technician discovers that a building's fire alarm system has not had sensitivity testing performed on any smoke detectors since installation 4 years ago. Per NFPA 72, how many sensitivity tests should have been completed by this point?

A. Two tests — one within the first year and one at the third year per the alternate-year schedule

B. Four tests — one per year for each year since installation

C. One test — only the initial test within the first year after installation

D. No tests are due because sensitivity testing begins at year 5 for all detector types

78. A fire alarm technician is testing the door holder release function during annual testing. The technician activates a smoke detector near a fire-rated corridor door held open by a magnetic holder. The panel alarms correctly and the notification appliances activate. The magnetic holder releases and the door closes completely and latches. After the technician resets the system, the magnetic holder re-energizes and the door opens. Is this complete sequence acceptable?

A. No, the door should remain closed until building management physically props it open again

B. Yes, the complete sequence — release on alarm, close and latch, re-energize on reset — is correct

C. No, the magnetic holder should not re-energize until the AHJ confirms the all-clear signal

D. Yes, but only if the door has a UL-listed door closer with an adjustable closing speed

79. During annual testing, a fire alarm technician discovers that the panel's AC power indicator is illuminated but the event log shows "AC POWER FAILURE" trouble signals occurring every night between 11 PM and 5 AM. The building has no scheduled power shutdowns. What should be investigated?

A. The panel's AC power monitoring circuit because it may have a temperature-sensitive fault

B. The panel's internal clock because the event timestamps may be inaccurate

C. Whether a building energy management system or timer is interrupting the fire alarm circuit at night

D. The utility company's overnight voltage levels because voltage drops may trigger the trouble

80. A fire alarm technician is performing a visual inspection and discovers that two smoke detectors on a corridor ceiling have been painted the same color as the ceiling by a painting contractor. What must be documented?

A. The paint does not affect detector operation and can remain as long as the devices test correctly

B. The painting contractor should be warned not to paint future detectors during the next renovation

C. The painted detectors should be cleaned with an approved solvent to restore original appearance

D. The painted detectors must be replaced because paint can obstruct sensing chambers and reduce performance

81. A fire alarm system in a warehouse has been generating nuisance alarms from smoke detectors approximately twice per month. Each alarm occurs during forklift operations when dust and cardboard debris are stirred up. The building owner requests that the detectors be removed to eliminate the nuisance alarms. What is the correct response?

A. Replace the smoke detectors with heat detectors appropriate for the warehouse environment

B. Remove the detectors per the owner's request and document the change on the as-built drawings

C. Increase the detector sensitivity thresholds in the panel to reduce nuisance alarm frequency

D. Install protective covers over each detector to filter out dust particles from the sensing chambers

82. Per NFPA 72, what is the maximum time delay permitted before the fire alarm panel must annunciate a trouble signal for loss of primary AC power?

A. Immediately upon any interruption lasting more than 10 seconds

B. Within 1 hour of sustained primary AC power loss to the panel

C. Within 3 hours of primary AC power loss per NFPA 72 Section 10.6.9

D. Within 30 minutes of primary AC power loss for panels in occupied buildings

DOMAIN 1.3 — SUBMITTAL PREPARATION AND SYSTEM LAYOUT (Questions 83–85)

83. A fire alarm technician reviews a battery calculation on a shop drawing. The calculation shows: standby current = 0.48A, alarm current = 3.6A, standby time = 24 hours, alarm time = 5 minutes, safety factor = 20%. The drawing specifies 18 Ah batteries. Is this battery size adequate?

A. No, the calculation yields approximately 14.2 Ah which is less than the 18 Ah specified

B. Yes, the calculation yields approximately 14.2 Ah and the 18 Ah batteries exceed the minimum

C. No, the calculation yields approximately 24 Ah which exceeds the 18 Ah specified

D. Yes, but only if the building has a qualifying emergency generator reducing the standby requirement

84. A fire alarm floor plan uses a scale of 1/4 inch = 1 foot. Two smoke detectors are shown 7.5 inches apart on the drawing. What is the actual distance between the detectors in the field?

A. 15 feet which is less than the required 30-foot maximum spacing between detectors

B. 22.5 feet which is within the 30-foot maximum spacing requirement

C. 37.5 feet which exceeds the 30-foot maximum spacing and requires an additional detector

D. 30 feet which is exactly at the maximum permitted spacing per the detector listing

85. A fire alarm riser diagram shows a fire alarm control panel on the first floor connected to two remote power supply/NAC expander panels on the third and fifth floors. What is the purpose of these remote panels?

A. They provide additional NAC output capacity and power for notification appliances on upper floors

B. They serve as backup fire alarm control panels in case the main panel fails

C. They provide SLC communication amplification for devices far from the main panel

D. They convert the main panel's DC output to AC for powering notification speakers

LEVEL I — SIMULATION EXAM 9: ANSWER KEY AND EXPLANATIONS

1. B — NFPA 72 Section 17.7.3.2.4 addresses beam and joist construction. At 4 inches deep, coffers are at the threshold where beam pocket spacing rules begin to apply. Coffers deeper than 4 inches can trap smoke and prevent it from traveling freely to adjacent detectors at standard spacing. The technician must evaluate the specific coffer configuration against NFPA 72 requirements rather than assuming smooth-ceiling spacing.

2. C — While some addressable SLC protocols permit T-tap wiring, excessive branch taps create impedance discontinuities and signal reflections that can degrade the quality of digital communication between devices and the panel. These reflections cause polling errors, communication timeouts, and unreliable device responses. The panel manufacturer's guidelines specify the maximum number and length of T-tap branches permitted.

3. A — The reading of 15.2 kΩ is significantly higher than the specified 4.7 kΩ EOLR. Since the EOLR is confirmed as installed, the additional resistance is likely caused by a device with an internal contact issue — such as a partially open detector base contact or a corroded terminal — that is adding resistance to the total circuit path. Each connection point on the IDC contributes to the total measured resistance.

4. D — Batteries connected in series add their voltages while the ampere-hour capacity remains equal to a single battery. Two 12V batteries in series produce 24 VDC (12 + 12 = 24) with 33 Ah capacity. Parallel connection would maintain 12V and double the capacity to 66 Ah, which does not meet the 24 VDC voltage requirement.

5. B — NEC Article 110.26 requires adequate working clearance in front of electrical equipment for safe access during installation, maintenance, and emergency operations. A door that blocks access to the panel when open violates working clearance requirements. The panel must be relocated, the door swing changed, or the door modified to prevent obstruction of the required clear space.

6. A — Project specifications are contractual documents that define the requirements the contractor must follow. Even if the code does not require conduit in a non-plenum ceiling space, the project specification requiring conduit installation is a binding contractual obligation. If the technician believes the specification is excessive, the proper course is to submit a formal request for interpretation or clarification — not to unilaterally ignore the requirement.

7. D — NFPA 72 Section 17.6.3.1.3 requires heat detectors to have a rated activation temperature at least 20°F above the maximum expected ceiling temperature in the protected area. This thermal

margin prevents nuisance activations caused by normal temperature variations while ensuring the detector responds to abnormal fire-related temperature increases.

8. C — NFPA 72 requires visible notification in sleeping rooms to alert hearing-impaired occupants who cannot hear audible notification. The visible appliance must have a candela rating appropriate for the room dimensions per Table 18.5.5.5.1(a). A 12 × 14 foot room falls within the 15 cd coverage area for a single wall-mounted strobe. Both audible (75 dB at pillow) and visible notification are required in sleeping areas.

9. B — Two 90-degree bends = 180 degrees. Two 45-degree bends = 90 degrees. Total = 180 + 90 = 270 degrees. This is within the 360-degree maximum between pull points, leaving 90 degrees available for any additional bends needed along the remainder of the run. Every bend regardless of angle counts individually toward the cumulative maximum.

10. D — After connecting the batteries, the technician must verify the total voltage across the series pair at the panel's battery terminals. A reading of approximately 24–27 VDC confirms the batteries are connected correctly with proper polarity and are delivering the expected voltage. This verification catches reversed polarity, loose connections, and defective batteries before the system is placed in service.

11. A — NFPA 72 Section 17.7.3.2.3 requires smoke detectors on sloped ceilings to be installed within 3 feet of the peak, where smoke accumulates first. Smoke rises along the ceiling slope following the natural convection path and collects at the highest point. The detector must be positioned near this collection point for the earliest possible detection.

12. C — Mechanical rooms containing gas-fired furnaces and water heaters create conditions — including combustion byproducts, radiant heat, and dust — that would cause smoke detector nuisance alarms. Heat detection is the appropriate technology because it responds only to abnormal temperature increases and is not affected by the normal airborne particles and gases present in these environments.

13. B — A stairwell serving multiple floors should have its own dedicated fire alarm zone rather than being combined with either floor's zone. This allows the fire alarm system to specifically identify when an alarm originates in the stairwell — a critical evacuation route — separate from the floor zones. Clear zone identification helps responders understand exactly where the alarm condition exists.

14. D — Wire resistance = 450 feet × (3.14 / 1000) = 1.413 ohms. V_drop = 2.4 amps × 1.413 ohms = 3.39 volts. Voltage at farthest device = 24 − 3.39 = 20.61 VDC. This is above the typical 16 VDC minimum listed operating voltage with a 4.61-volt margin, confirming the circuit design is acceptable.

15. A — Tapcon screws or concrete expansion anchors are specifically designed for mounting equipment directly to poured concrete surfaces. They provide reliable pullout strength in concrete

without requiring through-penetration. Wood screws with plastic anchors are not rated for the sustained support of ceiling-mounted devices, and self-adhesive mounting tape is not an approved mounting method for fire alarm devices.

16. C — At 35 feet, smoke rising from a fire at the floor level may cool and decelerate before reaching the ceiling-mounted detectors. The smoke can stratify — forming a layer at a height below the detector — because the smoke's buoyancy decreases as it cools during its long vertical rise. Alternative detection methods such as beam detectors at multiple elevations or aspirating systems should be evaluated.

17. B — The panel displays "HEAT DETECTOR" when address 087 is actually a smoke detector (device type error), and displays "KITCHEN" when address 087 is physically in Conference Room A (location descriptor error). Both the device type and location descriptor programmed for address 087 are incorrect and must be corrected in the panel programming.

18. A — OSHA and standard ladder safety practices prohibit standing on the top two rungs of a stepladder. The elevated center of gravity on the top rungs creates an unstable condition with a high risk of tipping and falling. The highest permissible standing position on a stepladder is the second rung from the top, and the technician should maintain three points of contact at all times.

19. D — Fluorescent light ballasts — particularly magnetic ballasts — can emit electromagnetic interference that affects low-voltage fire alarm signaling circuits. While the interference may not prevent system operation, it can cause communication errors, nuisance trouble signals, or intermittent device polling failures on addressable SLC circuits. Maintaining adequate separation or using shielded cable reduces this risk.

20. B — The fundamental advantage of Class A wiring is pathway diversity — the outgoing and return paths should follow physically separate routes so that a single event cannot destroy both paths. When both paths share the same conduit — even for a short section — a fire or physical damage at that location eliminates both communication paths simultaneously, defeating the redundancy that Class A is designed to provide.

21. D — NFPA 72 Section 17.14 requires manual fire alarm stations to be installed within 5 feet of each exit doorway, mounted at 42–48 inches above the finished floor. Pull stations are typically mounted inside the building adjacent to the exit door, where evacuating occupants pass the device on their way out. The placement is on the interior side of the exit, not on the exterior loading dock.

22. C — NFPA 72 Section 18.4.4.1 requires audible notification to be at least 15 dB above the average ambient noise level. With a 92 dB average ambient during production, the minimum required notification level is 92 + 15 = 107 dB. This extremely high requirement in industrial environments often necessitates supplemental visible notification because achieving 107 dB throughout a manufacturing plant is technically challenging.

23. A — VoIP telephone service relies on network equipment — routers, switches, and modems — that requires AC power to operate. During a power outage, VoIP service typically fails unless the network equipment is backed by a UPS or generator. A DACT connected to a VoIP line may be unable to transmit alarm signals during a power outage, which is precisely when fire alarm communication is most critical.

24. C — Server rooms and data centers require detection in multiple planes for comprehensive coverage. Above the ceiling tiles, cable trays and infrastructure can overheat. Below the raised access floor, power and data cables represent a significant fire risk. Both locations require sampling pipes or detection devices. NFPA 75 and project specifications typically mandate this multi-level detection approach.

25. B — Firestopping is required only at penetrations through fire-rated wall and floor assemblies. A 4-inch concrete wall with no fire resistance rating designation does not require firestopping at conduit penetrations because there is no fire rating to maintain. However, if the wall is later assigned a fire rating or the building code requires it, firestopping would become necessary.

26. A — Megger readings of 450 MΩ between each SLC conductor and ground indicate excellent insulation integrity with no compromised insulation or unintended paths to ground. Healthy fire alarm circuit insulation should read in the hundreds of megohms or higher. These readings confirm the wiring is free from insulation damage that could cause ground faults after the system is energized.

27. D — When fire alarm cable passes through a core-drilled hole in a concrete block wall, the rough and sharp edges of the hole can damage the cable jacket and conductor insulation during installation or over time due to building movement. A listed bushing or grommet must be installed in the hole to protect the cable from the sharp concrete edges, preventing insulation damage that could lead to ground faults.

28. C — NFPA 72 Section 23.8.5.4 requires that fire alarm zones not cross fire-rated walls because these walls create separate fire compartments. Zone 7 devices must be entirely within the new tenant space and must not extend into the adjacent tenant space on the other side of the 1-hour demising wall. This ensures that alarm zone identification correctly indicates which fire compartment contains the alarm.

29. B — Per NFPA 72 Table 18.5.5.5.1(a), a room measuring 24 × 24 feet exceeds the 20 × 20 foot maximum coverage of a 15 cd wall-mounted strobe but falls within the 28 × 28 foot maximum coverage of a 30 cd strobe. The minimum candela rating for this room size with a single wall-mounted visible appliance is 30 cd.

30. A — GFCI protection can trip and disconnect the fire alarm panel's primary power during ground fault conditions that do not represent a fire hazard — such as moisture in the building's electrical system or a ground fault on a non-fire-alarm circuit sharing the same grounding system. NEC

Article 760 and NFPA 72 prohibit GFCI and AFCI protection on fire alarm dedicated circuits to prevent this unintended power disconnection.

31. C — Minor ceiling textures with peaks of approximately 1/4 inch do not significantly affect smoke detector placement or performance. The textured surface does not create dead air spaces or obstruct smoke entry into the detector. Standard smooth-ceiling spacing and placement rules apply. Only significant ceiling features — such as beams deeper than 4 inches, coffers, or peaked construction — require placement adjustments.

32. D — An enclosed mezzanine with its own walls and ceiling is an independently occupied level that functions as a separate fire compartment. It should be treated as a separate fire alarm zone because alarm zone identification must allow responders to determine the specific level where an alarm originates. Combining it with another floor's zone would create ambiguity in alarm location identification.

33. B — A control module receives commands from the panel over the SLC and activates its output — typically a set of dry relay contacts. When the panel detects a condition requiring HVAC shutdown, it sends a command to the control module, which closes its contacts to activate the 120 VAC relay coil. The control module provides the interface between the panel's low-voltage SLC and the conventional relay circuit.

34. A — Factory-punched knockouts in metal studs are manufactured with smooth, rolled edges specifically designed to allow cable passage without insulation damage. Unlike field-drilled holes that may have sharp burrs, factory knockouts provide adequate protection for cable jackets. Additional bushings or grommets are typically not required at factory-punched knockout openings with properly rolled edges.

35. C — Tall merchandise displays near the ceiling can obstruct the horizontal travel of smoke along the ceiling surface to reach detectors. While ceiling-mounted detectors are above the displays, smoke traveling horizontally at ceiling level may be blocked or redirected by displays that extend close to the ceiling. The detector layout must account for any obstructions that could create detection gaps.

36. B — Thick reinforced concrete walls significantly attenuate cellular radio signals, potentially reducing signal strength inside the building to a level that prevents reliable communication with the cellular network. The technician should measure cellular signal strength at the communicator location and, if insufficient, install an external antenna routed to the building exterior or consider an alternative communication technology.

37. D — The manufacturer's installation instructions specify that the sampling tube must span the full width of the duct — 60 inches in this case. A 36-inch tube would leave 24 inches of the duct cross-section unsampled, creating a gap where smoke could pass undetected. The 60-inch tube must be used to ensure air is sampled across the entire duct width per the manufacturer's specifications.

38. A — NFPA 72 and ADA requirements address notification coverage in alcoves and recesses. Alcoves deeper than a specified threshold — typically referenced as 20 feet deep or requiring analysis based on the specific configuration — may create areas where corridor-mounted strobes cannot provide adequate visible coverage. The 4-foot-deep alcoves should be evaluated to determine if supplemental visible appliances are needed.

39. C — Eight 18 AWG THHN conductors in a 1/2-inch EMT conduit is well within the maximum of 22 permitted by NEC Annex C, Table C1. The installation uses only 36% of the maximum conductor count. The 40% conduit fill limit from NEC Chapter 9, Table 1 is also satisfied. The installation is fully acceptable.

40. B — NEC Article 760 requires that fire alarm circuits be separated from other building systems unless specific exceptions apply. Fire alarm and security system circuits from different panels cannot share the same conduit because they are separate systems with separate power sources. Each panel must have its own dedicated conduit entries and circuit pathways.

41. A — Zone assignment for addressable devices is determined by the device's physical location within the building — specifically its floor, its position relative to fire barriers, and the fire alarm zone boundaries established by the system design. Zone assignments ensure that alarm indications accurately identify the fire compartment where the device is located so responders can quickly reach the alarm origin.

42. A — Installing the EOLR at the second detector instead of the last device means the panel only supervises the circuit from the panel to the second detector. The wiring and devices beyond the EOLR — detectors 3 and 4 — are unsupervised. An open circuit, short, or device failure beyond the EOLR location will not be detected by the panel, leaving that portion of the circuit unmonitored.

43. B — Class A NAC circuits require a return path from the last appliance back to the panel, creating a loop. This return path ensures that if a single open fault occurs on the outgoing path, power can still reach all appliances via the alternate return path. Class B circuits have only a single path terminating with an EOLR, providing no alternate path for fault tolerance.

44. A — ETL (Intertek) is not the same as UL, and when a specification explicitly states "UL Listed," it requires the UL mark specifically. However, both UL and ETL are nationally recognized testing laboratories (NRTLs) per OSHA. Many specifications use "UL Listed" generically to mean "listed by a recognized NRTL." The technician should clarify with the specifying engineer or AHJ whether ETL listing satisfies the specification's intent.

45. B — NEC Article 760 requires both a lock-on device and permanent identification on the fire alarm panel's dedicated branch circuit breaker. The small adhesive label may satisfy the identification requirement depending on its permanence, but a lock-on device is a separate physical requirement that prevents the breaker from being accidentally turned off. The lock-on device must be added regardless of the label.

46. D — Open-air parking garage levels with natural ventilation typically use heat detectors because vehicle exhaust and environmental exposure make smoke detectors impractical due to constant nuisance alarms. Enclosed lower levels may use either smoke or heat detectors depending on the specific environmental conditions, ventilation configuration, and the project specifications.

47. B — Coordinating testing with nursing staff is essential in a 24-hour hospital environment. The system must be placed on test status to prevent building-wide alarm activation that could alarm patients, interfere with medical procedures, and trigger unnecessary emergency responses. Staff must be informed of the testing schedule so they can manage patient notification and maintain care continuity.

48. A — The panel's temporal pattern generator produces the three-pulse pattern that all devices on the NAC reproduce. When all other devices on the same circuit produce the correct pattern but one device produces a continuous tone, the fault is internal to that specific device — its temporal pattern circuitry has failed. The device must be replaced because it cannot produce the code-required evacuation signal.

49. D — When the panel correctly identified the alarm, activated notification on the correct floors, and transmitted the signal to the supervising station — but the elevator recall relay did not activate — the programming is the most likely cause. The panel processed all other outputs correctly but did not trigger the elevator recall. The panel programming likely does not link the elevator recall output to the third-floor detector zone.

50. C — A ground fault that appears specifically when a bathroom horn/strobe is reconnected strongly suggests moisture at that device location. Bathroom environments with high humidity, steam from showers, and occasional water exposure can compromise wiring insulation at the device box, creating an intermittent path between a conductor and the grounded metal box. The wiring and connections at the bathroom device location must be inspected and repaired.

51. B — Two elevators recalled correctly, confirming the fire alarm panel sent the recall signal and the interface is functioning for those units. The third elevator's failure to recall is a deficiency that must be documented and investigated. The cause may be in the wiring between the control module and the third elevator controller, the elevator controller itself, or a mechanical elevator fault.

52. D — Any unauthorized modification to a smoke detector — including homemade covers, containers, or filters — renders the detector non-compliant with its listing. The plastic container alters the airflow characteristics of the sensing chamber, potentially delaying or preventing smoke entry. Only manufacturer-approved protective covers designed for the specific detector model are acceptable. The unauthorized modification must be removed.

53. A — NFPA 72 Table 14.4.3.2 requires emergency control functions — including elevator recall, HVAC shutdown, door release, and all other programmed interfaces — to be functionally tested annually. Each interface must be physically verified: the elevator must actually recall, the AHU must shut down, and the doors must release and close.

54. B — The ground fault cleared with the full SLC disconnected. It remained clear with only the first quarter connected. It returned when the second quarter (devices 031–060) was added. This confirms the fault is on the second quarter of the SLC loop — between devices 031 and 060. The technician should continue dividing this section to narrow the fault location.

55. D — Dust stirred up from gymnasium floor activities — including ball impacts, running, and equipment movement — sends particles airborne that can enter smoke detector sensing chambers and trigger nuisance alarms. This is a common problem in gymnasiums and similar athletic facilities. Heat detectors or multi-criteria detectors may be more appropriate for this high-activity environment.

56. C — NFPA 72 requires tamper switches to generate a supervisory signal within two revolutions of the valve wheel from fully open, or the equivalent travel for butterfly valves. If the switch only activates when the valve is fully closed — requiring more movement than the standard allows — the switch adjustment is incorrect. The switch must be repositioned to detect partial closure within the required travel distance.

57. A — After a brief discharge period during the power transfer test, the batteries will read slightly below their normal float charge voltage. The charger has been reactivated (indicator is illuminated) and will gradually restore the batteries to their full float voltage — typically 27.0–27.6 VDC — over the next several hours. The 25.4 VDC reading during the recovery period is normal and expected.

58. B — Both AFCI and GFCI protection are prohibited on the fire alarm panel's dedicated branch circuit per NEC Article 760 and NFPA 72 Section 10.6.5. Either protective device can trip during conditions unrelated to fire, disconnecting primary power from the panel. The combination AFCI/GFCI breaker must be replaced with a standard thermal-magnetic breaker with a lock-on device.

59. D — The panel processed the alarm correctly and activated notification, confirming the alarm processing is functional. The supervising station received a signal but could not identify it, indicating the panel's communication module is transmitting with incorrect account information, an incorrect event code format, or a protocol mismatch that prevents the station from properly processing the received data.

60. C — NFPA 72 Section 18.5.5.5.7 requires all visible notification appliances within the same field of view to flash in synchronization. Two strobes 90 feet apart in the same corridor are clearly visible from the same location. Flashing 0.3 seconds apart violates the synchronization requirement and creates a disorienting visual effect that can be harmful to photosensitive individuals.

61. B — The Record of Completion must be updated whenever the fire alarm system is modified per NFPA 72 Section 7.8. Two renovations adding 30 devices and modifying programming represent

significant system changes that must be documented. The Record of Completion is not a one-time document — it must reflect the current system configuration throughout the system's service life.

62. A — The batteries ended the load test at 24.4 VDC, which is well above the manufacturer's minimum acceptable end-voltage of 20.4 VDC. The batteries demonstrated they can sustain the full alarm load with a comfortable 4.0-volt margin above the minimum threshold. This performance confirms adequate battery capacity.

63. D — "Device Dirty" trouble signals indicate smoke detectors have accumulated contamination in their sensing chambers that is causing sensitivity drift. The detectors must be cleaned per the manufacturer's procedures — typically removing the sensing chamber and using compressed air or the manufacturer's cleaning method — and retested to verify sensitivity returns to the acceptable range. Detectors that cannot be restored must be replaced.

64. C — The sequence of operations requires HVAC shutdown for all pull station alarms. The pull station alarm was correctly identified and notification activated, but the HVAC shutdown function did not operate. This is a deficiency that must be investigated — the cause may be a programming error, a control module fault, or a wiring issue between the control module and the HVAC equipment.

65. B — In a dry-pipe sprinkler system, the piping is filled with pressurized air rather than water. When the inspector's test valve is opened, the air must escape and the system air pressure must drop enough to trip the dry-pipe valve before water enters the piping. This process takes additional time compared to wet-pipe systems where water is immediately available at the test connection.

66. A — The panel displays "BATTERY CHARGER FAULT" and the batteries read 22.1 VDC — well below the normal float charge range of 27.0–27.6 VDC — while 120 VAC is present at the panel's AC input. The charger has failed and is not converting AC power to the DC charging voltage. The batteries are slowly discharging under standby load and will eventually fail if the charger is not repaired.

67. D — The panel displays the correct device type (smoke detector) and the correct address (055), but the location descriptor reads "MECHANICAL ROOM" when the detector is physically installed in a classroom. Only the location descriptor is incorrect — it must be updated in the panel programming to show the correct location where address 055 is actually installed.

68. B — The panel-side half reads 0.6 ohms — normal wire resistance confirming continuity. The field-side half reads infinite ohms — confirming an open circuit. The open fault is located on the field side of the circuit between the midpoint and the end of the NAC run. The technician should divide the field side again to narrow the fault location further.

69. C — Installing a drop ceiling below the original ceiling moves the occupied airspace boundary down to the new ceiling level. The smoke detector on the original ceiling above the drop tiles is now in a concealed space that is separated from the room by the tiles. Smoke from a fire in the

room may not reach the detector above the tiles in time for effective detection. The detector must be relocated below the new ceiling. Additionally, the concealed space above the drop ceiling may also require detection depending on its characteristics.

70. A — A voltage reading of 18.2 VDC on an SLC with a specified operating range of 24–32 VDC indicates excessive voltage drop. Causes include the SLC run being too long, too many devices drawing current from the loop, high-resistance connections along the circuit, or undersized conductors. The low voltage can cause communication failures and unreliable device operation at this location.

71. B — The amplifier serving the fourth floor is confirmed operational, and all other speakers work. A single silent speaker with a functioning amplifier points to a fault between the amplifier output and that specific speaker — either in the speaker circuit wiring (an open conductor or disconnected splice) or in the speaker itself (a failed driver or disconnected internal connection). The speaker and its circuit wiring must be inspected.

72. D — Adding 25 devices brought SLC 2 to 155 devices — approaching the 159-device maximum. While the device count is within limits, the cumulative standby current draw of 155 devices may be approaching or exceeding the SLC's maximum rated current capacity. Each device draws a small amount of standby current, and 155 devices collectively may exceed the loop's current budget. The total SLC current draw must be verified against the manufacturer's specifications.

73. A — NEC Article 110.26 requires minimum working clearances in front of electrical equipment — typically 30 inches wide and 36 inches deep for equipment operating at 0–150 VAC. Eighteen inches of clearance with boxes stacked on both sides violates these requirements. The storage must be removed and the required clear space maintained to allow safe access for installation, maintenance, and emergency operations.

74. C — NFPA 72 Table 14.4.3.2 requires smoke detectors to be functionally tested semiannually using an approved smoke aerosol or calibrated test source. Each test must verify that the detector activates and that the fire alarm system responds correctly — including panel identification, notification activation, and signal transmission. Semiannual testing ensures detectors remain functional between annual comprehensive inspections.

75. B — A trouble signal appearing on an unrelated zone simultaneously with an alarm test on a different zone may indicate a wiring error where the two zones are inadvertently connected at a shared junction box. This cross-connection can cause electrical interference between zones during alarm conditions. The wiring at junction boxes common to both zones should be inspected for incorrect connections.

76. D — The panel's communication module is transmitting account number 4478 instead of the correct 4487. This is a programming error in the panel's communicator settings. The account number must be corrected in the communication module programming to ensure the supervising station correctly identifies the building when alarm, trouble, or supervisory signals are received.

77. A — NFPA 72 Table 14.4.3.2 requires the first sensitivity test within one year of installation, then every alternate year thereafter. For a system installed 4 years ago, two tests should have been completed — one at year 1 and one at year 3. The system is out of compliance, and the overdue year-3 test must be performed immediately.

78. B — The complete sequence is correct and expected: the magnetic holder releases during alarm allowing the door to close and latch (providing fire compartmentalization), and then re-energizes when the system is reset, returning the door to its normal held-open position. This is the standard operating cycle for magnetic door holder release interfaces.

79. C — AC power loss trouble signals occurring every night at the same time — when the building has normal utility power — strongly suggests a scheduled building system is interrupting the fire alarm panel's branch circuit during off-peak hours. An energy management system, lighting timer, or cleaning crew switching off breakers at a scheduled time is the most likely cause. The fire alarm panel's dedicated circuit must be unswitched.

80. D — Painted smoke detectors must be replaced because paint can obstruct the sensing chamber openings, block light paths in photoelectric detectors, and alter the detector's calibrated response characteristics. Even if the devices activate during testing, their performance may be degraded below the manufacturer's listed specifications. The painted detectors must be replaced with new units.

81. A — Removing smoke detectors eliminates fire detection coverage and violates NFPA 72 requirements. The correct solution is to replace the smoke detectors with heat detectors that are appropriate for the dusty warehouse environment. Heat detectors are not affected by airborne dust and particles. The detection technology should match the environment while maintaining code-required coverage.

82. C — NFPA 72 Section 10.6.9 permits a maximum delay of 3 hours before annunciating an AC power failure trouble signal. This delay prevents nuisance trouble signals during brief power interruptions such as momentary outages, utility switching events, and short-duration voltage dips that resolve before the building's fire protection is meaningfully affected.

83. B — Standby energy = 0.48 × 24 = 11.52 Ah. Alarm energy = 3.6 × 0.083 = 0.30 Ah. Subtotal = 11.82 Ah. With 20% safety factor: 11.82 × 1.20 = 14.18 Ah. The calculated minimum is approximately 14.2 Ah. The specified 18 Ah batteries exceed this minimum by approximately 3.8 Ah, providing adequate capacity with margin.

84. D — At a scale of 1/4 inch = 1 foot, each inch on the drawing represents 4 feet in the field. The detectors are 7.5 inches apart on the drawing: 7.5 × 4 = 30 feet actual distance. This spacing is exactly at the maximum permitted 30-foot listed spacing for spot-type smoke detectors on a smooth flat ceiling.

85. A — Remote power supply/NAC expander panels provide additional NAC output capacity and power for notification appliances on upper floors. In multi-story buildings, the main panel's NAC outputs may not have sufficient current capacity or the wire runs may be too long for acceptable voltage drop. Remote panels provide local NAC power near the appliances they serve, reducing voltage drop and distributing the notification power load.